Pit No. 1 at Blairton mine.

CANADA
DEPARTMENT OF MINES
HON. LOUIS CODERRE, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER;
MINES RRANCH
EUGENE HAANEL, PH.D., DIRECTOR.

Magnetite Occurrences
Along the
Central Ontario Railway

BY

E. LINDEMAN

OTTAWA
GOVERNMENT PRINTING BUREAU
1913

No. 184

LETTER OF TRANSMITTAL

To Dr. Eugene Haanel,

Director of Mines Branch,

Department of Mines, Ottawa.

Sir,—

I beg to submit herewith the following report on the magnetite occurrences along the Central Ontario railway.

I have the honor to be,

Sir,

Your obedient servant,

(Signed) **E. Lindeman.**

Ottawa, May 10, 1912.

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MAGNETITE OCCURRENCES ALONG THE CENTRAL ONTARIO RAILWAY

BY

E. Lindeman

Introductory.

An investigation of the magnetite deposits along the Central Ontario railway was commenced by the Mines Branch in 1905, when a magnetometric survey of the Belmont iron mine was made by B. F. Haanel.[1] During the summer of 1908, H. Frechette made a magnetometric survey of several ore deposits near Bessemer and Hermon,[2] and in 1909 Mr. Haanel again visited the district and examined some of the deposits along the railway.[3] During the last part of the field season of 1910 a magnetometric survey was made by the writer, assisted by W. M. Morrison, of No. 4 deposit at Bessemer. In addition to this a topographical and geological map, including all the ore deposits at Bessemer, was made. During the summer of 1911 the field work was continued and visits were made to as many as possible of the reported deposits of magnetite along the railway. The points visited were as follows:—

Blairton mine	Lots 7 and 8	Con.	I	Belmont township.	
Belmont mine	Lot 19	"	I	"	"
Maloney mine	Lot 18	"	I	Marmora	"
	Lots 12, 13, and 14	"	I	"	"
	Lot 17	"	II	"	"
Seymour mine	Lot 11	"	V	Madoc	"
St. Charles mine	Lot 19	"	XI	Tudor	"
Horton mine	Lot 57	Hastings Rd.		"	"
	Lot 17	Con.	XI	Lake	"
	Lots 19 and 20	"	IV	"	"
Baker mine	Lot 18	"	XVIII	Tudor	"
Emily mine	Lot 7	"	XIX	"	"
	Lot 8	"	XV	"	"
Coehill mine	Lots 15, 16	"	VIII	Wollaston	"
Jenkins mine	Lot 17, 18	"	VIII	"	"
	Lots 9 and 10	"	XV	"	"
Ridge	Lots 17, 18	"	II	"	"
	Lots 16, 17	"	III	"	"
	Lot 28	"	XXVIII	Chandos	"
Bessemer	Lots 1–5	"	VI	Mayo	"
Rankin property	Lot 10	"	IX	"	"
Childs "	Lots 11, 12	"	IX	"	"
Stevens "	Lots 13, 14	"	IX	"	"
Kennedy "	Lot 17	"	V and VI	Carlow	"
	Lot 30	"	XIII	Dungannon	"
Bow lake	Lot 21	"	X and XI	Faraday	"

[1] See Summary Report of the Superintendent of Mines for 1906.
[2] " " " " Mines Branch for 1908.
[3] " " " " " " " 1909.

The geological features of the various ore deposits were studied and representative samples of the ores were taken. In addition to this, complete topographical and magnetometric surveys were made of the following properties:—

Blairton mine,
Belmont mine (topography),
St. Charles mine,
Baker mine,
Ridge property,
Coehill mine,
Jenkins property,
Rankin " (topography),
Childs " ("),
Stevens "
Kennedy "
Bow Lake "

In this work the writer was assisted by Messrs. W. M. Morrison and O. G. Gallagher.

As most of the ore deposits visited are altogether or partly covered by drift, the magnetometric survey has been of great help in ascertaining the probable area within which the ore is likely to occur. The general plan of the survey was as follows: a base line was first laid out, approximately following the strike of the ore deposit, and carefully chained. At right angles to this line, at intervals of every 50 feet, cross lines were run to the limit of the disturbed field. These lines were staked every 50 feet. In this manner the whole area to be investigated was laid out in squares. The magnetic observations were taken with a Thalen-Tiberg magnetometer. The distance between the points of observation varied from 25 to 100 feet, depending upon the local complication of the magnetic field. The readings in degrees as observed in the field were reduced to values corresponding to an angle for a magnetometer with a constant of 1.H[1].

The reduction of the vertical angle was done according to the following formula:—

$$\text{tg } V = k_n \text{ tg } V_n.$$

V = the angle which corresponds to the angle V_n for an instrument with constant 1.H.

V_n = the angle observed with a magnetometer with a constant $k_n H$.

The isodynamic lines of the accompanying magnetic maps have been drawn in a similar way to that in which contours of elevations are made. In order not to overload the map with too many lines, which would obscure rather than emphasize the salient features of the deposit, the 10 and 30 degree curves have been omitted. The colours used in these maps are, blue for positive or north pole attraction, and yellow for negative or south pole attraction, and the areas between the bounding curves are laid in with appropriate tints. The topographical survey was done by means of plane table and stadia, or by transit and stadia when the country was thickly wooded.

[1] H=horizontal component of the earth's magnetic field.

CHAPTER I.

LOCATION AND HISTORY OF THE DISTRICT.

The iron ore occurrences covered by the present report are situated along the Central Ontario railway, between Central Ontario Junction and the village of Bancroft, a distance of 60 miles.

The distance of the various deposits from the railway varies from 12 miles down to a few hundred feet.

Some of the iron ore deposits in Hastings and Peterborough counties have been known for many years, and as early as 1820 an attempt was made, at Marmora, to manufacture pig iron from magnetite taken from Blairton mine.

The venture does not seem to have met with any success, however, and operations were discontinued.

In 1867 the Blairton mine was opened up again and mining was carried on from time to time until 1875. In 1882 the building of the Central Ontario railway was commenced, with the object of opening up the numerous iron ore deposits of North Hastings. At this time mining operations started at Coehill and in several other places, but it was soon found that the magnetite contained so much sulphur as to be unmarketable, and the mines were closed. In 1906 a part of the Bessemer and Barrys Bay railway was built, connecting the ore deposits at Bessemer with the Central Ontario railway at a point about one mile south of L'Amable station. Mining operations were carried on by the Mineral Range Iron Company, until the beginning of 1908, when the properties were leased to the Canada Iron Furnace Company.

This Company continued operations until April, 1910. In the spring of 1911 the Bessemer, Childs, Coehill, and Blairton properties were acquired by a corporation known as the Canada Iron Mines, Limited. This new Company commenced mining operations at Bessemer in August, 1911, and intend to erect in the near future a magnetic concentration plant at Trenton for the treatment of their ores. The total amount of ore shipped from Bessemer up to the end of 1910 was 83,553 tons.

CHAPTER II.

GEOLOGY OF THE DISTRICT.

The greater portion of the area is occupied by Archæan rocks, consisting of crystalline limestones, interstratified with a series of paragneisses and schists, and intruded by various igneous rocks such as granites, syenites, diorites, and gabbros. On the denuded surface of these Archæan rocks the various sediments constituting the lowest beds of the Palæozoic series have been deposited. The latter are found in the most southerly portion of the area, forming a more or less continuous sheet, covering the older rocks. The crystalline limestone of the district generally has a coarse texture and is more or less impure, owing to the presence of various silicates. Some of the paragneisses are likely to represent alterations of more or less highly argillaceous sediments, while others are rich in quartz and seem to make transitions to true quartzites.

Associated with the paragneisses and often passing into them are dark coloured basic schists, which have been grouped by Adams and Barlow under the general name of amphibolite.[1] Their chief constituents are hornblende and feldspar, but pyroxene and biotite often take the place of the hornblende in part.

The granites of the area generally have a coarse texture and are grey to reddish in colour. They show for the most part a distinct foliation, though in many places the foliated structure gives way to a granitoid one, and every stage of transition, from a typical granite to granite gneiss, can be seen.

The syenites have a coarse texture and are of a reddish colour, their chief constituent being a red feldspar. They often seem to grade into the granite and granitic gneiss and there is good reason to believe that they are simply a differentiation phase of the granite magma.

The gabbros or diorites have all the character of great basic intrusions and are generally perfectly massive. Like the granite and syenite, they cut through the limestone and associated gneisses and schists, sending dykelike masses through them holding inclusions of the same.

[1]See Memoir No. 6 of the Geological Survey, Canada.

CHAPTER III.

ORE DEPOSITS.

The magnetites of the district may be divided into two groups:—

(1.) Magnetite occurring along or near the contacts of limestones and schists with various igneous rocks.

(2.) Titaniferous magnetite associated with gabbro eruptives.

Contact Magnetite Deposits.

This type of ore occurs as steeply dipping lenses and irregular masses interbanded with crystalline limestone and various schists along or adjacent to the contact of the latter with some igneous rock, generally diorite. Associated with the magnetite are numerous ferruginous silicates, such as pyroxene, hornblende, epidote, and garnet. Usually a considerable amount of calcite is also present. The association of the magnetite deposits with igneous rocks along the contact of crystalline limestone and their frequent content of metamorphic minerals would indicate that their development and concentration are due to the contact action of the igneous rocks on the limestone.

All the analyses, with one exception, represent average samples taken by the writer during the field work. It will be seen that the metallic iron content varies in these samples from 54 to 30 per cent. The iron content of the ore varies, however, considerably within the same ore deposit. Thus, we often find rich portions of the ore made up chiefly of magnetite embedded in others of considerably lower grade and composed of magnetite, amphibolite, pyroxene, epidote, and garnet; while in other places the gangue minerals predominate, practically to the exclusion of magnetite. The best quality of the ores averages about 54 per cent, but considerable cobbing would have to be done in order to keep the output of any of the mines up to that standard, and a large percentage of the ores does not contain more than 30 to 45 per cent, while some contains less. The sulphur content of the ores is variable, but generally high, owing to the presence of iron pyrites, and occasionally, as at Coehill, pyrrhotite.

In some cases the pyritous portions can be separated by cobbing the ore, while in others the sulphides are so abundant and so finely distributed throughout the ore as to render its elimination by such a process impossible. The phosphorus in the samples taken varies, with one exception, from 0·018 to 0·200 per cent.

It is very difficult to estimate with even an approximate correctness the quantity of ore available in this district, because of the lack of sufficient development and of the exceedingly irregular charater of the ore bodies. It seems, however, as if, so far, this feature had hardly been recognized sufficiently, as many property owners assume that the ore occurs in regular

The following table shows the analyses of some of the magnetites belonging to this class:—

Name of Mine.	Name of township.	Lot and concession.	Metallic iron.	FeO	Fe_2O_3	Phosphorus	Sulphur	Titanium TiO_2	Lime CaO	Magnesia MgO	Alumina Al_2O_3	Silica SiO_2	Insoluble matter
Blairton mine	Belmont	7, 8, Con. I.	50·10	.....	.....	0·046	1·423	0·10	3·52	1·64	1·73	9·88	.....
Belmont mine	"	19, Con. I	51·20	.....	.....	0·032	0·371	0·10	4·87	3·93	0·25	12·10	.....
St. Charles mine	Tudor	19, Con. XII	42·00	.....	.....	0·080	0·832	.....	.....	.....	.....	.....	31·85
Baker mine	"	18, Con. XVIII	38·70	.....	.....	0·200	3·347	.....	.....	.....	.....	.....	37·10
Coehill mine	Wollaston	15, 16, Con. VIII.	47·30	.....	.....	0·018	2·215	.....	.....	.....	.....	.....	30·90
Jenkins mine	"	17, 18, " "	35·30	.....	.....	0·054	0·522	0·10	.....	.....	.....	.....	46·08
No. 4, Bessemer	Mayo	4, Con. VI*	54·29	.....	.....	0·019	0·062	.....	6·86	1·35	2·02	9·84	.....
No. 4, Bessemer	"	4, Con. VI**	42·50	.....	.....	0·030	0·300	.....	13·05	2·80	2·79	19·20	.....
Rankin property	"	10, Con. IX.	42·70	.....	.....	0·104	0·215	0·10	8·08	1·74	3·80	15·87	31·00
Childs property	"	11, Con. IX.	42·00	.....	.....	0·066	0·160	0·10	7·75	2·00	3·35	12·53	31·30
Stevens property	"	13, Con. IX.	30·70	.....	.....	0·080	0·015	.....	.....	.....	.....	.....	23·00
Kennedy property	Carlow	17, Con. VI.	43·70	.....	.....	0·118	0·102	.....	.....	.....	.....	.....	10·50
Bow Lake property	Faraday	21, Con. X, XI.	51·00	24·80	45·30	1·94	0·070	0·50	7·14	1·78	4·73	9·03	.....

* Average analysis of the shipping ore supplied by the Canada Iron Furnace Co.

** Average sample of discarded ore.

beds, and therefrom erroneously infer the continuity of the deposits between widely separated outcrops; in some cases most exaggerated estimates of the amount of ore available are formed. The same error seems to have been frequent in using the dip needle. If, for instance, a few high magnetic readings have been obtained in some places lying several hundred or even thousands of feet apart, it has often been assumed that a continuous bed of ore existed.

The erroneousness of such a conclusion is evident. Reliable conclusions regarding the probable extent of the ore bodies can only be obtained by taking systematic magnetic readings sufficiently close together, and modifying and interpreting the data thus obtained in the light of other evidence, geological or topographical.

Occurrences of magnetite are very common in the district; indeed, they are so abundant that in certain areas they may be found on every lot; but there are only a few places where the results of our investigation indicate that magnetite is likely to occur in such a quantity as to render the deposits of economic importance. Among these deposits the following deserve mention:—

No. 4 deposit at Bessemer, Rankin, and Childs properties, Blairton mine, Belmont mine, the Ridge property.

On these properties the area within which magnetite is likely to occur has been roughly estimated as follows:—

No. 4 deposit at Bessemer	50,000	square	feet.
Rankin and Childs properties	412,000	"	"
Blairton mine	155,500	"	"
Belmont mine	43,000	"	"
The Ridge property	74,000	"	"
Total	734,500	"	"

Most of these areas being drift covered, it is, however, impossible to say how large a percentage of them is actually occupied by ore until further development has been done.

CHAPTER IV.

PROSPECT OF DEVELOPMENT.

Iron mining has in the past, with few exceptions, been rather disappointing in this district. In some cases this has been due to the high sulphur content of the ore, in others to the irregular character of the ore deposits and the intimate association of the magnetite with the surrounding gangue and country rocks. Hand-picking of the ore was, therefore, in most cases necessary. This not only increased the cost of mining, but was, in some places, of little or no use. From what the writer was able to ascertain during his field-work, it does not seem likely that any one of the deposits in the district could at the present time be profitably mined without submitting the ore to a magnetic concentration process. It may be that no single deposit contains ore reserves large enough to warrant the erection of a concentrating plant of sufficient capacity to ensure the profitable working of such a process, but should further development confirm the expectation which the result of the investigation of some of the above-mentioned deposits indicates, by a consolidation of some of these properties, it should be possible to carry on mining operations on a sufficiently large scale to make the erection of a large concentrating plant feasible. The ores of the above-mentioned properties are well adapted for magnetic concentration. A large percentage of the ore will undoubtedly have to be crushed rather fine in order to get a satisfactory separation of the magnetite from the associated gangue-minerals, but this is not necessary in all cases, and some of the ore can be made marketable simply by submitting it to a magnetic cobbing process.

CHAPTER V.

DESCRIPTION OF MAGNETITE OCCURRENCES.

Blairton Mine.

The Blairton iron mine is situated on lot 8, concession I, township of Belmont, Peterborough county, at the southwest end of Crow lake, about 5 miles west of the village of Marmora and about 3 miles northeast of Blairton station on the main line of the Canadian Pacific railway.

The first mining operations at Blairton date back to 1820, when ore was mined and taken across Crow lake to Marmora, where furnaces and a foundry had been built. The venture was not successful, however, and operations were discontinued after the plant had changed hands several times. In 1867 the Blairton mine was reopened by the Cobourg, Peterborough, and Marmora Railway and Mining Company. The ore was hauled by rail to Trent bridge, or the "Narrows," as it was then known, a distance of 9 miles. Here it was loaded on scows and towed down the Trent river and Rice lake 25 miles to Harwood, from where it was hauled by rail to Cobourg, a distance of 15 miles. From Cobourg the ore was shipped to Charlotte and other American points.

According to the books of the Company, 12,747 gross tons were shipped in 1868, and 15,440 tons in 1869. From November, 1872, to the end of September of the following year, 4,586 tons of ore are reported by Mr. J. E. Aunger of Blairton to have been shipped. The mine was worked continuously from 1868 to 1875, but no information regarding the total amount of ore mined during this period is available. The cost of mining is reported to have been about $1.25 per ton, and the transportation charges from the mine to Pittsburgh $4. Notwithstanding the excessive cost of transportation, mining operations could be carried on with some profit on account of the high price of iron ore. A change in the iron ore market, however, soon took place and lower prices prevailed. This fact, coupled with an increased duty on iron ore going into the United States, prevented operations from being carried on profitably, and the mine was closed in 1875. Since then, no attempt has been made to recommence work, and at the present time all the old workings are filled with water.

The area embraced in the accompanying map (185A) is chiefly occupied by Archæan rocks made up of dark-coloured hornblende and chlorite schists and crystalline limestone in contact with diorite. The general strike of the stratified rocks is about N. 15° W. with a steep dip towards the east. In several places beds of limestone underlain by conglomerate and constituting the lowest strata of the Palæozoic series are found overlying the Archæan rocks. In the conglomerate small pieces of hematite are often found embedded. The main deposits consist of magnetite. They occur in the older Archæan rocks along the contact of the crystalline limestone with the diorite.

The hornblende and chlorite schists are found in the northwest part of the area outcropping in several places along the shore and on the north and northwest sides of the big hill near the lake. They often show a porphyritic

texture, with phenocrysts of feldspar in a dark fine grained ground mass. East of these schists and conformable to their bedding plane lies a belt of crystalline limestone. Farther east the greater part of the area is occupied by diorite.

The latter generally has a coarse structure, but becomes so fine grained near its contact with the crystalline limestone as to make it impossible to distinguish with the naked eye the chief mineralogical constituents of the rock. Epidote is, however, often present, and iron pyrites is also of frequent occurrence. The magnetite occurs associated with this light green metamorphic rock. In some parts of the field it is found in well defined layers interstratified with the rock; in others finely disseminated throughout the same.

