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FIFTY-SECOND ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES
1943
PART II



PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. LESLIE M. FROST, *Minister of Mines*

H. C. RICKABY, *Deputy Minister*

FIFTY-SECOND ANNUAL REPORT
OF THE
ONTARIO DEPARTMENT OF MINES

BEING
VOL. LII, PART II, 1943

Mineral Occurrences in the Haliburton Area

By

J. SATTERLY

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1943



TABLE OF CONTENTS
Vol. LII, Part II

	PAGE		PAGE
Introduction	1	Feldspar	28
Acknowledgements	2	Haliburton County	28
Means of Access	2	Muskoka District	30
Previous Geological Work	3	Fluorspar	31
Topography and Drainage	4	Haliburton County	32
Natural Resources	5	Garnet	34
Agriculture	5	Haliburton County	35
Forests	5	Peterborough County	35
Water Powers	6	Victoria County	35
Fish and Game	6	Gold	36
Tourists	6	Peterborough County	36
Early Settlement	6	Graphite	40
General Geology	8	Haliburton County	40
Table of Formations	8	Peterborough County	43
Pre-Cambrian	9	Iron	44
Volcanics	9	Haliburton County	44
Sediments	10	Peterborough County	47
Paragneiss	10	Lead	49
Conglomerate	10	Peterborough County	49
Crystalline Limestone and Dolomite; Amphibolite	11	Victoria County	50
Intrusives	12	Limestone and Dolomite	51
Diorite, Gabbro, Anorthosite, Peridotite, Basalt	12	Marl	55
Granite, Granite Gneiss, Hybrid Gneiss	13	Peterborough County	55
Nepheline Syenite, Nepheline Pegmatite	13	Mica	55
Alkali Syenite and Syenite-Pegmatite	18	Haliburton County	56
Pink Granite and Pegmatite	18	Muskoka District	58
Diabase	18	Peterborough County	59
Paleozoic	19	Molybdenum	60
Ordovician	19	Haliburton County	60
Cenozoic	19	Victoria County	70
Pleistocene	19	Nepheline	71
Recent	19	Haliburton County	71
Mineral Occurrences	19	Peterborough County	78
Apatite	19	Peat	81
Haliburton County	20	Victoria County	81
Clay	20	Pyrite	82
Muskoka District	21	Peterborough County	82
Copper	21	Radioactive Minerals	83
Peterborough County	21	Haliburton County	83
Corundum	21	Stone	85
Haliburton County	22	Haliburton County	86
Peterborough County	23	Muskoka District	88
Diatomite	24	Ontario County	88
Muskoka District	25	Peterborough County	90
Parry Sound District	28	Victoria County	92
		Appendix I—Recent Developments on Fluorspar Showings	94
		Appendix II—Reference List by Townships to the Mineral Occurrences in the Haliburton Area	96

ILLUSTRATIONS

	PAGE
Falls and rapids on the Gull river, Haliburton county	4
Banded paragneiss showing alternation of biotite-rich and biotite-poor bands, No. 11 highway in Bracebridge	10
Banded hybrid gneiss cut by a pegmatite dike, near the northwest arm of Raven lake, Ridout township, Muskoka district	12
Closely spaced vertical jointing in nepheline syenite, Blue mountains, Methuen township, Peterborough county	13
Outcrop showing replacement of nepheline-albite gneiss along joint planes by alkali syenite, Monmouth township, Haliburton county	14
Outcrop showing replacement of nepheline-albite gneiss along intersecting joint planes by alkali syenite, Monmouth township, Haliburton county	15
Anticlinal fold in interbedded crystalline limestone and paragneiss intruded by nepheline pegmatite, lower Fraser quarry, Glamorgan township, Haliburton county	16
Scalloped border in black biotite-rich crystalline limestone or paragneiss adjacent to coarse nepheline pegmatite containing residual fragments of paragneiss, upper Fraser quarry, Glamorgan township, Haliburton county	17
Headframe and mill of Canada Radium Mines, Limited, at Cheddar, Cardiff township, Haliburton county	29
Nepheline pegmatite at the upper Gill quarry, Glamorgan township, Haliburton county	73
Nephelelized and albitized crystalline limestone underlain by biotite-nepheline-albite gneiss, lower Gill quarry, Glamorgan township, Haliburton county	74
Nepheline-albite pegmatite in the southern mass on the Mackay property, Monmouth township, Haliburton county	77
View looking northeast along the southeast face of the Blue mountains and overlooking the quarries of the American Nepheline Corporation	79
View looking west on the property of the American Nepheline Corporation on the Blue mountains, Methuen township, Peterborough county	79
Unloading platform and scow laden with nepheline syenite at the east end of Stony lake, Burleigh township, Peterborough county	80
Austin clam at dock, Lakefield, unloading nepheline syenite from scows	80
Mill block, 3 by 4 by 5 feet, of porphyritic biotite granite in the quarry of the Stoney Lake Granite Quarries, Limited, Dummer township, Peterborough county	91

SKETCH MAPS, SECTIONS, AND PLAN

	PAGE
Key map showing the location of the Haliburton area	1
Geological map of the Blue mountains <i>coloured insert facing</i>	14
Composite plan of surface buildings, underground workings, and diamond-drill holes, Cordova mine <i>insert facing</i>	36
Longitudinal vertical section of the Cordova mine <i>insert facing</i>	38
Transverse vertical section west of No. 1 shaft, Cordova mine	38
Transverse vertical section west of No. 3 shaft, Cordova mine	39
Geological sketch map of the workings of Brough Lake Molybdenite, Limited, Cardiff township, Haliburton county	62
Geological sketch map of the Joiner property, Cardiff township <i>insert facing</i>	64
Geological sketch map of the Gill property, Glamorgan township, Haliburton county	72
Geological sketch map showing the distribution of nepheline rocks in lots 10, 11, and 12, concessions VI, VII, and VIII, Monmouth township, Haliburton county	75
Geological sketch map of the Mackay property, Monmouth township, Haliburton county	76
Sketch map of the main workings of Wilberforce Minerals, Limited, Cardiff township, Haliburton county	84

COLOURED GEOLOGICAL MAP (In pocket at back of report)

Map No. 52a—Haliburton Area, Province of Ontario. Scale, 1 inch to 2 miles.

MINERAL OCCURRENCES IN THE HALIBURTON AREA

By J. Satterly

Introduction

The Haliburton map area comprises Haliburton county, parts of Ontario, Peterborough, and Victoria counties, and parts of Muskoka, Nipissing, and Parry Sound districts.

Numerous mineral occurrences have been found in the area during the past 50 years, but few of them have been operated on a commercial scale. For a number of years the only operations in the area have been for nepheline syenite,

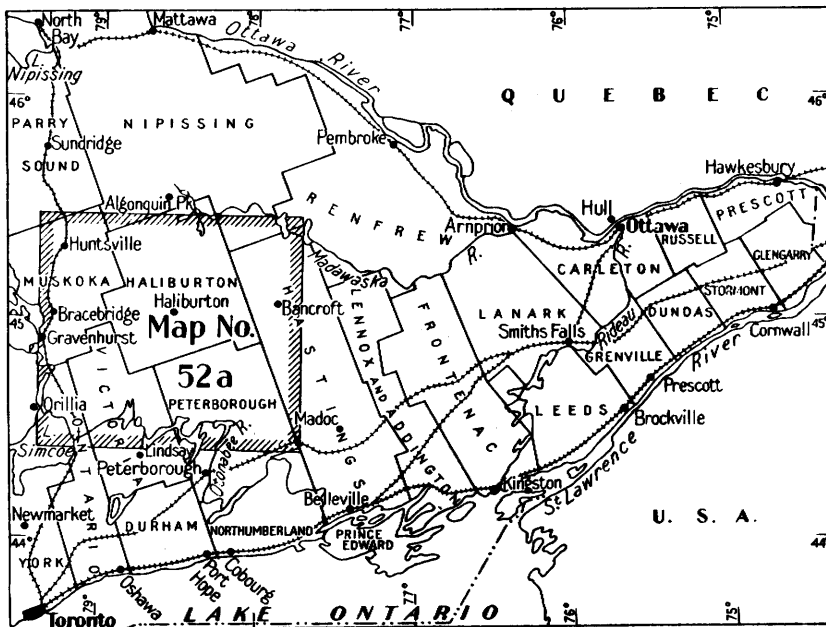


Fig. 1—Key map showing the location of the Haliburton area.
Scale, 1 inch to 60 miles.

stone, and clay. Except for a small gold production from the Cordova mine in 1939 and 1940, there has been no production of metallic minerals since the war of 1914–18, when a number of small molybdenite deposits were worked. The last few years have witnessed a revival of interest in the area, and there has been some prospecting for fluorspar, graphite, iron, nepheline, mica, and molybdenite.

In order to make an inventory of the mineral resources of the area the writer spent the 1942 field season in examining a large number of mineral occurrences. The mineral deposits include apatite, clay, copper, corundum, diatomite, feldspar, fluorspar, garnet, gold, graphite, iron, lead, marl, mica, molybdenum, nepheline, pyrite, radioactive and rare-element minerals, and stone. Few of these occur-

rences are of a size or grade to constitute commercial deposits at present market prices.

The mineral occurrences visited, as well as a number of others not seen by the writer but described in the literature on the area, are shown by a red spot and an appropriate symbol on the accompanying map. In the course of the field work practically all the roads in the area accessible to a car were travelled and a geological map was made. In a few localities more detailed mapping was carried out. From this information and previously published maps a geological map of the Haliburton area was compiled. There was no previously published geological map of the western third of the area.

In the descriptions of the mineral occurrences in this report the writer has included descriptions of a number of occurrences, not seen or located by the writer, taken from older reports.

Acknowledgements

The writer wishes to thank the many local residents for their friendly cooperation, and particularly for their help in the location of old workings. Special thanks are due to F. W. Chubb, who spent several days guiding the party to occurrences of nepheline syenite, mica, and corundum. To Ventures, Limited, the writer is indebted for permission to publish information and maps of properties examined or owned by them and for the use of certain plans during the field season. P. E. Hopkins has kindly permitted publication of information from a private report on a pyrite deposit in Galway township.

To the American Nepheline Corporation the writer is grateful for permission to publish a geological map of the Blue mountains and to the Consolidated Mining and Smelting Company of Canada, Limited, for plans and information on the Cordova gold mine.

D. F. Hewitt was the writer's assistant and carried out his duties in an efficient manner.

Means of Access

Main and secondary roads traverse much of the area and are the most convenient means of access. Haliburton is 150 miles by road from Toronto. The northern part of Haliburton county and the townships on both sides of the boundaries between Haliburton county and Muskoka district, Muskoka and Victoria county, and Victoria county and Haliburton county are more difficult of access and are best reached by canoe.

Branch lines of the Canadian National railway to Haliburton and Bancroft provide rail service to the southeast central part of the area. The Canadian Pacific Railway line from Toronto to Montreal via Smiths Falls crosses the extreme southeast corner of the map area. The western part of the area is traversed by the main line of the Canadian National railway from Toronto to North Bay.

The chain of lakes and rivers now known as the Trent system was long used by the Indians as a route from Lake Ontario to Lake Simcoe and thence to the upper lakes by way of Lake Couchiching, the Severn river, and Georgian bay. This was the route over which in 1615 the Hurons led Champlain from Georgian bay to Lake Ontario, and it was long considered the most direct way; over two centuries later the same belief prompted the construction of the Trent Valley canal.¹

¹E. C. Guillet, "Early Life in Upper Canada," Toronto, 1933, p. 374.

Previous Geological Work

Murray traversed part of Belmont township, Peterborough county, and the Kawartha lakes¹ in 1852.² In 1853³ he ascended the Muskoka and Oxtongue rivers, and on his return travelled through a chain of lakes in Haliburton county to Balsam lake. To Murray we owe the origin of a number of lake names well known now to tourists, that is Mary, Fairy, and Peninsula lakes, and Lake of Bays.

Miller's reports⁴ on the corundum deposits of Ontario contain geological descriptions of parts of the southeast quarter of the area.

Parks⁵ and Walker⁶ carried out geological surveys of Muskoka district in 1900 and 1905, but no map or detailed report was ever published. During the years 1905 to 1907 and in 1911 Johnston⁷ made a topographical and geological survey of a number of map areas east of Lake Simcoe. The topographical sheets were published, but no geological maps or detailed final report was ever issued.

In 1907-8 Miller and Knight⁸ made a survey of the Belmont Lake area.

In 1910 there appeared a very detailed geological report on the Haliburton and Bancroft areas by Adams and Barlow⁹ based on field work begun by Adams in 1893 and continued by both from 1895 to 1902. The two maps accompanying their report have been the only geological reference maps available of the area.

From 1920 to 1925 Wilson geologically mapped the Marmora and Madoc areas. No report has been published, but the Marmora sheet¹⁰ issued in 1940 includes parts of Belmont and Methuen townships in the southeast corner of the area.

Reports on corundum,¹¹ diatomite,¹² feldspar,¹³ garnet,¹⁴ graphite,¹⁵ iron,¹⁶ limestone,¹⁷ and molybdenum¹⁸ published by the Mines Branch, Canadian Department of Mines, and on corundum,¹⁹ fluorspar,²⁰ zinc and lead,²¹ and rare-element

¹See footnote on page 5.

²A. Murray, Geol. Surv. Can., Rept. of Progress 1852-53, pp. 76, 80, 132, 133, 139, 140, 144, 145.

³Ibid, 1853-56, pp. 61-63, 67, 87, 89, 98, and maps Nos. 30, 31, 37, 38.

⁴W. G. Miller, Ont. Bur. Mines, Vol. VII, 1898, pt. 3, pp. 227, 228; Vol. VIII, 1899, pt. 2, pp. 206-217.

⁵W. A. Parks, Geol. Surv. Can., Vol. XIII, 1900, pp. 121A-126A.

⁶T. L. Walker, Geol. Surv. Can., Sum. Rept. 1905, pp. 84-86.

⁷W. A. Johnston, Geol. Surv. Can., Sum. Rept. 1905, pp. 92-94; 1906, pp. 124-126; 1907, pp. 56-58; 1911, pp. 253-261.

⁸W. G. Miller and C. W. Knight, Ont. Bur. Mines, Vol. XXII, 1913, pt. 2, pp. 18-37 and map No. 22a.

⁹F. D. Adams and A. E. Barlow, "Geology of the Haliburton and Bancroft Areas," Geol. Surv. Can., Mem. 6, 1910.

¹⁰M. E. Wilson, "Marmora, Hastings, Peterborough, and Northumberland Counties, Ontario," Mines and Geol. Branch, Can. Dept. Mines and Resources, map 560A, 1940.

¹¹V. L. Eardley-Wilmot, Abrasives, Part II, "Corundum and Diamond," Mines Branch, Can. Dept. Mines, No. 675, 1927.

¹²V. L. Eardley-Wilmot, "Diatomite, Its Occurrence, Preparation, and Uses," Mines Branch, Can. Dept. Mines, No. 691, 1928.

¹³Hugh S. Spence, "Feldspar," Mines Branch, Can. Dept. Mines, No. 731, 1932.

¹⁴V. L. Eardley-Wilmot, Abrasives, Part III, "Garnet," Mines Branch, Can. Dept. Mines, No. 677, 1927.

¹⁵Hugh S. Spence, "Graphite," Mines Branch, Can. Dept. Mines, No. 511, 1920.

¹⁶E. Lindeman and L. L. Bolton, "Iron Ore Occurrences in Canada," Vol. I, Mines Branch, Can. Dept. Mines, No. 217, 1917.

¹⁷M. F. Goudge, "Limestones of Canada," pt. IV, Ontario, Bur. Mines, Can. Dept. Mines and Resources, No. 781, 1938.

¹⁸V. L. Eardley-Wilmot, "Molybdenum," Mines Branch, Can. Dept. Mines, No. 592, 1925.

¹⁹A. E. Barlow, "Corundum, Its Occurrence, Distribution, Exploitation, and Uses," Geol. Surv. Can., Mem. 57, 1915.

²⁰M. E. Wilson, "Fluorspar Deposits of Canada," Geol. Surv. Can., Econ. Geol. Series No. 6, 1929.

²¹F. J. Alcock, "Zinc and Lead Deposits of Canada," Geol. Surv. Can., Econ. Geol. Series No. 8, 1930.

minerals¹ by the Geological Survey of Canada, contain descriptions or brief accounts of many of the mineral occurrences in the area. References to a large number of deposits are also to be found scattered through reports of the Ontario Bureau (later Department) of Mines.

Topography and Drainage

Except for the extreme southern part, the area is underlain by pre-Cambrian rocks and has those physical features typically associated with the shield. The land slopes south from an altitude of more than 1,500 feet in the northeast



Falls and rapids on the Gull river above Minden, on or about lot 9, concession V, Minden township, Haliburton county, August, 1942.

corner of the area south to altitudes of 841 to 769 feet on Balsam and Stony lakes, respectively, and southwest and west to altitudes of 740 and 718 feet on Lake Muskoka and Lake Simcoe, respectively. Viewed from an isolated hill, such as Greens mountain in Glamorgan township, or the Blue mountains in Methuen township, a uniform sky line is observed, but in detail the country is a dissected plane cut by many steep-walled valleys leaving knob-shaped hills, which rise from 100 to as much as 300 feet above the level of the valley floors.

The pre-Cambrian surface, which slopes gently to the south, passes below the Paleozoic limestones that border it in the southern part of the area. Erosion along this contact exposes in many places the horizontally bedded limestones as conspicuous cliffs.

The mantle of glacial drift is fairly thin over most of the area underlain by the pre-Cambrian rocks as may be noted by the frequent outcrops on most of the roads, and especially in the "Blueberry barrens" of Methuen township.

¹H. V. Ellsworth, "Rare-element Minerals of Canada," Geol. Surv. Can., Econ. Geol. Series No. 11, 1932.

However, in that part of the area underlain by the Paleozoic limestone, moraines occur in a belt parallel to and just south of the pre-Cambrian contact. The western third of the area was largely covered at one time by glacial Lake Algonquin. The east boundary of this lake was close to a line extending north through Bolsover and Uphill and possibly on through Bracebridge to Huntsville. The country west of this line has many flat areas underlain by sand, silt, or clay laid down in this lake.

In the highlands proper are many hundreds of lakes and ponds, which spill from one to another by short stretches of water in which are many rapids and falls. In the eastern part of the area these waters emerge from the highlands as the Cordova, Crowe, Eels, Mississagua, Squaw, Irondale, Burnt, and Gull rivers flowing south into the Kawartha lakes,¹ which drain into Lake Ontario. The northeast corner of the area is drained by the Madawaska river, which flows east to the Ottawa. The Oxtongue, East, Muskoka, and Black rivers drain the eastern part of the area westward into Georgian bay.

Despite the mantle of glacial drift the present drainage pattern is in part controlled by the underlying structure of the pre-Cambrian. The following examples may be observed. The chain of lakes extending west from Moose lake to Ninatigo lake lie within an easily eroded band of crystalline limestone. Eels brook parallels the structure of the gneisses and crystalline limestone; and in many localities in the area underlain by granite or hybrid gneiss, lakes or lake shore-lines closely parallel gneissic or joint structures. It may be noted that the Kawartha lakes lie along or close to the contact between the pre-Cambrian and Paleozoic.

The wide valley flats of the Gull, Redstone, Burnt, and Irondale rivers and the chain of lakes from Moose to Beech are the result of blocked drainage during the glacial period, when silt, sand, and gravel were deposited in the impounded waters. Some of the best farms in Haliburton county are to be found on these flats.

Natural Resources

Agriculture

The agricultural settlement of the region developed in the wake of the lumber industry. While the lumber industry was thriving a local market existed for farm produce and, with winter employment in the industry, the settler was able to make a satisfactory living. At the present time, with the lumber industry much reduced in this region, the farmer is less able to eke out a living from the poor soils. Many abandoned farms and old clearings can now be seen in the area.

Forests

The map area lies within the Ottawa-Huron forest region, which was the scene of the earliest lumbering in Ontario, the most active exploitation being during the period 1860 to 1890. Only the best grades of white pine were removed, a great quantity in the form of square timber. The operations left the forest in a highly inflammable condition. Fires followed and rock barrens were left in certain sections where the thinner soils existed.² Four large areas aggregating 176,740 acres were burnt in 1913. These covered parts of the following townships: (1) Burleigh, Harvey, Anstruther, and Cavendish in Peterborough

¹The series of lakes generally known as the Kawartha lakes include Balsam, Cameron, Sturgeon, Pigeon, Buckhorn, Lovesick, Stony, and Clear lakes in Victoria and Peterborough counties along the south boundary of the map area.

²J. F. Sharpe and J. A. Brodie, "The Forest Resources of Ontario, 1920," Ont. Dept. Lands and Forests, pp. 26, 27.

county and Monmouth and Glamorgan in Haliburton county; (2) Methuen and Burleigh in Peterborough county; (3) Dysart, Glamorgan, and Snowdon in Haliburton county; and (4) Anson and Lutterworth in Haliburton county.¹ Since the inauguration of a fire protection service in 1918, there have been few large fires.

Sharpe and Brodie² report that the distribution of trees in the Ottawa-Huron forest region is as follows: 46 per cent. hardwood and mixed stands of hardwood and pine, 4 per cent. coniferous, 37 per cent. poplar and birch, 2 per cent. recent burn; the remaining 11 per cent. is rock barren.

Water Powers

Numerous water-power sites are situated on the Trent Canal system, the Muskoka river, the Severn river, and their tributaries. Within the map area the potential estimated capacity at 80 per cent. efficiency at ordinary six months flow of all sites is approximately 42,000 horse-power, and the installed horse-power is about 20,000. Details as to sites, estimated capacity, and installed horse-power will be found in Rorke's report.³

Fish and Game

The game fish lure many tourists to the area, and annually large numbers of visitors return to their favourite fishing haunts. In order to maintain the fish population many thousands of fry, fingerlings, and yearlings are planted every year in the lakes, creeks, and rivers of Haliburton, Muskoka, Ontario, Peterborough, and Victoria. In recent years the following species have been planted: large- and small-mouthed black bass, maskinonge, yellow pickerel, brown trout, lake trout, rainbow trout, speckled trout, Kamloops trout, and herring. Full details will be found in the annual reports of the Ontario Game and Fisheries Department.

The common game and fur-bearing animals of the area are black bear, Bonaparte weasel, mink, otter, skunk, red fox, brush wolf, timber wolf, muskrat, varying hare, and white-tailed deer. The following animals are quite rare: cotton-tail rabbit, beaver, marten, fisher, Canada lynx, bay lynx, and moose.⁴

The only game birds in the area are the ruffed grouse (partridge), pheasant, and various species of ducks.

Tourists

The map area includes parts of three of the best known summer playgrounds in Southern Ontario: Muskoka, the Kawartha lakes, and the Haliburton highlands. The first two have long attracted many visitors, and in recent years the Haliburton highlands have come to the fore as an important tourist district.

Winter sports enthusiasts are catered for by a number of camps near Huntsville; elsewhere few resorts are open in the winter season.

Early Settlement

Orillia, the largest town in the area, was originally the head village of the Ojibway Indians and from the earliest days of the nineteenth century was a fur-trading post. In 1838 the government removed the Indians to Rama township,

¹C. D. Howe and J. H. White, "Trent Watershed Survey," Commission of Conservation, Canada, The Bryant Press, Toronto, 1913, pp. 31, 32, and 2 maps in pocket.

²J. F. Sharpe and J. A. Brodie, *op. cit.*, p. 30.

³L. V. Rorke, "List of Water Powers in the Province of Ontario, 1931," Ont. Dept. of Surveys, pp. 52, 53, 71, 72, 79-81.

⁴S. C. Downing, Royal Ontario Museum of Zoology, private communication.

and surveyed the town plot of Orillia. The place grew slowly and was not incorporated until 1866.

In order to aid the settlement of the area the government in the sixties began the construction of a number of colonization roads, such as the Muskoka, Monck, Bobcaygeon, Buckhorn, and Burleigh.

The early settlement of so large an area cannot be conveniently described as a whole, and the following notes are arranged under county headings.

Haliburton county, consisting of twenty-three townships, was separated from Peterborough county in 1874. It was named after the writer Judge T. C. Haliburton (Sam Slick), who in 1861 was chairman of the Canadian Land and Emigration Company of London, England, which purchased ten townships from the Crown Land Department of Upper Canada. The townships were Dysart, Dudley, Harcourt, Guilford, Harburn, Bruton, Havelock, Eyre, and Clyde, and Longford in Victoria county. After a good deal of misunderstanding the purchase was concluded in 1865. In 1889 the holdings were transferred to the Canadian Land and Immigration Company, of Haliburton, Limited. The affairs of this company were in the process of being wound up in 1943.

The settlement of the county began with the construction of the colonization road north from Bobcaygeon. As early as 1859 there were a number of settlers in the township of Minden, and the nucleus of a village had formed at the point where the road crossed the Gull river. This village, now Minden, was long known as Buck's, the name of the local hotel proprietor. The village of Haliburton in Dysart township was founded in 1864, when a saw-mill was built by the Canadian Land and Emigration Company. The first settlers arrived in many of the townships between 1863 and 1866, and the population of the county was 2,676 in 1871 and 6,736 in 1941.

The name Muskoka is probably a corruption of Misquuckkey, an Indian chief, whose name appears on two treaties, dated 1815, for the surrender of land between Lake Simcoe and Lake Huron, including a tract west of a purchase said to have been made in 1785. The Indians used this country as a hunting ground.

The Muskoka road was opened in 1858 from Washago to the High Falls¹ of the Muskoka river, and the first land grants were made in 1859. The district was not constituted until 1868. Gravenhurst had its beginning in 1861 with McCabe's tavern, and in the same year Bracebridge consisted of three log huts, the only bridge across the Muskoka river being the trunk of a pine tree. The road was pushed on to Huntsville, named after a Mr. Hunt who built a cabin there in 1870. Its first post office was opened in 1873. The *Wenonah*, the first steamer on the Muskoka lakes, was built in 1866.

Ontario county was formed from a group of townships cut off from East York in 1849. The only townships within the area, Rama and Mara, were opened for settlement in 1820. Retired British officers were the first settlers in Rama township, but most of them got into difficulties with the Bank of Upper Canada. The bank sold the land to the Indian Department, and the Ojibway Indians at Orillia were removed to a village built for them in 1838.

Peterborough county was organized in 1849 from the northern riding of Northumberland. The townships within the area were settled between 1819 in the south to 1862 in the north, but settlement was very slow at first. The present village of Lakefield, south of the area, dates from about 1854, prior to then being just a "corners," known successively as Nelson's, Herriott's Falls, and Selby.

¹South fall on the South branch of the Muskoka river is probably the falls designated as High Falls in 1858, according to information supplied by W. H. Heath, chief Geographer, Ont. Dept. Lands and Forests.

Victoria county was organized in 1851 from portions of Durham and Peterborough counties. The townships within the map area were opened for settlement between 1820 and 1860, the first settlers arriving from one to ten years later. The origin of a few of the villages may be noted. T. Need built a mill in 1834 at Bobcaygeon and was the first storekeeper. The place was incorporated as a village in 1877. J. Wallis and R. Jamieson built a grist mill in 1841, and Mr. Wallis opened the first store in 1850 at Fenelon Falls, which was incorporated as a village in 1875. Coboconk was founded in 1851. The first steamer on the Kawartha lakes was the *Woodman* in 1851.

Information on early settlement was derived from a number of sources among which are:—

- J. E. MIDDLETON and F. LANDON, "The Province of Ontario—A History," The Dominion Publishing Co., Ltd., Toronto, 1927.
 H. F. GARDINER, "Nothing but Names," G. N. Morang and Co., Ltd., Toronto, 1899.
 A. SHORTT and A. G. DOUGHTY, "Canada and Its Provinces," Vol. XVII, sec. IX, The Province of Ontario, Part I, Glasgow, Brook, and Co., Toronto, 1914.
 EDWIN C. GUILLET, "Early Life in Upper Canada," The Ontario Publishing Co., Ltd., Toronto, 1933.

General Geology

The area is underlain by pre-Cambrian rocks except for an overlapping band of Paleozoic sediments along the south edge.

What are believed to be the oldest rocks in the area are confined to the townships of Belmont and Methuen in the southeastern corner. These are basic volcanic rocks, now represented by hornblende or chlorite schists. Probably younger than these is a group of sediments consisting mainly of paragneiss and crystalline limestone or dolomite, and a lesser amount of conglomerate. These sediments may belong to more than one age group. The terms Grenville and Hastings for these groups are not used in this report. They occur as great curving bands or lenses in the areas underlain by granite and hybrid gneiss. Intrusive into these volcanics and sediments are small masses of diorite, gabbro, anorthosite, peridotite, and basalt (extrusive). Granite and pegmatite intrude all of the above groups with the formation of hybrid rocks from some of the sediments. Hybrid gneisses and granite underlie much of the area. Nepheline-rich syenite (gneiss) and nepheline-rich pegmatite were formed still later and are intruded in turn by alkali syenite and by dikes and masses of pink granite. What is probably the youngest pre-Cambrian rock is a fresh diabase of Keweenawan type.

The Paleozoic sediments consist largely of limestone or dolomitic limestone, with lesser amounts of shale, quartzite, or arkose occurring as basal members at the contact with the underlying pre-Cambrian rocks.

The pre-Cambrian and Paleozoic rocks are mantled by a varying thickness of Pleistocene deposits consisting of boulders, gravel, sand, silt, and clay of glacial or glaciofluvial origin. Recent deposits consist of peat, diatomite or diatomaceous peat, silt, sand, etc., laid down in lakes and rivers.

The relations of these divisions are summarized in the following table:—

Table of Formations

CENOZOIC	
RECENT:	Clay, sand, gravel, boulders; peat; diatomite.
PLEISTOCENE:	Clay, sand, gravel, boulders.
PALEOZOIC	
ORDOVICIAN:	Limestone, dolomitic limestone, sandy limestone, shale, quartzite, arkose.

PRE-CAMBRIAN

INTRUSIVES:	{	Diabase.
		Pink granite, granite-pegmatite.
		Alkali syenite, syenite-pegmatite.
		Nepheline-rich syenite (gneiss), nepheline-rich pegmatite.
SEDIMENTS:	{	Granite, granite gneiss, hybrid gneisses of igneous and sedimentary origin.
		Diorite, gabbro, anorthosite, peridotite, basalt.
VOLCANICS:	{	Limestone and dolomite; minor amounts of amphibolite.
		Paragneisses: biotite or hornblende gneisses, garnet-biotite gneiss, garnet-hornblende gneiss; quartzite; greywacke.

Pre-Cambrian

VOLCANICS

Metamorphosed basic volcanic rocks, now represented by hornblende or chlorite schists, and hornblende-chlorite schists are only certainly known from exposures in Belmont and Methuen townships. The minerals in these schists are hornblende, chlorite, epidote, zoisite, biotite, feldspar, calcite, quartz, and magnetite. The volcanic character of these rocks may be observed in an exposure of amygdaloidal lava at the northwest corner of lot 25, concession VI, Belmont township.¹

The following analysis (No. 1) of the schist shows it to have the composition of a basalt. Three analyses of basalts based on averages are given for comparison.

	No. 1	No. 2	No. 3	No. 4
SiO ₂	44.85	48.80	49.43	48.19
Al ₂ O ₃	20.53	13.98	16.68	17.05
Fe ₂ O ₃	5.45	3.59	3.24	4.06
FeO.....	12.96	9.78	10.23	9.29
MgO.....	2.45	6.70	4.54	3.64
CaO.....	9.88	9.38	8.49	8.99
Na ₂ O.....	2.16	2.59	2.56	2.25
K ₂ O.....	.35	.69	.72	.87
TiO ₂		2.19		
P ₂ O ₅.....		.33		
CO ₂			1.24	2.43
MnO.....		.17		
H ₂ O.....	1.35	1.80	2.23	2.78
Total.....	99.98	100.00	99.36	99.55

Sample No. 1—Composite sample of schist from various points along the west shore of Belmont lake,²

Sample No. 2—Plateau basalt, average of 43 analyses.³

Sample No. 3—Keewatin pillowed basalt, Ontario, average of 7 analyses.⁴

Sample No. 4—Keewatin basalt, Ontario, average of 9 analyses.⁵

Some of the amphibolite or hornblende gneiss mapped as paragneiss in the area may be of volcanic origin.⁶ These rocks are exposed mainly in Methuen, Chandos, and Cardiff townships.

¹W. G. Miller and C. W. Knight, Ont. Bur. Mines, Vol. XXII, 1913, pt. 2, p. 20 and Fig. 15 on p. 34.

²Ibid, p. 19.

³R. A. Daly, "Igneous Rocks and the Depth of the Earth," McGraw-Hill Book Co., Inc., New York, 1930, p. 17 (No. 60).

⁴J. Satterly, Univ. Tor. Studies, Geol. Series, No. 46, 1941, p. 134 (No. 8).

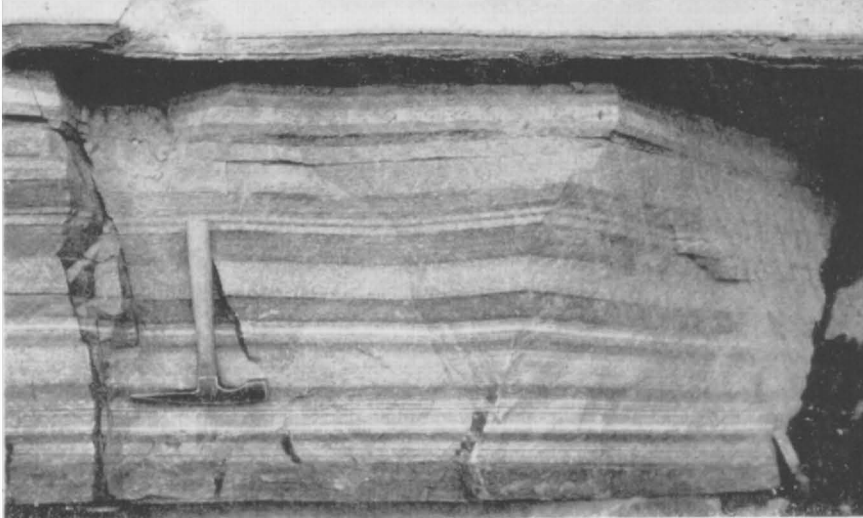
⁵Ibid, p. 133 (No. 12).

⁶cf. F. D. Adams and A. E. Barlow, op. cit., p. 162.

SEDIMENTS

Paragneiss

The paragneiss or sedimentary gneiss is a biotite or hornblende gneiss with or without garnet. Frequently it is well banded, the banding being due to minor differences in the composition of adjacent beds of the original sediment, such as the alternation of sandy and shaly beds (see photograph below). A rusty weathering is typical and in some cases is due to a small percentage of finely disseminated sulphide, but more often it is due to staining from other iron-bearing minerals in the rock. Graphite is a common accessory mineral in some bands.



Banded paragneiss showing alternation of biotite-rich and biotite-poor bands, No. 11 highway in Bracebridge, Muskoka district.

These paragneisses with associated quartzite and greywacke are well exposed as curving bands or lenses in Anstruther, Burleigh, Chandos, Methuen, and Belmont townships in Peterborough county. They have been described in detail elsewhere.¹ Some bands exposed in Monmouth and Cardiff townships, Haliburton county, consist in part of hornblende gneiss, some of which may not be of sedimentary origin.

Narrow interbeds of paragneiss are quite common in the belts of crystalline limestone.

The hybrid gneisses (see page 13) were largely derived from the paragneisses by granitization and *lit par lit* pegmatitic injection. From the distribution of the hybrid gneisses it is, therefore, apparent that the paragneisses formerly had a widespread distribution in the north and west parts of the area.

Conglomerate

Interbedded with members of the previous group, particularly in Belmont township and at a number of other isolated localities, are narrow bands of pebble conglomerate. The conglomerate in Belmont and Methuen townships has been

¹F. D. Adams and A. E. Barlow, op. cit., pp. 181, 182.

called Hastings¹ in age, and those in Belmont have been described in some detail by Miller and Knight.

Conglomerates that are much older in appearance than the above have been described as of autoclastic origin from lot 19, concession VIII, Monmouth township,² and as possibly a true epiclastic from lot 18, concession I, Cardiff township.³ The writer observed a deformed pebble conglomerate on the road south of Stony lake on or about lot 29, concession VI, Dummer township.

Crystalline Limestone and Dolomite; Amphibolite

Crystalline limestone and dolomite are exposed in the southeastern part of the area in a number of narrow to broad bands. These bands trend from a direction slightly east of north to northeast to east. The rocks show a considerable range in colour, texture, and composition. In colour some varieties are pure white, and many are dirty green or brown. In texture they range from fine to very coarse grained. Adams and Barlow describe an occurrence in which the individual grains of calcite measure 3 inches.⁴ The range in composition of the limestone and dolomite is shown by the analyses quoted on pages 52 to 54.

A large number of mineral species has been developed by the metamorphism of the limestones and dolomites, in part from the sandy and clayey impurities present in the original sediment and in part owing to emanations from the granitic intrusives. These minerals may be disseminated throughout the rock or occur in stringers or bands representing the original bedding planes or beds. Adams and Barlow list 37 species.⁵ Some of the more common minerals observed are pyroxene, amphibole, phlogopite, serpentine, muscovite, graphite, molybdenite, pyrrhotite, and chondrodite.

Interbands of biotite gneiss, hornblende gneiss, or amphibolite are common. In some exposures, owing to the intense deformation, these bands have been broken up into angular and rounded fragments lying in a highly contorted matrix of crystalline limestone.⁶ Complexes consisting of fragments and masses of hornblende gneiss, hybrid gneiss, granite, and pegmatite in a crystalline limestone cement are quite common adjacent to the large granite areas and are indicated on the map by the numbers corresponding to the rock types in the map legend.

Blue-grey limestones with well-developed bedding are exposed in Belmont township. They have been mapped as of Grenville age by Miller and Knight,⁷ and of Hastings age by Wilson.⁸ The crystalline limestones and dolomites exposed in other townships are often referred to by writers as of Grenville age, but this term will not be used in this report as the age relations of the different members of the geological succession were not determined.

A rock called "feather amphibolite" by Adams and Barlow occurs as narrow interbeds in the crystalline limestone and hornblende paragneiss of Chandos township.⁹ The "feathers" are flat prisms of amphibole in radiating clusters or scattered irregularly in the plane of the bedding of the original sediment. The rock is a variety of hornblende paragneiss derived by the metamorphism of sandy-limy-clayey interbeds in the limestone series.

¹W. G. Miller and C. W. Knight, *op. cit.*, pp. 27, 28.

M. E. Wilson, *Mines and Geol. Branch, Can. Dept. Mines and Resources, map 560A, 1940.*

²F. D. Adams and A. E. Barlow, *op. cit.*, pp. 39, 40.

³*Ibid.*, pp. 44-46.

⁴*Ibid.*, p. 194.

⁵*Ibid.*, p. 198.

⁶ cf. J. Satterly, *Ont. Dept. Mines, Vol. LI, 1942, pt. 2, photograph on p. 64.*

⁷W. G. Miller and C. W. Knight, *op. cit.*, pp. 20, 21.

⁸M. E. Wilson, *op. cit.*

⁹F. D. Adams and A. E. Barlow, *op. cit.*, pp. 168, 169; cf. plate XXXVII opposite p. 168.

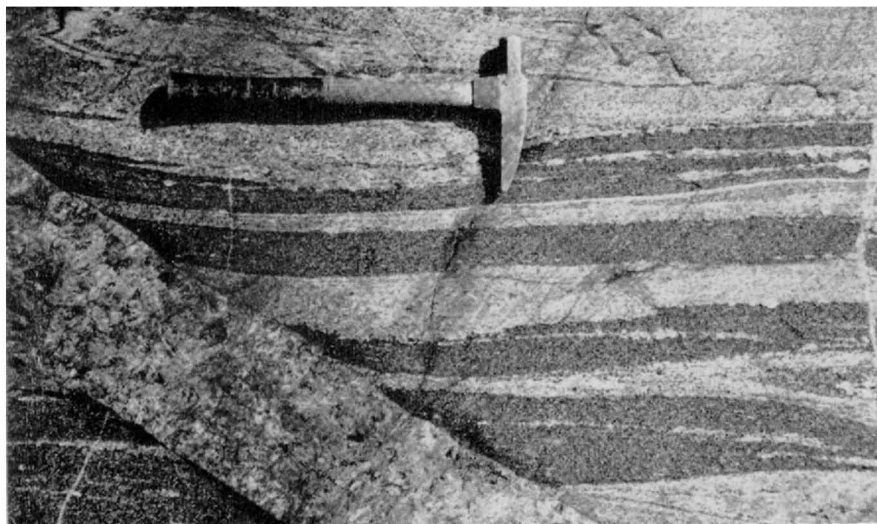
INTRUSIVES

Diorite, Gabbro, Anorthosite, Peridotite, Basalt

Basic intrusives occur as small masses at a number of localities in the area. The large mass in Belmont township in the southeast corner of the area consists of both intrusive (gabbro) and extrusive (basalt) phases.

The intrusives range in composition from gabbro to peridotite. The term diorite has been retained in the legend as no detailed petrographical examination of the rocks of this group has been made. It is thought, however, that most of the so-called diorite is a metamorphosed gabbro. Garnet is present in some varieties.

Some fine-grained amphibolites have been mapped in this group, although they may be older. These rocks occur as dikes, sills,¹ and masses in Chandos township.



Banded hybrid gneiss cut by a pegmatite dike in a glaciated outcrop in a sand pit off No. 35 highway near the northwest arm of Raven lake, Ridout township, Muskoka district.

Variations in the Glamorgan gabbro mass² are briefly described in an account of an iron deposit on page 44. A small body of gabbro to the west of the main mass forms Greens mountain, on which is situated a fire tower of the Ontario Forestry Branch.

The Belmont gabbro-basalt mass, as shown by the work of Miller and Knight,³ consists of gabbro only in the northeastern part of the mass around the Cordova mine, the remainder of the mass being extrusive basalt showing in places amygdaloidal texture, and containing on Belmont lake interbeds of tuff and agglomerate.

Anorthosite occurs as masses in Bruton, Harcourt, Dudley, Dysart, and Minden townships, Haliburton county.⁴ The writer has only seen the masses in Dysart and Minden townships. In these masses the anorthosite has been deformed and metamorphosed. The boundaries of the masses are ill defined

¹F. D. Adams and A. E. Barlow, op. cit., pp. 162, 163.

²Ibid, pp. 153-156.

³W. G. Miller and C. W. Knight, op. cit., pp. 31-33 and map No. 22a.

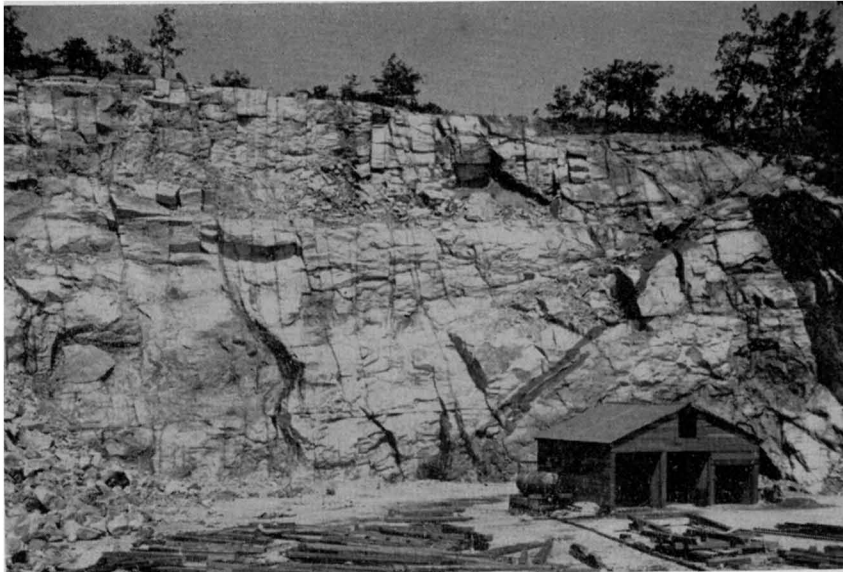
⁴F. D. Adams and A. E. Barlow, op. cit., p. 29.

owing to the presence of large numbers of inclusions of the country rock in the marginal zone and the frequent intrusions of pegmatite dikes. Pure anorthosite is uncommon, most of the rock being intermediate in composition between that and a gabbro.

Peridotite occurs at the old Imperial mine (see page 46) and as a dike in Muskoka district.¹

Granite, Granite Gneiss, Hybrid Gneiss

The northern and western parts of the area and sections between the bands of sedimentary rocks are largely underlain by granite, granite gneiss, and hybrid gneiss, with the hybrid gneiss predominating. The granite and granite gneiss range from grey to pink in colour. The hybrid gneiss (see photograph on page 12)



Closely spaced vertical jointing in nepheline syenite in the second quarry of the American Nepheline Corporation on the Blue mountains, Methuen township, Peterborough county. The pink alteration (see text) adjacent to the joint planes photographs dark.

originated from paragneiss through (1) the *lit par lit* injection of pegmatite stringers and (2) granitization.²

On the map complexes of limestone, paragneiss, granite gneiss, hybrid gneiss, and pegmatite in which the last three predominate have been shown in the pink colour with numbers corresponding to the rock types on the map legend.

Pink granite and pegmatite of later age are also shown in pink on the map as many of the bodies are too small to show separately or could not be satisfactorily differentiated from older granitic intrusives. More detailed mapping may permit such a separation.

Nepheline Syenite, Nepheline Pegmatite

Nepheline-bearing rocks occur in Methuen township, Peterborough county, and in a belt of alkali syenite between Gooderham and Wilberforce in Haliburton county.

¹J. Satterly, op. cit., p. 15.

² cf. *ibid.*, p. 10.

The Blue mountains in Methuen township expose an irregular oval stock of nepheline syenite $1\frac{1}{2}$ by $3\frac{1}{2}$ miles, with a long projection to the southwest, making its total length $5\frac{1}{4}$ miles (see insert map facing this page). The mountains rise 200 to 300 feet above the general level of the country. The quarries of the American Nepheline Corporation are situated on the southeast face of the mountains (for further details see page 78).

Time did not permit a detailed study of the mass, which has been described by Keith.¹ The nepheline syenite consists predominantly of albite (54 per cent.),



Outcrop showing replacement of nepheline-albite gneiss (dark-grey in photograph; black is moss filling nepheline pits) along joint planes by alkali syenite (light-grey), south of the road near Otter creek in lot 23, concession XI, Monmouth township, Haliburton county. Note small residual lens of nepheline-albite gneiss at the point of the hammer-head.

nepheline (22 per cent.), and microcline (20 per cent.), with muscovite, biotite, hastingsite, and magnetite as accessory minerals. Minor accessory minerals are ilmenite, corundum, garnet, and, very rarely, zircon.² The stock is intrusive into hornblende-biotite paraschist and was guided in its emplacement by the pre-existing structure of the schist.³ A gneissic structure near the borders of the mass is in general parallel to the foliation of the country rock and in the quarries strikes N. 30° - 35° E. and dips 40° S.E.

In the quarries of the American Nepheline Corporation the nepheline syenite is cut by a series of fractures, at right angles to the foliation, striking N. 60° - 65° W. and dipping vertically to 80° N.E. These are mainly joints spaced from several inches to several feet apart, about 75 occurring in a width of 250 feet in the second quarry. Another series of fractures occur approximately parallel to the strike and dip of the foliation. Some of these are in bands of biotite paraschist, along which there has been some movement.

¹M. L. Keith, Bull. Geol. Soc. Amer., Vol. 50, No. 12, pt. 1, 1939, pp. 1795-1826.

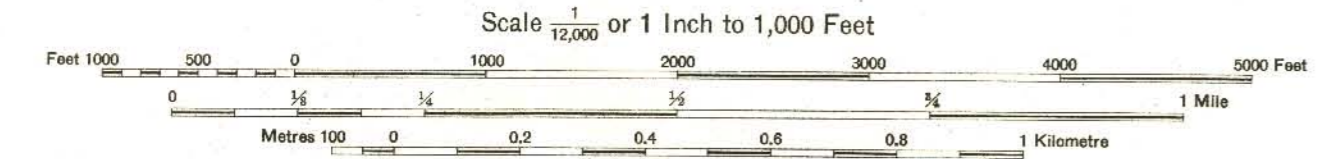
²Ibid, p. 1806.

³Ibid, p. 1824.

GEOLOGICAL MAP OF
THE BLUE MOUNTAINS
 TOWNSHIP OF METHUEN, COUNTY OF PETERBOROUGH

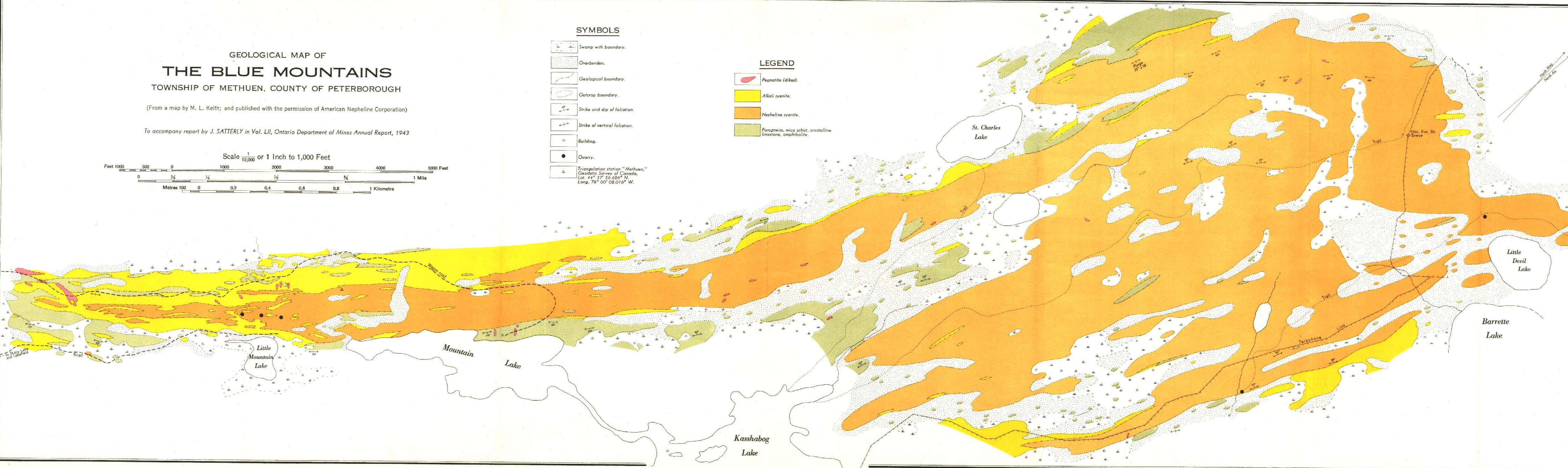
(From a map by M. L. Keith; and published with the permission of American Nepheline Corporation)

To accompany report by J. SATTERLY in Vol. LII, Ontario Department of Mines Annual Report, 1943

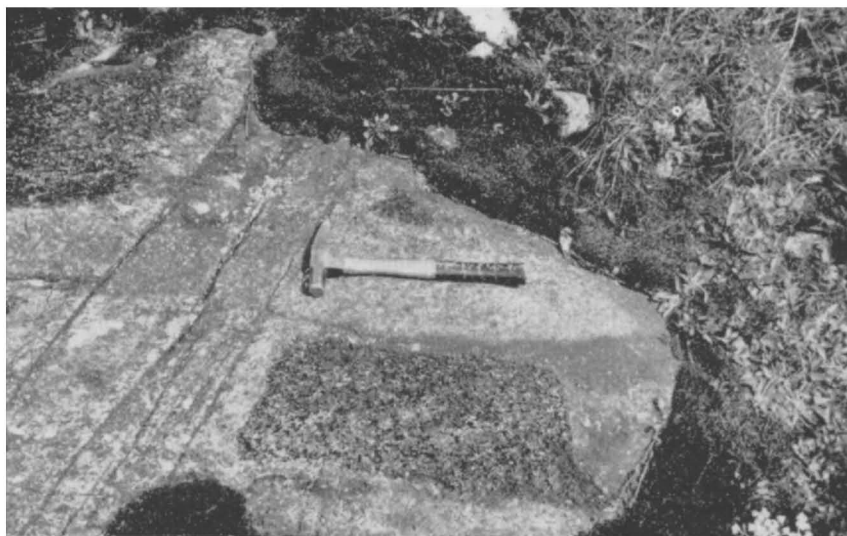


- SYMBOLS**
- Swamp with boundary.
 - Overburden.
 - Geological boundary.
 - Outcrop boundary.
 - Strike and dip of foliation.
 - Strike of vertical foliation.
 - Building.
 - Quarry.
 - Triangulation station "Methuen,"
 Geodetic Survey of Canada,
 Lat. $44^{\circ} 37' 56.926''$ N,
 Long. $78^{\circ} 00' 02.016''$ W.

- LEGEND**
- Pegmatite (dikes).
 - Alkali syenite.
 - Nepheline syenite.
 - Paragneiss, mica schist, crystalline limestone, amphibolite.



The younger alkali syenite has produced a pink alteration in the nepheline syenite around its borders, along joint planes (see photograph on page 13), and in irregular patches within the mass. The pink coloration is possibly due to iron, but the only mineralogical change observed is the development of a felted micaceous mass in the nepheline. In some places serpentinization is superimposed on the pink alteration along the joint planes.¹ The pink altered nepheline syenite is discarded in the quarry operations.



Outcrop showing replacement of nepheline-albite gneiss (dark-grey) along intersecting joint planes by alkali syenite (light-grey), south of the road near Otter creek in lot 23, concession XI, Monmouth township, Haliburton county. Note two isolated residual masses of nepheline-albite gneiss.

An average of five analyses of the nepheline syenite from the Blue mountains is as follows:²—

	Per cent.
SiO ₂	56.90
Al ₂ O ₃	24.49
Fe ₂ O ₃.....	.63
FeO.....	1.16
MgO.....	.19
CaO.....	.91
Na ₂ O.....	10.59
K ₂ O.....	4.06
H ₂ O—.....	.35
H ₂ O+.....	.57
Total.....	99.85

Nepheline syenite and pegmatite occur as narrow bands and small bodies in a belt of alkali syenite about 13 miles in length, extending northeast from a point south of Gooderham in Glamorgan township towards Wilberforce in Monmouth township. Minor occurrences, which may be remnants of the same belt, occur at Mumford and north of Highland Grove.

The main variety of nepheline rock in this belt has been called nepheline

¹M. L. Keith, op. cit., p. 1807.

²Ibid, p. 1814.

syenite. It contains, in addition to albite and nepheline, biotite or hornblende or both of these as essential minerals. The rock frequently exhibits a pronounced banding or gneissic structure, which parallels the foliation or bedding of adjacent sediments. Magnetite and graphite occur as accessory minerals and at some localities are quite abundant.

The nepheline syenite (gneiss) is intruded by the alkali syenite and pink granite. In the band of nepheline syenite south of Tory Hill and in the exposures near Otter creek 1½ miles east of Tory Hill the replacement of the nepheline syenite by alkali syenite is well shown. This replacement begins along



Anticlinal fold in interbedded crystalline limestone and paragneiss intruded by nepheline pegmatite, lower Fraser quarry, lot 30, concession IV, Glamorgan township, Haliburton county. White crystalline limestone cut by black amphibolite is seen in the lower left corner. In the centre a "saddle reef" of nepheline pegmatite (white) is overlain by a band of crystalline limestone containing biotite.

joint fractures leaving residual masses of nepheline syenite (nepheline-albite gneiss) (see photographs on pages 14 and 15) and all stages towards the final disappearance of the nepheline syenite may be observed in these exposures.

Nepheline pegmatite occurs at a number of localities in this belt, and the more important occurrences on the Fraser, Gill, and Mackay properties have been described on pages 71, 73, and 77. The minerals found in the pegmatite are albite, nepheline, sodalite, cancrinite, hydronephelite, carbonate, apatite, tourmaline, and zircon. Zircon is a characteristic accessory and was found in crystals as large as one inch in diameter.

The origin of the nepheline rocks of this area has long been a subject of much discussion. The writer made the following field observations in the Gooderham-Wilberforce belt.

At the Fraser quarry (see page 73) a folded complex of interbedded crystalline limestone and paragneiss (see photograph above) has been intruded by

nepheline pegmatite and syenite-pegmatite. The paragneiss has been partially replaced by nepheline, which in some beds is altered to a scarlet mineral. Against lenses of nepheline pegmatite the paragneiss shows scalloped borders (see photograph below), and it appears that the pegmatite became emplaced by both intrusion and replacement. In the past the replaced biotite paragneiss would have been termed nepheline syenite, but it might better be called biotite-nepheline gneiss.

At the lower quarry on the Gill property (see page 74) limestone and paragneiss have been replaced by nepheline and albite.

On lot 10, concession VIII, Monmouth township (see page 77) a biotite-hornblende-nepheline gneiss contains in places disseminated graphite, which elsewhere in the area is of frequent occurrence in the paragneiss. The percentage



Scalloped border in black biotite-rich crystalline limestone or paragneiss (top right) adjacent to coarse nepheline pegmatite containing residual fragments of paragneiss (black), vertical face in upper Fraser quarry, lot 30, concession IV, Glamorgan township, Haliburton county.

of nepheline here is very variable, suggesting differences in the porosity of adjacent bands. The rock may be a nephelized paragneiss.