The quality of the ore may best be judged from the following analysis representing an average sample of the ore taken across the ore body on the north side of pit No. 3:—

Iron	50·10	per cent.
Silica, SiO_2	9·88	"
Phosphorus	0·046	"
Sulphur	1·42	"
Titanium, TiO_2	0·10	"
Lime	3·52	"
Magnesia	1·64	"
Alumina	1·73	"

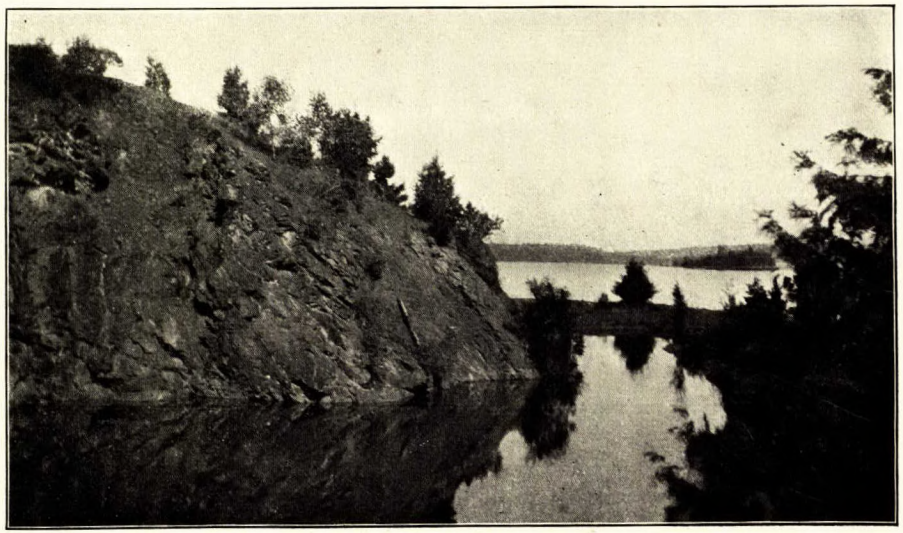
Judging from the magnetometric survey, the ore occurs in two separate areas. On the more southerly of these areas ore has been mined from two open pits, No. 1 and No. 2. The total area of these two pits is 27,500 square feet. The depth of pit No. 1 is 125 feet. By a diamond drill hole the deposit has been proved to a depth of 550 feet.

The other area has been opened up by a large open-cut on the hillside near Crow lake. Judging from the magnetometric survey (see map 185), the total length of this deposit may be roughly estimated at about 560 feet, its northern end extending about 130 feet under the lake. On the hillside immediately west of the open-cut several strongly positive magnetic areas, alternating with some strong negative ones, indicate an irregular distribution of the magnetite throughout the rock.

The total area within which ore is likely to occur in this part of the field is roughly estimated at 128,000 square feet, but no doubt a large percentage of this area is occupied by barren rock.

The Belmont Iron Mine.

The Belmont iron mine is situated on lot 19, concession I, of Belmont, Peterborough county, about 8 miles northeast of Marmora. It is connected with the Central Ontario railway by a branch line known as the Ontario, Belmont, and Northern railway. The distance from the mine to the Ontario, Belmont, and Northern junction is 9·5 miles. The workings are situated in a flat of low ground and consist of two open pits and a shaft. The principal mining operations have been confined to pit No. 1 (see accompanying maps 186 and 186A). The pit is of irregular shape and has a length



Open cut at Blairton mine.

of about 220 feet in a north and south direction, with a width ranging from 40 to 70 feet. The depth of the pit is from 3 to 20 feet. About 15 feet north of pit No. 1 the main shaft is being sunk. The depth of the shaft, at the time of the writer's visit, was 32 feet and from its bottom a drift 32 feet long was said to have been driven under pit No. 1. Pit No. 2, called the Nickel pit, is situated about 100 feet southeast of pit No. 1. It is about 55 feet long and 40 feet wide, with a depth ranging from 5 to 6 feet.

The ore consists of magnetite associated with pyroxene, chlorite, and some calcite. It occurs along the contact of crystalline limestone and diorite. A few outcrops of crystalline limestone are seen on the south wall of pits No. 1 and No. 2, while the diorite is well exposed on the small knolls west of the railway track. The character of the diorite varies from a grey, medium grained rock, made up chiefly of hornblende and feldspar, to a dark coarse grained variety, the chief constituent of which is hornblende carrying some magnetite and iron pyrites. The west part of the area embraced by the map is occupied by dark coloured, fine grained rocks, generally with a schistose structure. Similar rocks are also seen in several places on the knolls east of the railway track, where they are found as fragments of varying size embedded in the younger diorite.

The character of the iron-bearing formation varies considerably. In some places it consists of almost pure magnetite, in others of a mixture of magnetite and gangue minerals, chiefly pyroxene and chlorite; in other places again the latter minerals prevail almost to the exclusion of the magnetite. Iron pyrites is frequently seen throughout the ore.

The following analysis represents an average sample taken by the writer across pit No. 1 at the north end:—

Iron	51·20	per cent.
Silica	12·10	"
Phosphorus	0·032	"
Sulphur	0·34	"
Titanium, TiO_2	0·10	"
Lime, CaO	4·87	"
Magnesia, MgO	3·93	"

Judging from the magnetometric survey (see map 186), confirmed by a few natural exposures, the area within which the ore is likely to occur may be roughly estimated at 43,000 square feet, but a large percentage of this area is undoubtedly occupied by barren rock.

The Maloney Mine.

On lot 18, concession I, of Marmora, a few hundred feet south of the Ontario, Belmont, and Northern railway, a deposit of magnetite has been exposed. The workings consist of two open pits and a stripping. Between the three workings a magnetic attraction exists for a distance of about 280 feet. The ore body, as exposed in the main pit, shows a width of about 25 feet. It consists of magnetite mixed with a considerable amount of gangue

minerals. An average sample of the ore taken by the writer gave the following analysis:—

Iron	47·00	per cent.
Insoluble	21·03	"
Phosphorus	0·137	"
Sulphur	0·500	"
Titanium, TiO_2	0·250	"

On the hill immediately south of the workings, numerous outcrops of gabbro-diorite can be seen, while an outcrop of crystalline limestone was observed near the railway track to the north.

Lots 12, 13, 14, Con. I, of Marmora.

The greater part of lots 12, 13, and 14, con. I, of Marmora, is occupied by a coarse grained gabbro-diorite, cut in the most intricate manner by a red granite and pegmatites. Along the contact with the latter rocks magnetite in small quantities is found in several places disseminated through the gabbro-diorite. Where the magnetite has been found, the magnetic attraction is, however, very feeble and the discoveries so far made are of no economic importance.

Lot 17, Con. II, of Marmora.

On a hill running east and west, on lot 17, con. II, of Marmora, two test pits have been sunk about 150 feet apart, showing some magnetite disseminated throughout a gabbro-diorite similar in character to that seen on the Maloney property. The distance from the workings to the Ontario, Belmont, and Northern railway is about 500 feet.

An average sample of the iron-bearing rock gave the following analysis:—

Iron	34·80	per cent.
Insoluble	43·80	"
Phosphorus	0·134	"
Sulphur	0·410	"
Titanium, TiO_2	0·10	"

Seymour Mine.

The Seymour mine was one of the earliest producers of iron ore in the district, but has been abandoned for many years. It is located on the west half of lot 11, con. V, of Madoc, about 4 miles north of the village of that name. The old shaft is said to be 125 feet deep.

The old open-cut has a length of about 200 feet with a width ranging from 18 to 25 feet. The ore consists of a fine grained magnetite, associated with chlorite, pyroxene, and hornblende. It is surrounded by a large granite eruptive. The magnetic attraction near the workings is very weak.

St. Charles Mine.

The St. Charles mine is situated on lot 19, con. XI, of Tudor, about half a mile west of McDonald siding on the Central Ontario railway. The workings consist of five open pits (see accompanying maps, 187 and 187A). The ore is magnetite, associated with more or less gangue minerals, such as garnet, hornblende, pyroxene, and calcite. It occurs along the contact of crystalline limestone with a medium to fine grained diorite. There are, according to the plan of the magnetometric survey, three deposits on the property. On the principal deposit pits Nos. 1 and 2 have been made. Strong magnetic disturbances exist along the hillside for a distance of 320 feet. The total area within which magnetite is likely to occur is roughly estimated at 13,500 square feet. A considerable portion of this area, however, contains ore which is either too low in iron or has too much sulphur to be suitable for iron smelting without previous concentration.

An average sample taken by the writer across the ore body at open-cut No. 2 gave the following analysis:—

Insoluble	31·85	per cent.
Iron	42·00	"
Phosphorus	0·080	"
Sulphur	0·832	"

During the season of 1900, 3,000 tons of ore are reported to have been shipped from this property to the Hamilton blast furnace. The iron content of this ore varied from 57 to 60 per cent, while the sulphur ranged from 0·5 to 1 per cent.

Baker Mine.

The Baker mine is situated on lot 18, con. XVIII, of Tudor, about $1\frac{3}{4}$ miles west of Gilmour station.

The workings consist of three open-cuts and a number of test pits on the eastern slope of a ridge running north and south. The ore is a fine grained magnetite, intermixed with a large amount of gangue matter, chiefly pyroxene and chlorite. It occurs along the contact of crystalline limestone and diorite. Iron pyrites is of common occurrence in the diorite as well as throughout the ore. Judging from the accompanying magnetometric map (see map 188), the ore occurs in small detached bodies or pockets. The largest area of strong magnetic attraction is found around open-cut No. 1. The development work done here has, however, so far failed to reveal any ore of economic importance. The ore body opened up by open-cut No. 2 has a width of about 25 feet, but the magnetometric survey indicates that its extent is very small. Working No. 3 shows another small pocket of magnetite along the contact of crystalline limestone and diorite.

An average sample taken across the ore body at open-cut No. 2 gave the following analysis:—

Insoluble	37·10	per cent.
Iron	38·70	"
Phosphorus	0·20	"
Sulphur	3·35	"

Lot 28, Con. I, of Chandos.

On lot 28, con. I, of Chandos, an open-cut, 53 by 21 feet, has been made into a hill, exposing a dark coloured amphibolite, associated with some magnetite. Magnetic indications of several other deposits in the immediate vicinity were also noticed, but they all appeared to be of very small extent.

The Emily Mine.

The Emily mine is situated on lot 7, con. XIX, of Tudor, about $1\frac{3}{4}$ miles northeast of Gilmour station. Chapman, in the Transactions of the Royal Society of Canada, 1885, section III, p. 12, describes this as a magnetic ore deposit of considerable extent. He says: "The exposed ore rises in a series of ledges from the level of the ground to a height of from 150 to 180 feet, and extends over a space of at least 1,000 feet in length by 100 feet in breadth." This could not be verified by the writer. On lot 7 a somewhat abrupt ridge, chiefly made up of a coarse grained granite, was found. A large open-cut had been made into the hillside, showing in places some small patches of magnetite heavily intermixed with gangue matter. The magnetic attraction around the open-cut is also very irregular.

Lot 8, Con. XV, Tudor.

On the east side of a ridge running approximately north and south on lot 8, con. XV, of Tudor township, several strippings have been made showing a grey granite in contact with chlorite and hornblende schist. Associated with the schist are narrow bands of magnetite. The magnetic attraction is rather strong in places, but none of the workings has so far revealed any ore body of sufficient size to be of economic importance.

Coehill Mine.

This mine is situated on lots 15 and 16, con. VIII, of Wollaston, and is connected by a branch line, 7 miles long, with the Central Ontario railway at Ormsby Junction. The distance by rail from the mine to Trenton is 73 miles.

Mining operations at Coehill were begun in 1883 and were carried on for two years. During this time, 80,000 to 100,000 tons of ore are reported to have been mined. On account of the high sulphur content, rendering the ore unsaleable, mining operations were, however, discontinued in 1884, and a large percentage of the ore mined is still lying in stock piles at the mine. In 1885 Mr. Coste reports the depths of the three shafts to be : No. 1, 95 feet; No. 2, 130 feet; and No. 3, 100 feet. In 1901 about 10,000 tons of ore are reported to have been shipped from the stock piles. All the old workings are now filled with water. The main ore body is well exposed on the hill north of the railway track by two open pits. The general trend of the formation is northeast-southwest, with a dip of about 50 degrees towards the southeast. The deposit seems to form part of a limestone amphibolite series, locally enriched in iron by the intrusion of syenite, which cuts the series in the most intricate manner. The ore consists of a fine grained

Shaft No. 3 Coehill mine.

Jenkins mine.

magnetite, associated with hornblende, pyroxene, and calcite. It has a streaked or stratified appearance parallel to the strike; this is due to the variation in the relative amount of the constituent minerals present. Some streaks are very rich in magnetite, while others are composed of pyroxene and hornblende. The average sulphur content of the ore is high, a considerable amount of iron pyrites and pyrrhotite being disseminated throughout the ore. An average sample taken across the ore body gave the following analysis:—

Iron	47·3	per cent.
Insoluble	30·90	"
Sulphur	2·21	"
Phosphorus	0·018	"

The main deposit on which shafts Nos. 2 and 3 have been sunk has a length of about 550 feet, with a width varying from 25 to 70 feet. In addition to this, there are also several other deposits all covered by drift. It will be seen from the magnetometric map (see map 190), that the deposit on which shaft No. 1 has been sunk is of very small extent and does not, as has been supposed, connect with the main deposit. The map also shows several other strong magnetic areas north of the main ore body. The strong magnetic attraction noticed in a few places south of the workings is likely caused by the large stock piles of ore situated there.

The Jenkins Property.

The Jenkins property is situated on lots 17 and 18, con. VIII, of Wollaston, and adjoins the Coehill property to the east. Most of the area is drift covered, and the iron-bearing formation has been exposed in only a few places. The main work has been done on lot 18 and consists of a shallow open pit, 180 feet long, with a maximum width of about 40 feet. Some magnetite, associated with hornblende and pyroxene, is exposed in this pit. Ore of similar character has also been exposed in other pits and strippings, the locations of which are shown on the accompanying map (see maps 190 and 190A).

The following analyses represent two average samples taken across the exposed ore bodies:—

	I.	II.
Iron	46·08	49·50
Insoluble	35·30	34·20
Sulphur	0·52	0·28
Phosphorus	0·054	0·036

Sample No. 1 was taken from the main pit on lot 18, while No. 2 comes from one of the pits on lot 17.

The magnetic attraction of the area is, as shown by the accompanying map, very irregular, changing within small areas from strong positive to strong negative intensity, indicating an irregular and pockety distribution of the magnetite in the country rock. This is well confirmed by the open pit on lot 18.

The Ridge Property.

The property referred to under this name is situated near Ridge post-office, about 4·5 miles south of Coehill, and includes lots 17 and 18, con. III, and lots 16 and 17, con. II, of Wollaston township. The area is heavily drift covered, and the only exposure of magnetite so far found is situated on lot 17, con. II. Here a thin band of magnetite, lying in mica and hornblende schist, has been revealed by stripping at the foot of the hill. Farther up the hill side, a metamorphic rock, chiefly made up of garnet, is seen in contact with the same schist.

On lot 18, con. III, a test pit is reported to have been sunk through clay to a depth of 27 feet, without reaching bed-rock.

The accompanying magnetometric map shows that there is a considerable magnetic attraction on this property, extending in an east and west direction for about half a mile. On this stretch several detached areas are found, which have a magnetic attraction of 60 degrees or more. The two largest occupy a total area of about 74,000 square feet, and seem to warrant further investigation in the form of diamond drilling.

Lots 19 and 20, Con. IV, Lake.

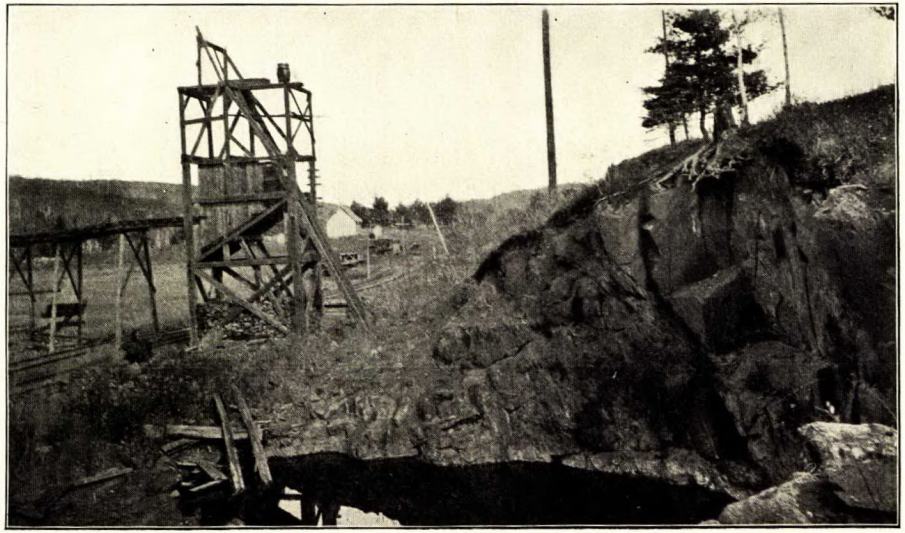
East of Whetstone lake, on lots 19 and 20, con. IV, of Lake township, small patches of magnetite are found associated with amphibolite. Several openings have been made along a ridge running north and south without revealing any ore body of economic importance.

Iron Ore Deposits at Bessemer.

The iron ore deposits at Bessemer are situated on lot 1, con. VII, and lots 2, 3, 4, and 5, con. VI, of Mayo township.

The first discovery of ore at Bessemer dates back to 1898, and in 1902 the Mineral Range Iron Mining Company was organized by Mr. H. C. Farnum to take over certain iron-bearing properties in the townships of Dungannon and Mayo.

The first shipment of ore was made in 1901, the ore being hauled by team to L'Amable station, a distance of about 5 miles. In 1906 a branch line called the Bessemer and Barrys Bay railway, was built, connecting the village at Bessemer with the Central Ontario railway, at a point about 1 mile south of L'Amable station. Mining operations were carried on by the Mineral Range Iron Mining Company until the beginning of 1908, when the properties were leased to the Canada Iron Furnace Company. This Company continued operations until April, 1910, when the lease was allowed to expire. In the spring of 1911, the Bessemer properties were acquired by the Canada Iron Mines, Limited. This Company commenced mining operations at Bessemer in August, 1911, and is now erecting a magnetic concentration plant at Trenton, for the treatment of the ore.