In lots 10, 11, and 12, concession VIII, Monmouth township, a garnet-hornblende rock occurs as a narrow border zone at the contact between nepheline gneiss and crystalline limestone. The nepheline mass at this locality has been described by Foye as a crescentic laccolith,¹ but the three-pronged mass (see Fig. 9 on page 75) may have originated through the intrusion and replacement of a previously folded structure in the sediments. The cores of alkali syenite, which is a younger intrusive, were controlled in their emplacement by the same structure.

The sequence of events in the region between Gooderham and Wilberforce may be summarized as follows:—

1. Replacement of the tilted and folded paragneiss and the limestone along a definite zone, possibly a fault, by nepheline-depositing solutions, resulting in

¹W. G. Foye, Amer. Jour. Sci., 4th series, Vol. XL, 1915, pp. 420, 421.

the formation of nepheline-albite gneiss; and formation of nepheline pegmatite masses by intrusion and partial replacement of nepheline gneiss and paragneiss.

2. Intrusion of alkali syenite with partial to complete replacement of much of the nepheline-albite gneiss; satellitic intrusion of syenite-pegmatite.

3. Intrusion immediately following of pink granite masses and granite-pegmatite dikes; gradational boundaries occur between granite and alkali syenite and their associated pegmatites.

A similar complex origin for nepheline gneiss near Bancroft, Hastings county, by injection of pegmatitic material, replacement, and intrusion of magma was first proposed in a paper by Osborne.¹

In 1941 Gummer and Burr made a detailed study of the nepheline-bearing rocks of the Bancroft-Haliburton region, and recently published a very brief account² of their investigations. In it they state that "all the evidence gathered points to a parasedimentary origin for the nepheline-bearing rocks." They also believe that most of the nepheline pegmatites originated as replacements.

Alkali Syenite and Syenite-Pegmatite

Pink alkali syenite, often gneissic, which intrudes and forms part of the border of the nepheline syenite mass of the Blue mountains in Methuen township, consists of albite (78 per cent.), microcline (16 per cent.) with accessory muscovite (2 per cent.), biotite (1 per cent.), magnetite (1 per cent.), and corundum (2 per cent.).³ It represents a border phase of the Methuen batholith, as south of Barrette lake it grades into pink granite.⁴

In the Gooderham-Wilberforce belt it contains residual bands, masses, and fragments of nepheline gneiss and has quite definitely intruded and replaced that rock. In places the presence of graphite in the alkali syenite is suggestive of the replacement or assimilation of graphite paragneiss.

Pink Granite and Pegmatite

The pink granite is a fine- to medium-grained rock containing few black minerals, and in places none. Its areal distribution is not known, but is probably widespread. Small masses occur southwest of Tory Hill in Monmouth township, on the Buckhorn road in Cavendish township, and east of Wilberforce in Cardiff township, where it contains accessory fluor spar. The Methuen batholith consists of this rock.⁵

A dike of pink granite cuts the nepheline gneiss on the road near Tory Hill, and elsewhere pink granite grades into the alkali syenite.

At one locality near Tory Hill the pink granite was worked for monumental purposes (see page 87). A porphyritic biotite granite, which may be of this age, was quarried in recent years just east of Stony lake (see page 91).

Granite-pegmatite occurs as a *lit par lit* injection in the hybrid gneiss and as dikes and sills cutting all the pre-Cambrian rocks except the later diabase. Syenite-pegmatite was observed to grade into granite-pegmatite at several localities.

These pink granites and pegmatites are shown in the same pink colour on the accompanying map as the granite gneiss and hybrid gneiss.

Diabase

Fresh quartz diabase similar lithologically to those rocks called Keweenawan

¹F. F. Osborne, Amer. Jour. Sci., 5th series, Vol. XX, 1930, pp. 33-61.

²W. K. Gummer and S. V. Burr, "The Nephelized Paragneisses of the Bancroft Region, Ontario," Science, March 26, 1943, Vol. 97, No. 2517, pp. 286, 287.

³M. L. Keith, op. cit., p. 1801 (named syenodiorite).

⁴Ibid, p. 1798 (named granodiorite).

⁵Ibid, p. 1799 (named granodiorite).

in Northern Ontario was observed only east of the Lake of Bays on No. 35 highway in Franklin township, Muskoka district. It was mentioned in a previous report.¹

Paleozoic

ORDOVICIAN

Ordovician sediments, mainly limestone and dolomitic limestone, with smaller amounts of sandy limestone, shale, quartzite, and arkose, overlap the pre-Cambrian rocks along the south border of the area and occur as a number of small outliers. The composition of these rocks is given in a number of analyses on pages 53 and 54, and quarry operations are described in the section of this report on "Stone."

Cenozoic

PLEISTOCENE

In Pleistocene time the area was covered by a continental glacier, which on its retreat left behind a mantle of drift. In the closing stages large lakes, in which sand and clay were deposited, were formed in front of the retreating ice-sheet. One of these, Lake Algonquin, covered the western part of the area, including part of the Trent Valley canal system of waters.² Some of the Lake Algonquin clay has been used for brick-making (see pages 20 and 21).

RECENT

In the Recent period deposits of clay, sand, gravel, and boulders have been laid down in streams, rivers, and lakes. Peat and diatomite have accumulated in some lakes or what were lakes at one time, particularly in the Muskoka district. The diatomite deposits are described on pages 24 to 28.

Mineral Occurrences

The mineral occurrences of the area which are described in the following pages are arranged in alphabetical order. Under each mineral the occurrences are listed alphabetically by counties and townships, and numerically and alphabetically by concessions and lots.

APATITE

Apatite, occurring either as green or reddish-brown crystals, is a common mineral in carbonate veins, particularly in the apatite-fluorspar-calcite veins of Cardiff township, Haliburton county. In all the occurrences visited the apatite is in the form of crystals, no massive apatite being observed. Local residents report shipments from one deposit, but there is no recorded production. None of the deposits seen contain sufficient apatite to be of any economic importance.

In addition to the occurrences described the following, which have not been indicated on the map, are reported by Adams and Barlow.³ They are all in Haliburton county.

1. Cardiff township, concession XIV, lot 22.
2. Cardiff township, concession XVI, lot 8.
3. Dudley township, concession III, lot 4.

¹J. Satterly, op. cit., p. 12.

²W. A. Johnston, Geol. Surv. Can., Mus. Bull. No. 23, 1916, diagram No. 1619.

³F. D. Adams and A. E. Barlow, Geol. Surv. Can., Mem. 6, 1910, pp. 383, 384.

4. Dysart township, concession V, lot 11.
5. Harcourt township, concession XI, lot 21.
6. Monmouth township, concession X, lot 3.
7. Monmouth township, concession XI, lot 14.
8. Monmouth township, concession XI, lot 17.

Haliburton County

CARDIFF TOWNSHIP

Concession XIX, Lot 22

On lot 22, concession XIX, Cardiff township, a shallow pit, now overgrown with grass, 8 by 4 feet and 1 to 2 feet deep, is located in a field 10 chains north of the road on the boundary between concessions XVIII and XIX. Rock fragments adjacent to the pit consist of coarsely crystalline, white carbonate containing a few crystals of greenish-brown apatite ranging in size from 1 by 3 to 3 by 12 inches. The country rock near the pit is a granite. This occurrence is recorded by Adams and Barlow.¹

The following occurrences in Cardiff township, in which the apatite is associated with fluorspar, are described in the section on "Fluorspar": concession XVIII, lot 2; concession XXI, lot 5; concession XXI, lot 8; concession XXI, lot 9; concession XXII, lot 8; concession XXII, lot 9; and concession XXII, lot 13.

MONMOUTH TOWNSHIP

Concession XI, Lot 15

Old workings for apatite on lot 15, concession XI, Monmouth township, are situated north and south of the road that parallels the south boundary of the lot. In the southwest corner of the lot are several pits and an adit, all of which are overgrown with vegetation. The adit is driven north into the side of a hill for a length of 30 feet. White carbonate veins containing pale-green apatite crystals are exposed in these workings.

Ten chains north of the road, near the top of a hill, a trench 45 feet long, 4 to 5 feet wide, and 8 feet deep was put down on a carbonate vein cutting a graphic granite-pegmatite. Remnants of carbonate on the walls of the trench indicate that the vein may have been from 2 to 5 feet wide, trending N. 40° W. The vein can be traced northwest for 60 feet beyond the trench. The walls of the trench are covered with pink feldspar crystals from 2 to 6 inches in diameter and dark-green hornblende crystals from 3 to 6 inches in diameter. Dump material shows books of dark mica with a maximum diameter of 9 inches, minor amounts of titanite, and crystals of green apatite from 1 to 4 inches in diameter.

This deposit is described as Millar's phosphate mine by Adams and Barlow.² Ab Gibson of Tory Hill reports that these deposits were worked about 1900, the apatite crystals being hand-cobbed for shipment. There is, however, no recorded production.

CLAY

Clays suitable for brick-making are found in Ontario county and Muskoka district. These clays were laid down in glacial Lake Algonquin. They have been worked at three localities, and two plants are still in operation.³

¹F. D. Adams and A. E. Barlow, op. cit., p. 199.

²Ibid, pp. 201, 383.

³R. J. Montgomery, "The Ceramic Industry of Ontario," Ont. Dept. Mines, Vol. XXXIX, 1930, pt. 4, p. 140.

Muskoka District**CHAFFEY TOWNSHIP****Concession I, Lot 8**

The Huntsville Brick Works, just west of Huntsville, in lot 8, concession I, Chaffey township, is owned and operated by C. H. Stevens.

The operation has been described by Montgomery¹ as follows:—

The plant makes about 400,000 red end wire-cut brick and 15,000 red drain tile in a season of four months. L. H. Ware built the plant in 1900 and sold to the present owner in 1912. The clay is worked by plow and scraper on the surface but is said to be 8 feet deep, with sand below.

Production in 1941 was 150,000 bricks.

DRAPER TOWNSHIP**Concession XIII, Lot 5**

The Watson Brick Company, owned and operated by Hutchison Brothers, Bracebridge, is located on the top of a hill in lot 5, concession XIII, Draper township. The clay is from 15 to 20 feet thick and consists of a finely laminated reddish-brown clay, and reddish sand, the bands of which are rarely over three-quarters of an inch in thickness. The clay is underlain by a white quartz sand. The upper three feet of clay contains many concretions.²

The owners report that the clay available would take in an area 600 feet long by 200 feet wide. The property is only operated in the months free of frost. About 1,000 to 1,500 tons of clay are removed annually.

The plant makes about 500,000 red soft-mud brick and 30,000 red drain tile in a season of four months.³

COPPER

Only one copper occurrence is shown on the map. At a reported occurrence in Dummer township, Peterborough county, there is a shaft, said to be 40 feet deep, in crystalline limestone, but no copper minerals were found.

Peterborough County**BELMONT TOWNSHIP****Concession V, Lot 8**

A copper occurrence on lot 8, concession V, Belmont township, is described by Wilson.⁴ An opening has been made in an outcrop containing aggregates of quartz and chlorite with minor amounts of calcite, chalcopyrite, and magnetite crystals. The largest aggregate measures 2 by 3 feet. The quantity of chalcopyrite present is insignificant.

CORUNDUM

Most of the corundum deposits are associated with the Blue mountains syenite mass. The corundum is bluish to greenish-grey in colour and occurs usually as rounded crystals surrounded or embedded in mica.

¹R. J. Montgomery, *op. cit.*, p. 140.

²M. B. Baker, *Ont. Bur. Mines*, Vol. XV, 1906, pt. 2, p. 82.

³R. J. Montgomery, *op. cit.*, p. 140.

⁴M. E. Wilson, private communication.

The deposits have been described in reports by Miller,¹ Barlow,² and Eardley-Wilmot.³

Besides the deposits described below a number of other minor occurrences, which have not been indicated on the map, have been reported:—

1. Haliburton county, Cardiff township, concession XXII, lot 26.⁴
2. Haliburton county, Monmouth township, concession VIII, lot 15.⁵
3. Haliburton county, Monmouth township, concession XII, lot 26.⁶
4. Haliburton county, Monmouth township, concession XIII, lot 28.⁷
5. Peterborough county, Burleigh township, concession X, lot 3 (island in front of west part of lot 3).⁸
6. Peterborough county, Burleigh township, concession XII, lot 7.⁹
7. Peterborough county, Methuen township, concession VII, lots 15 and 16.¹⁰
8. Peterborough county, Methuen township, concession X, lot 13.¹¹

None of the occurrences in Haliburton or Peterborough counties appear to be of any commercial importance.

Haliburton County

LUTTERWORTH TOWNSHIP

Concession IV, Lot 12

On the road on the boundary between concessions III and IV, in lot 12, Lutterworth township, and north and south of it, corundum syenite-pegmatite occurs as flat outcrops over an area 4 chains long from north and south and 2 chains wide. The corundum is present as deep-brown crystals ranging from a quarter of an inch to one inch in diameter, the largest being 4 inches in length. The amount of corundum present varies; some areas of the outcrop 1 foot in diameter contain 10 per cent.; in the remainder of the outcrop the corundum content is low or negligible. The average content may be 3 per cent.

South of the road the corundum syenite-pegmatite grades into a graphic granite-pegmatite. To the east and west the rocks exposed are granite or hybrid gneisses with a gneissic structure trending north and south and dipping 30° to 45° E. To the north and northeast a few corundum crystals were found in pegmatite bands in the gneiss, the last outcrop in which the crystals occur was 12 chains from the road. One small outcrop at the edge of a swamp contained 25 per cent. corundum across 3 feet in a pegmatite. The corundum syenite-pegmatite may be a sill trending north and south, not more than 2 chains in width.

¹W. G. Miller, *Ont. Bur. Mines*, Vol. VII, 1898, pt. 3, pp. 227, 228; Vol. VIII, 1899, pt. 2, pp. 206-216.

²A. E. Barlow, "Corundum, Its Occurrence, Distribution, Exploitation, and Uses," *Geol. Surv. Can.*, Mem. 57, 1915, pp. 180-182, 188-191.

³V. L. Eardley-Wilmot, *Abrasives*, Part II, "Corundum and Diamond," *Mines Branch, Can. Dept. Mines*, No. 675, 1927, pp. 13, 18, 19.

⁴W. G. Miller, *Ont. Bur. Mines*, Vol. VIII, 1899, pt. 2, p. 216.

⁵*Ibid.*, p. 215.

⁶F. D. Adams and A. E. Barlow, *Geol. Surv. Can.*, Mem. 6, 1910, p. 268.

⁷W. G. Miller, *op. cit.*, p. 216.

⁸*Ibid.*, p. 212.

⁹A. E. Barlow, *op. cit.*, p. 189. In F. D. Adams and A. E. Barlow, *op. cit.*, p. 299 location is given as lot 6.

¹⁰V. L. Eardley-Wilmot, *op. cit.*, p. 18.

¹¹F. D. Adams and A. E. Barlow, *op. cit.*, p. 303.

Owing to the erratic distribution of the corundum and the small size of the corundum-bearing pegmatite, the deposit is not of any economic importance. This occurrence was discovered by B. Tett in 1905.¹

Peterborough County

METHUEN TOWNSHIP

Concession VIII, Lots 14 and 15

An occurrence of corundum on lots 14 and 15, concession VIII, Methuen township, is described by Eardley-Wilmot² as follows:—

What is known as the Croft property was worked during 1901 by the Imperial Corundum Company. Dykes of pegmatite from 2 to 5 feet wide occur close to the contact of the dark gneiss and nepheline syenite in which several pits, up to 20 feet in depth, have been sunk close to the northwest end of Kasshabog lake. The corundum occurs with the muscovite mica, for which most of the mining was done, and although the company set aside about 10 tons of hand-picked corundum ore, apparently no shipments were made.

Concession IX, Lot 13

Of a deposit in lot 13, concession IX, Methuen township, Eardley-Wilmot³ makes the following note:—

On the Miller property, concession IX, lot 13, on the south side of Little Mountain lake, most of the work was done for mica near the contact of a fine-grained syenite and the granite, but the percentage of corundum is small.

Concessions IX and X, Lot 14

Bennett's mine in lot 14, concessions IX and X, Methuen township, has been described by Eardley-Wilmot⁴ as follows:—

During 1901 the Crown Corundum and Mica Company did some work in the northwest corner of the above lot near the boundary between concessions IX and X. Nine or ten pits for white mica had previously been opened up in the coarse-grained syenite, and on the northeastern slope of the mountain several pits were sunk and three or four level entry cuts, each about 100 feet in length, had been driven, following coarse, pink syenite dykes of 1 to 4 feet in width. Nearly all these northerly workings, particularly the most westerly cut, show the presence of a bluish corundum embedded in the muscovite. In many cases the corundum is not revealed until the mica books are broken open. The surface of the corundum crystals are frequently rounded due to their alteration into the mica. In other cases the corundum is splashed through the pink rock and is invariably completely fringed with a coating of pearly mica. In some instances also the presence of the corundum is somewhat deceptive as it occurs in small mica-like flakes of a bronze lustre on the weathered surfaces.

In places some of the syenite dykes contain probably up to 10 per cent. corundum, but the average mining ore is decidedly less.

It was stated by the local inhabitants that 150 tons of mica and corundum ore were shipped to the United States, but there is no official record of this.

For recent work on this deposit in search of mica see the description under that mineral on page 59 of this report.

Concession IX, Lot 15

Of an occurrence on lot 15, concession IX, Methuen township, Eardley-Wilmot⁵ records the following:—

On the Madill property, concession IX, lot 15, a little work has been done, where corundum, of a somewhat radiated structure, occurs surrounded by tough nodules containing masses of granular white feldspar and species of black mica.

¹A. Johnston, Geol. Surv. Can., Sum. Rept., 1905, pp. 93, 94.

²V. L. Eardley-Wilmot, op. cit., p. 18.

³Ibid, p. 19.

⁴Ibid, pp. 18, 19.

⁵Ibid, p. 19.

DIATOMITE

Except for one occurrence in Parry Sound district all the deposits of diatomite in the map area are found in Muskoka district. Sporadic attempts to develop the various deposits have been discouraging. In this connection a paragraph from a recent summary on diatomite by Eardley-Wilmot¹ is of interest:—

Indications are that not more than 25 per cent. of the calcined material produced from the best quality Canadian deposit so far discovered, can be made into an efficient filter-aid that can compete with the imported product. Therefore, unless the remaining 75 per cent. or more of the non-filter grades produced can be sold, the cost of producing the filter-aid alone would be too high to be commercial. At present, the Canadian consumption of all non-filter grades is less than 800 tons annually, mainly in the form of diatomite insulation bricks, the greatly increased production of which by Canadian firms is necessary before the Canadian diatomite industry can be profitable.

Eardley-Wilmot² has published the following analyses of diatomite from the deposits to be described:—

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
SiO ₂	70.60	79.30	52.10	76.64	70.00	87.46	79.90	41.74	74.70
Al ₂ O ₃	12.73	10.00	11.44	14.34	4.56	6.94	6.64	4.28	14.50
Fe ₂ O ₃	2.67	.54	2.46	2.76	1.30	1.46	1.30	1.46	2.76
CaO.....	1.65	.93	2.16	2.71	.73	1.88	.85	.80	2.33
MgO.....	1.00	.85	1.00	1.31	.56	.91	.56	.50	1.22
CO ₂ + organic....	*8.20	*5.16	*27.50	.66	*22.40	1.60	*9.88	*50.08	.94
Total.....	96.85	96.78	96.66	98.42	99.55	100.25	99.13	98.86	96.45

Sample No. 1—Average sample from Tynan's farm, lots 19 and 20, concession X, Chaffey township.

Sample No. 2—Selected sample from Tynan's farm, lots 19 and 20, concession X, Chaffey township.

Sample No. 3—Crude peat from Beaver meadows, H. Southby's land, lot 18, concession X, Chaffey township.

Sample No. 4—Calcined peat from Beaver meadows, H. Southby's land, lot 18, concession X, Chaffey township.

Sample No. 5—Crude mud from Spence lake, lots 3 and 4, concession X, Draper township.

Sample No. 6—Calcined mud, diatoms well preserved, from Spence lake, lots 3 and 4, concession X, Draper township.

Sample No. 7—Crude white diatomite from Spence lake, lots 3 and 4, concession X, Draper township.

Sample No. 8—Crude peat from the Hodge farm, lot 19, concession XI, Stisted township.

Sample No. 9—Calcined mud from the Hodge farm, lot 19, concession XI, Stisted township.

H. P. H. Brummell reports⁴ diatomite occurrences on the following lots in Muskoka district:—

1. McLean township, concession III, lot 32.
2. McLean township, concession IV, lot 21.
3. McLean township, concession V, lot 15.
4. McLean township, concession VI, lot 14.
5. McLean township, concession VII, lot 27.
6. Oakley township, concession XI, lot 30.
7. Ridout township, concession VIII, lots 28 and 29.

These occurrences are not indicated on the geological map.

¹V. L. Eardley-Wilmot, "Diatomite in 1941," The Canadian Mineral Industry in 1941, Bur. Mines, Can. Dept. Mines and Resources (mimeographed), March, 1942.

²V. L. Eardley-Wilmot, "Diatomite, Its Occurrence, Preparation, and Uses," Mines Branch, Can. Dept. Mines, No. 691, 1928, p. 97.

³Total loss on ignition and includes combined water.

⁴Private communication.

Muskoka District**CHAFFEY TOWNSHIP****Concession X, Lot 18**

Eardley-Wilmot¹ gives the following description of an occurrence in lot 18, concession X, Chaffey township:—

On Harry Southby's land, locally known as the Beaver meadows, about 50 acres of swampy ground are covered with long grass and a few alders. The swamp contains 4 to 6 feet of dark brown diatomaceous peat underlain by silt or sand. The dry peat is self-calcing, leaving a pink and gritty residue containing diatoms and sponge spicules.

Analyses (Nos. 3 and 4) are given in the table on page 24 of this report.

Concession X, Lots 19 and 20

Of an occurrence in lots 19 and 20, concession X, Chaffey township, Eardley-Wilmot² says:—

Grey-white diatomite, 6 inches to 1 foot in depth, occurs over 3 or 4 acres of high marshy ground, a few hundred yards north of Little East river, on Tynan's farm, 7 miles north of Huntsville. The material is in places mixed with sand and covered with peat and vegetable matter, but in some places comparatively clean though somewhat gritty material may be obtained. The deposit contains well-formed, unbroken diatoms but is high in alumina.

Analyses (Nos. 1 and 2) are given in the table on page 24 of this report.

DRAPER TOWNSHIP**Concession X, Lots 3 and 4**

Eardley-Wilmot³ describes an occurrence in lots 3 and 4, concession X, Draper township, as follows:—

Diatomite occurs on the west end of Spence lake some 2 miles east of Muskoka Falls and 5 miles south of Bracebridge. Swampy meadows about a quarter of a mile wide and half a mile long extend on either side of the outlet. A small area of grey-white diatomite which in places is 18 inches thick, but averages 1 foot, and is underlain by blue-grey silt, is exposed in the banks and bed of the creek. This deposit contains about 200 tons of the only natural white diatomite so far found in this locality. However, a considerable area of grey-brown mud occurs, which in places varies from 6 to 10 feet in thickness. The calcined mud is pure white in colour and consists almost entirely of well-preserved rod and oval-shaped diatoms. When calcined it appears to be of better quality than the burnt white material which assumes a slightly pink tinge. . . . The diatom structure is such that it should be suitable for all purposes including sugar refining. Recent power developments by the Ontario Hydro-Electric Company have flooded this area, so that the deposit can not be drained and the material can now be recovered only by dredging.

A trial shipment of 10 tons of crude diatomite, presumably from this deposit, was made in 1930 by R. Morrow.⁴

The property was acquired by Spence Lake Diatomite, Limited, which was taken over by the Air-Lite Silica Company, Limited, in 1935. No operations were carried out by either company.

Three analyses, Nos. 5, 6, and 7, are included in the table on page 24 of this report.

MACAULAY TOWNSHIP**Concession VI, Lot 30**

A diatomite deposit on the farm of D. Vanclieaf, lot 30, concession VI, Macaulay township, was leased by G. Bailey in 1931. Mr. Bailey shipped 60

¹V. L. Eardley-Wilmot, "Diatomite, Its Occurrence, Preparation, and Uses," Mines Branch, Can. Dept. Mines, No. 691, 1928, p. 6.

²Ibid, p. 77.

³Ibid, p. 78.

⁴Ont. Dept. Mines, Vol. XL, 1931, pt. 1, p. 27.

tons of crude diatomite to his fire and insulating brick plant at Brampton in 1931. Eardley-Wilmot¹ reported that the diatomite was of a good grade near the top of the deposit, but that there was only a limited amount, about 200 tons, of the better grade being found at depths between 6 inches and 2½ feet. The deposit was thicker in the centre, where a depth of 17 feet was reached, but the lower part was not of the highest-grade material.

MORRISON TOWNSHIP

West Muskoka Road, Lots 33, 34, 35, 36

Muskoka Diatomite, Limited, was incorporated in 1932 to work a diatomite deposit in lots 33, 34, 35, and 36, West Muskoka Road, Morrison township. Northern Diatomite, Limited, incorporated in 1942, acquired the dredging lease issued to Muskoka Diatomite, Limited, covering 80 acres of lot 35, and the adjoining 20 acres in lot 36, West Muskoka Road. A mill was erected in 1936, and the swamp drained in 1937.²

In 1937 the company "excavated about a thousand tons of crude material . . . Trial runs were made in the mill . . . and a few tons of prepared product were shipped to various users for testing, the results of which were said to have been satisfactory."³ In 1938 the company "ran a few tons of raw material through its mill . . . and distributed a small amount of prepared product locally."⁴

F. E. Robson made a test run in the plant in 1939 producing 5 tons, but found the material could not be handled at a profit.

In 1940 "from the Muskoka region a very small amount of diatomite was sent for testing . . . but no shipments were made."⁵ There were no operations in 1941.

STEPHENSON TOWNSHIP

Concession XIII, Lots 24, 25, and 26

Concession XIV, Lots 23, 24, 25, and 26

A diatomite deposit underlies the waters of Round lake in lots 24, 25, 26, concession XIII, and lots 23, 24, 25, 26, concession XIV, Stephenson township, adjacent to Martin Siding, Canadian National railway.

Diatomite Products, Limited, attempted to operate this deposit, but later transferred operations to Slocombe lake (see paragraphs following).

STISTED TOWNSHIP

Concessions I and II, Lots 22 and 23

A diatomite deposit underlies the waters of Slocombe lake in lots 22 and 23, concessions I and II, Stisted township, about 1½ miles northwest of Martin Siding on the Canadian National railway. Martin Siding is 5 miles southwest of Huntsville. This property, as well as Lee lake and Round lake, was first acquired by the Canadian Kieselguhr Company, Limited. In 1929 Diatomite Products, Limited, acquired the property, and in 1935 leased it to Canadian Multi-Cell, Limited.

¹V. L. Eardley-Wilmot, personal communication to W. R. Rogers, 1931.

²Clay Products News, Vol. XI, No. 3, 1938, p. 5.

³V. L. Eardley-Wilmot, "Diatomite," The Canadian Mineral Industry in 1937, Bur. Mines, Can. Dept. Mines and Resources, No. 791, p. 46.

⁴V. L. Eardley-Wilmot, "Diatomite," The Canadian Mineral Industry in 1938, Bur. Mines, Can. Dept. Mines and Resources, No. 804, p. 47.

⁵V. L. Eardley-Wilmot, "Diatomite in 1940," The Canadian Mineral Industry in 1940, Mines Branch, Can. Dept. Mines and Resources, March, 1941 (mimeographed).

In 1931 the following description was published by Eardley-Wilmot:¹—

The Diatomite Products Company, of Toronto, has erected a dredge in Slocombe lake . . . and has started to pipe the sludge one mile into a natural basin at Martin Siding, Muskoka, where an efficient and up-to-date treatment plant is almost completed. The material is high in carbonaceous matter and there is a considerable shrinkage when the wet product is dried; nevertheless, about a hundred thousand tons of the finished product can be obtained from the different lakes in the immediate vicinity . . . The calcined diatomite is light in weight and the diatoms, both large and small, are well preserved.

From test shipments of crude diatomite by Diatomite Products, Limited, in 1931, to the Mines Branch, Ottawa, it was reported that satisfactory products could be prepared by calcining, crushing, and separating the grit from the fine diatomite.²

The following table gives the information available on production:³—

Year	Mined	Milled	Sold		Operators
			Tons	Value	
1933.....	tons ?	tons 20	20	\$ 860	Diatomite Products, Ltd.
1934.....	nil	nil	40	1,600	" " "
1935.....		1,500	100	4,600	Canadian Multi-Cell, Ltd.
1936.....		800	40	2,000	" " "
1937.....			*20	41,000	" " "

The property has been inactive since 1937.

Concession II, Lots 25, 26

A diatomite deposit under the water of Lee lake in lots 25 and 26, concession II, Stisted township, was acquired by Canadian Kieselguhr Company, Limited, which was succeeded by Diatomite Products, Limited. The latter company worked a deposit in Slocombe lake (see above), but it is not known whether any material was pumped from Lee lake.

Concession VIII, Lots 7 and 8

The following description of a diatomite deposit in lots 7 and 8, concession VIII, Stisted township, is taken from the Parry Sound report:⁵—

Samples of diatomite were collected from a deposit of diatomite and clay underlying a swamp on Black creek on lots 7 and 8, concession VIII, Stisted township, Muskoka district, southwest of Ashworth. Two samples were taken, one white, the other brown. A microscopic examination showed the presence of the diatoms, *Stauronies phoenicenteron* and *Pinnularia major*,⁶ and much silty material in both samples. The swamp is 75 yards wide and about half a mile in length. Only grab samples were taken. The correct procedure for sampling such deposits has been outlined by Eardley-Wilmot.⁷ The writer gained the impression in spading over the diatomite that it forms a thin layer and is too intimately associated with sand, silt, or clay to allow for a clean recovery if worked.

Concession XI, Lot 19

Eardley-Wilmot⁸ gives the following description of a diatomite deposit on lot 19, concession XI, Stisted township:—

¹V. L. Eardley-Wilmot, "Diatomite," Investigations of Mineral Resources and the Mining Industry, 1930, Mines Branch, Can. Dept. Mines, No. 723, 1931, pp. 47, 48.

²"The Treatment of Diatomite from Martin Siding, Ontario," Report No. 465 in "Investigations in Ore Dressing and Metallurgy, 1932," Mines Branch, Can. Dept. Mines, No. 736, 1934, pp. 222-225.

³Ont. Dept. Mines, files of the Statistics Branch.

⁴Estimated.

⁵J. Satterly, op. cit., p. 53.

⁶V. L. Eardley-Wilmot, "Diatomite," Mines Branch, Can. Dept. Mines, No. 691, 1928, plate I.

⁷Ibid, pp. 27-33.

⁸Ibid, p. 78.

About 12 miles northwest of Huntsville, a diatomaceous peat, 2 to 15 feet in thickness, and covering about 50 acres, occurs on the north and west sides of Duck lake on Hodge's farm. The swamp extends for some hundreds of feet back from the north edge of the lake and the dried peat is somewhat similar to that from Beaver meadows [Chaffey township], but contains less carbonaceous matter. The proportion of grit appears to increase with depth, but the best material occurs from 1 to 3 feet below the surface. The pink residue after calcining is gritty and high in alumina. . . . The diatoms are well preserved.

Two analyses (Nos. 8 and 9) are given in the table on page 24 of this report. The deposit was leased by the Canadian Diatomite and Silica Company, of Toronto. There is no recorded production.

Parry Sound District

PERRY TOWNSHIP

Concession I, Lot 3

The following description of a diatomite deposit on lot 3, concession I, Perry township, west of Novar, in what is known as Austin swamp, is taken from the Parry Sound report:¹—

Dominion Diatomite, Limited, was incorporated in August, 1931, to operate this deposit,² and a small production was recorded for the years 1932-34.³ In 1933, Dominion Diatomite, Limited, was succeeded by F. P. Macklem. The property has been idle since 1934.

Year	Tons milled	Tons sold	Value
1932.....	134	10	\$309
1933.....	96	8	438
1934.....	68	6	320

An analysis of the diatomite was reported to show 84 per cent. silica, but it is not stated what amount of this was diatom silica. Microscopic inspection of the crude diatomite collected by the writer from the old drying racks shows a fair amount of grit, and it is suspected that a high-grade product could not be obtained without a considerable percentage of the inferior grades for which there is little sale.

FELDSPAR

Pegmatite dikes have a widespread distribution in the area, but few of them contain feldspar of commercial grade, and very little production has been recorded.

Haliburton County

CARDIFF TOWNSHIP

Concession XII, Lot 9

Canada Radium Mines, Limited, holds lots 6, 7, 8, 9, and 10 in concession XII and the south half of lot 7 and all of lot 8 in concession XIII, Cardiff township. A two-compartment vertical shaft, 400 feet deep, with levels at 125, 250, and 375 feet, is situated on lot 9, concession XII. Lateral work on the three levels amounts to 1,810 feet.⁴ There is a 100-ton mill on the property. Late in 1941 a 50-ton Exolon magnetic separator and Johnson electrostatic separator were installed. The property closed down on July 15, 1942.

The company is mining a pink graphic granite pegmatite, which occurs as a number of dikes cutting hornblende gneiss. The pegmatite contains varying

¹J. Satterly, op. cit., p. 53.

²Ont. Dept. Mines, Vol. XLI, 1932, pt. 1, p. 30.

³Ont. Dept. Mines, files of the Statistics Branch; Vol. XLII, 1933, pt. 1, p. 29.

⁴Ont. Dept. Mines, Vol. I, 1941, pt. 1, p. 159.

amounts of hornblende and minor amounts of magnetite and is reported to carry rare-element minerals. All these minerals are removed, after crushing through stages of 20, 30, and 60 mesh, by the magnetic separator. The resulting quartz-feldspar mixture is then fed through a Johnson electrostatic separator in order to effect a separation of the quartz and feldspar. A method of treatment of the magnetic concentrate for the recovery of other minerals has not yet been solved.

A fluorspar occurrence on this lot is described on page 32.



Headframe and mill of Canada Radium Mines, Limited, at Cheddar, Cardiff township, Haliburton county, June, 1942.

GLAMORGAN TOWNSHIP

Concession VI, Lot 31

On lot 31, concession VI, Glamorgan township, at a point 11 chains north of the road and 3 chains east of the line between lots 30 and 31, an open cut 20 by 15 feet and 15 feet deep has been put into the northwest face of an outcrop of coarse pink pegmatite. Pink feldspar masses are mainly less than 4 inches and rarely 6 inches in diameter. There is much quartz present, the average amount being about 10 per cent. Most of the mined material is waste. P. J. Dwyer is reported to have shipped a carload in 1918 from this prospect.¹

Concession VI, Lot 32

A trench 20 feet long, 6 feet wide, and from 3 to 4 feet deep, has been sunk on a pegmatite dike 5 chains north of the road in lot 32, concession VI, Glamorgan township. The pink pegmatite dike strikes N. 25° E. and has a vertical dip. It is 5 feet wide in the trench, but in a 25-foot stripping to the northeast of the trench it narrows to 2 feet. The dike contains pink feldspar, some quartz, and rarely a little fluorspar. The country rock is a pink biotite granite gneiss. This occurrence is of no economic importance.

¹Ont. Bur. Mines, Vol. XXVIII, 1919, pt. 1, p. 158.

MONMOUTH TOWNSHIP

Concession XI, Lot 26

A trench 45 feet long, 10 feet wide, and 3 feet deep, now full of leaves, has been put down on a syenite-pegmatite in lot 26, concession XI, Monmouth township, about 13 chains north from the road at a point 0.7 miles east from Otter creek. The pegmatite consists of pink feldspar, most of which is less than 12 inches and none greater than 18 inches in diameter; black biotite books as much as 4 inches in diameter; black tourmaline crystals with a cross-section of 3 inches; and, rarely, fluorspar. The country rock is a biotite syenite. Owing to the abundance of black mica and the small size of the feldspar masses, the deposit is of no economic importance.

This is probably the deposit reported by Spence¹ as in lot 25, which was worked in a small way in 1922 by Ontario Feldspars, Limited. No shipments were made.

Concession XV, Lot 30

On lot 30, concession XV, Monmouth township, at 1 chain west of the fence between lots 30 and 31, an open cut 30 by 50 feet extends two-thirds of the way down the southwest face of a rock ridge 50 feet high. The rock exposed is a graphic granite-pegmatite containing 25 per cent. or more quartz. There is no No. 1 grade feldspar present. Rare accessory minerals are titanite, tourmaline, and calcite. Crystalline limestone, which may be an inclusion, occurs just south-east of the open cut, in contact with the pegmatite.

Industrial Minerals Corporation of Canada, Limited, is reported to have operated this property from 1921² to 1924³ with a production of 534 tons.⁴ Spence states this production was of second-grade spar.⁵

Muskoka District

BRUNEL TOWNSHIP

Concession XIV, Lot 16

The following account of an occurrence on lot 16, concession XIV, Brunel township, Muskoka district, is taken from the Parry Sound report:⁶—

About 100 feet above lake level at the ski jump on the west shore of Fairy lake, 1½ miles from Huntsville, old pits expose a pegmatite dike . . . In one pit pink microcline . . . forms crystals as large as 1½ by 2 feet, and banded grey or white quartz and some small books of muscovite occur interstitially. At the mouth of this pit waste rock consists of a coarse-grained aggregate of pink microcline, yellow-brown plagioclase, quartz, muscovite, and biotite. On the dump partly stained muscovite is found in sheets as much as 3 inches in diameter, and biotite in crushed sheets as much as 2 feet in diameter. Other strippings near the top of the ski jump and much of the waste rock forming a talus slope on the side of hill show abundant graphic granite. It would appear that the abundance of graphic granite prevents any commercial development.

STEPHENSON TOWNSHIP

Concession II, Lots 26 and 27

One car of feldspar is reported to have been shipped by S. W. Hall in 1915 from a deposit on lots 26 and 27, concession II, Stephenson township.⁷

¹Hugh S. Spence, "Feldspar," Mines Branch, Can. Dept. Mines, No. 731, 1932, p. 87.

²Ont. Bur. Mines, Vol. XXXI, 1922, pt. 1, p. 21.

³Ont. Bur. Mines, Vol. XXXIV, 1925, pt. 1, p. 26.

⁴Files of the Statistics Branch, Ont. Dept. Mines.

⁵Hugh S. Spence, op. cit., p. 44.

⁶J. Satterly, op. cit., p. 61.

⁷Ont. Bur. Mines, Vol. XXV, 1916, pt. 1, p. 131.

Concession XIV, Lot 24

A feldspar deposit on lot 24, concession XIV, Stephenson township, has been described in the Parry Sound report as follows:¹—

At the time of the writer's visit in September, 1941, F. C. Hammond and Allan McKay were developing a feldspar property. . . . 1½ miles from Martins on the Canadian National railway. A stripping 25 by 50 feet had been cleared on a pegmatite dike on the north slope of a hill just south of the road on the boundary between Stephenson and Stisted townships. Work was in progress in a pit 25 feet square and from 3 to 5 feet deep to obtain a carload of feldspar for a test shipment to the Genesee Feldspar Company, Incorporated, Rochester, N.Y.

The pegmatite dike, which is about 25 feet wide, is composed of pink microcline. . . . graphic granite, glassy white or grey quartz, odd books of biotite with a maximum diameter of 3 inches, and some magnetite. A very small amount of plagioclase . . . was seen on the west wall. Quartz forms a 10-foot width in the centre of the dike flanked by pink microcline with coarse grey quartz. The ratio of feldspar to waste in September, 1941, was reported to be very low, about 1 to 10.

The dike cuts a biotite augen gneiss, which is also exposed in a low cliff 30 feet south of the stripping. The gneissic structure strikes N. 65° W. and dips 45° S.W. There is no trace of the dike here, as would be expected, which suggests that the pegmatite body may be just a small mass.

The feldspar obtained from the pit was still on the property in September, 1942, no shipments having been made. The property is now idle.

FLUORSPAR

Fluorspar occurs mainly in apatite-fluorspar-calcite veins, which at most localities are fairly intimately associated with hornblende syenite-pegmatite dikes. The more important deposits are confined to Cardiff township, Haliburton county.

Ellsworth has described the chief characteristics of these deposits at some length.² The vein material is a streaked or banded aggregate of purple fluorspar and white to cream or, more rarely, pink calcite containing usually crystals of apatite. The apatite is generally green in colour when forming part of the aggregate, but reddish-brown in colour when forming part of the wall-mineral assemblage. Other minerals present include hornblende, pyroxene, magnetite, or ilmenite, and "in some cases a little titanite, molybdenite, zircon, allanite, ellsworthite, or uraninite. There is generally, if not always, a relatively narrow border of feldspar next the wall-rock carrying inwardly projecting feldspar crystals."³

Some of the vein material contains no fluorspar; the maximum content is 90 per cent., and the average may be 30 per cent. The veins are narrow, being usually from 3 to 6 feet in width, with occasional lenses as much as 15 feet in width.

The commercial exploitation of these apatite-fluorspar-calcite veins depends not only on the percentage of fluorspar present in the aggregate, but on the successful removal of all of the phosphorus-bearing mineral apatite. It is doubtful if the latter can be accomplished economically by hand-cobbing. It is not likely that any large production of fluorspar can be secured from the deposits owing to (1) the lenticular character of the veins, (2) the variable percentage of fluorspar, and (3) the presence of apatite. At the prices prevailing in 1942, however, some of the deposits may be profitably worked on a small scale.

It is not likely that heavy-media separation processes⁴ could be used on the

¹J. Satterly, *op. cit.*, p. 61.

²H. V. Ellsworth, "Rare-element Minerals of Canada," *Geol. Surv. Can., Econ. Geol. Series No. 11*, 1932, pp. 197, 198.

³*Ibid.*, pp. 197, 198.

⁴"Heavy-Media Separation Processes," *Ore Dressing Notes, American Cyanamid Company, No. 11*, July, 1942.

apatite-fluorspar-calcite aggregate. The specific gravities of these minerals in samples taken in Cardiff township, as determined by the Provincial Assay Office, are as follows: calcite, 2.74; apatite, 3.22; fluorspar, 3.18. Although the calcite could be quite easily removed, the apatite could not, as in practice a difference in gravity of 0.25 is necessary. Further, even if the separation were possible, the cost of the necessary equipment for this process would be too great considering the small tonnages indicated in the known deposits.

Haliburton County

CARDIFF TOWNSHIP

Concession XII, Lot 9

The occurrence on lot 9, concession XII, Cardiff township, is briefly described by Wilson as a "vein of calcite 5-6 feet wide, striking N. 25° E. mag., and dipping 45° W. The calcite contains apatite, mica, pyroxene, and a small proportion of fluorspar."¹

Concession XVIII, Lot 2

A number of workings expose fluorspar on lot 2, concession XVIII, Cardiff township. These are reached by turning off from the Wilberforce-Tory Hill road at Wilbermere lake and taking the road to G. Barnes' farm, and then walking northeast about half a mile through fields to the bush. The workings consist of pits and trenches along a line trending N. 50° W.

A pit 4 by 4 feet and 4 feet deep beside a creek exposes a purple fluorspar-pyroxene-feldspar lens, a few feet in width, in pegmatite. The lens may strike north. No apatite was seen in this exposure. On the hill to the northwest two pits and a trench show fluorspar-pyroxene-apatite veins. In one pit a vein, 2 feet wide, strikes N. 10° E. and dips vertically. The fluorspar content ranges from 30 to 50 per cent. Lack of exposures makes it difficult to decipher the geological relationships. The veins cut pyroxene-albite pegmatite and impure crystalline limestone.

A brecciated pyroxene-albite pegmatite cemented by white calcite vein material containing purple fluorspar, green pyroxene, and brown albite, and as accessory minerals red or green apatite, titanite, and red-brown zircon, has been exposed in a trench 50 feet long, trending N. 30° E. The fluorspar content is variable and would not exceed 25 per cent. The exposed area of fluorspar-bearing rock is 25 feet. It appears to be cut off to the south by pegmatite.

Further work would be necessary to prove the continuity of the fluorspar-bearing rocks seen in these workings. The fluorspar content is so low, however, that such work could hardly be justified.

The writer is indebted to T. Morrison for showing him this occurrence.

Concession XXI, Lot 5

Fluorspar occurs on lot 5, concession XXI, Cardiff township, on the property of Wilberforce Minerals, Limited. A detailed description of this deposit will be found in the section of this report on "Radioactive Minerals," on page 83.

Concession XXI, Lot 8

The Tripp deposit on lot 8, concession XXI, Cardiff township, lies 8 chains west of the road on the boundary between lots 8 and 9 at a point 0.5 miles south

¹M. E. Wilson, "Fluorspar Deposits of Canada," Geol. Surv. Can., Econ. Geol. Series No. 6, 1929, p. 39.

of the Wilberforce-Bancroft highway. The main workings consist of stripping and trenching in a direction N. 45° E. for a length of 4 chains and as much as 10 feet wide, and a 5- by 7-foot shaft, 22 feet deep. Fifteen feet to the southwest of the stripping, trenching through 2 to 2½ feet of drift exposes rock over an area 10 by 6 feet.

Southwest of the shaft the present opening indicates the removal of a lens of banded vein material from 6 inches to 3 feet in width and 20 feet long, composed of white calcite, purple fluor spar, and red apatite. The footwall of the vein strikes N. 45° E. and dips 85° N.W. The vein walls consist of an aggregate of large feldspar, hornblende, and red apatite crystals. The country rock is a syenite gneiss. The shaft was put down on a pod of calcite-fluor spar about 5 feet in diameter. Northeast of the shaft a fracture containing a fluor spar-calcite vein occurs on the footwall of a very coarse (6 inches to 1 foot) hornblende syenite-pegmatite dike, 6 feet wide. The vein narrows from 2 feet to a few inches in width in a distance of 30 feet, at which place small pods or lenses of fluor spar-calcite aggregate several feet in diameter are present. The hornblende syenite-pegmatite at the same place grades into a pink syenite-pegmatite cut by a few irregular purple fluor spar stringers.

The fluor spar content of the apatite-fluor spar-calcite aggregate now on the dump ranges from 20 to 30 per cent. Industrial Minerals Corporation report¹ that in 1924 they drifted 18 feet from the 22-foot deep shaft and hand-picked 2 tons of fluor spar, which was sold for \$32. This material analysed 98½ per cent. CaF₂.

On this same lot, just northeast of the above workings and 4 chains west of the same road, a stripping 25 feet square through 1 foot of overburden exposes buff biotite granite gneiss cut by fine-grained pink syenite and hornblende pegmatite. A small trench on the northwest edge of the stripping exposes a lenticular apatite-fluor spar-calcite vein 1 foot wide, and perhaps 10 feet long, trending N. 20° E. This deposit is of no importance.

Concession XXI, Lot 9

A banded apatite-fluor spar-calcite vein cutting a hornblende syenite gneiss in a field on lot 9, concession XXI, Cardiff township, 4 chains east of the road on the boundary between lots 8 and 9 at a point 0.5 miles south of the Wilberforce-Bancroft highway, was opened up in August, 1942, by F. K. Montgomery, of Havelock.

The minerals present in the vein are creamy calcite, purple fluor spar, and green apatite. The latter occurs as crystals from less than an inch to 6 inches in diameter. The fluor spar content is about 30 per cent., but much richer material occurs in places. The walls of the vein show large hornblende crystals, and some red apatite crystals.

Test shipments were made by the owners to a foundry supply firm in Toronto.

Concession XXII, Lot 8

The workings for fluor spar on lot 8, concession XXII, Cardiff township, occur from 1½ to 3 chains south of the Wilberforce-Bancroft highway and 17 chains west of the road on the line between lots 8 and 9. The workings consist of an open cut 30 feet in diameter on the slope of a hill 3 chains south of the road and an adit near the bottom of the hill at 1½ chains south of the road.

¹From information on file in the Statistics Branch, Ont. Dept. Mines.

In the open cut, below a pink granite capping, there is exposed an irregular calcite vein containing hornblende and red apatite crystals and, on the east wall, much purple fluorspar. The vein may be 5 feet wide; it dips 30° S. The east wall of the open cut exposes an aggregate of white calcite and purple fluorspar 15 feet in width.

The adit is driven into low-dipping (5° S.) biotite paragneiss with *lit par lit* granite stringers from half an inch to one inch in width. Wilson¹ reports that fluorspar was exposed in this adit.

P. J. Dwyer mined 180 tons, of which 37 tons was shipped, in 1918.²

Concession XXII, Lot 9

The deposit of fluorspar on lot 9, concession XXII, Cardiff township, is 9 chains at N. 10° E. from the junction of the Wilberforce-Bancroft highway with the road on the line between lots 8 and 9. The deposit has been opened up by a trench 110 feet long, 6 feet wide, and from 6 to 10 feet deep. The country rock is a medium-grained fluorspar-hornblende granite. The trench is now partly filled with debris and contains trees 2 to 3 inches in diameter. From an examination of the walls of the trench and material on the dump, it appears that the trench was put down on a vein 5 feet wide composed of a banded aggregate of apatite, purple fluorspar, and calcite. Some of the fluorspar forms veinlets as much as 2 inches in width. The walls of the vein consist of crystals of hornblende, feldspar, scapolite, and apatite.

There is no recorded production.

Concession XXII, Lot 13

The fluorspar deposit of W. E. Clark on lot 13, concession XXII, Cardiff township, is about a quarter of a mile due south of Mumford station on the Canadian National railway.

The workings, which are on the top of a hill, extend over a length of 600 feet and consist of a series of trenches and pits on six fluorspar veins striking approximately northeast. According to information supplied by the owner, the longest vein worked was 91 feet in length and the largest lens of pure fluorspar recovered was 5 feet thick and 16 feet long. The fluorspar is either a smoky amethystine type or a deep-purple fetid variety. The country rock adjacent to the veins is a complex pegmatite consisting of pink or buff feldspar, pyroxene, scapolite, apatite, salmon-pink calcite, a little brown mica, and purple fluorspar. The pyroxene, scapolite, and apatite occur as terminated crystals. The pyroxene crystals range from a few inches to 18 inches in diameter. The order of deposition of these minerals appears to be apatite, pyroxene and scapolite, calcite, and lastly fluorspar.

W. E. Clark operated the property from 1940 to 1942, making shipments of 12 tons in 1940, and 18 tons in 1942 of acid grade spar.

GARNET

Garnet occurs as a constituent of some of the paragneisses, and is developed as a contact mineral at one of the iron deposits. The occurrences are of no economic importance as a source of abrasive garnet at the present time.

¹M. E. Wilson, *op. cit.*, p. 40.

²Files of the Statistics Branch, Ont. Dept. Mines.

Haliburton County

CARDIFF TOWNSHIP

Concessions VI and VII, Lot 22

The garnets in lot 22, concession VI and VII, Cardiff township, according to brief notes given by Eardley-Wilmot,¹ occur in a garnet gneiss band 20 feet in width on the road bed where it crosses the county line. The garnets are of a fair size but badly broken and of a pale red-brown colour. The deposit is classified by him as of doubtful commercial value.

HARCOURT TOWNSHIP

Concession IX, Lots 11, 12, and 13

The occurrence of garnets on Fishtail lake in lots 11, 12, and 13, concession IX, Harcourt township, has been described by Eardley-Wilmot as follows:²—

On the north shore of the lake, where the garnet occurs, the rock is a dark brown, basic gneiss or amphibolite . . . The garnet band lies in the granite gneiss between two narrow masses of limestone and has a general east and west strike.

On approaching from the east, or "tail" of the lake, the first garnet outcrop occurs on the southern shore of the narrows and again on a small island at the northeast end of the main body of the lake, where the garnets are small and not very plentiful. Farther west along the strike the ore again outcrops along the north shore, at the mouth of a small creek, about half way down the lake. Here there is a mass about 30 feet wide which averages 30 per cent. garnet and is composed mainly of large, pink garnets, many of which are over 1½ inches in diameter.

These garnetiferous outcrops are exposed for about 500 yards and in places are rich in well-formed, large and clear red garnets. Near the west end of the lake the garnet ridge disappears into a marsh. Isolated and small patches of garnet can be traced for over 100 feet north across the strike but the main body along the north shore appears to be about 30 feet wide and dips flatly to the south and under the lake. . . .

Tests on small samples showed that there would be no difficulty in concentrating the ore by ordinary gravity methods and the garnet appears to possess good abrasive qualities. The deposit, though at present difficult of access, is worthy of further investigation.

Peterborough County

BELMONT TOWNSHIP

Concession I, Lot 19

Eardley-Wilmot³ described the occurrence of garnet on lot 19, concession I, Belmont township, as follows:—

The gangue mineral of the Belmont iron mine is almost entirely composed of massive, greenish black garnet which is intimately associated with the magnetite. Thousands of tons of this garnet-magnetite ore are lying on the waste dump. The garnet is very friable and crumbles up into a fine powder rendering it unfit for abrasive purposes.

Concession II, Lot 17

An occurrence of garnet is shown on Wilson's map⁴ in lot 17, concession II, Belmont township. What is probably the same occurrence is briefly noted by Eardley-Wilmot⁵ as pea- to walnut-sized garnets in pockets in a limestone belt adjacent to the gabbro contact. The garnet is stated to be probably of no use for abrasive purposes.

Victoria County

SOMERVILLE TOWNSHIP

Concession XI, Lot 1

Eardley-Wilmot⁶ briefly describes an occurrence of garnet in lot 1, conces-

¹V. L. Eardley-Wilmot, Abrasives, Part III, "Garnet," Mines Branch, Can. Dept. Mines, No. 677, 1927, p. 29.

²V. L. Eardley-Wilmot, op. cit., pp. 11, 12.

³Ibid, p. 17.

⁴Map 560A, Geol. Surv. Can. Dept. Mines and Resources, 1940.

⁵V. L. Eardley-Wilmot, op. cit., p. 30.

⁶Ibid, p. 31.

sion XI, Somerville township, near the Bobcaygeon road. Pea-sized garnets occur in pyritiferous rusty gneisses. The gneisses form a band 150 yards wide bounded on both sides by crystalline limestone. The garnet is classed by him as probably of no use for abrasive purposes.

GOLD

Except for the Cordova and Ledyard gold mines in Belmont township, Peterborough county, the many gold prospects reported in Haliburton, Peterborough, and Victoria counties have, in many cases at least, proved to be barren of that metal or to contain it in uneconomic amounts. Adams¹ examined a number of occurrences of disseminated pyrrhotite and pyrite in gneiss, which form rusty-weathering bands in the limestone in Galway township, Peterborough county, and Somerville township, Victoria county. Samples taken by him were assayed for gold and silver, and in some cases for nickel as well. In all cases no gold or silver were found. The occurrences examined by Adams are listed below:—

1. Galway township, concession A, lot 7.
2. Galway township, concession IV, lot 11.
3. Galway township, concession IV, lot 15.
4. Galway township, concession IV, lot 18.
5. Galway township, concession X, lot 1.
6. Galway township, concession XIV, lot 16 (south end).
7. Galway township, concession XV, lot 16 (north end).
8. Galway township, concession XVIII, lot 11.
9. Somerville township, concession XI, lot 1.

These occurrences are not indicated on the map.

Peterborough County

BELMONT TOWNSHIP

Concession I, Lot 19, East Half (Ledyard Mine)

The Ledyard gold mine,² in the east half of lot 19, concession I, Belmont township, was operated between the years 1893 and 1896. A shaft 8 by 11 feet, was sunk to a depth of 100 feet upon an east and west quartz vein cutting gabbro. A crosscut was driven for a length of 85 feet. The quartz vein at the surface was 4 to 6 feet wide; at a depth of 45 feet the vein was divided by a horse, so that the walls are 12 feet apart. At a depth of 100 feet the crosscut showed the vein to be 18 feet wide. The vein dips 45° S. Gold production for the years 1893 and 1894, from 55 tons milled, was valued at \$236.³

Concession I, Lot 20, East Half (Cordova Mine)

The Cordova, formerly the Belmont, gold mine was discovered in 1892. Production in the years 1892-93, 1898-1903, 1912-15, 1917, and 1939-40 from 120,670 tons milled amounted to 22,774 ounces of gold, valued at \$474,201. Silver produced was 687 ounces, valued at \$347. The total production, therefore, was valued at \$474,548.

The Consolidated Mining and Smelting Company of Canada, Limited,

¹F. D. Adams, Geol. Surv. Can., Ann. Rept., Vol. VI, 1892-93, pp. 9J-12J.

²Ont. Bur. Mines, Vol. III, 1893, p. 51; Vol. IV, 1894, p. 234; Vol. V, 1895, p. 262; Vol. VI, 1896, p. 58.

³Ont. Dept. Mines, files of the Statistics Branch.