No. 3 mine at Bessemer.

No. 4 mine at Bessemer.

Open cut of No. 4 mine at Bessemer.

The following table gives the total amount of ore shipped from these properties:—

1901	3,000	short	tons.
1902	1,396	"	"
1903	50	"	"
1904	.....	"	"
1905	.....	"	"
1906	2,500	"	"
1907	20,660	"	"
1908	28,956	"	"
1909	19,635	"	"
1910	7,356	"	"
Total	83,553	"	"

The distance by rail from Bessemer to Trenton is 83 miles.

The area embraced by the accompanying map (191A) is underlain chiefly by granite gneiss and a limestone-amphibolite series.

The ore deposits occur as isolated lenses of varying extent, associated with the limestone-amphibolite series, along, or adjacent to, the granite contact.

The general strike of the formation is northeast-southwest, with a steep dip towards the southeast, averaging about 60 degrees. The ore consists of a fairly coarse grained magnetite. Its quality varies greatly in different parts of the deposits. In come cases a clean magnetite of high iron content is observed; in others, the magnetite is closely associated with garnet, hornblende, epidote, and calcite, and the ore often appears to pass gradually into such gangue minerals.

The best quality of the ore averages about 54 per cent of iron, but considerable cobbing has to be done in order to keep it up to that standard, as a large percentage of the ore does not average more than 40 to 48 per cent of iron.

This latter ore has so far been relegated to the waste dumps, or left in the mine. Locally, stringers and patches of iron pyrites are found, but by hand cobbing the ore it has been posssible to keep the sulphur down to somewhere near 0·07 per cent. The percentage of phosphorus is very low, averaging from 0·010 to 0·025 per cent.

An average analysis of the shipping ore, given by the Canada Iron Furnace Company, Midland, Ontario, is as follows:—

Metallic iron (Fe)	54·29	per cent.
Lime (CaO)	6·86	"
Magnesia (MgO)	1·35	"
Alumina (Al_2O_3)	2·02	"
Silica (SiO_2)	9·84	"
Phosphorus (P)	0·019	"
Sulphur (S)	0·062	"

An average analysis of 25 carloads shipped to Midland during 1908 is as follows:—

Iron	54·0	per cent.
Sulphur	0·075	"
Phosphorus	0·022	"

Two average samples of discarded ore taken by the writer from No. 4 mine gave the following analysis:—

	No. 1.		No. 2.	
Metallic iron, Fe	47·70	per cent.	42·50	per cent.
Lime	8·75	"	13·05	"
Magnesia	4·07	"	2·80	"
Alumina	2·34	"	2·79	"
Silica	15·30	"	19·20	"
Phosphorus	0·004	"	0·30	"
Sulphur	0·63	"	0·30	"

The ore bodies occur in four groups, which have been designated on the map as No. 1, No. 2, No. 3, and No. 4. (See maps 191, 191A.)

The magnetometric survey made on the south half of lot 1, con. VII, indicates the presence of a number of small ore lenses. On one of these a pit has been sunk, and a small quantity of ore removed. The ore is badly mixed with gangue minerals, chiefly hornblende.

The other deposits indicated by the magnetic map on this lot are all drift covered.

On lot No. 2, con. VI, an open-cut, known as No. 2, has been made a short distance north of the railway, revealing some magnetite intermixed with various gangue minerals. The magnetometric survey indicates, however, this deposit to be a mere pocket. It also indicates the presence of a few other small deposits east of No. 2.

No. 3 mine is situated on lot 3, about 1,300 feet east of No. 2. It consists of two open pits, which have been opened up on two ore lenses, separated from each other by about 50 feet of gangue rock, through which a small amount of magnetite is disseminated.

The ore body dips at an angle of 70 degrees to the southeast, the hanging wall being amphibolite.

On the hill immediately south of the workings intrusions of granite are seen in the amphibolite series.

In addition to the two ore lenses of No. 3 mine, the magnetometric survey indicates a short distance east and west of these workings, several other deposits, all of which are, however, covered by drift.

No. 4 mine, the principal deposit at Bessemer, is situated on lots 4 and 5, con. VI. It lies in the limestone-amphibolite series, near its contact with the granite. According to the magnetometric survey, the total length of this deposit may be estimated at about 1,000 feet, its western end extending 400 feet under Little Mullet lake. The average width of the deposit is roughly estimated to be about 50 feet.

So far, the mining operations have been confined to the eastern half of the deposit, and the greater part of the ore taken from an open-cut 265 feet long, 40 to 60 feet wide, and with a maximum depth of about 60 feet. At the west end of the open-cut, an inclined shaft has been sunk, following the dip of the ore body. The vertical depth of the shaft is 100 feet, with stations and levels cut at a depth of 50 and 94 feet. Ore has also been mined on the west side of the shaft, where, for a distance of about 100 feet, the ore has been stoped out between the 50 and 94 ft. levels. In width, the stope varies from 29 to 17 feet, with its north side still in ore. The ore is here, however, of low grade, highly mixed with gangue minerals, and also carrying a rather high percentage of iron pyrites, and has, therefore, been left.

Judging from the results of the magnetometric surveys, confirmed by the distribution of a few natural exposures, we may estimate the total ore area of the seven largest deposits to be about 83,000 square feet, of which 50,000 are attributed to No. 4 deposit.

This estimate does not, however, pretend to be more than a very rough approximation; besides, a considerable portion of this area contains, no doubt, ore which has too low iron content to be suitable for economic iron smelting without previous concentration.

In order to ascertain the suitability of the ore for magnetic concentration, tests have been made at the ore concentrating laboratory at Ottawa on a shipment of 1·5 tons of discarded ore from No. 4 mine. The sample was crushed down until 50 per cent of the ore passed through 200 mesh, and separated by the Gröndal wet process. The result of the test is shown in the following table:—

Analyses of Crude Ore, Concentrate, and Tailings.

	Crude ore.	Tails.	Concentrates
Iron	36·50	4·5	67·4
Insoluble matter	35·37	...	5·87
Phosphorus	0·026	...	0·007
Sulphur	0·314	...	0·185
Lime	5·68	...	.....
Magnesia	0·030	...	.....

It will be seen from the above figures that 1·96 tons of this material are required to make 1 ton of concentrate with an iron content of 67·4 per cent. The percentage of iron in the crude ore saved in the concentrate is 94 per cent, while about 6 per cent of the iron content of the ore is lost in the tailings. The phosphorus, although below Bessemer limit, in the crude ore, has been depressed to a point that should make the concentrate very valuable for the production of special low phosphorus iron.

Rankin, Childs, and Stevens Properties.

The workings, known locally by these names, are situated on lots 10, 11, 12 and 13, con. IX, of Mayo, about 2·5 miles northeast of Bessemer and about 1 mile south of Herman post-office.

The area is chiefly underlain by a fine grained mica schist and a limestone-amphibolite series intruded by granite and other igneous rocks.

The ore deposits occur associated with the schist and amphibolite series near the contact of the igneous rocks. Outcrops of ore are very scarce, the greater part of the area being heavily drift covered. The general strike of the iron bearing formation is northeast-southwest with a steep dip towards the southeast.

The approximate location of the various ore deposits is shown on the accompanying map, 192A.

On the Rankin property, lot 10, con. IX, considerable stripping has been done exposing magnetite associated with hornblende and chlorite schist over an area of 300 feet × 68 feet.

On the Childs property, lots 11 and 12, con. IX, 4 openings have been made. No. 1 is a surface stripping on the road allowance between lot 11, cons. VIII and IX.

It shows a dark coloured hornblende schist impregnated in places with magnetite, and intruded by an igneous rock carrying epidote and garnet. No. 2 consists of an open-cut on the hillside. The face of the cut is 26 feet wide and shows magnetite intermixed with some garnet, epidote, calcite, and other gangue minerals. No. 3 is an open-cut, showing two magnetite lenses embedded in the amphibolite in contact with a granite intrusive. No. 4 is also an open-cut revealing ore similar in character to that seen in working No. 2.

On the Stevens property, lot 13, con. IX, a number of test pits and strippings have been made. Judging from the magnetometric survey (see map 192), the ore deposits on this lot are of an extremely irregular character, which is well confirmed by the work done.

On the other hand the straight continuity and breadth of the magnetic area shown by the magnetometric survey on the Rankin and Childs properties would indicate that their properties are likely to contain ore bodies of considerable proportions.

On these two properties the total area within which magnetite is likely to occur has been estimated roughly at 412,000 square feet. Most of this area being heavily drift covered, it is, however, impossible to say how large a percentage of it is actually occupied by ore until further development has been done.

Average samples of the ore taken from the Rankin, Childs, and Stevens properties gave the following analyses:—

	Rankin.	Childs.	Stevens.
	per cent.	per cent.	per cent.
Iron	42·70	42·00	30·70
Insoluble matter	.....	.....	23·00
Silica	15·87	12·53	.....
Phosphorus	0·104	0·066	0·080
Sulphur	0·215	0·160	0·015
Lime	8·08	7·75	.....
Magnesia	1·74	2·00	.....
Titanium	0·10	0·10	.....

Childs property.

Concentrating tests on a shipment of ore, 1·89 gross tons, from the Childs property, gave the following result:—

Analyses of Crude Ore, Concentrate, and Tailings.

	Crude.	Concentrate.	Tails.
Iron	35·0	66·4	5·7
Insoluble matter	36·8	6·09	...
Phosphorus	0·083	0·016	...
Sulphur	0·045	0·022	...
Lime	5·83	.....	...
Magnesia	0·41	.....	...

The ore was crushed down until 60 per cent of the material passed 100 mesh, and separated by the Gröndal wet process.

Kennedy Property.

On the Kennedy property, lot 17, con. V, of Carlow, an occurrence of magnetite has lately been discovered. The property lies about 1½ miles northeast of Boulter P.O., and may be reached by wagon road from L'Amable station, on the Central Ontario railway, the distance being about 22 miles.

The area is heavily drift covered. The formation is made up of a coarse grained mica granite, intruding limestone and amphibolites.

A body of magnetite has been exposed by a surface stripping 182 feet long and in width 10 to 34 feet. An average sample taken across the ore body gave the following analysis:—

Iron	43·70	per cent.
Insoluble	10·50	"
Phosphorus	0·118	"
Sulphur	0·020	"

The general trend of the ore body is N. 25° W. It lies embedded in the granite and is cut in its southern part by a pegmatite dyke, 3 feet in width.

Judging from the magnetometric survey, the ore body has a total length of about 220 feet. A short distance farther north the magnetic survey indicates the presence of another ore body of somewhat smaller extent and completely covered by drift. On the Allison farm, about 850 feet southwest of the main working, two strong magnetic areas can be seen on the map. The larger strikes in a northwest-southeast direction and has an approximate length of about 200 feet. Both are totally covered by drift.

Lot 17, Con. VII, Carlow.

On lot 17, con. VII, adjoining the Kennedy property, a strong but very irregular magnetic attraction indicates the presence of several detached small ore bodies. Two small outcrops of magnetite and several isolated exposures of white crystalline limestone and amphibolite, apparently inclusions in a large granite intrusive, were observed on this lot.

Lot 30, Con. XIII, Dungannon.

On the south side of a ridge running east and west on lot 30, con. XIII, of Dungannon, an open-cut has been made exposing a coarse grained granite, with some magnetite. The ore is of good character as shown by the following analysis, but the extent of the ore body is very limited, the magnetic attraction being very weak only a few feet from the exposure of magnetite.

Iron	69·67	per cent.
Silica	1·20	"
Phosphorus	0·042	"
Sulphur	0·011	"

Bow Lake Iron Ore Deposit.

On the north half of lot 21, con. X, and on the south half of lot 21, con. XI, township of Faraday, some occurrences of magnetite have been found. The properties are situated on the west side of Bow lake, and can easily be reached by wagon road from the village of Bancroft, a distance of about 6 miles.

The rock formation of the area is to a great extent made up of a coarse grained red granite, the chief constituents of which are a pink feldspar with some hornblende and quartz. Other rocks of the area are crystalline limestone and amphibolites, forming smaller or larger inclusions in the granite.

The magnetite, associated with mica, chlorite, apatite, and hornblende, occurs along the contact of the limestone with the granite. It will be seen from the accompanying map that there exists a rather strong magnetic field, along the west slope of a hill trending north and south on lot 21, con. XI. Several open-cuts and test pits have been made along the line but none of these workings has revealed any ore body of sufficient size to be of economic importance. An average sample of the ore gave the following analysis:—

Iron	51·0	per cent.
Silica	9·03	"
Phosphorus	1·94	"
Sulphur	0·070	"

Farther south on both sides of the line between concessions X and XI, a strong but irregular attraction is found in several places.

Workings on iron property at Bow lake.

CHAPTER VI.

DESCRIPTION OF TITANIFEROUS MAGNETITE OCCURRENCES.

Several small deposits of titaniferous magnetite are found in the district, associated with the gabbro-intrusives. The character of these deposits, their lack of definite form, and the manner in which they gradually shade into the normal gabbro, show that they are only a phase of the rock, in which the titaniferous magnetite, usually scattered through in small grains, is locally concentrated. The high percentage of titanium, together with the irregular extent of these deposits, render them of little economic importance.

The Horton Mine.

On lot 57, west of Hastings road, Tudor township, some stripping and trenching has been done on some more deposits of magnetite, which occur at the western end of the lot near the boundary line between the townships of Lake and Tudor.

The magnetite occurs in a gabbro-diorite into which it seems to gradually merge. An average sample taken by the writer gave the following analysis:—

Insoluble	29·00	per cent.
Iron	46·60	"
Phosphorus	0·020	"
Sulphur	0·06	"
Titanium	10·00	"

Lot 17, Con. XI, Lake.

On lot 17, con. XI, of Lake township, some prospecting has been done on several small patches of magnetite associated with gabbro-diorite. An average sample taken from one of the workings gave the following analysis:—

Insoluble	25·25	per cent.
Iron	52·40	"
Phosphorus	0.012	"
Sulphur	0·034	"
Titanium	15·31	"

Lots 9 and 10, Con. XV, Wollaston.

On lots 9 and 10, con. XV, of Wollaston, a large intrusion of gabbro diorite occurs with some magnetite disseminated through the rock.

CANADA

DEPARTMENT OF MINES

MINES BRANCH

HON. LOUIS CODERRE, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER;
EUGENE HAANEL, PH.D., DIRECTOR.

REPORTS AND MAPS OF ECONOMIC INTEREST

PUBLISHED BY THE

MINES BRANCH

REPORTS.

1. Mining Conditions in the Klondike, Yukon. Report on—by Eugene Haanel, Ph.D., 1902.

2. Great Landslide at Frank, Alta. Report on—by R. G. McConnell and R. W. Brock, M.A., 1903. (Out of print).

3. Investigation of the different electro-thermic processes for the smelting of iron ores, and the making of steel, in operation in Europe. Report of Special Commission—by Dr. Haanel, 1904. (Out of print.)

4. Rapport de la Commission nommée pour étudier les divers procédés électro-thermiques pour la réduction des minerais de fer et la fabrication de l'acier employés en Europe—by Dr. Haanel. (French Edition), 1905. (Out of print.)

5. On the location and examination of magnetic ore deposits by magnetometric measurements—by Dr. Haanel, 1904.

7. Limestones, and the Lime Industry of Manitoba. Preliminary Report on—by J. W. Wells, 1905. (Out of print.)

8. Clays and Shales of Manitoba: Their Industrial Value. Preliminary Report on—by J. W. Wells, 1905. (Out of print.)

9. Hydraulic Cements (Raw Materials)in Manitoba: Manufacture and Uses of. Preliminary Report on—by J. W. Wells, 1905. (Out of print.)

10. Mica: Its Occurrence, Exploitation, and Uses—by Fritz Cirkel, M.E., 1905. (Out of print: see No. 118).

11. Asbestos: Its Occurrence, Exploitation, and Uses—by Fritz Cirkel, 1905. (Out of print: see No. 69).

12. Zinc Resources of British Columbia and the Conditions affecting their Exploitation. Report of the Commission appointed to investigate—by W. R. Ingalls, 1905. (Out of print.)

16. *Experiments made at Sault Ste. Marie, under Government auspices, in the smelting of Canadian iron ores by the electro-thermic process. Final Report on—by Dr. Haanel, 1907. (Out of print.)

17. Mines of the Silver-Cobalt Ores of the Cobalt district: Their Present and Prospective Output. Report on—by Dr. Haanel, 1907. (Out of print.)

18. Graphite: Its Properties, Occurrence, Refining, and Uses—by Fritz Cirkel, 1907. (Out of print.)

19. Peat and Lignite: Their Manufacture and Uses in Europe—by Erik Nystrom, M.E., 1908. (Out of print.)

20. Iron Ore Deposits of Nova Scotia. Report on (Part I)—by Dr. J. E. Woodman.

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* A few copies of the Preliminary Report, 1906, are still available.

21. Summary Report of Mines Branch, 1907-8. (Out of print.)

22. Iron Ore Deposits of Thunder Bay and Rainy River districts. Report on—by F. Hille, M.E.

23. Iron Ore Deposits, along the Ottawa (Quebec side) and Gatineau rivers. Report on—by Fritz Cirkel (Out of print.)

24. General Report on the Mining and Metallurgical Industries of Canada, 1907-8.

25. The Tungsten Ores of Canada. Report on—by Dr. T. L. Walker.

26. The Mineral Production of Canada, 1906. Annual Report on—by John McLeish, B.A.

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27. The Mineral Production of Canada, 1907. Preliminary Report on—by John McLeish.

27a. The Mineral Production of Canada, 1908. Preliminary Report on—by John McLeish. (Out of print.)

28. Summary Report of Mines Branch, 1908. (Out of print.)

28a. French translation: Summary Report of Mines Branch, 1908. (Out of print.)

29. Chrome Iron Ore Deposits of the Eastern Townships. Monograph on—by Fritz Cirkel. (Supplementary Section: Experiments with Chromite at McGill University—by Dr. J. B. Porter.)

30. Investigation of the Peat Bogs and Peat Fuel Industry of Canada, 1908. Bulletin No. 1—by Erik Nystrom, and A. Anrep, Peat Expert.