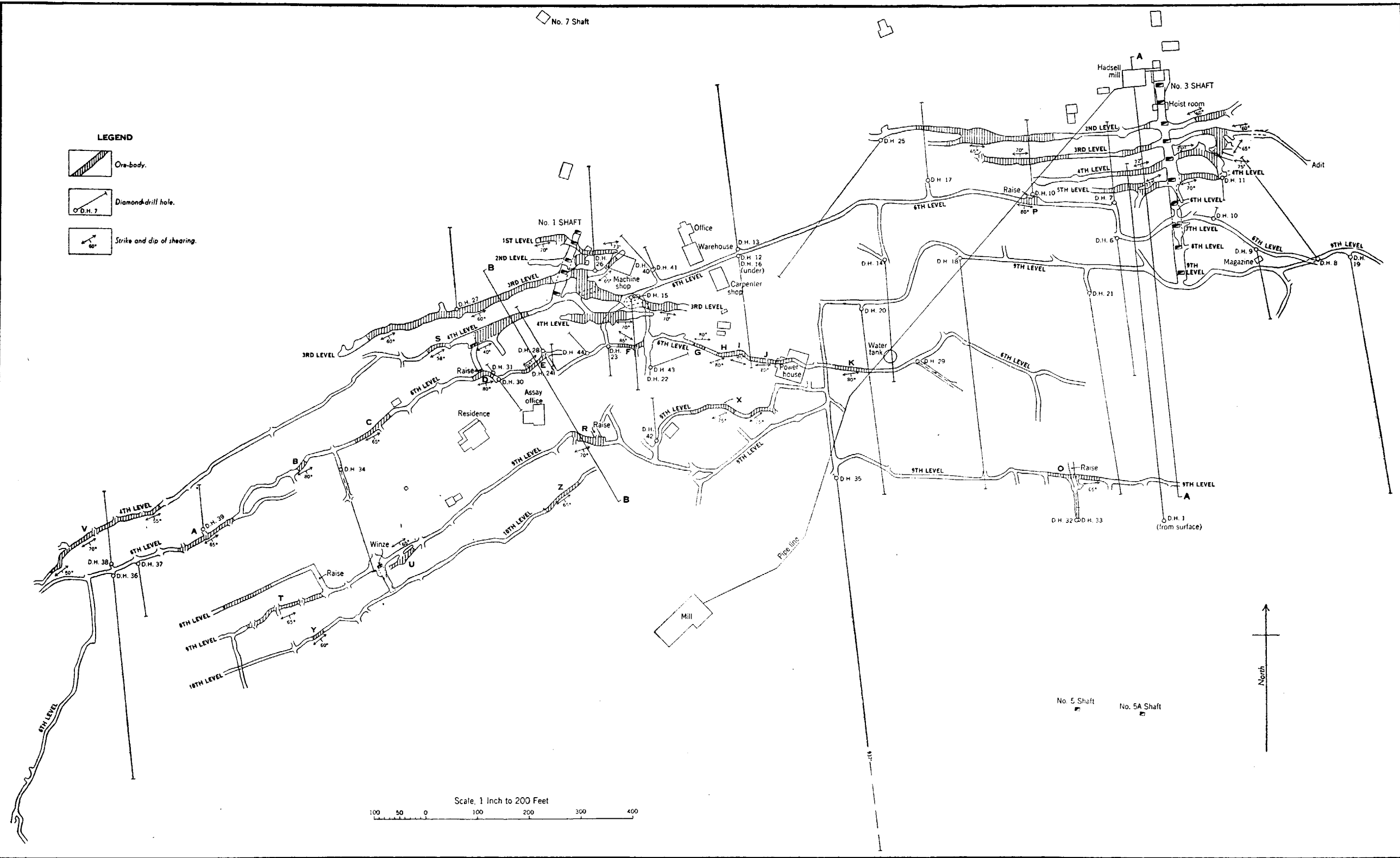


FIG. 2—COMPOSITE PLAN OF SURFACE BUILDINGS, UNDERGROUND WORKINGS, AND DIAMOND-DRILL HOLES, CORDOVA MINE, BELMONT TOWNSHIP, PETERBOROUGH COUNTY.
 (Copied from a plan dated June 21, 1940, and published with the permission of the Consolidated Mining and Smelting Company of Canada, Limited.)

acquired the Cordova mine in 1935¹ and carried on operations at the property until July 31, 1940.² The workings at the close of operations were as follows: No. 1 shaft is 401 feet deep; No. 2 is 185 feet deep; and No. 3 or Main shaft is 1,050 feet in inclined depth with 9 levels.³ During 1938 a 2-compartment inclined winze, No. 912, was sunk from the ninth level to the tenth, 152 feet on the incline.⁴

A 125-ton mill was built in 1939 and was operated from October, 1939, to July 31, 1940, treating 33,434 tons, from which 3,487 ounces of gold was recovered.

The writer has compiled the following account of the ore deposits from notes and plans supplied by L. V. Bell.⁵

The gold deposits occur entirely within, but near the west margin of, an intrusive body of diorite [gabbro], which forms the northeast part of the gabbro-basalt mass shown on map No. 52a. To the west and north of the diorite mass crystalline limestone, paragneiss, conglomerate, and altered volcanic rocks are exposed.

The diorite is a medium- to coarse-grained, usually massive rock composed of plagioclase (labradorite) and hornblende. Secondary minerals include carbonate, chlorite, serpentine, sericite, quartz, and apatite. In places local differentiation is indicated by more acid and basic phases, such as (1) pegmatite including pegmatitic diorite, (2) highly feldspathic rock or anorthosite, and (3) aplite. The first two occur within the diorite, and the third cuts the diorite as dikes. Diamond-drilling in the area of the mine indicated that the main diorite is cut by a later diorite similar to it in composition. A banding is also found in the diorite and is interpreted as a primary structure due to differentiation. The diorite mass as a whole is, therefore, composite in nature.

Near the western contact of the diorite are a series of shear zones striking east to southeast. The diorite where cut by the shear zones shows considerable alteration, partly to chlorite but mainly to biotite. In some of the shear zones gold-bearing vein material occurs and constitutes the deposits of the Cordova mine. Bell considers that there is a direct structural relationship between the shear zones and the contact of the diorite mass.⁶ Up to the present, however, none of the shear zones has been followed in the underground workings as far west as the contact of the diorite mass.

A number of shear zones occur in the vicinity of the mine, and although several of them have been partly explored, only three have been extensively explored by underground workings. The shearing in any one zone is commonly irregular, owing to branching and contortion, but nevertheless is persistent along its strike. Bell believes there is a connection between the occurrence of the ore bodies and the irregularities in the pattern of shearing. The underground work indicates that at least one of the shear zones is much less persistent on its dip than it is along its strike. The width of the individual shear zones ranges from as little as a foot to more than 40 feet, the average being about 6 feet. The shearing across any one zone may be uniformly developed, but in some cases certain shear planes seem to have taken up most of the movement and have become major shear planes or "mud slips."

The shear zones show some silicification and slight mineralization throughout

¹Ont. Dept. Mines, Vol. XLV, 1936, pt. 1, p. 96.

²Ont. Dept. Mines, Vol. L, 1941, pt. 1, p. 28.

³Ibid.

⁴Ont. Dept. Mines, Vol. XLVIII, 1939, pt. 1, p. 99.

⁵Published with the permission of L. W. Oughtred of the Consolidated Mining and Smelting Company of Canada, Limited.

⁶cf. L. V. Bell and A. M. Bell, *Econ. Geol.*, Vol. XXX, 1935, pp. 353-355.

much of their exposed lengths, but only three, or possibly two, as extensively developed underground contain workable ore bodies. The ore bodies (see Figs. 2 and 3) developed from and west of No. 1 shaft strike from N. 60° to 70° E. and N. 80° W. and generally dip from 60° (see Fig. 4) to 70° S.E. In the vicinity

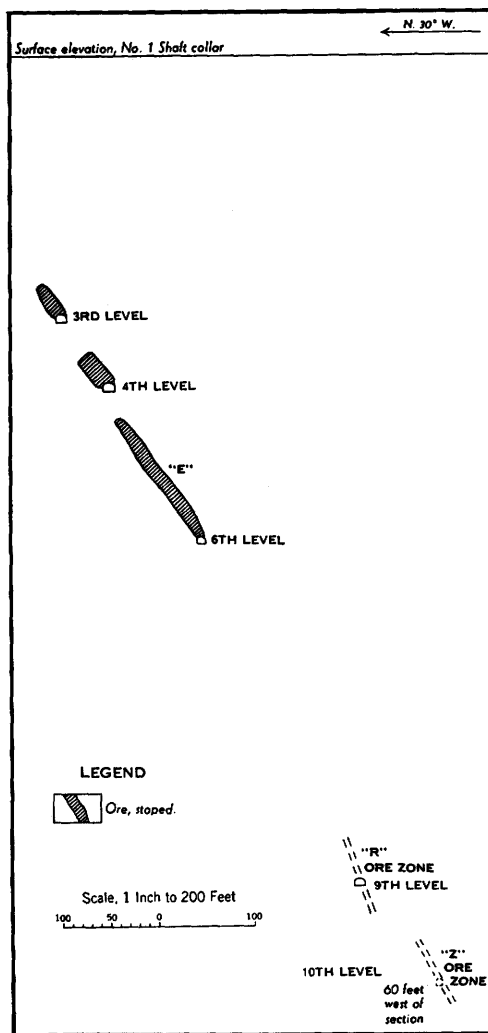


Fig. 4—Transverse vertical section B-B (see Fig. 2) west of No. 1 shaft, Cordova mine. (Compiled from plans and published with the permission of the Consolidated Mining and Smelting Company of Canada, Limited.)

of No. 3 shaft they strike N. 70° to 85° E. to N. 85° W., and the average dip is about 65° S. (see Fig. 5). Bell reports that no definite control for the localization of the ore bodies has been found but that the following structural factors are significant. Many of the ore bodies in the vicinity of No. 1 shaft occur at or close to the intersection of two shear zones trending N. 80° W. and N. 65° E. The ore bodies also occur where there is contortion and variation in the shearing within the shear zones, as in old stope areas near both No. 1 and No. 3 shafts.

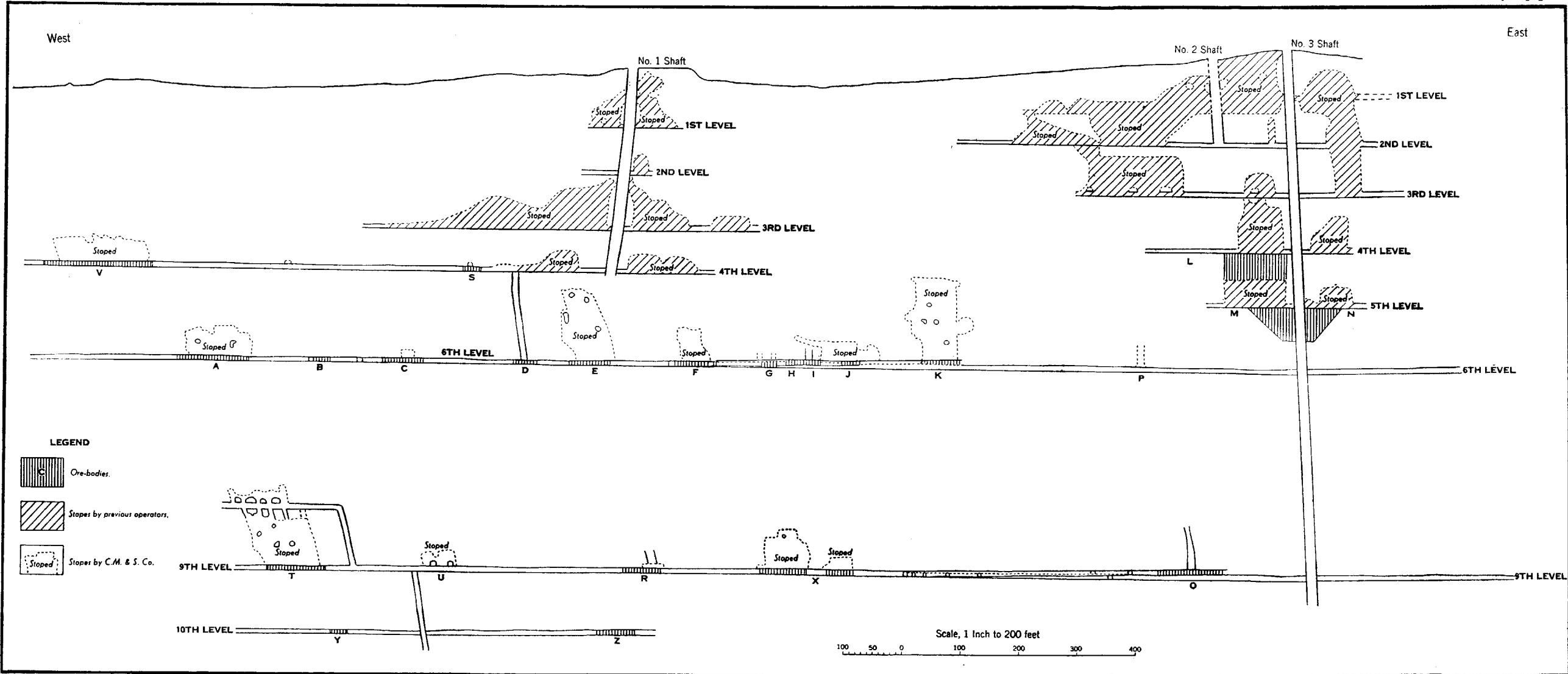


FIG. 3—LONGITUDINAL VERTICAL SECTION OF THE CORDOVA MINE, BELMONT TOWNSHIP, PETERBOROUGH COUNTY.
 (Copied from a plan dated June 30, 1940, and published with the permission of the Consolidated Mining and Smelting Company of Canada, Limited.)

This irregularity may account for the wide ore bodies on the upper levels. Major shear planes occurring within the shear zones may, according to Bell, have acted as channels for the ore-bearing solutions.

Bell recognizes at least two types of vein material, only one of which makes ore. This type includes (1) replacement of the shear zones by vein material,

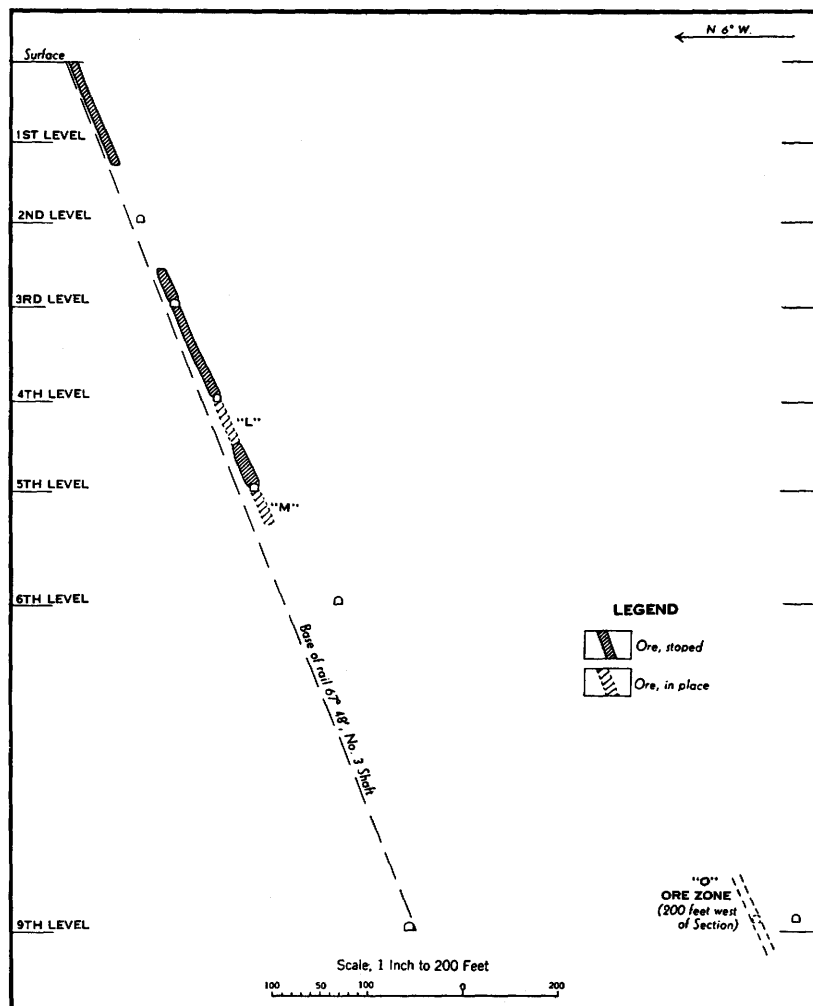


Fig. 5—Transverse vertical section A-A (see Fig. 2) 50 feet west of No. 3 shaft, Cordova mine. (Compiled from plans and published with the permission of the Consolidated Mining and Smelting Company of Canada, Limited.)

(2) the development of a series or zone of closely spaced stringers or veinlets paralleling the planes of shearing, (3) the occurrence of ramifying veinlets in a more or less brecciated irregular replacement zone, and (4) the rarer occurrence of individual large lenses of massive vein material parallel with the shearing planes.

The vein matter, owing to its emplacement along shear planes, usually exhibits a parallel banding, which is not so evident in the more richly mineralized

ore bodies as in the irregularly brecciated ore bodies containing much disseminated fine pyrite. Pyrite is the predominant metallic mineral, but pyrrhotite does occur. In the better-grade ore bodies pyrite may constitute locally as much as 50 per cent. of the ore. The gold is apparently confined to the pyrite, as no native gold was seen by Bell. A limited microscopic study of the vein material shows it to consist, in order of abundance, of carbonate, feldspar (including plagioclase and orthoclase), and quartz. The carbonate is definitely later than the feldspar and at least partly later than the quartz.

The second type of vein material, which occurs on the 9th level in the southeastern part of the mine, consists of lenses of carbonate and quartz mineralized with pyrrhotite. Gold is not present in economic amounts.

In conclusion it may be noted that underground work prior to 1935 had exposed a number of wide ore bodies on the upper levels, but the extensive underground development carried out between 1935 and 1940 by the Consolidated Mining and Smelting Company of Canada, Limited, disclosed a number of ore bodies of only moderate tonnage and grade. This company treated 33,305 tons for a recovery of 0.117 ounces of gold per ton (\$4.50 per ton at \$38.50 per ounce of gold). Bell states that there is no evidence to support a belief that ore bodies of larger size or better grade than those already known are likely to be found by additional development.

GRAPHITE

Disseminated graphite in the paragneiss and crystalline limestone and, to a lesser extent, in pegmatite is not uncommon in the area. Owing to the small size of the flake, the low percentage of graphite present, or the small size of the graphite-bearing body, none of the occurrences are thought to be of economic importance. Some production is reported from properties near Wilberforce, but it is believed most of this was from ore shipped from Hastings county.

In 1942 there was some prospecting for graphite in Haliburton county.

Haliburton County

CARDIFF TOWNSHIP

Concession XIV, Lot 18

For a description of an occurrence of graphite on lot 18, concession XIV, Cardiff township, see an account under "Molybdenum" on page 63.

Concession XV, Lot 18

B. E. MacDougall showed the writer an occurrence of graphite in lot 18, concession XV, Cardiff township, on the north side of a small creek between the two parts of Cup lake.

Beside the creek an old shallow pit on the dip face of a quartz-feldspar gneiss, striking N. 80° W. and dipping 55° S., shows disseminated graphite flakes one-sixteenth to one-quarter of an inch in diameter in a band 4 feet thick. The richest material occurs on a slip in this band parallel to the gneissic structure. The gneisses north and south of the band contain little or no graphite. Another shallow pit just south of the creek exposes a rusty siliceous gneiss in which some bands carry a few flakes of fine to coarse graphite.

At the outlet of the west part of Cup lake the rocks exposed are injected and granitized biotite paragneiss. No graphite was observed here, although the exposures are approximately on the strike of the graphite occurrence.

Concession XXII, Lot 11

The pits and adits at the graphite showing in lot 11, concession XXII, Cardiff township, are now caved in and overgrown with vegetation. The rocks exposed are flat or gently dipping biotite paragneiss. On the dump the rock is a biotite-graphite gneiss containing 10 per cent. of graphite in flakes as much as one-eighth of an inch in diameter. The property lies a few hundred yards south of the railway track at a point three-quarters of a mile west of Mumford station on the Canadian National railway.

A description taken from a report by Spence¹ follows:—

It [the property] was taken up originally in 1912 by the New York Graphite Company, who erected a large mill and proceeded to develop an ore-body outcropping along the north slope of a low ridge facing the railway. A series of small pits opened along this ridge showed the presence of a rather flat-dipping ore-body having an easterly strike and dipping south. The deposit has been proved for a distance of several hundred feet, and several small drifts were run, from which a small tonnage of ore was secured. The largest opening is an open pit 40 feet deep, by 60 feet long and 15 feet wide. The deposit has also been tested by a number of diamond drill holes. The New York Graphite Company continued intermittent operations up to 1915, when it was merged into the present company [National Graphite Company]. Mining was thenceforth largely discontinued on the above lots, and ore was shipped to the mill from a deposit in Hastings county, near Maynooth.

The mill was started up again in January, 1919,² ore being obtained from a pit near by.

It is believed that the property has been inactive since, and the mill has been dismantled.

Concession XXII, Lot 24

B. E. MacDougall was prospecting a graphite occurrence in August, 1942, on lot 24, concession XXII, Cardiff township. The workings are about 30 chains north of the Wilberforce-Bancroft road.

A pit 10 by 10 feet and 7 feet deep and an adjacent one 6 by 6 feet and 4 feet deep expose a 3-foot sill of grey, brown-weathering, syenite-pegmatite striking N. 50° W. and dipping 40° S.W., containing 5 to 20 per cent. coarse graphite in flakes from less than a quarter of an inch to as much as three-quarters of an inch in diameter. The hanging-wall rock is a crumbly-weathering biotite paragneiss, and the footwall a white, medium-grained, crystalline limestone containing disseminated phlogopite and a few small flakes of graphite. A third pit on strike to the northwest, on which work was in progress, had not found the graphite-bearing pegmatite, only crystalline limestone being exposed at the time of the writer's visit.

Owing to the narrow width of the graphite-bearing pegmatite this deposit cannot be considered of any economic importance.

MONMOUTH TOWNSHIP**Concession XIII, Lot 32**

An open cut, 20 by 15 feet and 10 feet deep, on the south face of a hill just below its crest on lot 32, concession XIII, Monmouth township, exposes impure, white to grey crystalline limestone striking N. 55° E. and dipping 30 degrees or less to the south. The limestone contains one-half to one per cent. of disseminated graphite in flakes one-twentieth of an inch in diameter, but locally on joints and slips cutting across the bedding the graphite forms 10 per cent. In the back of the pit lenticular pegmatite stringers contain graphite flakes as much as one-quarter of an inch in diameter.

¹Hugh S. Spence, "Graphite," Mines Branch, Can. Dept. Mines, No. 511, 1920, p. 26.

²Ont. Bur. Mines, Vol. XXVIII, 1919, pt. 1, p. 163.

The crest of the hill is composed of pegmatite, and to the west pegmatite and biotite-hornblende gneiss are exposed. Another patch of crystalline limestone containing a few flakes of graphite occurs on the south slope of the hill to the southeast of the pit. These two occurrences of limestone are remnants or inclusions in the pegmatite or gneiss. The deposit is of no importance.

Concession XIV, Lot 35, North Half

T. Morrison has an option on the mineral rights from G. Barnes, the owner of the north half of lot 35, concession XIV, Monmouth township. Old workings occur at the base and top of a hill about four-tenths of a mile, at N. 50° W., from the farm-house. Two pits, 10 by 10 feet and 10 feet deep and 10 by 10 feet and 3 feet deep, at the base of the hill expose a well-bedded crystalline limestone containing lenses of graphite-rich limestone, which is exposed only in the pits and not on the hill slope above. The bedding of the limestone is vertical and varies in strike from N. 45° W. at the base, to N. 25° W. on the slope, to N. 5° W. on the top of the hill. On the top of the hill three small pits, 11 chains from the two pits at the base, expose disseminated graphite in crystalline limestone. Phlogopite is present in varying amounts in different beds.

The lenticular nature of the occurrence at the base of the hill and the general spotty distribution of the graphite indicate that no further development is warranted.

Concession XIV, Lot 35, South Half

T. Morrison has prospected a graphite occurrence on the south half of lot 35, concession XIV, Monmouth township, near the line between lots 34 and 35, on both slopes of an east and west valley between hills just north of Wilbermere lake.

From broken float and a few outcrops a graphite gneiss has been traced for a possible width of 200 feet in an east-west direction, being bounded on the east and west by coarse pegmatite. The trend of the gneissic structure varies from N. 75° W., with a dip of 45° S., on the hill south of the valley to N. 5° W., with a vertical (?) dip, on the north slope of the valley. This variation may be due to the influence of the two adjacent pegmatite masses.

The graphite flakes in the exposures on the south side of the valley range from one-twentieth to one-quarter of an inch in diameter and form on the average 8 to 10 per cent. of the rock. To the north the percentage of graphite is lower, and it is doubtful from float samples if it would average 5 per cent.

Further work in the form of trenches to bed rock across the graphite-bearing band would be necessary before a satisfactory estimate could be made of the percentage of graphite present.

Concession XV, Lot 35, South Half

Old workings for graphite in the south half of lot 35, concession XV, Monmouth township, are to be found on the east face of the hill mentioned above in the north half of lot 35, concession XIV, and are 17 chains north from the base of that hill. The workings consist of a pit 40 by 25 feet and 20 feet deep and another adjacent but to the south of it, which is 25 by 20 feet and 7 feet deep. The rock exposed is a white crystalline limestone with the bedding planes marked by disseminated graphite flakes from one-tenth to one-eighth of an inch in diameter, and the graphite-bearing beds range from mere seams to beds 4 inches in thickness. The bedding strikes N. 35° W. and dips vertically. On

the dump were found a few masses of solid amorphous graphite cut by stringers of flake graphite from one-twentieth to one-fifth of an inch in width.

Hand-picked material would average 10 per cent. graphite. Several small dumps of such material lie adjacent to the pits. It is apparent from the size of the waste dump that only a small percentage of the limestone graded 10 per cent., and the deposit is not thought to be of any economic importance.

The writer is indebted to T. Morrison for showing him this deposit.

Concession XVI, Lots 34 and 35

The workings seen on lot 34, concession XVI, Monmouth township, consist of an inclined adit on the side of a hill just southwest of the dam on the creek about a quarter of a mile east of Wilberforce station on the Canadian National railway. The country rock is a crystalline limestone with interbeds of paragneiss. Disseminated graphite is present, the maximum amount being 10 per cent. Spence¹ reports that the inclined adit was 8 by 15 feet, and 100 feet long. The site of the old mill erected by the original owners in 1910 is just above this adit.

On lot 35, concession XVI, Monmouth township, about 30 chains by trail from the above location, there are four pits. The largest is an oval pit, 40 by 75 feet and 30 feet to the water level, in a clearing just to the east of the bush in which the three other pits occur. Spence states that this pit is reported to be 100 feet deep. The walls of the pit expose a contorted complex of grey to white crystalline limestone with inclusions of paragneiss. Some of the limestone contains no graphite or phlogopite, and the maximum content is 5 and 25 per cent., respectively. There is no well-defined graphite-bearing zone, and most of the rock quarried was waste, judging from the size of the dump. Spence² states that "the ore is comparatively low grade, probably averaging about 5 per cent. of graphite." This must have been the material that was fed to the mill.

The Virginia Graphite Company operated the property from 1910 to 1913 and was succeeded by the Tonkin-Dupont Graphite Company, Limited. The mill was closed down in May, 1914, and was subsequently dismantled. Most of the ore fed to the mill probably came from the latter company's deposit at Maynooth in Hastings county.

Peterborough County

ANSTRUTHER TOWNSHIP

Concession I, Lot 38

On the farm of W. Parks in lot 38, concession I, Anstruther township, about 10 chains north of the road, a 35-foot shaft³ was sunk in 1890 on a coarse blue-grey pegmatite dike cutting crystalline limestone. This shaft is now filled to within 10 feet of the surface. The pegmatite on the dump shows very rarely a little disseminated graphite. The deposit is of no economic importance.

GALWAY TOWNSHIP

Concession XIII, Lot 16

The writer's attention was drawn to the occurrence of graphite schist float just east of the road on the line between lots 15 and 16 and north of the creek in lot 16, concession XIII, Galway township. The country rock is a crystalline limestone. The graphite is in a very finely disseminated state, and it is not likely a deposit of any importance is present below the drift.

¹Hugh S. Spence, op. cit., p. 27.

²Ibid.

³F. D. Adams and A. E. Barlow, op. cit., p. 370.

IRON

Titaniferous magnetite deposits occur at a number of localities in the area, but are mostly found in Glamorgan, Snowden, and Lutterworth townships along the south border of Haliburton county, and in Belmont township, Peterborough county.

The Blairton mine in Belmont township was opened up about 1820 and was operated intermittently until 1875. It furnished ore for some of the early efforts at smelting in Marmora.¹ The Belmont mine, in the same township, was worked in 1891 and again in 1911.

C. J. Pusey, president of the Toronto Iron Company, organized in 1881, was actively interested in the development of an iron industry in Haliburton county. The company owned five properties known as the Howland and Imperial in Snowdon township, and the Pine Lake (Pusey), National, and New York in Glamorgan township. Two other old iron mines in Haliburton county are the Victoria in Snowdon township and the Paxton in Lutterworth township.