32. Investigation of Electric Shaft Furnace, Sweden. Report on—by Dr. Haanel.

47. Iron Ore Deposits of Vancouver and Texada islands. Report on—by Einar Lindeman, M.E.

55. Report on the Bituminous, or Oil-shales of New Brunswick and Nova Scotia; also on the Oil-shale Industry of Scotland—by Dr. R. W. Ells.

58. The Mineral Production of Canada, 1907 and 1908. Annual Report on—by John McLeish.

NOTE.—*The following preliminary Bulletins were published prior to the issuance of the Annual Report for 1907-8.*

31. Production of Cement in Canada, 1908. (Out of print.)

42. Production of Iron and Steel in Canada during the Calendar Years 1907 and 1908.

43. Production of Chromite in Canada during the Calendar Years 1907 and 1908.

44. Production of Asbestos in Canada, during the Calendar Years 1907 and 1908.

45. Production of Coal, Coke, and Peat in Canada, during the Calendar Years 1907 and 1908. (Out of print).

46. Production of Natural Gas and Petroleum in Canada during the Calendar Years 1907 and 1908.

59 Chemical Analyses of Special Economic Importance made in the Laboratories of the Department of Mines, 1906-7-8. Report on—by F. G. Wait, M.A., F.C.S. (With Appendix on the Commercial Methods and Apparatus for the Analysis of Oil-shales—by H. A. Leverin, Ch. E.)

Schedule of Charges for Chemical Analyses and Assays.

62. Mineral Production of Canada, 1909. Preliminary Report on—by John McLeish.

63. Summary Report of Mines Branch, 1909.

67. Iron Ore Deposits of the Bristol Mine, Pontiac county, Quebec. Bulletin No. 2—by Einar Lindeman, and Geo. C. Mackenzie, B.Sc.

68. Recent advances in the Construction of Electric Furnaces for the Production of Pig Iron, Steel, and Zinc. Bulletin No. 3—by Dr. Haanel. (Out of print.)

69. Chrysotile-Asbestos: Its Occurrence, Exploitation, Milling, and Uses. Report on—by Fritz Cirkel. (Second Edition, Enlarged.)

71. Investigation of the Peat Bogs, and Peat Industry of Canada, 1909-10; to which is appended Mr. Alf. Larson's Paper on Dr. M. Ekenberg's Wet-Carbonizing Process: from Teknisk Tidskrift, No. 12, December 26, 1908—translation by Mr. A. Anrep, Jr.; also a translation of Lieut. Ekelund's Pamphlet entitled 'A Solution of the Peat Problem,' 1909, describing the Ekelund Process for the Manufacture of Peat Powder, by Harold A. Leverin, Ch.E. Bulletin No. 4—by A. Anrep (Second Edition, enlarged). (Out of print.)

81. French Translation: Chrysotile-Asbestos, Its Occurrence, Exploitation, Milling, and Uses: Report on—by Fritz Cirkel.

82. Magnetic Concentration Experiments. Bulletin No. 5—by Geo. C. Mackenzie.

83. An investigation of the Coals of Canada with reference to their Economic Qualities: as conducted at McGill University under the authority of the Dominion Government. Report on—by J. B. Porter, E.M., D.Sc., R. J. Durley, Ma.E., and others—
Vol. I—Coal Washing and Coking Tests.
Vol. II—Boiler and Gas Producer Tests.
Vol. III—
Appendix I
Coal Washing Tests and Diagrams.

Vol. IV—
Appendix II
Boiler Tests and Diagrams.
Vol. V—
Appendix III
Producer Tests and Diagrams.
Vol. VI—
Appendix IV
Coking Tests.
Appendix V
Chemical Tests.

84. Gypsum Deposits of the Maritime Provinces of Cauada—including the Magdalen islands. Report on—by W. F. Jennison, M.E. (Out of print.)

88. The Mineral Production of Canada, 1909. Annual Report on—by John McLeish.

NOTE.—*The following preliminary Bulletins were published prior to the issuance of the Annual Report for 1909.*

79. Production of Iron and Steel in Canada during the Calendar Year 1909. (Out of print.)

80. Production of Coal and Coke in Canada during the Calendar Year 1909. (Out of print.)

85. Production of Cement, Lime, Clay Products, Stone, and other Structural Materials during the Calendar Year 1909.

89. Reprint of Presidential address delivered before the American Peat Society of Ottawa, July 25, 1910. By Dr. Haanel.

90. Proceedings of Conference on Explosives.

92. Investigation of the Explosives Industry in the Dominion of Canada, 1910. Report on—by Capt Arthur Desborough. (Second Edition.)

93. Molybdenum Ores of Canada. Report on—by Dr. T. L. Walker.

100. The Building and Ornamental Stones of Canada. Report on—by Professor W. A. Parks.

102. Mineral Production of Canada, 1910. Preliminary Report on—by John McLeish.

103. Summary Report of Mines Branch, 1910. (Out of print.)

104. Catalogue of Publications of Mines Branch, from 1902 to 1911; containing Tables of Contents and List of Maps, etc.

105. Austin Brook Iron-bearing district, New Brunswick. Report on—by Einar Lindeman.

110. Western Portion of Torbrook Iron Ore Deposits, Annapolis county, N.S. Bulletin No. 7—by Howells Fréchette, M.Sc.

111. Diamond Drilling at Point Mamainse, Ont. Bulletin No. 6—by A. C. Lane, Ph.D., with Introductory by A. W. G. Wilson, Ph.D.

118. Mica: Its Occurrence, Exploitation, and Uses. Report on—by Hugh S. de Schmid, M.E.

142. Summary Report of Mines Branch, 1911.

143. The Mineral Production of Canada, 1910. Annual Report on—by John McLeish.

NOTE.—*The following preliminary Bulletins were published prior to the issuance of the Annual Report for 1910.*

114. Production of Cement, Lime, Clay Products, Stone, and other Structural Materials in Canada 1910. (Out of print.)

115. Production of Iron and Steel in Canada during the Calendar Year 1910. (Out of print.)

116. Production of Coal and Coke in Canada during the Calendar Year 1910. (Out of print.)

117. General Summary of the Mineral Production of Canada during the Calendar Year 1910. (Out of print.)

145. Magnetic Iron Sands of Natashkwan, Saguenay county, Que. Report on—by Geo. C. Mackenzie.

150. The Mineral Production of Canada, 1911. Preliminary Report on—by John McLeish. (Out of print.)

151. Investigation of the Peat Bogs and Peat Industry of Canada, 1910-11. Bulletin No. 8—by A. Anrep.

154. The Utilization of Peat Fuel for the Production of Power, being a record of experiments conducted at the Fuel Testing Station, Ottawa, 1910-11. Report on—by B. F. Haanel, B.Sc.

156. French translation: The Tungsten Ores of Canada. Report on—by Dr. T. L. Walker.

167. Pyrites in Canada: Its Occurrence, Exploitation, Dressing, and Uses. Report on—by A. W. G. Wilson.

170. The Nickel Industry: with Special Reference to the Sudbury region, Ont. Report on—by Prof. A. P. Coleman, Ph.D.

184. Magnetite Occurrences along the Central Ontario railway. Report on—by E. Lindeman.

197. French translation: Molybdenum Ores of Canada. Report on—by Dr. T. L. Walker.

198. French translation: Peat and Lignite: Their Manufacture and Uses in Europe—by Erik Nystrom, M.E., 1908.

201. The Mineral Production of Canada during the calendar year 1911. Annual Report on—by John McLeish.

NOTE.—*The following preliminary Bulletins were published prior to the issuance of the Annual Report for 1911.*

181. Production of Cement, Lime, Clay Products, Stone, and other Structural Materials in Canada during the Calendar year 1911. Bulletin on—by John McLeish.

182. Production of Iron and Steel in Canada during the calendar year 1911. Bulletin on—by John McLeish.

183. General Summary of the Mineral Production in Canada during the calendar year 1911. Bulletin on—by John McLeish.

199. Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and other Metals of Canada, during the calendar year 1911. Bulletin on—by C. T. Cartwright.

200. The Production of Coal and Coke in Canada during the Calendar year 1911. Bulletin on—by John McLeish.

202. French translation: Graphite: Its Properties, Occurrence, Refining, and Uses—by Fritz Cirkel, 1907

216. The Mineral Production of Canada, 1912. Preliminary Report on—by John McLeish.

224. Summary Report of Mines Branch 1912.

IN THE PRESS.

196. French translation: Investigation of the Peat Bogs and Peat Industry of Canada, 1909-10; to which is appended Mr. Alf. Larson's paper on Dr. Ekenburg's Wet-Carbonizing Process: from Teknisk Tidskrift, No. 12, December 26, 1908—translation by Mr. A. Anrep; also a translation of Lieut. Ekelund's Pamphlet entitled "A Solution of the Peat Problem," 1909, describing the Ekelund Process for the Manufacture of Peat Powder, by Harold A Leverin, Ch.E. Bulletin No. 4—by A. Anrep. (Second Edition enlarged.)

203. Building Stones of Canada—Vol. II: Building and Ornamental Stones of the Maritime Provinces. Report on—by W. A. Parks.

233. French translation: Gypsum Deposits of the Maritime Provinces of Canada—including the Magdalen islands. Report on—by W. F. Jennison.

NOTE.—*Lists of manufacturers of clay products, stone quarry operators, and operators of limekilns, are prepared annually by the Division of Mineral Resources and Statistics, and copies may be had on application.*

MAPS.

†6. Magnetometric Survey, Vertical Intensity: Calabogie Mine, Bagot township, Renfrew county, Ontario —by E. Nystrom, 1904.

†13. Magnetometric Survey of the Belmont Iron Mines, Belmont township, Peterborough county, Ontario —by B. F. Haanel, 1905.

†14. Magnetometric Survey of the Wilbur mine, Lavant township, Lanark county, Ontario—by B. F. Haanel, 1905.

†33. Magnetometric Survey, Vertical Intensity: Lot 1, Concession VI, Mayo township, Hastings county, Ontario—by Howells Fréchette, 1909.

†34. Magnetometric Survey, Vertical Intensity: Lots 2 and 3, Concession VI, Mayo township, Hastings county, Ontario—by Howells Fréchette, 1909.

†35. Magnetometric Survey, Vertical Intensity: Lots 10, 11, and 12, Concession IX, and Lots 11 and 12, Concession VIII, Mayo township, Hastings county, Ontario—by Howells Fréchette, 1909.

*36. Survey of Mer Bleue Peat Bog, Gloucester township, Carleton county, and Cumberland township, Russell county, Ontario—by Erik Nystrom, and A. Anrep.

*37. Survey of Alfred Peat Bog, Alfred and Caledonia townships, Prescott county, Ontario—by Erik Nystrom, and A. Anrep.

Note.—1. Maps marked thus * are out of print.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

*38. Survey of Welland Peat Bog, Wainfleet and Humberstone townships, Welland county, Ontario—by Erik Nystrom, and A. Anrep.

*39. Survey of Newington Peat Bog, Osnabrook, Roxborough, and Cornwall townships, Stormont county, Ontario—by Erik Nystrom, and A. Anrep.

*40. Survey of Perth Peat Bog, Drummond township, Lanark county, Ontario—by Erik Nystrom, and A. Anrep.

*41. Survey of Victoria Road Peat Bog, Bexley and Carden townships, Victoria county, Ontario—by Erik Nystrom and A. Anrep.

48. Magnetometric Map of Iron Crown claim at Klaanch river, Vancouver island, B.C.—by Einar Lindeman.

49. Magnetometric Map of Western Steel Iron claim, at Sechart, Vancouver island, B.C.—by Einar Lindeman.

50. Vancouver island, B.C.—by Einar Lindeman.

51. Iron Mines, Texada island, B.C.—by E. H. Shepherd, C.E.

52. Sketch Map of Bog Iron Ore Deposits, West Arm, Quatsino sound, Vancouver island, B.C.

*53. Iron Ore Occurrences, Ottawa and Pontiac counties, Quebec, 1908—by J. White and Fritz Cirkel.

†54. Iron Ore Occurrences, Argenteuil county, Quebec, 1908—by Fritz Cirkel.

†57. The Productive Chrome Iron Ore District of Quebec—by Fritz Cirkel.

†60. Magnetometric Survey of the Bristol mine, Pontiac county, Quebec—by Einar Lindeman.

61. Topographical Map of Bristol mine, Pontiac county, Quebec—by Einar Lindeman.

†64. Index Map of Nova Scotia: Gypsum—by W. F. Jennison.

†65. Index Map of New Brunswick: Gypsum—by W. F. Jennison.

†66. Map of Magdalen Islands: Gypsum—by W. F. Jennison.

70. Magnetometric Survey of Northeast Arm Iron Range, Lake Timagami, Nipissing district, Ontario—by Einar Lindeman.

†72. Brunner Peat Bog, Ontario—by A. Anrep.

†73. Komoka Peat Bog, Ontario—by A. Anrep.

†74. Brockville Peat Bog, Ontario—by A. Anrep.

†75. Rondeau Peat Bog, Ontario—by A. Anrep.

†76. Alfred Peat Bog, Ontario—by A. Anrep.

†77. Alfred Peat Bog, Ontario: Main Ditch profile—by A. Anrep.

†78. Map of Asbestos Region, Province of Quebec, 1910—by Fritz Cirkel.

94. Map showing Cobalt, Gowganda, Shiningtree, and Porcupine districts—by L. H. Cole, B.Sc.

95. General Map of Canada showing Coal Fields. (Accompanying report No. 83—by Dr. J. B. Porter,)

96. General Map of Coal Fields of Nova Scotia and New Brunswick. (Accompanying Report No. 83—by Dr. J. B. Porter.)

97. General Map showing Coal Fields in Alberta, Saskatchewan, and Manitoba. (Accompanying Report No. 83—by Dr. J. B. Porter.)

98. General Map of Coal Fields in British Columbia. (Accompanying Report No. 83—by Dr. J. B. Porter.)

99. General Map of Coal Field in Yukon Territory. (Accompanying Report No. 83—by Dr. J. B. Porter.)

†106. Austin Brook Iron Bearing district, Bathurst township, Gloucester county, N.B.—by E. Lindeman.

†107. Magnetometric Survey, Vertical Intensity: Austin Brook Iron Bearing District—by E. Lindeman.

†108. Index Map showing Iron Bearing Area at Austin brook—by E. Lindeman.

112. Sketch plan showing Geology of Point Mamainse, Ont.—by Professor A. C. Lane.

†113. Holland Peat Bog, Ontario—by A. Anrep.

119-137. Mica: Township maps, Ontario and Quebec—by Hugh S. de Schmid.

†138. Mica: Showing Location of Principal Mines and Occurrences in the Quebec Mica Area—by Hugh S. de Schmid.

Note.—1. Maps marked thus * are out of print.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†139. Mica: Showing Location of Principal Mines and Occurrences in the Ontario Mica Area—by Hugh S. de Schmid.

140. Mica: Showing Distribution of the Principal Mica Occurrences in the Dominion of Canada—by Hugh S. de Schmid.

†141. Torbrook Iron Bearing District, Annapolis county, N.S.—by Howells Fréchette.

†146. Distribution of Iron Ore Sands of the Iron Ore Deposits on the North Shore of the River and Gulf of St. Lawrence, Canada—by Geo. C. Mackenzie.

†147. Magnetic Iron Sand Deposits in Relation to Natashkwan harbour and Great Natashkwan river, Que. (Index Map)—by Geo. C. Mackenzie.

†148. Natashkwan Magnetic Iron Sand Deposits, Saguenay county, Que.—by Geo. C. Mackenzie.

†152. Map Showing the Location of Peat Bogs investigated in Ontario—by A. Anrep.

†153. Map Showing the Location of Peat Bogs investigated in Manitoba—by A. Anrep.

†157. Lac du Bonnet Peat Bog, Manitoba—by A. Anrep.

†158. Transmission Peat Bog, Manitoba—by A. Anrep.

†159. Corduroy Peat Bog, Manitoba—by A. Anrep.

†160. Boggy Creek Peat Bog, Manitoba—by A. Anrep.

†161. Rice Lake Peat Bog, Manitoba—by A. Anrep.

†162. Mud Lake Peat Bog, Manitoba—by A. Anrep.

†163. Litter Peat Bog, Manitoba—by A. Anrep.

†164. Julius Peat Litter Bog, Manitoba—by A. Anrep.

†165. Fort Frances Peat Bog, Ontario—by A. Anrep.

166. Magnetometric Map of No. 3 mine, Lot 7, Concessions V and VI, McKim township, Sudbury district, Ont.—by E. Lindeman. (Accompanying Summary Report 1911.)

†168. Map showing Pyrites Mines and Prospects in Eastern Canada, and Their Relation to the United States Market—by A. W. G. Wilson.

†171. Geological Map of Sudbury Nickel region, Ont.—by Prof. A. P. Coleman.

†172. " Victoria Mine—by Prof. A. P. Coleman.

†173. " Crean Hill mine—by Prof. A. P. Coleman.

†174. " Creighton mine—by Prof. A. P. Coleman.

†175. " showing Contact of Norite and Laurentian in vicinity of Creighton mine—by Prof. A. P. Coleman.

†176. " of Copper Cliff offset—by Prof. A. P. Coleman.

†177. " No. 3. mine—by Prof. A. P. Coleman.

†178. " showing vicinity of Stobie and No. 3 mines—by Prof. A. P. Coleman.

†185. Magnetometric Survey, Vertical Intensity: Blairton iron mine, Belmont township, Peterborough county, Ontario—by E. Lindeman, 1911.

†185a. Geological Map, Blairton iron mine, Belmont township, Peterborough county, Ontario—by E. Lindeman, 1911.

†186. Magnetometric Survey, Belmont iron mine, Belmont township, Peterborough county, Ontario—by E. Lindeman, 1911.

†186a. Geological Map, Belmont iron mine, Belmont township, Peterborough county, Ontario—by E. Lindeman, 1911.

†187. Magnetometric Survey, Vertical Intensity: St. Charles mine, Tudor township, Hastings county, Ontario—by E. Lindeman, 1911.

†187a. Geological Map, St. Charles mine, Tudor township, Hastings county, Ontario—by E. Lindeman, 1911.

†188. Magnetometric Survey, Vertical Intensity: Baker mine, Tudor township, Hastings county, Ontario—by E. Lindeman, 1911.

†188a. Geological Map, Baker mine, Tudor township, Hastings county, Ontario—by E. Lindeman, 1911.

†189. Magnetometric Survey, Vertical Intensity: Ridge iron ore deposits, Wollaston township, Hastings county, Ontario—by E. Lindeman, 1911.

†190. Magnetometric Survey, Vertical Intensity: Coehill and Jenkins mines, Wollaston township, Hastings county, Ontario—by E. Lindeman, 1911.

†190a. Geological Map, Coehill and Jenkins mines, Wollaston township, Hastings county, Ontario—by E. Lindeman, 1911.

†191. Magnetometric Survey, Vertical Intensity: Bessemer iron ore deposits, Mayo township, Hastings county, Ontario—by E. Lindeman, 1911.

†191a. Geological Map, Bessemer iron ore deposits, Mayo township, Hastings county, Ontario—by E. Lindeman, 1911.

†192. Magnetometric Survey, Vertical Intensity: Rankin, Childs, and Stevens mines, Mayo township, Hastings county, Ontario—by E. Lindeman, 1911.

†192a. Geological Map, Rankin, Childs, and Stevens mines, Mayo township, Hastings county, Ontario—by E. Lindeman, 1911.

†193. Magnetometric Survey, Vertical Intensity: Kennedy property, Carlow township, Hastings county, Ontario—by E. Lindeman, 1911.

†193a. Geological Map, Kennedy property, Carlow township, Hastings county, Ontario—by E. Lindeman, 1911.

†194. Magnetometric Survey, Vertical Intensity: Bow Lake iron ore occurrences, Faraday township, Hastings county, Ontario—by E. Lindeman, 1911.

†204. Index Map, Magnetite occurrences along the Central Ontario Railway—by E. Lindeman, 1911.

†205. Magnetometric Map of Moose Mountain iron-bearing district—by E. Lindeman.

NOTE.—1. Maps marked thus * are out of print.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

CALL NO.	TITLE
TN 26 E5f no.184 1913	Magnetite occurrences along the Central Ontario railway.
	AUTHOR (Book) LINDEMAN, E
DATE BORROWED	VOL/NO/YR (Periodical)

BORROWER: _____

Name _____

Div. _____

Phone _____

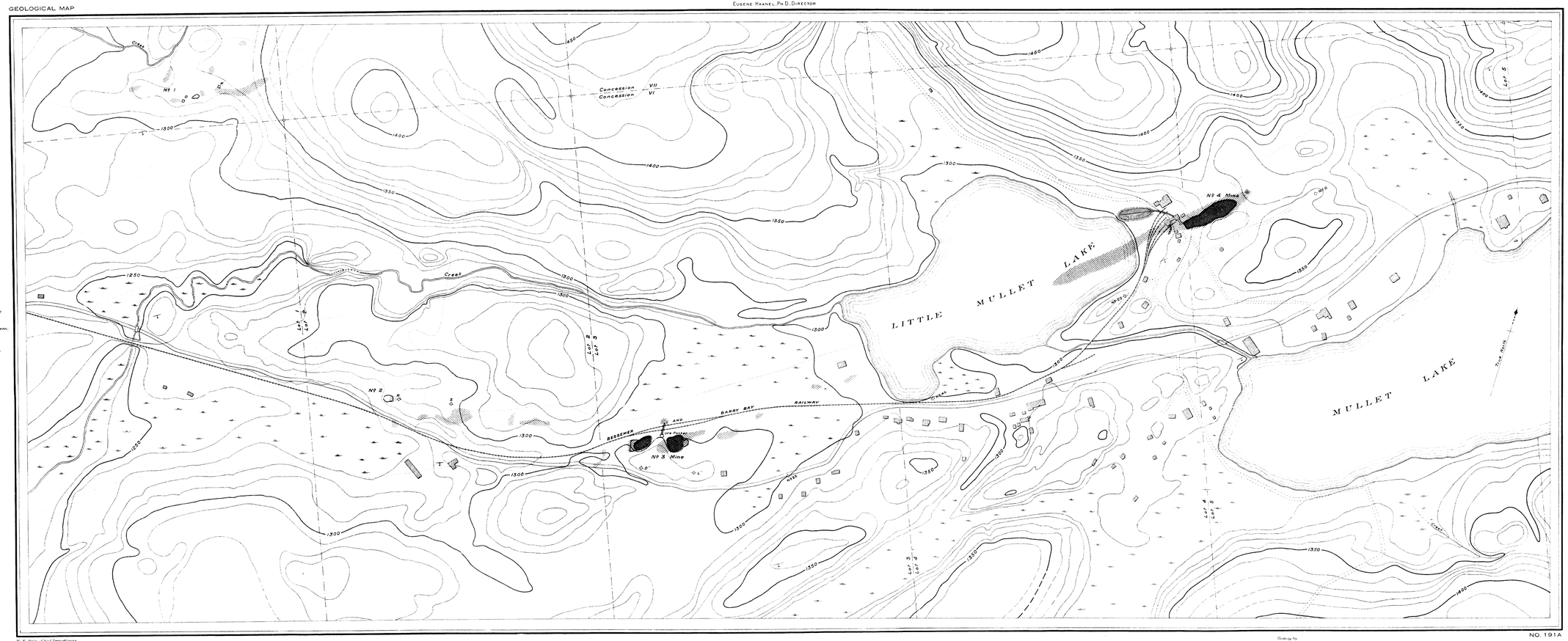
Room No. _____

MRB-132

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER. A. P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

GEOLOGICAL MAP



LEGEND

- Outcrop of Magnetite
- Drift-covered area within which Magnetite is likely to occur indicated by Magnetometer Survey
- Crystalline limestone schists (Archaean) and amphibolites
- Granite and granitegneiss
- Strike and dip

LEGEND

- Roads and boathouses
- Corner posts and Lot lines
- Reference posts
- Railways
- Elevated tramway
- Bridges
- Diamond drill hole
- Open cuts and Test pits
- Stripplings
- Streams
- Swamps
- Contours, interval 50 feet. Elevations above sea level
- Mine dumps

H. F. Bain, Chief Draughtsman
L. H. S. Pereira, Draughtsman

Geology by
E. Lindeman 1913

NO. 191A

IRON ORE DEPOSITS AT BESSEMER

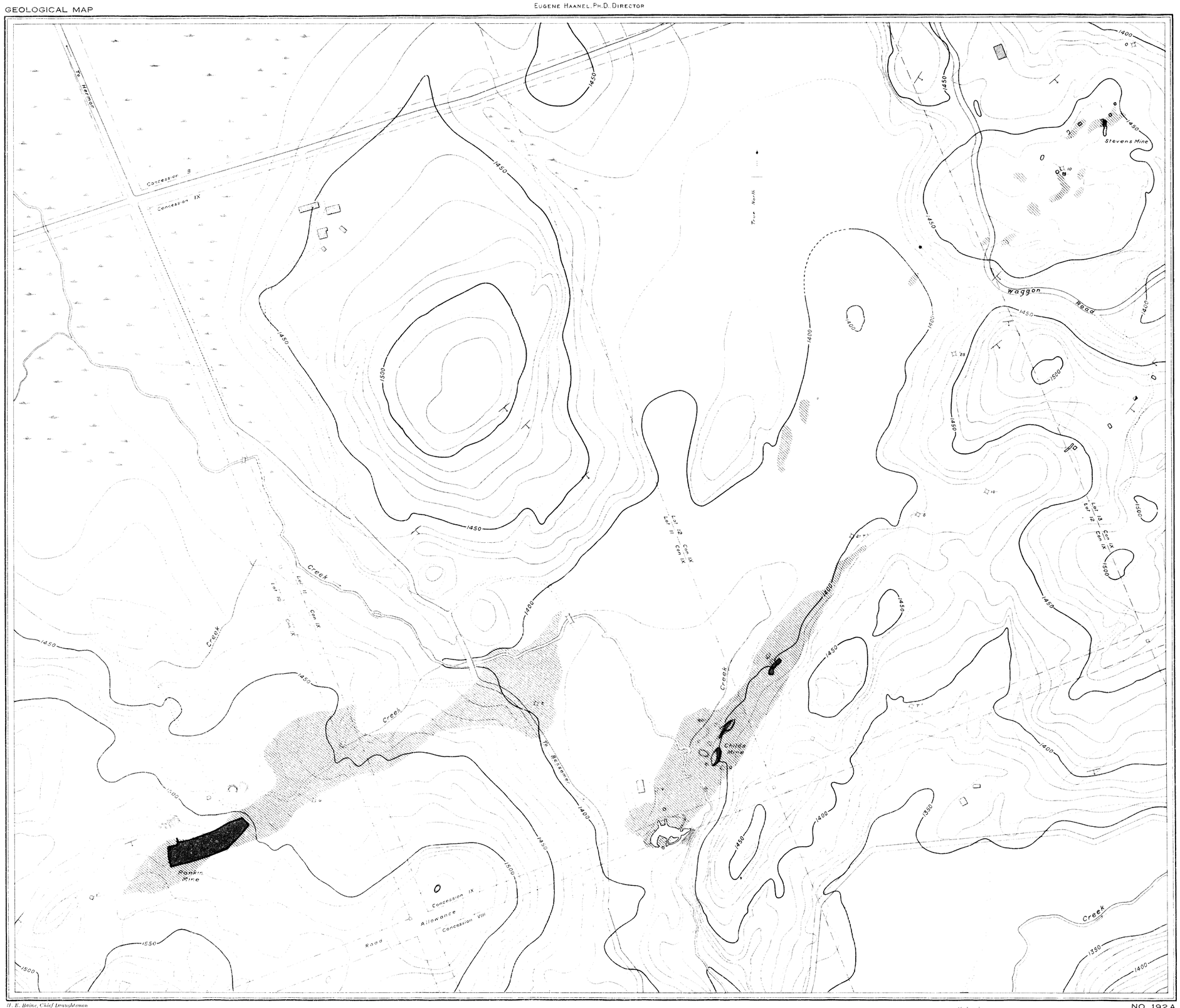
LOT 1, CON. VII, 2, 3, 4 AND 5, CON. VI
TOWNSHIP OF MAYO
HASTINGS COUNTY
ONTARIO

Scale, 1/2400 = 200 Feet to 1 inch

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

GEOLOGICAL MAP



LEGEND

- Undiscovered area
- Outcrop of Magnetite
- Undiscovered area within which Magnetite is likely to occur, indicated by Magnetometric Survey
- Crystalline limestone Schists (Archæan) and amphibolites
- Granite and granitegneiss "
- Strike and dip

LEGEND

- Roads and buildings
- Corner posts and Lot lines
- Reference posts
- Bridges
- Shafts
- Open cuts and Test pits
- Strippings
- Swamps
- Contours, interval 10 feet. Elevations above sea level
- Mine dumps

H. E. Braine, Chief Draughtsman
L. H. S. Percive, Draughtsman

Geology by
E. Lindeman 1911

NO. 192 A

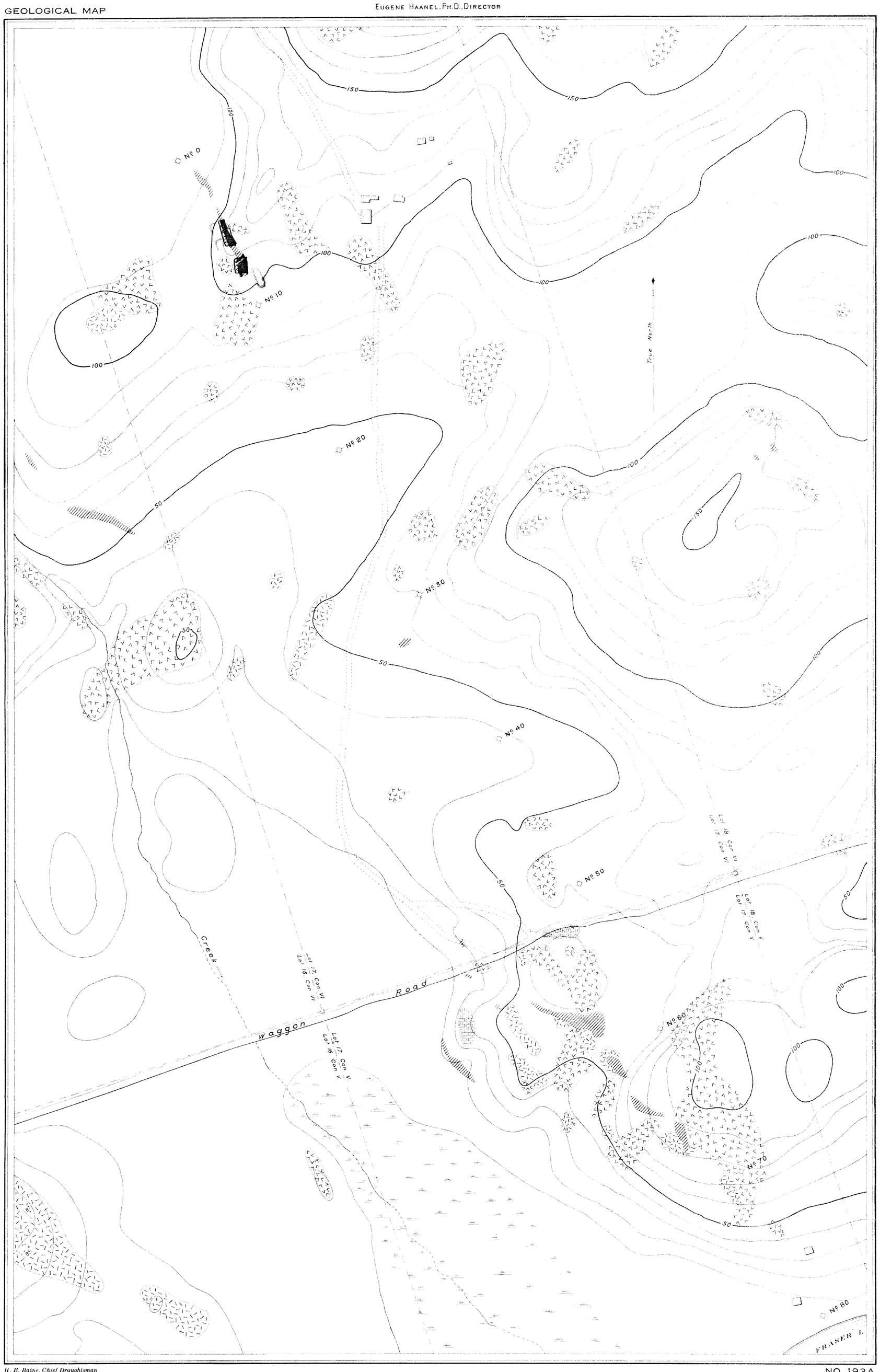
RANKIN, CHILDS AND STEPHENS IRON ORE DEPOSITS
LOTS 10, 11, 12 AND 13, CON. IX
TOWNSHIP OF MAYO
HASTINGS COUNTY
ONTARIO

Scale 16.5 rods to 1 Inch

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON ROBERT ROGERS, MINISTER: A. P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

GEOLOGICAL MAP



LEGEND

- Drift-covered area
- Outcrop of Magnetite
- Drift-covered area within which Magnetite is likely to occur, indicated by Magnetometric Survey
- Granites and pegmatite (Archæan)
- Mica and hornblende schists "
- Crystalline limestone "
- Strike and dip

LEGEND

- Roads and buildings
- Corner posts and Lot lines
- Reference posts
- Strippings
- Swamps
- Contours, interval 10 feet. Elevations above level of Fraser Lake
- Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

IRON ORE DEPOSITS
LOTS 16, 17, 18, CON. VI AND LOT 17 CON. V
CARLOW TOWNSHIP
ONTARIO

Scale 200' to 1 Inch

Geology by
E. Lindeman 1911

NO. 193A

Canada

DEPARTMENT OF MINES

MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER

EUGENE HAANEL, PH.D., DIRECTOR

GEOLOGICAL MAP

LEGEND

- Drift-covered area
- Outcrop of Magnetite
- Drift-covered area within which Magnetite is likely to occur indicated by Magnetometric Survey
- Syenite (Archæan)
- Crystalline limestone "
- Schists and amphibolites "
- Strike and dip

LEGEND

- Roads and buildings
- Fence posts and Lot lines
- Reference posts
- Railways
- Open cuts
- Shafts
- Strippings
- Pits filled with water
- Swamps
- Diamond drill hole
- Contours interval 20 feet Elevations above sea level
- Mine dumps