An American firm, Parry and Mills, started to erect a blast furnace in 1882 on the Irondale (then called the Burnt) river, but the works were never completed owing to lack of capital.² All the properties have been inactive for a number of years.

Haliburton County

GLAMORGAN TOWNSHIP

Concession IV, Lot 35

In the southeast corner of lot 35, concession IV, Glamorgan township, a number of old test pits, trenches, and strippings, now filled with dead leaves, constitute the so-called Pusey or Pine Lake iron mine.³ The country rock is a metamorphosed gabbro showing great variations in texture, grain size, and composition. Phases range from pyroxene-rich to feldspar-rich; some of the latter may be called anorthosite. The average type contains 60 to 70 per cent. pyroxene. A gneissic banding or marked foliation is a common characteristic of the rock. In the old workings and in float, magnetite as disseminated grains one-twentieth to one-tenth of an inch in diameter forms from less than 1 per cent. to as much as 30 per cent. of the rock. No massive magnetite was seen at any place. The zone in which the streaks of magnetite-bearing rocks occur may be 300 feet in width, but owing to the lack of exposures it is difficult to determine the strike of the zone. As noted by Robinson⁴ the large dimensions given to this deposit in earlier reports are quite misleading. Actually, there is no large body of magnetite of ore grade. Two analyses quoted by Robinson⁵ show the presence of vanadium and are given below. These are based on selected samples and by no means represent the average of the deposit.

	No. 1	No. 2
Fe.....	44.10	41.91
TiO ₂	13.52	14.91
P.....	.009	.076
S.....	.11	.082
Cr ₂ O ₃.....		.03
Ni.....	.21	nil
V ₂ O ₅.....	.52	.04

Sample No. 1—Analyst, F. J. Pope (for the remainder of the analysis see F. D. Adams and A. E. Barlow, *op. cit.*, p. 354).

Sample No. 2—Analyst, H. A. Leverin, Mines Branch Laboratory, Ottawa.

¹T. W. Gibson, "Mining in Ontario," Ont. Dept. Mines, 1937, p. 119.

²Ibid, p. 114.

³F. D. Adams and A. E. Barlow, *op. cit.*, pp. 155, 156, 353, 354.

⁴A. H. A. Robinson, "Titanium," Mines Branch, Can. Dept. Mines, No. 579, 1922, p. 79.

⁵Ibid, p. 35.

Concession XIII, Lot 30

The so-called National mine is on lot 30, concession XIII, Glamorgan township. C. J. Pusey reported that iron mineralization was indicated by deflection of the compass needle, but no development work had been done on the occurrence.¹ Residents informed the writer that magnetite occurs on a hill in lot 31 just north of Stormy lake.

This occurrence is not indicated on the map.

Concession XV, Lot 27

On lot 27, concession XV, Glamorgan township, according to Adams and Barlow, there "are several well-developed veins, one of which can be traced on its strike for over 60 yards, reaching in places a width of 4 feet. The vein matter is coarsely crystalline, and consists of pale pink calcite, with apatite, sphene, biotite, hornblende, orthoclase, and magnetite."² The magnetite constitutes about 50 per cent. of the vein, "but the quantity is entirely too small to permit of the deposit being seriously considered as a source of iron."³

This is the so-called New York mine, on which a pit was sunk by C. J. Pusey about 1880.⁴

This occurrence is not shown on the map.

LUTTERWORTH TOWNSHIP**Concession VI, Lot 5**

The old Paxton iron mine in lot 5, concession VI, Lutterworth township, is situated about 28 chains north of the road between Miners Bay and Kinmount.

The main pit is 50 by 75 feet and from 15 to 20 feet deep to water level. The material on the dump consists of magnetite-garnet aggregate; and hornblende gneiss veined by coarse aggregates of pink feldspar, quartz, calcite, scapolite, brown garnet, hornblende, and magnetite. The west wall of the main pit shows a magnetite zone about 30 feet thick apparently parallel to the gneissic structure of the hornblende gneiss, which dips flatly 45° S.

Another pit, 150 feet south of the main pit, is 50 by 60 feet and from 15 to 30 feet deep to water level. Material on the dump from this pit consists of pink pegmatite, impure crystalline limestone, and a minor amount of magnetite aggregate.

On neither dump was any massive pure magnetite found. It is reported that about 1,000 tons⁵ of ore were shipped from this property.

SNOWDON TOWNSHIP**Concession I, Lot 17**

R. Carr guided the writer to three old pits in lot 17, concession I, Snowdon township. The pits expose a magnetite-amphibole rock with pyrrhotite as an accessory mineral. In the fields between the pits crystalline limestone outcrops. Mr. Carr reported that W. Coe about 50 years ago made a test shipment of one carload from this occurrence and reported that the ore was too high in sulphur.

Concession I, Lot 20

The workings of the old Victoria mine in lot 20, concession I, Snowdon township, are situated 20 chains north of the road on the boundary between Peterborough and Haliburton counties.

¹Report of the Royal Commission on the Mineral Resources of Ontario, 1890, p. 132.

²F. D. Adams and A. E. Barlow, *op. cit.*, p. 200.

³*Ibid.*, p. 352.

⁴Report of the Royal Commission on the Mineral Resources of Ontario, 1890, p. 132.

⁵Archibald Blue, *Ont. Bur. Mines*, Vol. II, 1892, p. 61.

Adams and Barlow¹ describe the occurrence as follows:—

This deposit of magnetite has been worked quite extensively, a considerable amount of the ore having been shipped. The ore contains a rather large admixture of dark iron-bearing silicates, and has a not inconsiderable amount of pyrrhotite scattered through it.

The workings, when visited in 1893, consisted of a trench 240 feet long, and about 16 feet wide, opened up on the iron ore bed. The ore bed lies in crystalline limestone, which has interstratified with it occasional strings of green pyroxene rock, red garnet rock, and gneiss. The ore body conforms to the strike of the limestone, and like it stands nearly vertical, but with a slight easterly dip. The ore body at the north end of the trench is seven feet wide—its actual width in the trench could not be determined as the latter was filled with water. At the south end of the trench the iron ore has been practically all replaced by black hornblende, and other highly ferruginous silicates.

A grab sample taken by the writer from the dump was analysed for vanadium and none was found.

R. Carr of Furnace Falls informed the writer that W. Coe made a test shipment of 7 carloads about 50 years ago from this deposit and that the sulphur content was found to be too high.

Concession II, Lot 19

A deposit of concretionary limonite occurs in a sandy field in lot 19, concession II, Snowdon township, just north of the highway. The limonite layers range from 2 to 4 inches in thickness. This is a mineral occurrence of no economic importance.

Concession IV, Lot 26

The old Howland mine is situated on lot 26, concession IV, Snowdon township. It is reached by walking 27 chains west on the Canadian National railway track from the highway, and then south across a field to an old road that climbs a gully in a hill to another road at the top of the hill, which in turn is followed westwards to the old workings, a total distance of 21 chains from the track.

A large dump, 150 feet in diameter and 10 to 15 feet high, surrounds two shafts 60 feet apart, now filled with water. Material on the dump consists of a fine-grained, dark-green hornblende gneiss with streaks and disseminations of magnetite and pyrrhotite, the latter sometimes being in streaks as much as 1½ inches in width, and bands of coarse calcite with magnetite. Pyrite is rare. Coarse crystalline limestone outcrops on the road. Adams and Barlow report² that the ore was rich in pyrite near the surface, becoming almost free of pyrite with depth.

A grab sample of the magnetite-pyrrhotite-hornblende rock taken by the writer from the dump was analysed for vanadium and gave none.

C. J. Pusey reported³ that operations started in 1880 and that 1,500 tons were shipped in 1881 and 1882. A cross-section of the old workings will be found in the Report of the Royal Commission.⁴

Concession V, Lot 33

The so-called Imperial mine is situated in lot 33, concession V, Snowdon township, 2 chains north of the Canadian National Railway bridge over the Irondale river. The workings consist of a curved open cut, 20 by 60 feet, now partly filled with water. The rock on the dump is a peridotite carrying a little disseminated magnetite. No massive magnetite was found. The peridotite forms a ridge about 150 feet wide and may be a sill, as to the south on the river

¹F. D. Adams and A. E. Barlow, op. cit., pp. 359, 360.

²Ibid, p. 361.

³Report of the Royal Commission on the Mineral Resources of Ontario, 1890, p. 131.

⁴Ibid, p. 131.

bank there outcrops a banded siliceous gneiss with an interbed of crystalline limestone striking N. 80° E. and dipping 25° S.; 6 chains to the north there is a ridge composed of pink pegmatite and granite gneiss.

A grab sample of the magnetite rock taken by the writer was analysed for vanadium and none was found.

As noted by Adams and Barlow,¹ no iron ore is really present at this locality.

Peterborough County

BELMONT TOWNSHIP

Concession I, Lots 7 and 8

The old Blairton mine is situated on lots 7 and 8, concession I, Belmont township. The workings consist of three pits. The Lake pit is near the shore of Crowe lake, and the Derick and Morton pits about 1,000 feet south of the Lake pit.

A description of the Blairton mine accompanied by geological and magnetometric maps on the scale of 200 feet to the inch will be found in a report by Lindeman and Bolton.²

The Lake pit trends north and south and extends almost to the shore of Crowe lake, the present flat between it and the lake being an old dump now supporting a forest of white pine. The pit is 240 feet long and from 50 to 75 feet wide, and the height of the south and west wall above the water level in the pit is 50 to 75 feet. The wall rock is a metamorphosed gabbro strongly stained from the weathering of sulphides. Pyrite, pyrrhotite, and chalcopyrite were found. What appeared to be an old ore dump exposes magnetite with much sulphide. A grab sample of this material taken by the writer was analysed for vanadium and gave none.

The Derick pit, 1,000 feet south of the Lake pit, is 200 feet long, 150 feet wide, and from 20 to 30 feet deep to the present water level. It is reported³ to be 125 feet deep. The Morton pit, which adjoins it on the south, is 30 by 70 feet. The south and east sides of the Derick pit expose low-dipping Ordovician limestone lying unconformably on a magnetite-bearing gabbro. At the contact the gabbro consists of broken fragments, and the basal Ordovician bed is a conglomerate composed of angular fragments from less than an inch to as much as three inches in diameter of a red hematite rock in an impure limestone matrix. There is a very large dump, indicating that much of the rock was not of ore grade. Small ore (?) dumps consist of a fine-grained magnetite veined by serpentine and, to a lesser extent, epidote. Numerous slips faced with serpentine cut the magnetite. Sulphides do not seem to be so abundant here as at the Lake pit. Pyrite is common, pyrrhotite is rare, and chalcopyrite was not found.

A grab sample of magnetite taken by the writer from the dump was analysed for vanadium and none was found.

Lindeman and Bolton⁴ give the following description of the mine:—

The mine was opened up about 1820, and was operated intermittently until 1875. During these years very considerable tonnages of ore were shipped. In 1908 some diamond drilling was done, and in 1910 thirteen holes, with an aggregate footage of 3,600 feet, were put down . . .

No record of the total tonnage of ore shipped is now available, but the amount is estimated to have been from 250,000 to 300,000 tons. The average composition of these shipments is not known, but it appears from the piles of waste ore on the property that only an ore of high iron

¹F. D. Adams and A. E. Barlow, *op. cit.*, p. 362.

²E. Lindeman and L. L. Bolton, "Iron Ore Occurrences in Canada," Vol. I, Mines Branch, Can. Dept. Mines, No. 217, 1917, pp. 44 and 45 and maps Nos. 185 and 185a.

³*Ibid.*, p. 45.

⁴*Ibid.*, pp. 44, 45.

content was shipped. An average sample across the north end of the Lake pit taken by E. Lindeman in 1911 gave the following analysis:—

	Per cent.
Fe.....	50.10
SiO ₂	9.88
S.....	1.42
P.....	.046
Al ₂ O ₃	1.73
CaO.....	3.52
MgO.....	1.64
TiO ₂.....	.10

The magnetometric work of Lindeman shows that the Lake and Derick pits were put down on two separate magnetite bodies. The aggregate tonnage of commercial ore remaining in these bodies must be small.

Concession I, Lot 19

The old Belmont (formerly Ledyard) iron mine is situated on lot 19, concession I, Belmont township, just south of the village of Cordova Mines.

A detailed description of the mine accompanied by magnetometrical and geological maps on the scale of 200 feet to the inch will be found in a report by Lindeman and Bolton,¹ much of which is reproduced below.

This property was operated many years ago, ore being extracted from No. 1 and No. 2 (or Nichol) pits. In 1911 the former had a length of 220 feet, a width varying from 40 to 70 feet, and a depth of from 3 to 20 feet; and the latter (located 100 feet southeast of No. 1) had a length of 55 feet, a width of 40 feet and a depth of 5 to 6 feet. Six diamond drill holes [were] put down in 1906

In 1911 development work was resumed after a lapse of several years. A 3-compartment shaft, started that year about 15 feet north of No. 1 pit, had reached a depth of 260 feet early in 1914, when mining operations were discontinued. Levels were opened from this shaft at depths of 100, 170, and 230 feet.

The writer observed on the dump fine- to coarse-grained magnetite accompanied by a variable amount of pyrite. The gangue minerals are brown garnet, dark-green amphibole, white calcite, epidote, and tremolite. The tremolite was found in a fragment of crystalline limestone containing in addition a little arsenopyrite. Lindeman states that the ore body lies along a contact between crystalline limestone and diorite.

An analysis of an average sample taken from the north end of No. 1 pit by Lindeman in 1911 follows:—

	Per cent.
Fe.....	51.20
SiO ₂	12.10
S.....	.34
P.....	.032
CaO.....	4.87
MgO.....	3.93
Ti.....	.10

Since the resumption of mining in 1911 the shipments have aggregated 5,746 short tons, the shipments by years being as follows: 126 tons in 1911, 28 tons in 1912, and 5,592 tons in 1913.

Judging from the magnetometric survey confirmed by a few natural exposures, the area within which the ore is likely to occur may be roughly estimated at 4,300 square feet, but a large percentage of this area is undoubtedly occupied by barren rock.

Concession IV, Lot 20

On lot 20, concession IV, Belmont township, just east of the road, lean iron formation outcrops. This exposure is 50 to 60 feet wide and about a quarter of a mile long. In some places the bands of iron oxides are a quarter of an inch wide. A partial analysis² of this part of the iron formation is as follows: Fe, 24.06;

¹E. Lindeman and L. L. Bolton, op. cit., pp. 46 and 47 and maps Nos. 186 and 186a.

²W. G. Miller and C. W. Knight, Ont. Bur. Mines, Vol. XXII, 1913, pt. 2, p. 26.

S, 0.024; P, 0.126. There is, however, very little of this richer zone exposed. The occurrence is of no economic importance.

Concession V, Lot 15

Tomahawk Iron Mines, Limited, owns the mineral rights of lot 15, concession V, Belmont township. The workings consist of two small trenches and an old pit 6 by 5 feet and 4 feet deep. In these working and in a few outcrops, there is a north-south band of lean iron formation with an exposed width of 20 feet. To the east and west are outcrops of altered Keewatin-type basic volcanics. The iron formation is a blue-grey sugary quartzite with films of specular hematite parallel to the bedding. The deposit is of no economic importance.

CHANDOS TOWNSHIP

Concession II, Lot 28

An occurrence in lot 28, concession II, Chandos township, has been described by Lindeman¹ as follows:—

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.

This may be the same deposit as one described by Miller² on lot 27, concession II, in a valley north of Devil's lake. The magnetite body is 15 to 18 feet wide. Miller mentions another occurrence in lot 30, concession II, Chandos township.

LEAD

Most of the lead occurrences are located in the vicinity of the Bobcaygeon road in Galway township, Peterborough county, and Somerville township, Victoria county. There is one isolated occurrence in the southeast corner of Methuen township, Peterborough county. None of the occurrences are of economic importance.

Peterborough County

GALWAY TOWNSHIP

Concession IX, Lot 18

The workings on the farm of F. Flaherty, lot 18, concession IX, Galway township, are situated about a quarter of a mile south of the farmhouse and consist of an old shaft, put down in 1916, and five pits and trenches, now mostly caved in, opened up in 1941 over a length of 250 feet in a direction N. 60° W.

The country rock is a grey micaceous limestone cut by a vertical fissure vein composed of white calcite ranging in width from an inch to a reported seventeen inches. Galena is present as a narrow vein in the calcite, and where observed in material on the dump has a maximum width of one and a half inches. The occurrence is of no economic importance.

Concession X, Lot 17

The shaft of the old Hopkins mine on lot 17, concession X, Galway township, is 7½ chains east of the west boundary of the lot. The following informa-

¹E. Lindeman, "Magnetite Occurrences along the Central Ontario Railway," Mines Branch, Can. Dept. Mines, No. 184, 1913, p. 14 (listed by error as in concession I).

²W. G. Miller, Ont. Bur. Mines, Vol. VIII, 1899, pt. 2, p. 214.

tion was supplied by P. E. Hopkins:¹ A. Y. Hopkins sank a shaft approximately 45 feet deep about the year 1906 on a pyrite-galena vein about 6 inches in width. Some galena was disseminated in the adjoining wall rock. No gold was present. The writer found the rock on the dump to be a grey impure crystalline limestone slightly mineralized with pyrite. He did not find any galena.

Concession A, Lot 20

The old workings of the Union Creek lead mine on lot 20, concession A, Galway township, consist of two shafts and an adit along a line N. 40° W. A local resident reported that the main shaft is 100 feet deep with drifts 70 feet to the south and 80 feet to the north. The vein was about 2 feet wide and contained very little galena. In drifting occasional barrel-sized masses of galena were encountered, but these were few in number.

Samples on the dump around the main shaft indicate that the country rock is a dark-grey, well-bedded, biotite paragneiss cut by a brecciated vein consisting of fragments of the country rock cemented by pink calcite, pink barite, and cream barite showing colloform structure. Rarely, a little galena and a few grains of sphalerite occur with the calcite and barite.

Adams reports² that 30 kegs of galena were shipped. According to Uglow the property was worked in 1911, and some ore was concentrated in the mill.³

METHUEN TOWNSHIP

Concession I, Lot 2

The occurrence on lot 2, concession I, Methuen township, was not seen by the writer. It has been described by Vennor⁴ as follows:—

There occurs a north-west and south-east lode near the south-east corner of Methuen, where, in 1868, a shaft was being sunk by Messrs. Parker and Baker. On this lode two or more shafts have been opened on the eastern edge of the second lot of the first range, close to the boundary line of Lake. The lode cuts gray vertical calc-schist, striking N. 20° E., and is composed of calcspar and heavy spar, the former being of a rose or flesh-red color, in which there is a good shew of galena. The average width of the lode is about eighteen inches, and it has been traced in a south-easterly direction for nearly three miles into Marmora.

Victoria County

SOMERVILLE TOWNSHIP

Concession V, Lot 2

The old Victoria lead mine in lot 2, concession V, Somerville township, was operated in 1927 by Summerville Lead Mines, Limited,⁵ and again in 1937 by Consolidated Lead Mines, Limited.⁶ The previous operators erected camp and plant buildings and sank a 2-compartment shaft, with levels at 50 and 100 feet. A local resident reports that from the bottom of the shaft there was a drift 90 feet long to the northeast, one 70 feet long to the southwest, and a crosscut 140

¹P. E. Hopkins, personal communication.

²F. D. Adams, Geol. Surv. Can., Ann. Rept., Vol. VI, 1892-93, p. 14J.

³W. L. Uglow, Ont. Bur. Mines, Vol. XXV, 1916, pt. 2, p. 26.

⁴H. G. Vennor, Geol. Surv. Can., Rept. of Progress, 1866-69, pp. 163, 164.

⁵Ont. Dept. Mines, Vol. XXXVII, 1928, pt. 1, p. 157.

⁶Ont. Dept. Mines, Vol. XLVII, 1938, pt. 1, pp. 231, 232.

feet to the northwest. No veins were found in this crosscut. Drifting on the vein showed its maximum width to be 10 inches.

On the surface the vein is not exposed at the shaft, the country rock near by being a coarse-grey to white crystalline limestone. At 150 to 410 feet N. 60° W. from the shaft the crystalline limestone is cut by a trench from 4 to 12 feet wide and partly filled with water; the banks are caved in and trees are growing in it. At two places fractures in the limestone from one-quarter to one inch in width are filled with barite. These fractures strike N. 60° W. and dip vertically to 80° S.W. No galena was observed.

From the information available this occurrence cannot be considered of any economic importance.

Concession VII, Lot 1

The workings of the old Crown King lead prospect on lot 1, concession VII, Somerville township, are now filled in or overgrown, so that nothing can be seen.

The following information is taken from a report by Uglow.¹ The country rocks consist of interbedded crystalline limestone and mica paragneiss striking northeast and dipping vertically. Three parallel veins, as much as 4 inches in width, cut across the formation in a direction N. 50° W., magnetic. The veins consist of banded barite and a little galena. The old workings consisted of 3 small pits and strippings within a length of 200 feet. The main pit was 17½ feet deep.

LIMESTONE AND DOLOMITE

Limestones of Paleozoic age underlie a band along the south border of the Haliburton map area and are quarried at a number of localities in Ontario, Victoria, and Peterborough counties. In that part of the area underlain by pre-Cambrian rocks there are a number of belts of crystalline limestone and dolomite. Much of this rock is impure, and only a few quarries have been opened up in Haliburton and Victoria counties.

The occurrences of limestone and dolomite which have been quarried are described under the heading Stone (see page 85), since most of the rock quarried is sold as crushed stone for road metal, concrete aggregate, and railroad ballast, and to a lesser extent as asphalt filler, poultry grit, rough building stone, rubble, and riprap. One company reports sales for smelter flux. Only one company produces quicklime, which in 1941 was sold for making sand-lime brick, as mason's lime, and for the manufacture of lime acetate and chemicals used in iron-ferrous smelters and tanneries.

A very detailed report by Goudge² has been published on the limestone and dolomite of the area, accompanied by a number of analyses, which are reproduced in the following tables arranged alphabetically under the four counties, Haliburton, Ontario, Peterborough, and Victoria. Additional analyses from other sources are also listed.

These analyses indicate that the Paleozoic limestones are an excellent source of high-calcium limestone. The Black River limestones as a rule have a higher

¹W. L. Uglow, "Lead and Zinc Deposits in Ontario," Ont. Bur. Mines, Vol. XXV, 1916, pt. 2, p. 27.

²M. F. Goudge, "Limestones of Canada," pt. IV, Ontario, Bur. Mines, Can. Dept. Mines and Resources, No. 781, 1938.

percentage of lime and less silica, iron oxides, and alumina than the Trenton limestones. The high-calcium Black River limestone from the Longford quarries in Rama township, Ontario county, has the highest lime-magnesia ratio (361:1) of the rocks analysed.

ANALYSES OF HALIBURTON COUNTY PRE-CAMBRIAN LIMESTONES¹

	No. 20	No. 21	No. 21A	No. 22	No. 22A	No. 23	No. 24	No. 25	No. 26
SiO ₂	7.30	6.40	20.60	1.34	2.10	4.22	1.80	5.90	6.06
Fe ₂ O ₃.....	.53	.96	1.59	.24	.25	.47	.34	.55	.64
Al ₂ O ₃.....	.55	.06	.41	.12	.25	.26	.08	.41	.50
Ca ₃ (PO ₄) ₂	nil	.04	.09	.04	.02	.02	.02	.04	.07
CaCO ₃	52.82	51.36	75.64	90.56	89.07	90.36	90.41	87.18	90.88
MgCO ₃	41.82	41.31	1.88	7.34	9.33	4.81	8.27	6.82	1.71
Total.....	103.02	100.13	100.21	99.64	101.02	100.14	100.92	100.90	99.86
S.....	nil	0.33	0.50	nil	trace	0.11	nil	0.16	0.20
CaO.....	29.58	28.78	42.41	50.74	49.81	50.61	50.64	48.84	50.92
MgO.....	20.00	19.75	.90	3.51	4.46	2.30	3.95	3.26	.82
Ratio of CaO to MgO.....	1.48:1	1.46:1	47:1	14:1	11:1	22:1	13:1	15:1	62:1

Sample No. 20—Crushed dolomite from the bins of the White Star mine, block W, Haliburton, Dysart township.

Sample No. 21—Dolomite representing a thickness of about 20 feet, just southwest of Furnace Falls, lot 17, concession I, Snowdon township.

Sample No. 21A—Impure calcium limestone from several outcrops near the railway crossing, Furnace Falls, lot 17, concession I, Snowdon township.

Sample No. 22—Bluish-white calcium limestone, taken at frequent intervals along the southern side of the ridge 2½ miles west of Gooderham, along the White Lake road, on or about lot 19, concession V, Glamorgan township.

Sample No. 22A—Limestone taken along the northern side of the same ridge.

Sample No. 23—Four large fragments of bluish-white, very coarse grained limestone, south of Gooderham, lot 25, concession IV, Glamorgan township.

Sample No. 24—One large piece of very coarse grained, bluish-white calcium limestone, 2½ miles east of Hadley along the road to Wilberforce.

Sample No. 25—Coarse-grained, white limestone, just east of Tory Hill, lot 19, concession XI, Monmouth township.

Sample No. 26—Taken from a ridge of rusty, white calcium limestone, near Wilberforce, lot 1, concession XXII, Cardiff township.

Gouge² gives the following additional analysis of a sample of interbedded, coarse-grained, impure, greyish-white calcium limestone and dolomite from a railway cutting a short distance east of the Irondale railway station, lot 29, concession V, Snowdon township.

	Per cent.
SiO ₂	11.50
Fe ₂ O ₃.....	.35
Al ₂ O ₃.....	.24
P ₂ O ₅.....	.03
CaO.....	37.89
MgO.....	11.30
CO ₂	37.90
H ₂ O.....	1.14
Total.....	100.35

¹M. F. Gouge, op. cit., p. 88, with additional information from the text (pp. 84-87).

²Ibid, p. 86.

ANALYSES OF ONTARIO COUNTY PALEOZOIC LIMESTONES¹

	No. 8	No. 8A	No. 8B	No. 8C	No. 8D	No. 8E	No. 8F	No. 8G	No. 9	No. 10
SiO ₂	1.42	2.62	2.82	3.76	10.10	5.00	3.88	3.48	4.10	5.70
Fe ₂ O ₃.....	.40	1.03	1.01	.93	2.15	1.08	1.23	1.03	.40	.59
Al ₂ O ₃.....	.96	.30	.67	1.73	2.86	1.66	.89	1.95	.60	1.13
Ca ₃ (PO ₄) ₂.....	.02	.02	.02	.02	n.d.	n.d.	n.d.	n.d.	.11	.13
CaCO ₃	96.64	92.19	60.19	58.39	52.86	62.40	64.40	62.20	91.78	91.36
MgCO ₃.....	.32	2.44	34.50	30.20	30.43	29.78	29.70	31.80	2.19	1.93
Total.....	99.76	98.60	99.21	95.03	98.40	99.92	100.10	100.46	99.18	100.84
S.....	0.04	0.06	0.01	0.01	0.33	0.16	0.14	0.07	0.10	0.11
CaO.....	54.13	51.59	33.72	35.14	29.62	35.48	36.08	34.88	51.46	51.23
MgO.....	.15	1.16	16.51	14.45	15.61	14.24	14.20	15.21	1.05	.92
Ratio of CaO to MgO.....	361:1	44:1	2:1	2.4:1	1.9:1	2.5:1	2.5:1	2.2:1	49:1	56:1

Sample No. 8—Top 20 feet of dense-textured, high-calcium Black River limestone from a quarry of Longford Quarries, Ltd., near Lake St. John, Rama township.

Sample No. 8A—Bottom 6 feet of dense-textured calcium limestone, same quarry.

Sample No. 8B—Top bed of magnesian limestone, "Rama buff," same quarry.

Sample No. 8C—Second bed of magnesian limestone, "Rama grey," same quarry.

Sample No. 8D—Third bed of magnesian limestone, same quarry.

Sample No. 8E—Fourth bed of magnesian limestone, same quarry.

Sample No. 8F—Fifth bed of magnesian limestone, same quarry.

Sample No. 8G—Sixth bed of magnesian limestone, same quarry.

Sample No. 9—Trenton limestone taken from 4 feet exposed in abandoned quarry, lot 14, concession VIII, Mara township.

Sample No. 10—Representative of the top 12 feet of Trenton limestone, exclusive of shale and chert nodules, in quarry of Gamebridge Limestone Products Company, near Gamebridge, lot 13, concession A, Mara township.

ANALYSES OF PETERBOROUGH COUNTY LIMESTONES²

	No. 27	No. 28	No. 28A	No. 28B	No. 29	No. 29A	No. 30
SiO ₂	1.86	6.84	8.22	6.98	1.86	1.98	1.60
Fe ₂ O ₃.....	.21	.74	.52	.41	.21	.42	.32
Al ₂ O ₃.....	.49	.58	.34	.29	.21	.38	.31
Ca ₃ (PO ₄) ₂.....	.04	.04	.02	.02	.02	.04	.02
CaCO ₃	96.43	90.16	89.13	90.68	97.05	96.34	94.25
MgCO ₃.....	.92	2.06	1.66	1.58	.50	.86	1.74
Total.....	99.95	100.42	99.89	99.96	99.85	100.02	98.24
S.....	trace	nil	nil	nil	trace	trace	0.01
CaO.....	54.02	50.54	49.92	50.79	54.36	53.97	52.74
MgO.....	.44	.99	.79	.75	.24	.41	.83
Ratio of CaO to MgO.....	123:1	51:1	63:1	68:1	227:1	132:1	64:1

Sample No. 27—Black River limestone, in an old quarry 1½ miles northeast of Warsaw, lot 14, concession II, Dummer township.

Sample No. 28—Pre-Cambrian limestone from 7 feet exposed in a pit on the north shore of Stony lake just east of the mouth of Eel creek.

Sample No. 28A—Pre-Cambrian limestone from 4 feet exposed in a pit to the north of the above.

Sample No. 28B—Pre-Cambrian limestone from 3 feet exposed in a pit 300 feet to the east of the pit from which sample No. 28A was taken.

Sample No. 29—Top 7½ feet of Black River high-calcium limestone in a cutting on the Canadian Pacific railway three-quarters of a mile east of Havelock, on lot 6, concession VIII, Belmont township.

Sample No. 29A—Bottom 8 feet exposed in the same cutting.

Sample No. 30—Top 25 feet of Black River limestone, quarry of the Ontario Rock Co., Ltd., lots 6 and 7, concession VI, Belmont township.

¹M. F. Goudge, op. cit., p. 141, with additional information from the text (pp. 137-140).

²Ibid, p. 152, with additional information from the text (pp. 150, 151).

Numerous analyses of calcium and dolomite limestones from the islands and shores of Belmont lake, Belmont township, Peterborough county, are given by Miller and Knight.¹ A number from shore localities are reproduced below.

ANALYSES OF PRE-CAMBRIAN LIMESTONES, BELMONT TOWNSHIP, PETERBOROUGH COUNTY

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
CaO.....	43.84	49.09	30.62	30.22	29.78	29.82	30.14
MgO.....	1.81	1.34	17.78	20.85	21.54	19.57	21.06
Al ₂ O ₃	1.38	1.22	4.90	.98	.84	.80	1.76
Fe ₂ O ₃							
Insoluble.....	16.38	7.75	3.50	1.82	1.74	6.70	1.28
Loss on ignition.....	35.94	40.07	43.03	45.89	46.46	43.38	46.30
Total.....	99.35	99.47	99.83	99.76	100.36	100.27	100.54

Sample No. 1²—Blue and white crystalline limestone, east shore of Belmont lake, opposite north part of Green island.

Sample No. 2³—Pale, flesh-coloured limestone on east side of small band of iron formation about 150 feet east of bridge over Deer [Cordova] river, north of Belmont lake.

Sample No. 3⁴—Fine-grained, light-brown dolomitic crystalline limestone, west shore of Belmont lake, south of Deer [Cordova] river.

Sample No. 4⁵—Fine-grained, greyish-yellow dolomitic crystalline limestone, west shore of Belmont lake, northwest of Twin islands.

Sample No. 5⁶—Fine-grained, pink or flesh-coloured dolomitic crystalline limestone, west shore of Belmont lake, southwest of Twin islands.

Sample No. 6⁷—Fine-grained, greyish-brown dolomitic crystalline limestone, north end of Breckenridge bay, Belmont lake.

Sample No. 7⁸—From a narrow belt of dolomitic limestone weathering to a brown or yellow colour, but having a bluish-grey appearance on fresh surfaces, east side of Belmont lake, opposite Sammy island.

ANALYSES OF VICTORIA COUNTY LIMESTONE⁹

	No. 12	No. 12A	No. 13	No. 13A	No. 13B	No. 14	No. 15	No. 16	No. 16A	No. 17	No. 17A	No. 18A
SiO ₂	2.92	4.72	1.38	1.20	1.54	1.12	0.80	2.36	14.70	2.78	26.22	1.56
Fe ₂ O ₃.....	.34	.46	.31	.29	.33	.39	.28	.71	2.21	.28	2.03	.50
Al ₂ O ₃.....	.85	1.11	.51	.57	.55	.57	.34	1.09	2.27	.18	1.09	.58
Ca ₃ (PO ₄) ₂.....	.52	.20	.02	.07	.04	.02	.07	.07	.13	.04	.15	.04
CaCO ₃	92.91	90.59	96.55	96.70	95.61	96.89	97.48	89.18	51.35	92.91	69.02	94.48
MgCO ₃.....	.88	1.47	.76	.69	.74	.80	.97	6.29	28.67	3.95	2.02	1.89
Total.....	98.42	98.55	99.53	99.52	98.81	99.79	99.94	99.70	99.33	100.14	100.53	99.05
S.....	0.14	0.22	0.03	0.08	0.02	0.10	trace	0.02	0.05	trace	trace	n.d.
CaO.....	52.32	50.84	54.08	54.19	53.56	54.27	54.63	49.98	28.83	52.05	38.72	52.88
MgO.....	.42	.70	.36	.33	.35	.38	.46	3.01	13.71	1.88	.97	.90
Ratio of CaO to MgO.....	125:1	73:1	150:1	164:1	153:1	143:1	119:1	17:1	2:1	28:1	40:1	59:1

Sample No. 12—Top 17 feet of Trenton limestone, quarry of Kirkfield Crushed Stone Co., Ltd., in lot 49, Portage Road, North side, Eldon township.

Sample No. 12A—Bottom 22 feet of Trenton limestone, same quarry.

Sample No. 13—Top 8 feet of thinly bedded oolitic stone (Black River limestone) not used for making lime, quarry of Canada Lime Co., Ltd., in lot 37, Front concession, Somerville township.

¹W. G. Miller and C. W. Knight, Ont. Bur. Mines, Vol. XXII, 1913, pt. 2, pp. 21, 23.

²Ibid, first table on p. 21, No. 3.

³Ibid, second table on p. 21, No. 12.

⁴Ibid, table on p. 23, No. 3.

⁵Ibid, No. 4.

⁶Ibid, No. 5.

⁷Ibid, No. 6.

⁸Ibid, No. 9.

⁹M. F. Goudge, op. cit., p. 203, with additional information from the text (pp. 198-203).

- Sample No. 13A—Bottom 21 feet of Black River limestone, same quarry.
 Sample No. 13B—Dense-textured beds beneath the quarry floor (Black River), same quarry.
 Sample No. 14—Representative of the entire 20-foot face of Black River limestone, quarry of Toronto Brick Co., Ltd., in lot 36, Front concession, Somerville township.
 Sample No. 15—Outcrops of Black River limestone at outlet of Four-mile lake, 3½ miles by road southeast of Coboconk.
 Sample No. 16—Top 12 feet of dense-textured Black River limestone in the Britnell quarry near Burnt River, lot 13, concession VI, Somerville township.
 Sample No. 16A—Bottom 12 feet of fine-grained Black River magnesian limestone in the same quarry.
 Sample No. 17—Pre-Cambrian limestone 3 miles northeast of Burnt River, on lot 8, concession IX, Somerville township.
 Sample No. 17A—Siliceous bands of pre-Cambrian limestone, same locality.
 Sample No. 18A—Eight feet of heavily bedded Black River limestone east of Bobcaygeon.

MARL

In many limestone regions, or in places where glacial deposits contain ground limestone or limestone pebbles, the ground and surface waters may be sufficiently high in dissolved lime to support lime-secreting plants and animals. Algae are the most important organisms in the extraction of the calcareous matter. The material deposited is known as marl or bog lime. It is dark-grey to white, depending on the amount of organic matter present. Owing to the occurrence of a variable amount of clay or sand, the material ranges from practically pure calcium carbonate to a clay or sand containing only a small percentage of lime. Stream deposits are usually of no commercial importance, but in lakes and marshes deposits from 15 to 30 feet thick, or even more, have accumulated.¹

Marl suitable for making whiting substitute should be white or nearly so, be nearly free from grit and clayey material, and have a very low content of organic matter.

The main uses of whiting substitute are in the manufacture of oilcloth, linoleum, certain kinds of rubber products, putty, and explosives, and as a filler in newsprint, book and magazine paper.²

Until 1940 all whiting substitute made in Canada was made from white limestone or white marble. In 1940 White Valley Chemicals, Limited (see below), began production of whiting substitute from white marl from a deposit north of Bobcaygeon.³

Peterborough County

HARVEY TOWNSHIP

Concession XVIII, Lot 31

A deposit of marl occurs in a small lake in lot 31, concession XVIII, Harvey township. Five claims, totalling approximately 125 acres, were staked in 1934 and patented in 1940. White Valley Mines, Limited, was organized to develop the deposit, the name being changed to White Valley Chemicals, Limited, in 1939. Production in 1940 was 900 tons of whiting substitute worth \$9,600. The capacity of the plant was about 80 tons a day. The plant has been inactive since 1940.

MICA

The only commercial variety of mica found in Haliburton county is amber mica (phlogopite). The occurrences are mainly in Cardiff, Glamorgan, and Mon-

¹"Industrial Minerals and Rocks," Amer. Inst. Min. and Met. Eng., New York, 1937, p. 179.

²M. F. Goudge, "Whiting Substitute in 1941," The Canadian Mineral Industry in 1941, Bur. Mines, Can. Dept. Mines and Resources, March, 1942 (mimeographed).

³M. F. Goudge, "Whiting Substitute in 1940," The Canadian Mineral Industry in 1940, Mines Branch, Can. Dept. Mines and Resources, March, 1941 (mimeographed).

mouth townships. White mica (muscovite) occurs at a few places in Methuen township, Peterborough county. As many of the workings are very old and little can be seen, it is impossible to form an opinion as to the quality or quantity of mica that may still be present in the deposits.

The phlogopite usually occurs in a green pyroxenite associated with crystalline limestone; the muscovite in pegmatite dikes.

Haliburton County

CARDIFF TOWNSHIP

Concession XI, Lot 28

The old Dixon mica mine is located on the farm of A. Sarginson in lot 28, concession XI, Cardiff township, about half a mile north of the road and 2 chains east of the line between lots 27 and 28. The workings consist of three pits, about 10 feet deep, which expose a 2-foot phlogopite-pyroxene dike at the contact between a coarse crystalline limestone on the west and a medium-grained, rusty biotite gneiss on the east. The gneissic structure trends N. 20° E. and dips 65° S.E. Crushed books of phlogopite with numerous parallel cracks, ranging from 3 to 6 inches in diameter, were found on the dump.

Concession XXII, Lot 7

On the south side of the Canadian National railway 2 chains east of the 18-mile post in lot 7, concession XXII, Cardiff township, there is a pit 20 feet in diameter and 18 feet deep. Fragments on the dump are a mica pyroxenite or coarse aggregates composed of calcite, dark mica, and a little apatite. Adams and Barlow report that some books of mica measured as much as 2½ by 2 feet in dimensions.¹

GLAMORGAN TOWNSHIP

Concession XIII, Lots 33 and 34

An amber mica deposit was operated by the Tory Hill Marble and Mica Company, Limited, on lots 33 and 34, concession XIII, Glamorgan township. The writer was unable to locate the old workings. Sales of thumb-trimmed sheet are reported as follows:²—

Year	Pounds	Value
1918.....	150	\$75
1919.....	300	27
1920.....	150	215
1922.....	145	36
1923.....	651½	166
1925.....	2,000	180

Local residents report that these shipments were made, however, from mica taken from several deposits.

Concession XV, Lot 28

The workings in lot 28, concession XV, Glamorgan township, 10 chains south of the schoolhouse, consist of 2 pits 1½ chains apart. The northeast pit is 7 by 7 feet and 6 feet deep; the southeast pit is 7 by 7 feet and 12 feet deep

¹F. D. Adams and A. E. Barlow, op. cit., p. 367.

²Ont. Dept. Mines, files of the Statistics Branch.

in an area of stripping 10 by 20 feet. These pits expose a calcite vein, which strikes N. 30° E., dips 70° N.W., and is 7 feet wide in the northeast pit and from 5 to 7 feet wide in the southwest pit. The walls of the calcite vein consist of an aggregate about 9 inches thick of books of dark mica ranging in size from less than 3 by 3 inches to as much as 5 by 7 inches. The mica is crossed by three sets of closely spaced fractures at 60 degrees to one another. Away from the walls the calcite contains a few books of mica, small crystals of apatite, and irregular stringers of pink to mauve fluorspar. The country rock is a pink biotite granite gneiss with an aggregate of hornblende crystals from 3 to 6 inches in width developed adjacent to the vein.

The mica in this deposit is worthless, and the amount of fluorspar present is negligible from an economic standpoint.

MONMOUTH TOWNSHIP

Concession X, Lot 13

F. W. Chubb showed the writer an old mica occurrence on lot 13, concession X, Monmouth township, about 15 chains north of the Canadian National railway and 1 chain west of the boundary line between lots 13 and 14. An old pit, 10 by 15 feet, is now partly filled in with rock and overgrown with moss. The north wall of the pit is composed of an aggregate of hornblende, pyroxene, calcite, apatite, peristerite, and amber mica. The south wall exposes pink granite pegmatite. An 8-inch balsam is now growing up through the mica dump, in which sheets as much as 10 by 14 inches occur. These show cross-checking and wrinkling, but some flawless mica is present.

The pit would have to be cleaned out and further development work carried out to show whether any mica is still present in the vein material.

Concession X, Lot 16

Old workings for mica occur in the northwest corner of lot 16, concession X, Monmouth township, northwest of McCue lake. The main working is a curved trench 95 feet long, 20 feet wide, and from 5 to 10 feet deep with a pit 25 feet in diameter and 15 feet deep. Several small pits occur to the northwest. The work was carried out about 1900, and the trench and pits are now overgrown with vegetation. Rocks present are rusty syenite gneiss, crystalline serpentine limestone, and pegmatite. Small books of amber mica and apatite occur in coarse white calcite vein material. A. Gibson reports that books as much as 16 inches in diameter were found in the bottom of the pit and that shipments were made.

Concession XII, Lot 22

Amber mica float was found by Alex. McColl and F. W. Chubb in a field to the north of the Canadian National railway in lot 22, concession XII, Monmouth township. The west edge of the field is 89 chains east of Tory Hill village. It is reported that books as much as 12 inches in diameter and from 2 to 3 inches thick were found when this field was ploughed some years ago. Subsoil fragments suggest that the country rock is crystalline limestone and pegmatite. Only extensive trenching would show whether a workable deposit of mica is present.

Concession XII, Lot 23

The writer was shown an amber mica occurrence by F. W. Chubb on the south side of the Canadian National railway in lot 23, concession XII, Monmouth

township, at a point 1½ miles east of the village of Tory Hill. The mica occurs in a flat vein, 4 inches thick, composed of amber mica, hornblende, and apatite. The country rock is a pink chloritized biotite granite. This deposit is of no economic importance.

Concession XII, Lot 23

An old pit 12 by 15 feet in diameter, now partly filled in and overgrown with vegetation, is situated 2 chains south of the Canadian National railway in lot 23, concession XII, Monmouth township, near the east boundary of the lot. Weathered books of amber mica are present in a gravelly soil. The largest book found measured 4 by 5 inches. The country rocks are hornblende gneiss and biotite gneiss.

F. W. Chubb reports that mica from this deposit was sold during the war of 1914-18.

Concession XV, Lot 35

On the western slope of a rock ridge in lot 35, concession XV, Monmouth township, several trenches have been put down on veins carrying mica. The largest trench trends N. 85° E. and is 70 feet long, 10 feet wide, and from 6 to 10 feet deep. Some 100 feet north of it there is another trench 25 feet long, from 12 to 30 feet wide, and 20 feet deep.

The country rock is a white-, pink-, or brown-weathering biotite-poor gneiss striking N. 30° W. to N. 5° E. and dipping 80° E. The trenches expose a series of veins of irregular strike and dip, composed of phlogopite, pyroxene, calcite, and green apatite. In places the veins are wholly composed of a crushed aggregate of phlogopite in books as much as 10 inches in diameter, but mainly less than 3 inches and sometimes a quarter of an inch in diameter.

The deposit does not appear to have economic possibilities.

Muskoka District

BRUNEL TOWNSHIP

Concession XIV, Lot 16

For description of a mica occurrence on lot 16, concession XIV, Brunel township, see the account of a feldspar deposit on page 30.

CHAFFEY TOWNSHIP

Concession X, Lot 13

The following description of a mica occurrence on lot 13, concession X, Chaffey township, is taken from the Parry Sound report:¹—

On lot 13, half a mile south of the road on the boundary between concessions X and XI, Chaffey township, Muskoka district, a curved trench, 120 feet long, from 10 to 20 feet wide, and from 2 to 5 feet deep, trending N. 30° E., exposes biotite granite gneiss cut by a 3- to 4-foot dike of muscovite pegmatite. The muscovite is irregularly distributed, but in places clusters of books form aggregates 1 by 2 feet. The individual books average 2 inches in diameter. Much of the microcline of the dike is graphic. Test shipments of mica and feldspar are reported. The deposit does not appear to be of economic importance.

¹J. Satterly, op. cit., p. 74.

Peterborough County**METHUEN TOWNSHIP****Concession VII, Lot 15**

The following information is taken from the report by Adams and Barlow.¹ At the extremity of Brooks bay, Kasshabog lake, on lot 15, concession VII, Methuen township, mica is found in syenite dikes cutting amphibolite. This occurrence was known as the Lynn mine. Muscovite and biotite are present, and both of them occur in small sheets showing many cracks. The deposit is not likely to be of any economic importance.

Concession VII, Lot 16

A mica occurrence, formerly known as Osterhause's mine, in lot 16, concession VII, Methuen township, is described by Adams and Barlow.² Biotite and muscovite, in sheets of small size, occur in pegmatitic segregations in syenite dikes and masses, which cut amphibolite. The largest dike was 3 feet in width. The deposit is of no economic importance.

Concession IX, Lot 13

In lot 13, concession IX, Methuen township, old mica workings were found about 15 chains west of the boundary line between concessions VIII and IX. A trench 4 to 8 feet wide and 70 feet long, with a maximum depth of 9 feet, had been put down on a 4-foot pink muscovite syenite-pegmatite dike cutting hornblende gneiss. One muscovite book $2\frac{1}{2}$ inches in diameter was found. Two chains to the west a second trench, 40 by 20 feet, is filled with water; and a third, 25 feet south of the second, is 50 by 10 feet and 10 feet deep. In the third trench pegmatite dikes 10 to 12 inches wide occur on each wall and are separated by hornblende gneiss. The dikes trend N. 40° W. and dip 80° W. An old stockpile between the pits contains sheets of muscovite as much as 4 inches in diameter.

This occurrence does not appear to be worth any further investigation.

Concession IX, Lot 14

Lot 14, concession IX, Methuen township, was held under lease from the American Nepheline Corporation, Limited, by J. E. Ayrhart in 1940 and by the White Mica Mining Syndicate, Limited, in 1941-42. All work ceased in mid-summer, 1942.

Two open cuts, probably those first opened up as Bennett's mine, are located in the northwestern part of the lot on the north slope of the Blue mountains. The first open cut is 100 feet long in a direction S. 70° E. and from 5 to 10 feet wide. There is a pit in the bottom of the open cut 15 feet long and 4 feet deep. The rocks exposed are pink syenite gneiss and grey granite gneiss showing a pegmatitic development along two vertical fractures, $3\frac{1}{2}$ feet apart, in the face of the trench. The pegmatitic phases have gradational contacts with the gneiss and are 1 and $1\frac{1}{2}$ feet in width. In places books of muscovite form as much as 25 per cent. of the pegmatite. They range in width from 1 to 5 inches and are as much as 6 inches in length.

The second open cut, which is $2\frac{1}{2}$ chains southeast of the first, is 7 feet wide and from 10 to 15 feet deep. It trends S. 65° E. and extends for 70 feet into the slope of the hill. It exposes pink syenite gneiss and a pegmatitized

¹F. D. Adams and A. E. Barlow, op. cit., p. 368.

²Ibid.

phase containing mica and cutting irregularly across the face of the open cut. The structure of the gneiss trends N. 30°-35° E. The pegmatite zone ranges from 1 to 2 feet in width. Books of muscovite average 2 inches across, the maximum seen being 5 inches across and 6 inches in thickness. Parallel fracturing is common, and if the mica were trimmed most of it would be not larger than 1 by 1 or 1 by 2 inches. The deposit is not considered of any economic importance owing to the small size of the zones of muscovite-bearing pegmatites. At this occurrence corundum is reported to occur within the books of muscovite,¹ and Eardley-Wilmot's description is given on page 23.

Another group of workings occur at the southeast corner of the lot at or near the north shore of Mountain lake. In 1941 J. E. Ayrhart opened up a pit on the shore of Mountain lake 2 chains east of a cabin. The pit, which is 40 feet long and 25 feet wide and has a maximum depth of 15 feet, was put down on a 25-foot muscovite pegmatite dike. The books of muscovite range in width from less than 1 inch to a maximum of 4 inches.

Two chains north of the cabin and 4 chains north of Mountain lake a pit, 20 feet long, from 4 to 6 feet wide, and from 6 to 20 feet deep, exposes a 25-foot sill of pink muscovite syenite-pegmatite, which trends N. 30°-35° E. and dips vertically. It is bounded on the north and south by hornblende gneiss. The muscovite occurs in fractured books as much as 3 inches in width. Muscovite pegmatite is also exposed in a second pit 1 chain west of the first and in a third at the lake shore, 4 chains to the south.

From what can be seen in these occurrences there appears to be little hope of recovering any quantity of commercial mica.

MOLYBDENUM

There are a large number of molybdenite occurrences in the area, most of them being found in Cardiff and Monmouth townships, Haliburton county. Some of these deposits were worked at a loss during the War of 1914-18, and the total production from all the deposits does not amount to more than 10,000 pounds of molybdenite concentrate. Owing to the spotty distribution of molybdenite in all the deposits seen it is believed there is little incentive to carry out further development. The results of extensive sampling of one of the properties, the Joiner (see page 63), are indicative of the low average grade obtained even when apparently considerable amounts of large flakes are present.

As practically all the workings date from the war of 1914-18 little can be seen; the writer has therefore reproduced in some cases the descriptions of the deposits to be found in reports by Parsons² and Eardley-Wilmot.³

Haliburton County

CARDIFF TOWNSHIP

Concession V, Lot 11

The Orr-Kidd prospect on lot 11, concession V, Cardiff township, was staked in 1914. Eardley-Wilmot⁴ reports that the deposit consists of two pegmatite dikes, 6 inches and 2 feet wide, cutting gneiss. The pegmatite contains finely disseminated pyrite, and a small amount of molybdenite in large flakes. An

¹V. L. Eardley-Wilmot, *Abrasives, Part II, "Corundum and Diamond,"* Mines Branch, Can. Dept Mines, No. 675, 1927, p. 18.

²A. L. Parsons, "Molybdenite Deposits of Ontario," *Ont. Bur. Mines, Vol. XXVI, 1917,* pp. 275-313.

³V. L. Eardley-Wilmot, "Molybdenum," *Mines Branch, Can. Dept. Mines, No. 592, 1925.*

⁴*Ibid,* p. 66.

open cut 55 feet long and from 4 to 6 feet wide, with an average depth of 5 feet, has been made along the pegmatite zone.

In 1915 F. O. Orr sold 50 pounds of MoS_2 concentrates.¹

Concession IX, Lot 6

The Powell and Anderson prospect is on lot 6, concession IX, Cardiff township. Eardley-Wilmot² reports that there are three open cuts, the largest being 40 by 8 feet and 10 feet at its deepest part. Two parallel pegmatite dikes, each about 1 foot wide, cut the gneiss. Small amounts of molybdenite have been found in several places along the dike.

No shipments have been recorded.

Concession IX, Lot 18

Development work on lot 18, concession IX, Cardiff township, was carried out by W. E. Joiner for Paudash Lake Molybdenite Mines, Limited, in the autumn of 1917 and consists of 3 pits with the following dimensions: 75 by 15 feet and 7 feet deep; 50 by 30 feet and 10 feet deep; 15 by 15 feet and 7 feet deep.³ The pits are 33 chains north of the boundary line between concessions VIII and IX and 17 chains N. 50° E. from the old farmhouse.

The country rock is a hornblende gneiss. In the pits there is exposed a rusty-weathering, coarse pegmatite containing molybdenite as sparse large flakes as much as $1\frac{1}{4}$ inches in diameter, much pyrite in vugs with smoky quartz, irregular splashes of pyrrhotite, and locally small amounts of purple fluorite.

The several tons of selected ore, averaging between 3 and 4 per cent., mentioned by Eardley-Wilmot as stored in a shed were still on the property in 1942. This material seems to be free of pyrite. The same author reports that several hundred pounds of pure flake averaging over 90 per cent. MoS_2 was sent to the United States.

Concession X, Lot 11

The workings of the Evans, O'Brien, or Treasure Hill mine are situated in the north half of lot 11, concession X, Cardiff township, 6 chains east of the Paudash-Cheddar road. A plan of the workings will be found in Eardley-Wilmot's report.⁴ Owing to the weathering of the large amount of sulphides present the writer has nothing to add to Eardley-Wilmot's description,⁵ parts of which follow:—

The deposit occurs near the contact of granite and gneiss in which bands of crystalline limestone are prominent. In the main showings, pyroxenite, pyrites, pyrrhotite, and molybdenite occur on the contact between a reddish pegmatite phase of the granite and the gneiss. . . . The molybdenite is either pockety, or very low grade when it occurs with the other sulphides.

The work done consists of a shaft 7 by 9 feet and 45 feet deep, started in 1907, and two open cuts 50 by 120 feet long, excavated in 1910 and 1914.

About 150 tons of ore were treated in a small concentrating plant, and the resulting ton of concentrates was shipped to Toronto.

The showing was staked in 1907 by Alex. Evans. In 1913 an option was taken by M. J. O'Brien, who completed sinking the shaft and dug some pits.

Concession X, Lot 14

In 1937 Brough Lake Molybdenite, Limited, carried out stripping and trenching at intervals over a length of 660 feet (Fig. 6) in a direction N. 70° W.

¹Ont. Dept. Mines, files of the Statistics Branch.

²V. L. Eardley-Wilmot, "Molybdenum," op. cit., p. 67.

³Ibid.

⁴Ibid, p. 68.

⁵Ibid.

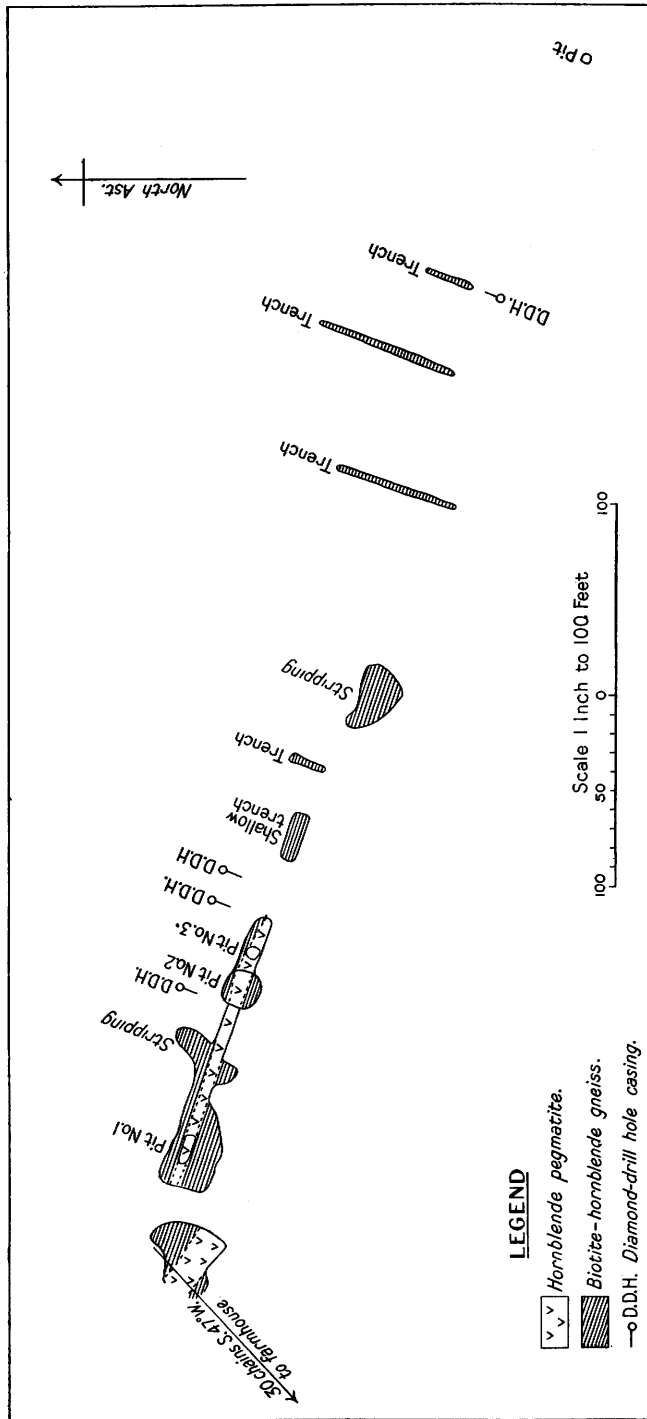


Fig. 6—Geological sketch map of the workings of Brough Lake Molybdenite, Limited, in lot 14, concession X, Cardiff township, Haliburton county.

on lot 14, concession X, Cardiff township. This surface work is 30 chains N. 47° E. from a farmhouse in lot 13, concession X. Diamond-drill casings indicate that at least four holes were put down, but no information on the results obtained is available.