H. E. Bates, Chief Draughtsman.
L. H. S. Pereira, Draughtsman

COEHILL AND JENKINS IRON ORE DEPOSITS

LOTS 15, 16, 17 AND 18, CON. VIII

TOWNSHIP OF WOLLASTON

HASTINGS COUNTY

ONTARIO

Scale 1680 - 200' to 1 Inch

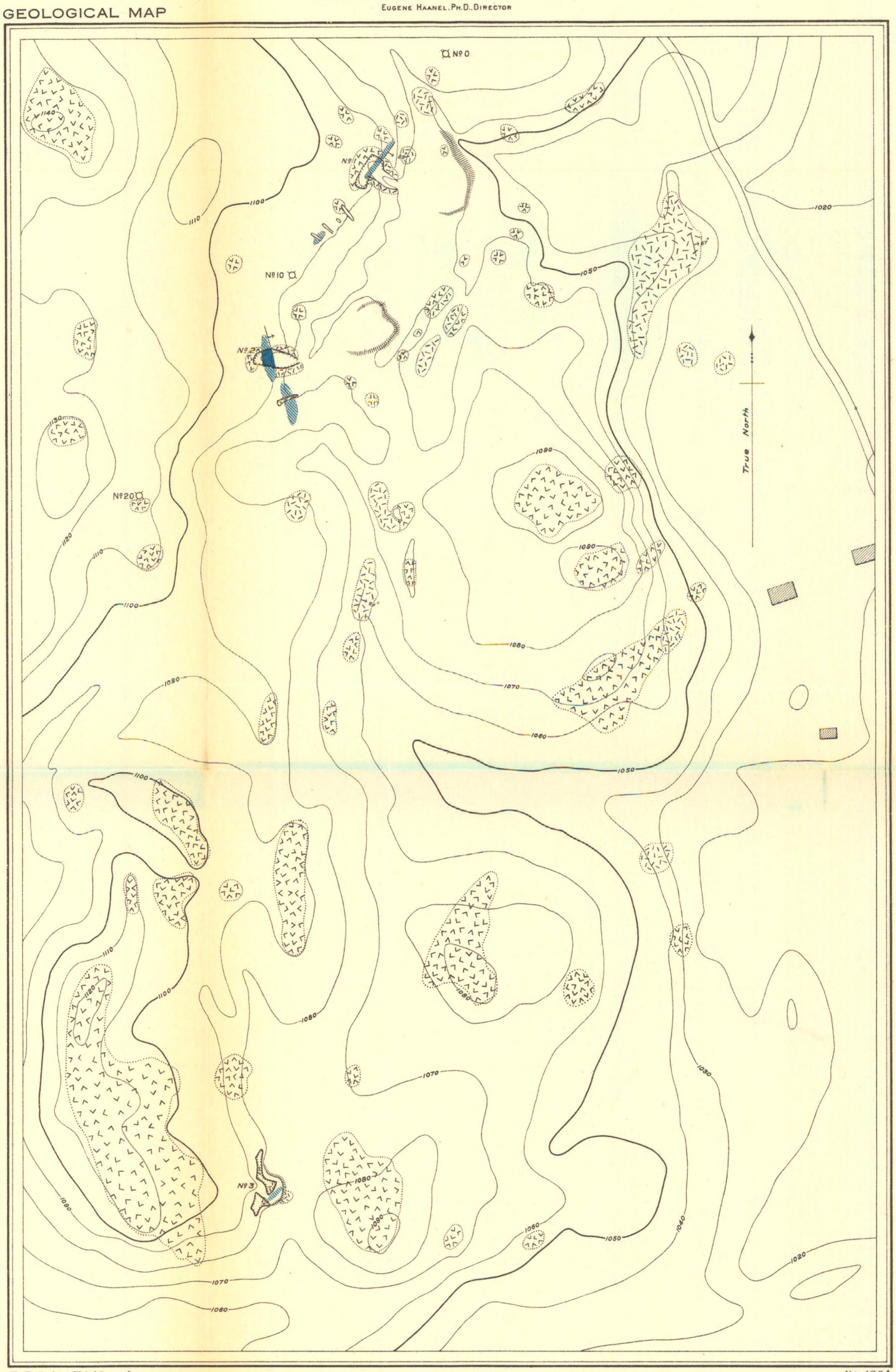
Geology by
E. Lindeman 1911

NO. 190A

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A.P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

GEOLOGICAL MAP



LEGEND

- *Driftcovered area*
- *Outcrop of Magnetite*
- *Driftcovered area within which Magnetite is likely to occur, indicated by Magnetometric Survey*
- *Diorite* (Archæan)
- *Crystalline limestone and amphibolites* "
- *Strike and dip*

LEGEND

- *Roads and buildings*
- *Reference posts Lot lines*
- *Open cuts and Test pits*
- *Contours, interval 10 feet Elevations above sea-level* (1200)
- *Mine dumps*

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

BAKER MINE
LOT 18, CON. XVIII
TOWNSHIP OF TUDOR
HASTINGS COUNTY
ONTARIO

Scale 1/600 - 200' to 1 Inch

100 0 100 200 300 400

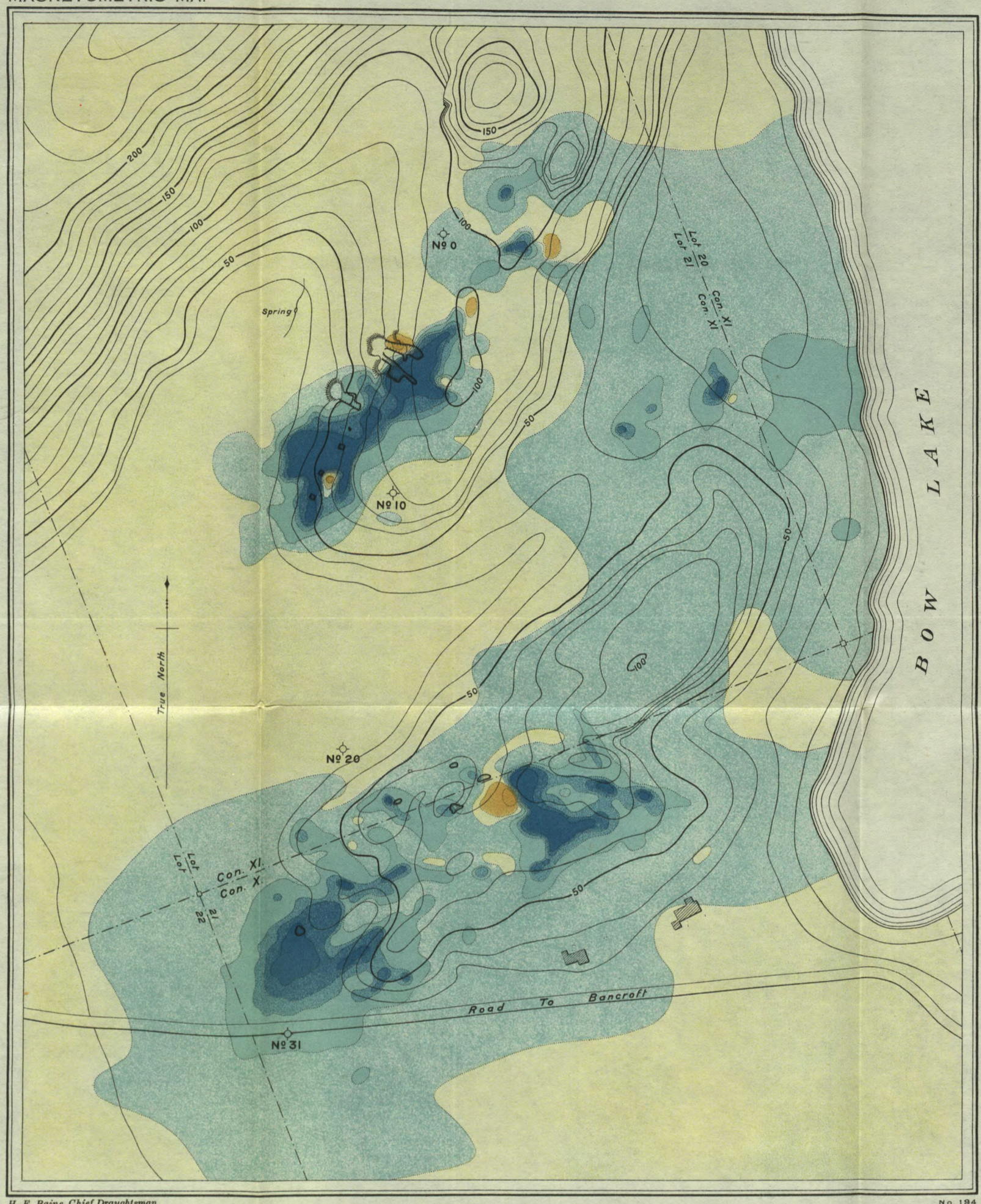
Geology by
E. Lindeman 1911

No. 188

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A.P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

MAGNETOMETRIC MAP



LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than 60°
between 50° – 60°
" 40° – 50°
" 20° – 40°
" 0° – 20°

Negative Intensity

between 0° – −20°
" −20° – −40°
" −40° – −60°

Constant of Instrument = 1.0 H

Magnetic declination about 9° West

LEGEND

Roads and buildings
Corner posts and Lot lines
Reference posts
Open cuts and Test pits
Strippings
Contours, interval 10 feet, based on assumed elevation of Bow Lake = 0
Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

No. 194

BOW LAKE IRON ORE DEPOSITS

LOT 21 CONS. X AND XI
TOWNSHIP OF FARADAY
HASTINGS COUNTY
ONTARIO

Scale 1/600 = 200' to 1 Inch

100 0 100 200 300 400

Surveyed by
E. Lindeman 1911
Assisted by W. M. Morrison

Canada

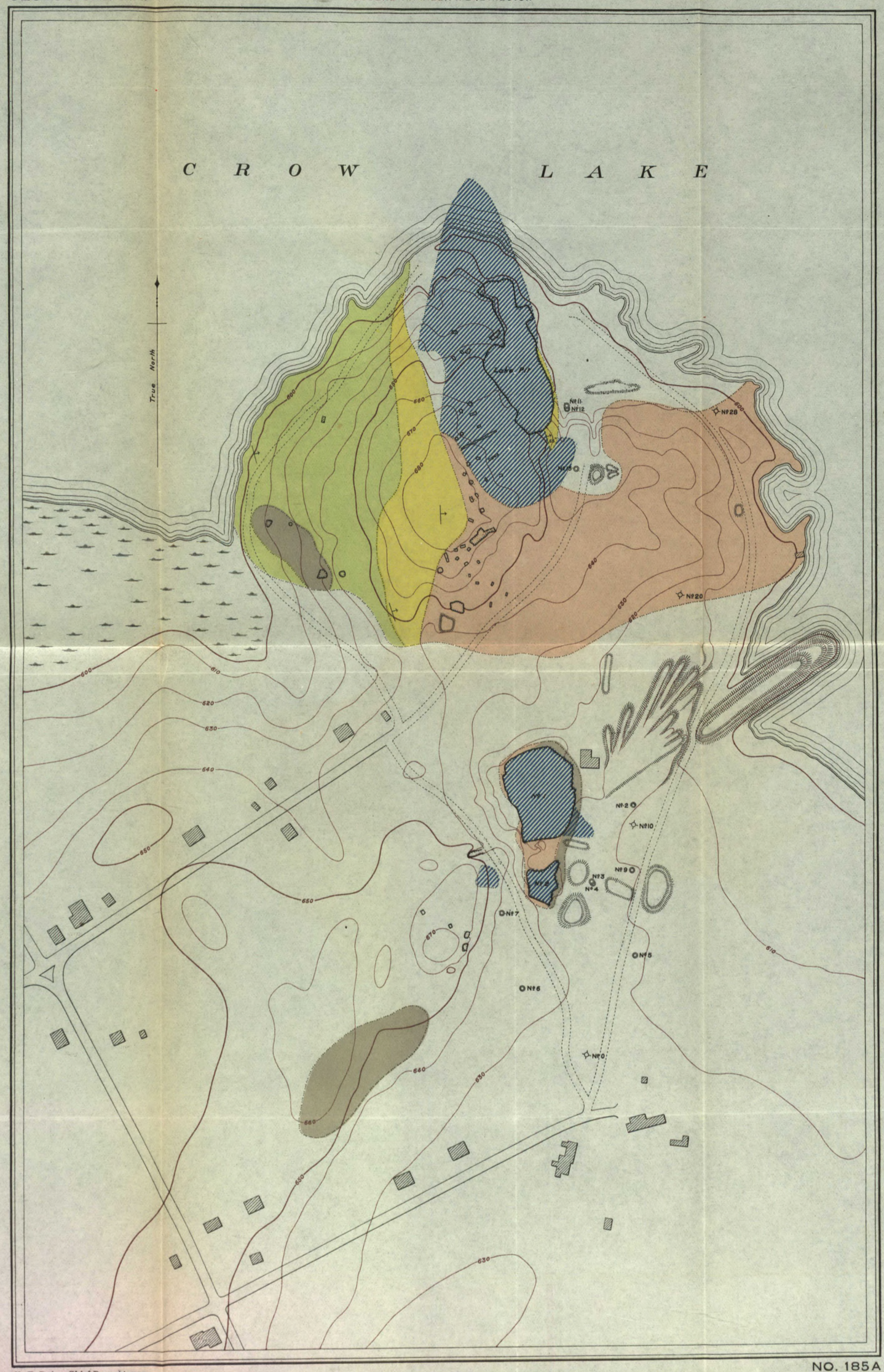
DEPARTMENT OF MINES

MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A.P. LOW, LL.D., DEPUTY MINISTER

EUGENE HAANEL, PH.D., DIRECTOR

GEOLOGICAL MAP



LEGEND

- Driftcovered area
- Area within which Magnetite is likely to occur, indicated by Magnetometric Survey
- Cambro-Silurian limestone and conglomerate
- Diorite (Archæan)
- Crystalline limestone, "
- Porphyritic hornblende and chlorite schist "
- Strike and dip

LEGEND

- Roads and buildings
- Reference posts
- Diamond drill-hole
- Open cuts and Test pits
- Swamps
- Contours, interval 10 feet Elevations above sea-level
- Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

BLAIRTON IRON MINE

LOT 8, CON. I
TOWNSHIP OF BELMONT
PETERBOROUGH COUNTY
ONTARIO

Scale 1250 - 200' to 1 Inch

100 0 100 200 300 400

Geology by
E. Lindeman 1911

NO. 185A

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A.P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

GEOLOGICAL MAP

LEGEND

- *Driftcovered area*
- *Outcrop of Magnetite*
- *Driftcovered area within which Magnetite is likely to occur, indicated by Magnetometric Survey*
- *Diorite* (Archæan)
- *Crystalline limestone* "
- *Porphyritic schist* "

LEGEND

- *Roads and buildings*
- *Reference posts*
- *Railways*
- *Bridges*
- *Diamond drill-hole*
- *Open cuts*
- *Strippings*
- *Swamps*
- *Contours, interval 10 feet Elevations above sea-level*
- *Trenches*
- *Mine dumps*

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

BELMONT IRON MINE
LOT 19, CON. I
TOWNSHIP OF BELMONT
PETERBOROUGH COUNTY
ONTARIO

Scale 1/2400 = 200' to 1 Inch

100 0 100 200 300 400

Geology by
E. Lindeman 1911

No. 186

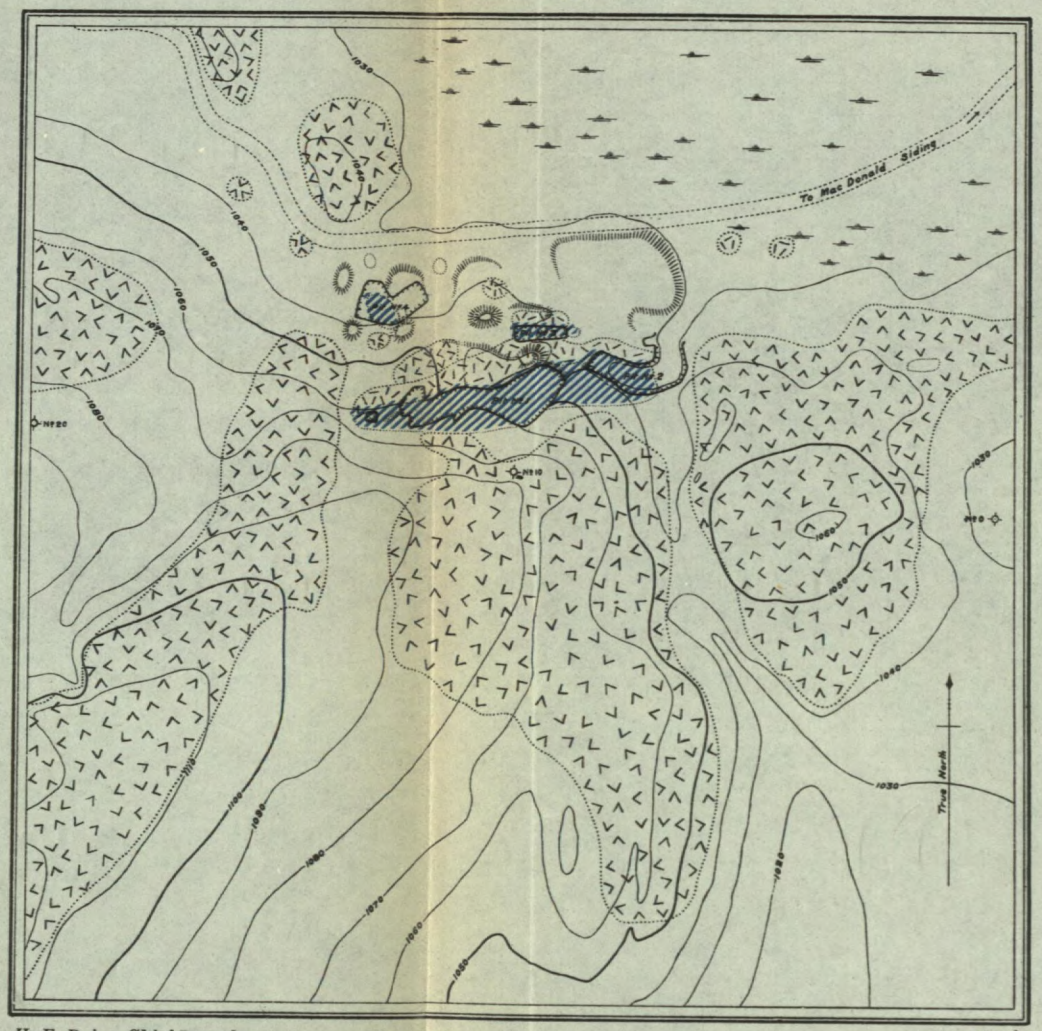
Canada

DEPARTMENT OF MINES

MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A.P. LOW, LL.D., DEPUTY MINISTER

EUGENE HAANEL, PH.D., DIRECTOR



LEGEND

Driftcovered area

Area within which Magnetite is likely to occur, indicated by Magnetometric Survey

Diorite (Archæan)

Crystalline limestone „

LEGEND

Roads and buildings

Reference posts

Open cuts

Strippings

Swamps

Contours, interval 10 feet
Elevations above sea-level

Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

ST. CHARLES MINE
LOT 19, CON. XI
TOWNSHIP OF TUDOR
HASTINGS COUNTY
ONTARIO

Scale 1/2400 = 200' to 1 Inch

100 0 100 200

Geology by
E. Lindeman 1911

No. 187

Canada

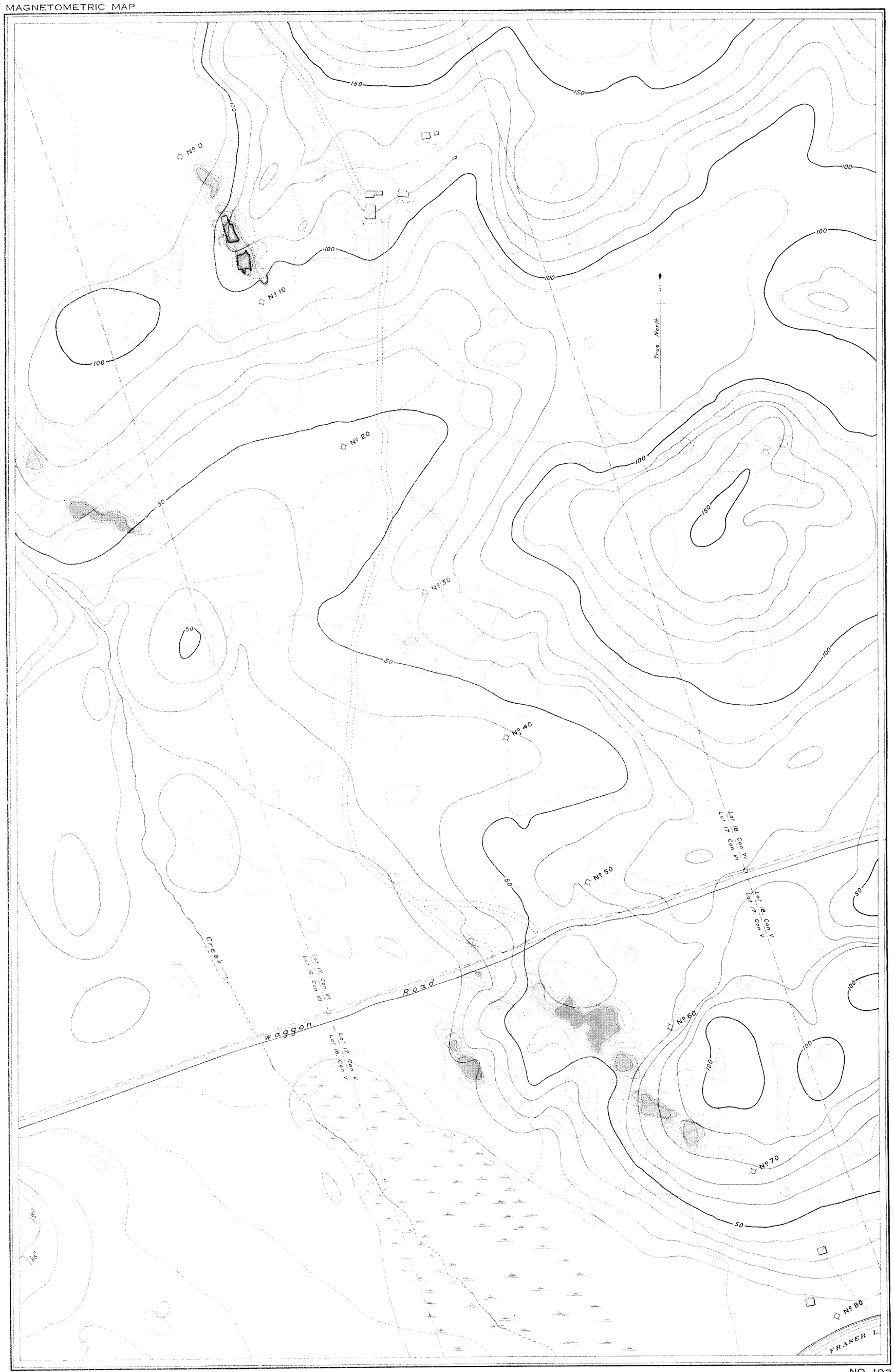
DEPARTMENT OF MINES

MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER

EUGENE HAANEL, PH.D., DIRECTOR

MAGNETOMETRIC MAP



LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than	60		
between	50	—	60
"	40	—	50
"	30	—	40
"	0	—	20

Negative Intensity

between	0	—	20
"	20	—	40
"	30	—	50

Constant of Instrument 1.0 R

Magnetic declination about 7° West

LEGEND

Roads and buildings

Corner posts and Lot lines

Reference posts

Strippings

Swamp

Contours, interval 10 feet Elevations above level of Fraser Lake

Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

IRON ORE DEPOSITS

LOTS 16, 17, 18, CON. V AND VI

CARLOW TOWNSHIP

ONTARIO

Scale 1/50 - 200' to 1 Inch

0 100 200 300 400

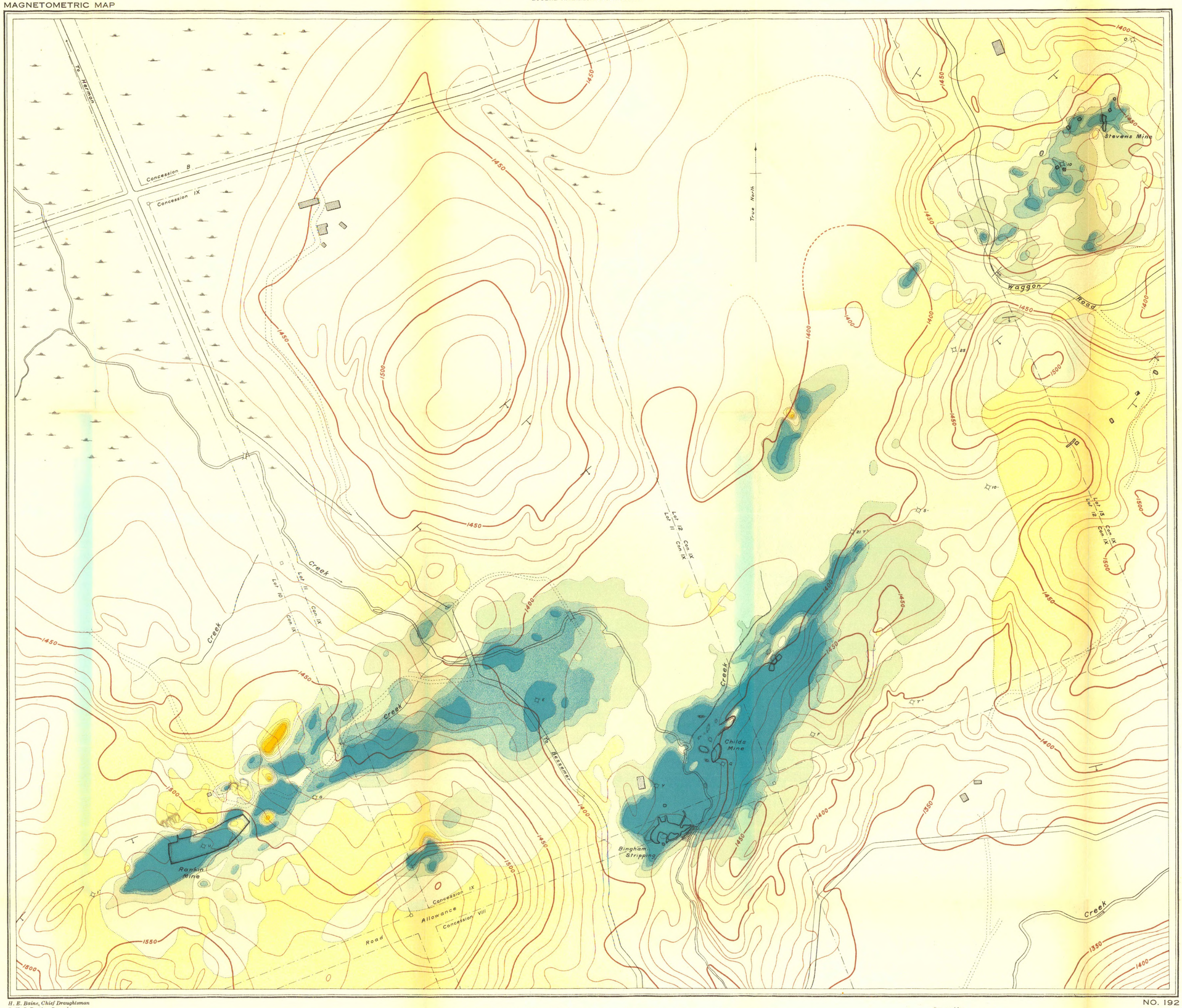
Surveyed by
E. Lindeman 1911
Assisted by W. M. Morrison

NO. 193

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

MAGNETOMETRIC MAP



LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

- Magnetic attraction greater than 60°
- between 50° – 60°
- " 40° – 50°
- " 20° – 40°
- " 0° – 20°

Negative Intensity

- between 0° – −20°
- " −20° – −40°
- " −40° – −50°
- " −50° – −60°
- Magnetic attraction greater than −60°

Constant of Instrument = 1.0 H

Magnetic declination about 11° West

LEGEND

- Roads and buildings
- Corner posts and Lot lines
- Reference posts
- Bridges
- Shafts
- Open cuts and Test pits
- Strippings
- Swamps
- Contours, interval 10 feet. Elevations above sea-level
- Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

NO. 192

RANKIN, CHILDS AND STEPHENS IRON ORE DEPOSITS
LOTS 10, 11, 12 AND 13, CON. IX
TOWNSHIP OF MAYO
HASTINGS COUNTY
ONTARIO

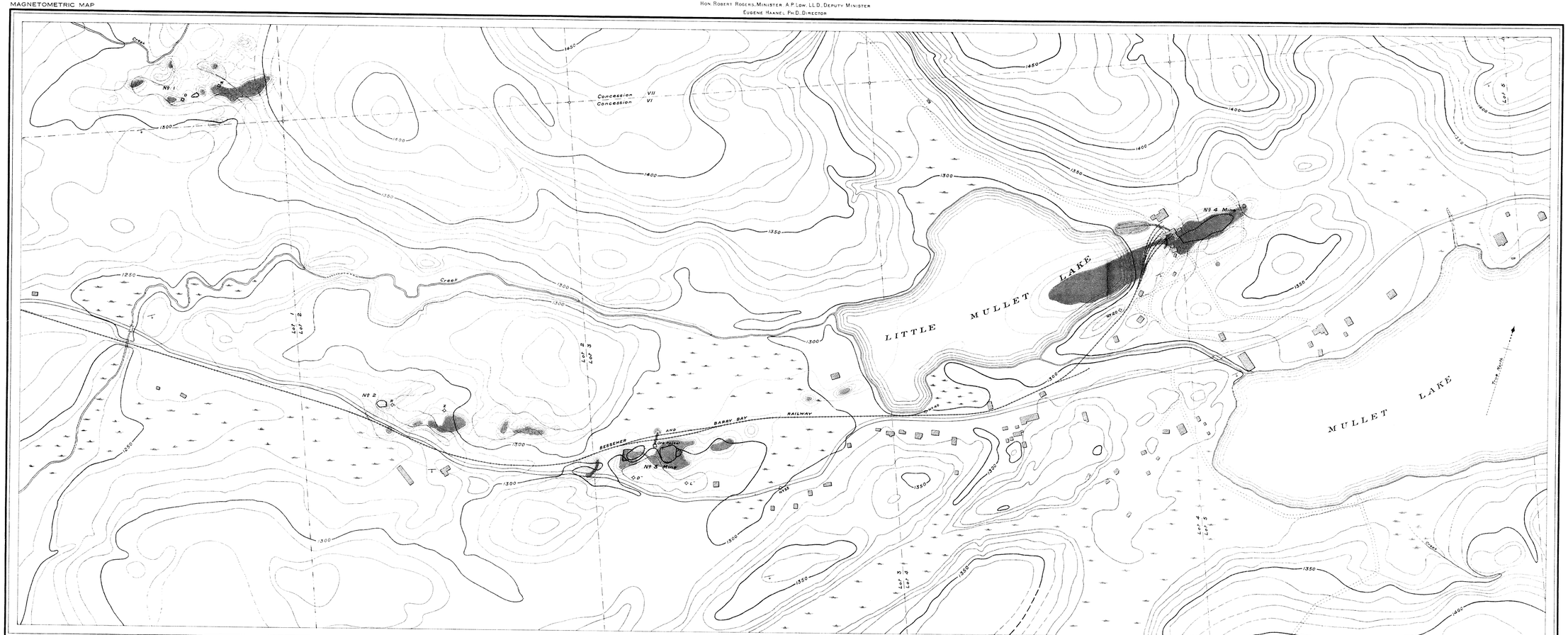
Scale 1080 - 200' to 1 Inch

Surveyed by
H. Frichette - 1908
E. Lindeman - 1911
Assisted by W. M. Morrison
O. G. Gallaher

Canada
DEPARTMENT OF MINES
MINES BRANCH

Hon. Robert Rogers, Minister A. P. Low, LL.D., Deputy Minister
Eugene Haanel, Ph.D., Director

MAGNETOMETRIC MAP



LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than 60°

between 50° and 60°
" 40° " 50°
" 30° " 40°
" 20° " 30°
" 0° " 20°

Negative Intensity

between 0° and 20°
" 20° " 30°
" 30° " 40°
" 40° " 50°
" 50° " 60°

Constant of Instrument – 108

Magnetic declination about 11 West

LEGEND

Roads and buildings
Corner posts and Lot lines
Bellevue posts
Railways
Elevated tramway
Bridges
Diamond drill hole
Open cuts and test pits
Strippings
Swamps
Contours interval 10 feet
Elevations above sea level
Mine dumps

H. E. Brine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

Iron Ore Deposits at Bessemer

Lot 1, Con. VII, 2, 3, 4 and 5, Con. VI

Township of Mayo

Hastings County

Ontario

Scale, 1/2400 = 200 Feet to 1 Inch

Magnetometric Survey
H. Prichett 1908
E. Lindeman 1911

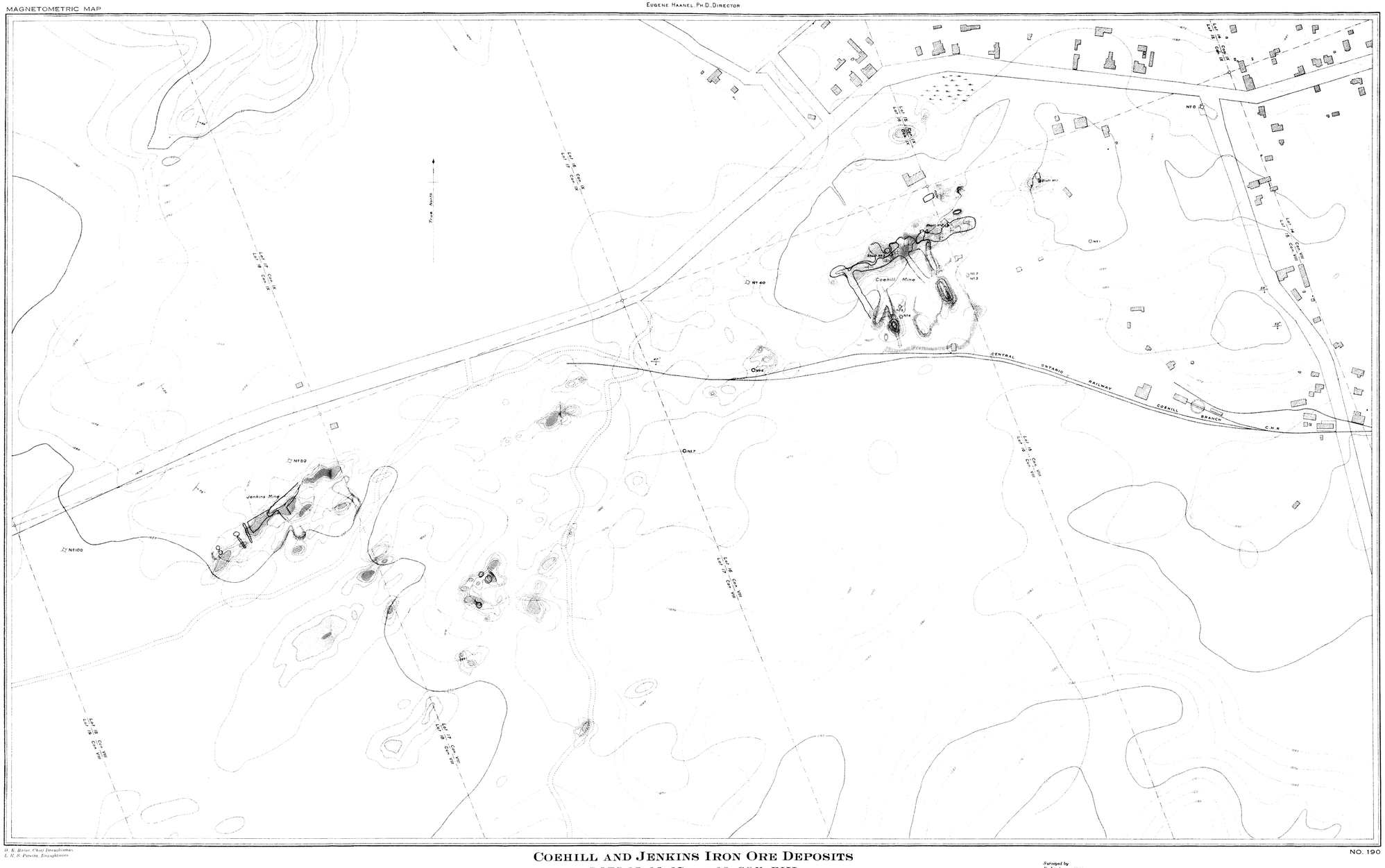
Topography
E. Lindeman 1911
Assisted by W. M. Morrison

NO. 191

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

MAGNETOMETRIC MAP



LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than	640	
between	560	640
"	480	560
"	400	480
"	320	400
"	240	320

Negative Intensity

between	40	240
"	80	80
"	160	80
"	240	160
"	320	240
Magnetic attraction greater than		320

Constant of Instrument 10 R

Magnetic declination about 10° West

LEGEND

- *Roads and buildings*
- *Corner posts and Lot lines*
- *Reference posts*
- *Railways*
- *Diamond drill hole*
- *Open cuts and Test pits*
- *Shafts*
- *Strippings*
- *Pits filled with water*
- *Swamps*
- *Contours, interval 10 feet Elevations above sea level*
- *Mine dumps*

H. K. Benn, Chief Draughtsman
L. H. S. Pereira, Draughtsman

COEHILL AND JENKINS IRON ORE DEPOSITS
LOTS 15, 16, 17 AND 18, CON. VIII
TOWNSHIP OF WOLLASTON
HASTINGS COUNTY
ONTARIO

Scale 400 feet to 1 Inch

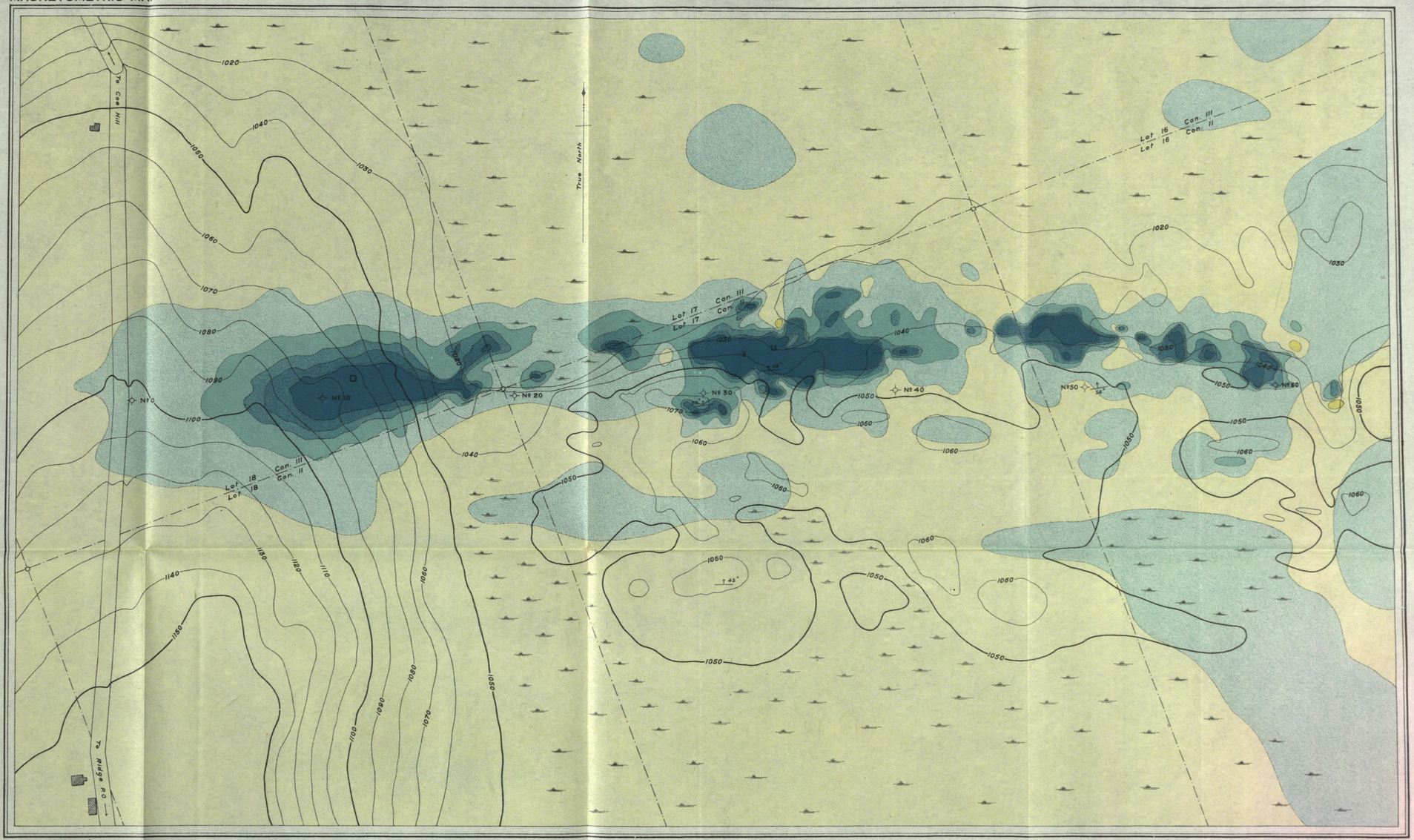
Surveyed by
R. Lindeman 1911
Assisted by O. G. Gallisher

NO. 190

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

MAGNETOMETRIC MAP



LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than 60°

between 50° – 60°

" 40° – 50°

" 20° – 40°

" 0° – 20°

Negative Intensity

between 0° – −20°

" −20° – −40°

Constant of Instrument = 1.0 H

Magnetic declination about 10° West

LEGEND

Road and buildings

Corner posts and Lot lines

Reference posts

Test pit

Strippings

Swamps

Contours, interval 10 feet. Elevations above sea-level

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

NO. 189

RIDGE IRON ORE DEPOSITS

LOTS 17 AND 18, CON. III, AND LOTS 16 AND 17, CON. II
TOWNSHIP OF WOLLASTON
HASTINGS COUNTY
ONTARIO

Scale 1 in. = 200′ to 1 Inch

Surveyed by
E. Lindeman 1911
Assisted by O. G. Gallaher

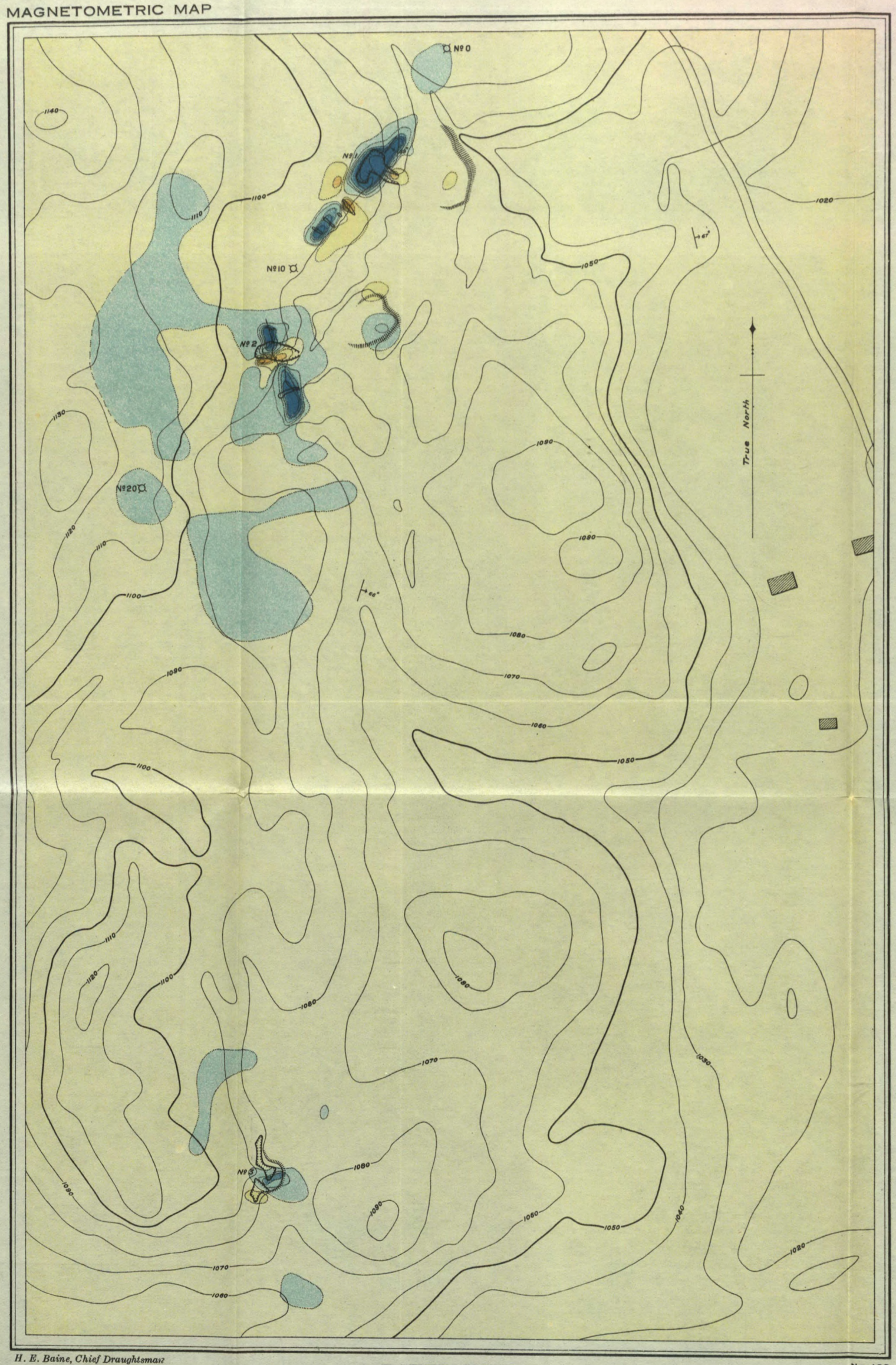
Canada

DEPARTMENT OF MINES

MINES BRANCH

HON. ROBERT ROGERS, MINISTER: A.P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

MAGNETOMETRIC MAP



LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than 60°
between 50° – 60°
" 40° – 50°
" 20° – 40°
" 0° – 20°

Negative Intensity

between 0° – –20°
" – 20° – –40°
" – 40° – –50°
" – 50° – –60°

Constant of Instrument = 1.0 H

Magnetic declination about 11°30' West

LEGEND

Road and buildings
Reference posts
Open cuts and Test pits
Contours, interval 10 feet Elevations above sea-level (1200)
Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

BAKER MINE

LOT 18, CON. XVIII

TOWNSHIP OF TUDOR

HASTINGS COUNTY

ONTARIO

Scale 1/200 - 200' to 1 Inch

100 0 100 200 300 400'

Surveyed by
E. Lindeman 1911
Assisted by O. G. Gallaher

No. 188

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A.P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than 60°

between 50° – 60°

" 40° – 50°

" 20° – 40°

" 0° – 20°

Negative Intensity

between 0° – −20°

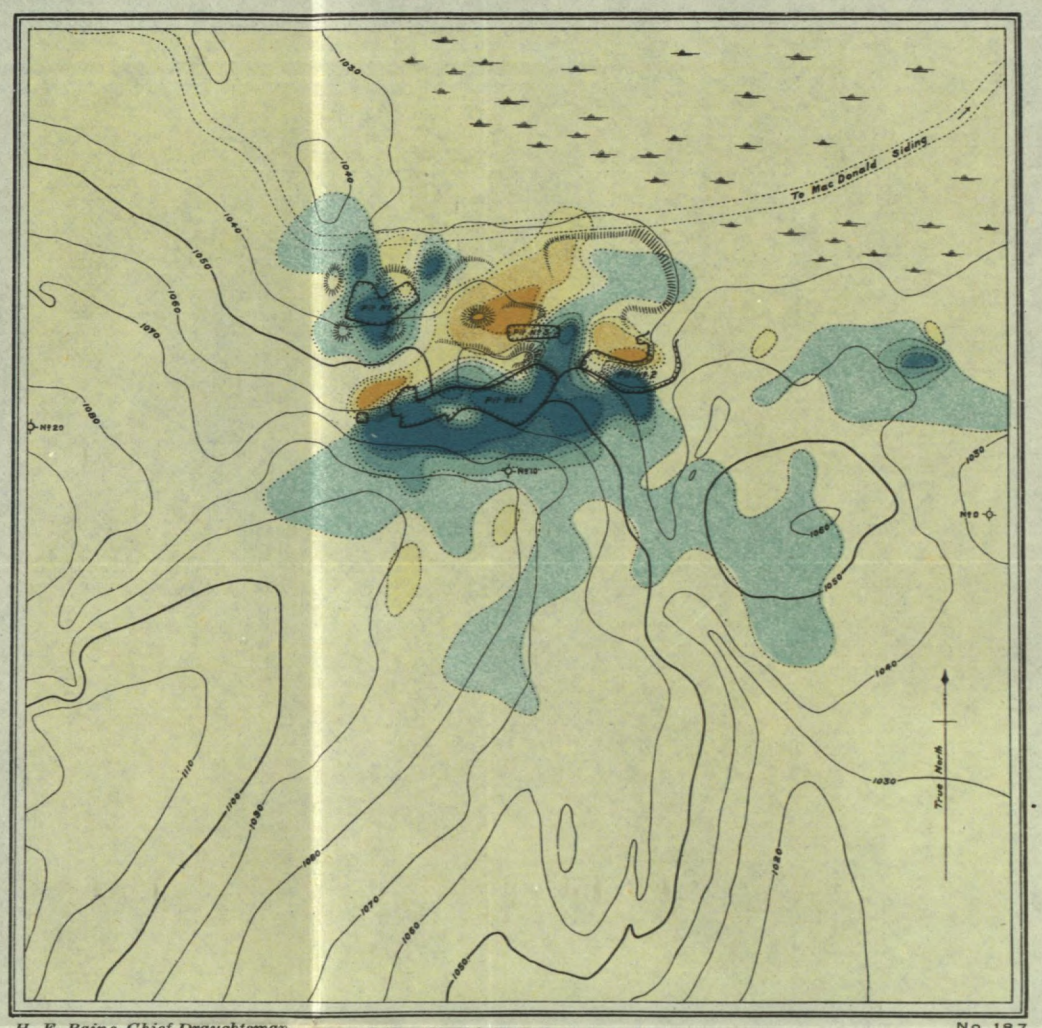
" −20° – −40°

" −40° – −60°

Magnetic attraction greater than −60°

Constant of Instrument = 1.0 H

Magnetic declination about 12° West



LEGEND

Road

Reference posts

Open cuts and Test pits

Strippings

Swamps

Contours, interval 10 feet
Elevations above sea-level

Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

ST. CHARLES MINE
LOT 19, CON. XI
TOWNSHIP OF TUDOR
HASTINGS COUNTY
ONTARIO

Scale $\frac{1}{2400}$ = 200′ to 1 Inch

100 0 100 200 300 400

No. 187

Magnetometric Survey 1911
E. Lindeman
Assisted by O. G. Gallaher

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A.P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

MAGNETOMETRIC MAP

LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than	*60°*
between	*50° – 60°*
„	*40° – 50°*
„	*20° – 40°*
„	*0° – 20°*

Negative Intensity

between	*0° – −20°*
„	*− 20° – −40°*
„	*− 40° – −50°*
„	*− 50° – −60°*
Magnetic attraction greater than	*− 60°*

Constant of Instrument = 1.0 H

Magnetic declination about 13° West

LEGEND

Roads and buildings

Reference posts

Diamond drill-hole

Open cuts and Test pits

Swamp

Contours, interval 10 feet
Elevations above sea-level

Mine dumps

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

BLAIRTON IRON MINE
LOT 8, CON. I
TOWNSHIP OF BELMONT
PETERBOROUGH COUNTY
ONTARIO

Scale 1/2400 = 200' to 1 Inch

100 0 100 200 300 400

Surveyed by
E. Lindeman 1911
Assisted by W. M. Morrison

No. 185

Canada
DEPARTMENT OF MINES
MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER
EUGENE HAANEL, PH.D., DIRECTOR

LEGEND

Isodynamic lines of the vertical magnetic intensity

Positive Intensity

Magnetic attraction greater than	60°		
between	50°	–	60°
"	40°	–	50°
"	20°	–	40°
"	0°	–	20°

Negative Intensity

between	0°	–	– 20°
"	– 20°	–	– 40°
"	– 40°	–	– 50°

Constant of Instrument = 1.0 H

Magnetic declination about 13° West

LEGEND

Roads and buildings

Reference posts

Railways

Bridges

Diamond drill-hole

Open cuts and Test pits

Strippings

Swamps

Contours, interval 10 feet
Elevations above sea-level

Mine dumps

Trenches

H. E. Baine, Chief Draughtsman
L. H. S. Pereira, Draughtsman

No. 186

BELMONT IRON MINE
LOT 19, CON. I
TOWNSHIP OF BELMONT
PETERBOROUGH COUNTY
ONTARIO

Scale 1/2400 = 200' to 1 Inch

100 0 100 200 300 400

Magnetometric Survey
B. F. Haanel 1905
Topography
E. Lindeman 1911
Assisted by W. M. Morrison

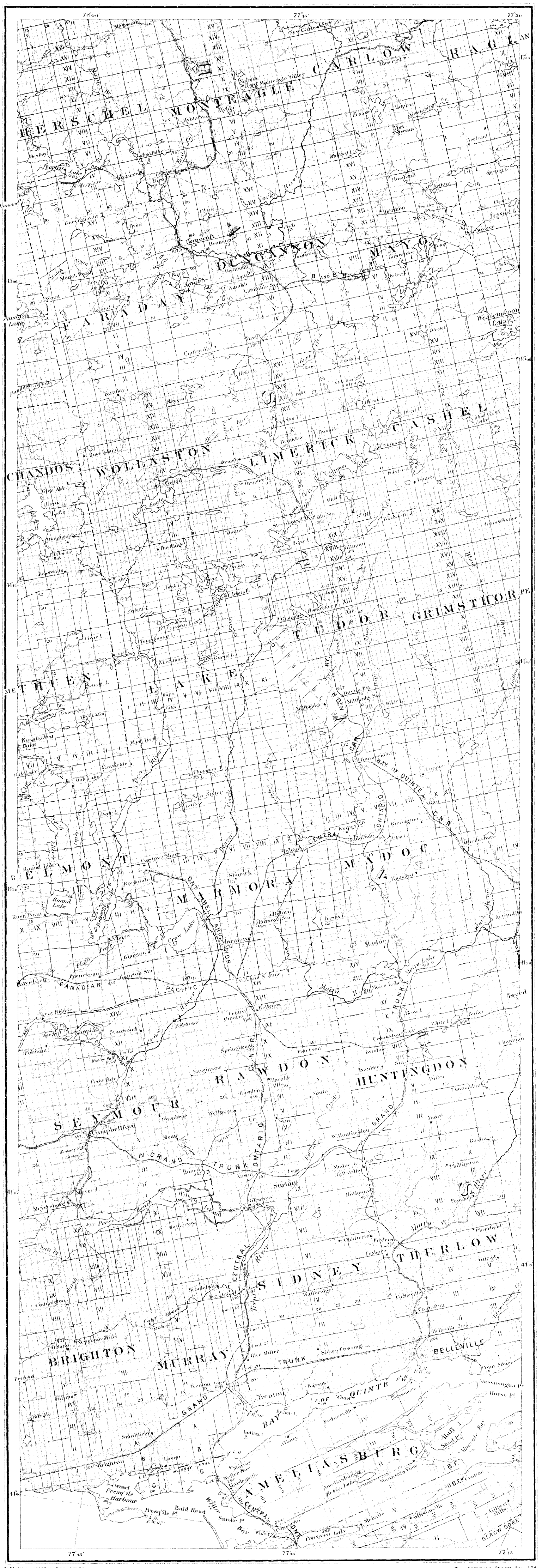
CANADA

DEPARTMENT OF MINES

MINES BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER;
EUGENE HAANEL, PH.D., DIRECTOR.

1912



BASE MAP, GEOGRAPHER'S OFFICE
DEPT. OF INTERIOR

TO ACCOMPANY REPORT No. 184
No. 204

INDEX MAP

MAGNETITE OCCURRENCES

ALONG THE

CENTRAL ONTARIO Ry

Scale: 250,000 or 3·95 miles to one inch

1 0 1 2 3 4 5 6 7 8 9 10 Miles