The main showing is a rusty-weathering, coarse hornblende pegmatite sill from 2 to 7 feet wide, striking N. 70° W. and having an exposed length of 150 feet. It intrudes biotite-hornblende gneiss, which strikes N. 70° W. and dips 45°-65° S. The pegmatite is mineralized with pyrite and a few flakes of molybdenite, the latter being closely associated with the hornblende crystals. The mineralization is practically confined to the pegmatite exposed in the pits numbered 1, 2, and 3 in Fig. 6. No mineralization was observed in the other trenches.

From surface indications the grade of the mineralization is much too low to be of any economic importance.

Concession XI, Lot 12

The Mathews-McMahon prospect is situated on the west side of Mud lake in the northwest corner of lot 12, concession XI, Cardiff township. The writer was unable to locate this property. The following notes are taken from reports by Parsons¹ and Eardley-Wilmot.²

Two small open cuts were put down on the contact of a pegmatite dike, 50 feet wide, cutting gneiss. Some large flakes, as much as 6 inches in diameter, of molybdenite were found on this property.

F. McMahon sold 60 pounds of MoS₂ concentrate in 1915.³

Concession XI, Lot 27

The old Dixon mine is situated on the top of a hill in lot 27, concession XI, Cardiff township, about a quarter of a mile north of the road on the boundary line between concessions X and XI. A. Sarginson guided the writer to the old pit, which is 15 by 10 feet and 4 feet deep, the bottom now being filled with loose rock and leaves. The country rock is a rusty biotite paragneiss, which strikes north, dips 45° E., and is intruded by a 2-foot sill of coarse pink pegmatite containing a few large flakes of molybdenite. The deposit is of no economic importance.

Concession XIV, Lot 18

A pit 15 by 15 feet and 10 feet deep, with leaves and water in the bottom, was put down in 1909 by R. Dickson and A. Riddell on the top of a hill about 10 chains west of a small lake in lot 18, concession XIV, Cardiff township. B. E. MacDougall took the writer to this old pit. The country rock is a graphitic and siliceous banded paragneiss striking N. 85° W. and dipping 45° S. Some bands contain considerable graphite in flakes from one-eighth to one-quarter of an inch in diameter; other bands are mineralized with finely disseminated pyrrhotite and the occasional small flake of molybdenite. The showing is not a promising prospect.

Concession XX, Lot 3

The Joiner property on the north half of lot 3, concession XX, Cardiff township, is situated on a high north-south ridge rising 160 feet above the valley floor. Work was performed on this property in 1917 by W. E. Joiner and Company. The property was acquired by Cardiff Molybdenite Mines, Limited,

¹A. L. Parsons, *op. cit.*, p. 294.

²V. L. Eardley-Wilmot, *op. cit.*, p. 68.

³Ont. Dept. Mines, files of the Statistics Branch.

incorporated in 1920, then by the United Molybdenum Corporation, Limited, incorporated in 1922, and in 1935 by Shallberg Molybdenite Company. The most recent work was a sampling programme carried out for Ventures, Limited, under the direction of E. Y. Dougherty between June and September, 1936.

The route taken to reach the property in 1942 was northeast on the road that leaves the Wilberforce highway just north of Wilbermere lake, then north through the farm of G. Barnes, and then following a wagon road on foot; the workings on the ridge were reached at between 69 and 97 chains from a field. This would be a distance of 5 miles from Wilberforce. The ridge is just over three-quarters of a mile east of the Canadian National Railway track.

Most of the information that follows is taken from a report by E. Y. Dougherty.

The workings are shown in Fig. 7. New trenches aggregating over 3,000 feet in length were opened up at intervals across or along a north-northeast length of about 1,600 feet in the course of the sampling programme, and several old pits and trenches were cleared out. This work disclosed three main showings of molybdenite from 250 to 500 feet in length and a number of minor showings. A large number of chip and a lesser number of channel samples were taken.

The geological sketch map (Fig. 7) shows that the ridge consists of crystalline limestone and interbedded paragneiss intruded by a large number of sills of monzonite and monzonite-pegmatite. The monzonite is extremely variable in texture and composition. Gneissic, coarse granitoid, and pegmatitic phases are irregularly mixed. These rocks range in composition from almost pure pyroxene at one extreme to almost pure feldspar at the other.

Much of the molybdenite is in pegmatite or in the coarse-grained phases of the monzonite, particularly where the rock is fairly basic (pyroxenic). Other occurrences are in the sedimentary gneisses and in crystalline limestone where monzonite is near or in immediate contact with the sediments.

The molybdenite forms coarse flakes erratically distributed in fractures in most of the exposures. Irregularity in distribution and coarseness of the flakes are particularly characteristic where the molybdenite is in pegmatite. Physical or structural control on the localization of the molybdenite are mainly jointing or an erratic fracturing in which the molybdenite lies in scattered flakes. There is little definite alignment of the molybdenite in persistent or definite zones or planes of fracturing.

Nearly 50 assays were made on the samples taken and show a range from nil to 0.64 per cent. MoS_2 , but only 5 assays were greater than 0.20 per cent. MoS_2 , and over half the assays were below 0.10 per cent. MoS_2 . The grade of the samples is, therefore, well below a profitable grade with molybdenite worth 90 cents a pound. It is doubtful if, even by selective mining, any large tonnage of ore grading 0.5 per cent. could be obtained. The property must be considered of no economic importance at present.

Eardley-Wilmot¹ reports that in 1920, 30 tons of 0.31 per cent. ore and in 1921, 600 pounds of 0.53 per cent. ore were sent to the Department of Mines at Ottawa for testing. Judging from assays obtained in the sampling programme, these shipments must have been of selected ore.

GLAMORGAN TOWNSHIP

Concession V, Lot 32

A molybdenite prospect, acquired by British Molybdenite, Limited, in 1919, is situated in lot 32, concession V, Glamorgan township, 17 chains north of the

¹V. L. Eardley-Wilmot, op. cit., p. 71.

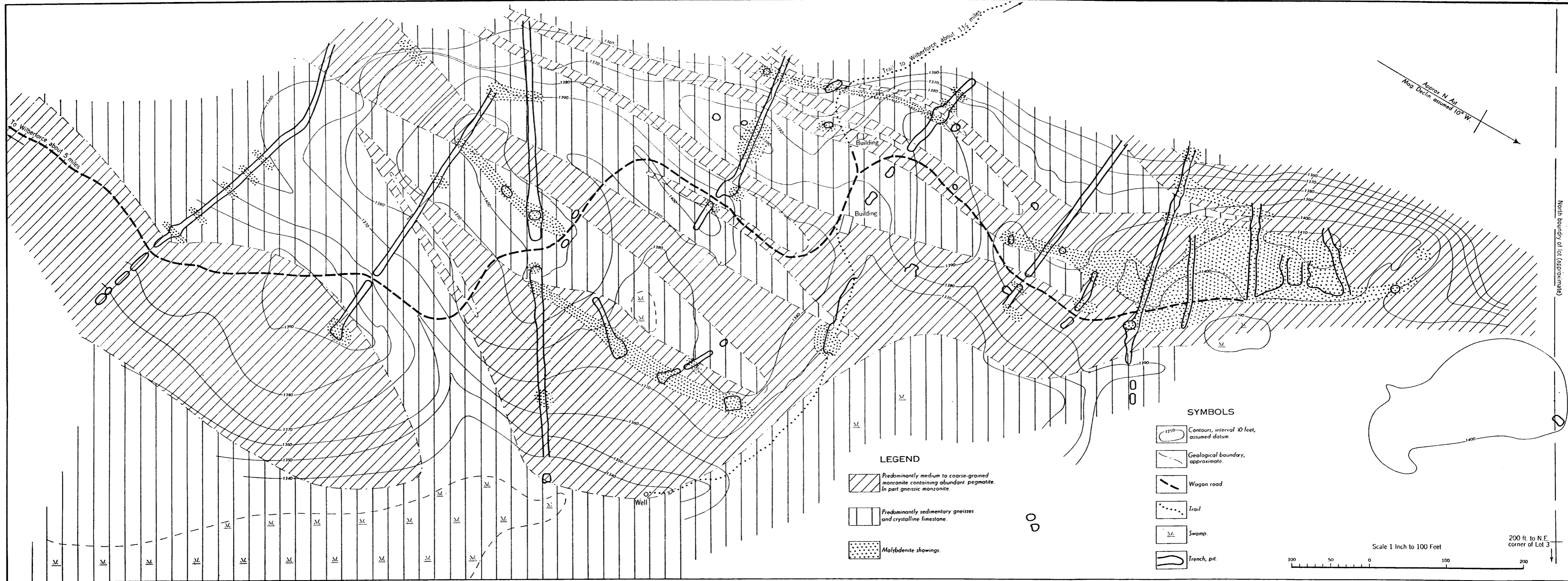


FIG. 7—GEOLOGICAL SKETCH MAP OF THE JOINER PROPERTY SHOWING WORKINGS AND MOLYBDENITE SHOWINGS IN THE NORTH HALF OF LOT 3, CONCESSION XX, CARDIFF TOWNSHIP, HALIBURTON COUNTY.
 (Copied from a plan by E. Y. Dougherty and published with the permission of Ventures, Limited.)

road on the boundary line between concessions IV and V. The workings consist of an open cut 30 feet long with a 10- to 12-foot face and a stripping extending 70 feet from the open cut to some test pits. The rock exposed is a very pale greenish-white, siliceous rock showing no trace of bedding. No other rocks are exposed in the adjacent fields. It may be an intrusive. Irregular stringers, lenses, and grains of glassy quartz occur in the rock. Pyrite is present in splashes as much as 1 inch in diameter. A few molybdenite flakes one-eighth of an inch in diameter were seen at one place. The deposit is of no economic importance.

Concession XIII, Lot 34

A shallow pit, 15 by 25 feet, occurs between a disused farmhouse and a barn 10 chains north of Little Bear lake in lot 34, concession XIII, Glamorgan township. The only rocks exposed in the immediate vicinity are in the pit. They are a rusty quartzitic gneiss and a pegmatite mineralized with pyrite and pyrrhotite. A few flakes of molybdenite were seen in fragments of pegmatite lying in the barn which may have come from the pit. This occurrence is of no economic importance.

Tory Hill Marble and Mica Company, Limited, the owners, mined mica from this same lot. The production of amber mica is given on page 56 of this report.

HARCOURT TOWNSHIP

Concession I, Lot 3

In lot 3, concession I, Harcourt township, near the south end of Farquart lake, some work was carried out in the fall of 1901 by the Land and Immigration Company, Limited, of Haliburton, under the direction of S. Dillon Mills.¹

When visited in 1942 the workings comprised a large open cut, which is 60 feet by 6 feet and from 15 to 20 feet deep and trends N. 85° W. There is a shaft 8 by 7 feet and 15 feet deep at its west end, a small open cut 3 chains south of the above, and a 6- by 10-foot shaft, 12 feet deep² and now filled with water, 5 chains to the south of the latter. A photograph of the open cut will be found in Parson's report.³ A description by S. Dillon Mills will be found in an old report of the Ontario Bureau of Mines,⁴ and a sketch map by him appears in a report by Eardley-Wilmot.⁵

In an examination of these workings the writer and his assistant found very little molybdenite. The country rock is a dark-green, fine- to medium-grained pyroxenite. A granite pegmatite is exposed west of the south shaft. In the shaft at the west end of the open cut and in the open cut itself are a number of pyrite veins ranging from stringers to veins 3 inches in width, dipping 65° E., and containing very minor to insignificant amounts of pyrrhotite and molybdenite. Only 3 flakes of molybdenite were seen in the open cut. Parts of the pyrite veins are vuggy, and Dillon Mills reports⁶ that a ton of pyrite was taken from one vug. In 1917 Parsons⁷ reported that very little molybdenite could be seen on either the dump or the walls of the open cut.

The open cut 3 chains to the south on the east side of the outcrop exposes pyroxenite carrying pyrite and a few 1-inch flakes of molybdenite. At the south shaft pyrite and a little molybdenite were again observed in the pyroxenite.

¹A. L. Parsons, *op. cit.*, p. 298.

²V. L. Eardley-Wilmot, *op. cit.*, p. 72.

³A. L. Parsons, *op. cit.*, p. 298, Fig. 13.

⁴Ont. Bur. Mines, Vol. XI, 1902, p. 47.

⁵V. L. Eardley-Wilmot, *op. cit.*, p. 72, Fig. 13.

⁶Ont. Bur. Mines, Vol. XI, p. 47.

⁷A. L. Parsons, *op. cit.*, p. 298.

Owing to the scarcity of molybdenite in this occurrence no additional exploration would appear to be justified.

Eardley-Wilmot¹ reports that in 1911 50 pounds of flake were taken out for experimental purposes by an English steel company.

LUTTERWORTH TOWNSHIP

Concession II, Lots 7 and 8

Occurrences of molybdenite on lots 7 and 8, concession II, Lutterworth township, were not seen by the writer. Parsons² reports that A. Y. Hopkins opened up a quartz vein with a maximum width of 3 feet containing a little molybdenite. The vein occurs in gneiss a short distance from the shore of Davis lake. Some molybdenite occurs on a small island a few hundred feet from the shore. These occurrences appear to be of no economic importance.

Concession V, Lot 23

Hamilton Molybdenum Alloys Company, Limited, is reported³ to have sunk, in 1916 and 1917, on lot 23, concession V, Lutterworth township, a shaft 6 by 12 feet and 30 feet deep. When the writer visited this occurrence in 1942 he found the shaft caved in. The rocks on the dump consist of a biotite-poor, quartz-rich granite gneiss with inclusions of an epidote-tremolite rock. A little pyrite, but no molybdenite was found. This shaft is at the edge of a wagon road adjacent to the east bay of Moore lake. Points on this part of the lake expose crystalline limestone cut by pegmatite dikes. This occurrence is of no economic importance.

MONMOUTH TOWNSHIP

Concession XI, Lot 12

The Anderson prospect in lot 12, concession XI, Monmouth township, was not seen by the writer. The workings consist of a 30-foot shaft and test pits.⁴ Shipments for gold and silver were made. Molybdenite is found on the dump. Eardley-Wilmot does not consider it an encouraging prospect.⁵

Concession XII, Lot 14

The old Lillico mine is situated in lot 14, concession XII, Monmouth township, 16 chains S. 15° W. from the northeast corner of the lot. The main workings consist of one open cut 200 feet long, 100 feet wide, and 5 to 10 feet deep and another to the southeast 60 by 50 feet and 10 feet deep,⁶ nearly filled with water in 1942.

In the large open cut the floor exposes granite gneiss and hornblende gneiss. No molybdenite was seen. The shaft marked on the sketch in Eardley-Wilmot's report⁷ was not found and must be filled in. On a 5-foot face at the southeast side of this open cut tourmaline pegmatite containing coarse pyrite, a little molybdenite, and pyrrhotite cuts flat-lying brownish granite gneiss.

At the northwest edge of the smaller open cut, pyrite and molybdenite were found in pegmatite. On the dump here pyrite was found in masses as much as 5 inches in diameter.

¹V. L. Eardley-Wilmot, op. cit., p. 72.

²A. L. Parsons, op. cit., p. 302.

³V. L. Eardley-Wilmot, op. cit., p. 72.

⁴Ibid, p. 113.

⁵Ibid.

⁶V. L. Eardley-Wilmot, op. cit., p. 73.

⁷Ibid, Fig. 14.

The deposit was apparently a flat-lying body, which has been largely mined out, and it is doubtful if any further exploration is justified.

R. J. Lillico for the Ontario Molybdenum Company, Limited, shipped in 1917 55 tons of 1.01 per cent. MoS_2 ore, from which 1,117 pounds of molybdenite was recovered; and in 1918, 102 tons of 0.533 per cent. MoS_2 ore, from which 680 pounds of molybdenite was recovered. About 3,000 tons of ore and rock were mined to obtain the above amounts of shipping ore. Work ceased in August, 1918.¹

Concession XIII, Lot 13

In 1916 G. Padwell opened up a quarry face² 50 feet long and about 10 feet high on lot 13, concession XIII, Monmouth township, and made a shipment³ of 1,300 pounds of hand-picked ore, running 3.85 per cent. MoS_2 , to the Mines Branch, Ottawa.

When visited by the writer in 1942 the quarry, which is 2 chains north of the south boundary of the lot and 4 chains east of the west boundary, had a length of 130 feet from east to west and a width of 120 feet from north to south. One pit in the northwestern part of the quarry floor measured 25 by 30 feet and 15 feet in depth; another in the southeastern part measured 40 by 25 feet and from 1 to 4 feet in depth. The enlargement of the quarry was made by Canadian Molybdenite Mines, Limited, in 1939.

The country rock is a flat-lying hornblende-feldspar gneiss with a few *lit par lit* stringers of hornblende pegmatite. The gneissic structure trends N. 80° W. and dips 10° S. The hornblende gneiss is slightly mineralized with large flakes of molybdenite, coarse pyrite, and pyrrhotite occurring in part in flat sulphide veinlets parallel to the gneissosity. The mineralization is very spotty, some bands of gneiss several feet thick showing none. Cutting the gneiss are several 1- to 4-foot wide pink pegmatite dikes.

A small stock pile adjacent to the pits actually shows very little molybdenite, and the deposit is considered to be of no economic importance.

Concession XIV, Lot 10

The Madill property is on lot 10, concession XIV, Monmouth township. The writer could not locate the old workings, of which Eardley-Wilmot has the following note: "There is a showing of molybdenite owned by Mr. William Madill, of Essonville, which has only been slightly explored by a few shots."⁴

Concession XV, Lots 10 and 12

The Affenby and Henery occurrences in lots 10 and 12, concession XV, Monmouth township, are described by Eardley-Wilmot as similar to and in the same zone as the Padwell property described next.⁵ These occurrences were not located by the writer.

Concession XV, Lot 11

The Padwell property on lot 11, concession XV, Monmouth township, was first opened up in 1916 by G. Padwell,⁶ who shipped to the Mines Branch concentrator, Ottawa, 55.6 tons of hand-picked ore, grading 1.4 per cent. MoS_2 ,

¹Ont. Bur. Mines, Vol. XXVIII, 1919, pt. 1, p. 161.

²A. L. Parsons, op. cit., p. 307 and Fig. 19 on p. 306.

³V. L. Eardley-Wilmot, op. cit., p. 74.

⁴Ibid.

⁵Ibid, p. 114.

⁶A. L. Parsons, op. cit., p. 307.

from which 1,268 pounds of molybdenite was recovered; in 1917 he shipped 62 tons of 1.0 per cent. MoS_2 ore to the International Molybdenum Company's concentrator at Renfrew.¹

Additional development on this property and the lot to the south was performed by Canadian Molybdenite Mines, Limited, in 1940. On the site of the old Padwell workings there is now a pit, which trends N. 20° W. and is 150 feet long, 10 to 50 feet wide, and from 1 to 10 feet deep. The south end of the pit is 1 chain north of the Essonville road at the south side of the lot. This pit exposes cream, pink, green, and white banded crystalline limestone containing some bands rich in phlogopite or diopside and inclusions of hornblende gneiss. About the centre of the pit there is a mass of rusty basic pegmatite, perhaps 10 by 3 feet in size, which contains much pyrite and a few large flakes of molybdenite. The limestones dip gently to the south.

A new excavation, circular in shape, 4 feet deep and 30 feet across, was put down 16 chains north of the south boundary of the lot and 3 chains east of the west boundary. It exposes impure green, grey, and white diopside-phlogopite crystalline limestone containing accessory graphite and cut by pegmatite dikes. No molybdenite was seen.

Two trenches were put down by the same company in the lot to the south, that is, lot 11, concession XIV. The trenches extend eastward from the west boundary of the lot and are 15 and 17 chains south of the north boundary of the lot. The north trench, trending N. 65° E., is 80 feet long, from 2 to 3 feet wide, and 4 feet deep. It is partly caved in, and exposes a decomposed crystalline limestone. The south trench, trending N. 75° E., is 85 feet long, from 5 to 10 feet wide, and from 4 to 6 feet deep. It exposes crystalline limestone, which contains phlogopite, diopside, and accessory grains of pyrite and is cut by granite and pegmatite dikes. No molybdenite was seen in these trenches.

It would appear that G. Padwell in 1916 and 1917 mined out a small body of ore and that later exploration has failed to reveal any commercial bodies of molybdenite.

Concession XV, Lot 17

The Johnston occurrence on lot 17, concession XV, Monmouth township, is 6 chains north of the Essonville road. A pit 20 by 12 feet and 4 feet deep exposes a hornblende gneiss injected *lit par lit* by pegmatite. At the bottom of the south side of the pit a rusty sulphide-bearing band, which is 1 foot thick and carries pyrite and a few large flakes of molybdenite, is exposed. The dip is 20° S. Eardley-Wilmot considers that this deposit has possibilities on a small scale and could be economically hand-cobbed.² From the observations the writer was able to make in 1942, the deposit appears to be of no economic importance.

Concession XV, Lot 33

A molybdenite prospect on lot 33, concession XV, Monmouth township, was opened up by the Wilberforce Molybdenite Company, Limited, in 1917.³ The workings are on a bare knoll just west and south of some farm buildings. At 2½ chains north of a side road there is a trench trending N. 65° E., which is 100 feet long, 10 feet wide, and 10 feet deep and has a pit at the west end 20 feet deep. At 5 chains north of the road stripping and small pits expose rusty-weathering mica-pyroxene gneisses. The trench exposes a complex of banded gneisses containing bands rich in phlogopite and pale-green pyroxene; one band

¹Ont. Dept. Mines, files of the Statistics Branch.

²V. L. Eardley-Wilmot, *op. cit.*, p. 114.

³Ont. Bur. Mines, Vol. XXVII, 1918, pt. 1, p. 143 (reference has Cardiff township in error).

consisting of calcite, actinolite, and minor quantities of fluorite and titanite. The gneisses are cut by a dikelet of feldspar-apatite-pyroxene rock. Rusty gneisses contain pyrrhotite, and one 1-inch flake of molybdenite was found.

No further development would appear to be justified in view of the negligible amount of molybdenite present. It is reported locally that some additional pitting in the trench was carried out in recent years, but little or no molybdenite was found.

Concession XVI, Lot 31

In 1942 B. E. MacDougall prospected lot 31, concession XVI, Monmouth township. The work consists of stripping and shallow test pits or trenches on a low ridge trending N. 10° E. The showings are reached by going west from Wilberforce for three-quarters of a mile, north on a bush road for one-quarter of a mile, and then 12 chains northeast to the top of the ridge. The rocks exposed are pyroxene crystalline limestones showing a pronounced banding and injected by narrow sills of albite-smoky quartz pegmatite. Stringers of calcite-apatite-pyroxene rock cut these rocks. A few flakes of molybdenite and pyrite occur in the pyroxene-calcite rock. Lower down the ridge graphic granite-pegmatite is exposed. Since the pyroxene crystalline limestones are flat-lying, it would appear that the pyroxene-calcite rock is a contact zone developed adjacent to a mass of graphic graphite-pegmatite and is possibly not more than 20 feet thick at this locality. The occurrence is not considered of any economic importance.

Work on the property had ceased at the time of the writer's visit in August, 1942.

Concession XVI, Lot 32

The workings on lot 32, concession XVI, Monmouth township, are situated about 7 chains south of the Canadian National railway and four-tenths of a mile west of Wilberforce station. An outcrop 2 chains wide and 4 chains long has been stripped. At its north end are 2 shafts 30 and 40 feet deep,¹ now filled with water. On the east edge of the outcrop is a large open cut. The base of an old mill is 4 chains east of the outcrop. The outcrop consists of an aggregate of pale-green pyroxene and white albite very sparsely mineralized with flakes of molybdenite from a quarter of an inch to 1 inch in diameter cut by stringers of albite and pyroxene carrying small quantities of pyrrhotite, pyrite, and molybdenite. Within the pyroxene-albite rock are numerous remnants or inclusions of rusty biotite paragneiss containing disseminated pyrrhotite. Crystalline limestone is exposed near the mill site. The ore zone is a replacement deposit in crystalline limestone.

In 1917 the following shipments were made: to the Mines Branch, Ottawa, 58.6 tons of 0.205 per cent. ore, from which 168 pounds of molybdenite was recovered; to Renfrew, 27.2 tons of 0.39 per cent. ore, from which 152 pounds was recovered.²

The deposit is too low grade to be of any economic importance.

The property was owned by Dominion Molybdenites, Limited, incorporated in May, 1917, the name of which was changed to American Molybdenites, Limited, in August, 1917. The Molybdenum Products Company optioned the property in 1918, and it has since reverted to American Molybdenites, Limited.³

Concession XVII, Lot 32

The workings are reported to be near the middle of the east boundary of lot 32, concession XVII, Monmouth township, about 1¼ miles northwest of Wilber-

¹V. L. Eardley-Wilmot, op. cit., p. 75.

²Ont Dept. Mines, files of the Statistics Branch.

³V. L. Eardley-Wilmot, op. cit., pp. 75, 76.

force station on the Canadian National railway. On the west side of the bush-covered ridge two excavations were made in 1921, and some further work was done on one of these in 1940. No surface work was carried out, but a few short holes were drilled in the autumn of 1942.

The north opening, near the north end of the ridge, consists of a pit 7 feet wide, 8 feet long, and from 5 to 8 feet deep at the base of a cliff face. From the top of the cliff to the bottom of the pit is about 25 feet. A drift 6 feet wide and 7 feet high has been driven 10 feet into the base of the cliff from the bottom of the pit. A few chains south there is a shallow open cut on the same cliff face.

The pit and drift at the north end of the ridge expose a medium- to coarse-grained, light-green pyroxenite very sparsely mineralized with large flakes of molybdenite, pyrite, and pyrrhotite. In the pit crumbly crystalline limestone and pegmatite occur. These rocks may be the footwall of the pyroxenite band. Overlying the pyroxenite band and exposed in the cliff face are interbedded rusty pyroxene and biotite paragneiss trending N. 25° W. and dipping 45° E.

The open cut to the south shows rusty paragneiss underlain by pyroxenite with an exposed thickness of 4 feet. Scattered molybdenite flakes were found.

The grade is extremely low, and it is very doubtful if hand-cobbing would allow the production of sufficient tonnage of marketable ore to pay all mining costs.

The writer is indebted to R. Elliott, foreman for P. J. Dwyer, for guiding him to this property.

Victoria County

LAXTON TOWNSHIP

Concession XI, Lot 5

Parsons¹ has described and illustrated two old mines in lot 5, concession XI, Laxton township, adjacent to the shore of Mud Turtle lake, and the writer has nothing to add to his report.

The workings at the Horscroft mine consist of a trench 70 feet by 20 feet and 10 feet deep put down in soil and decomposed pyroxenite. In 1916 T. Horscroft shipped to the Mines Branch, Ottawa, 36.33 tons of 2.0 per cent. MoS₂ ore, from which 864 pounds of molybdenite was recovered.²

Adjoining the Horscroft and right at the shore of the lake is the Ponton-Russell mine. A shaft 7 by 9 feet and 50 feet deep was sunk by D. Ponton and A. J. H. Russell, and was full of water when Parsons saw it in 1916.³ The ore was a micaceous pyroxenite containing much molybdenite.

Owing to the location of the showings it is doubtful if the properties could be worked economically. The writer does not think that further exploration would be justified under the circumstances.

SOMERVILLE TOWNSHIP

Concession A, Lot 3

T. Horscroft put down several pits in lot 3, concession A, Somerville township, just north of the road at the north end of Mud Turtle lake. The writer saw only one pit, 3 chains north of the road, now overgrown with moss and nearly covered by fallen trees and slash. Pink granite gneiss is exposed on the east wall and a rusty quartz-mica-pyroxene rock on the west wall of the pit.

¹A. L. Parsons, op. cit., pp. 299-302 and Figs. 14, 15, 16.

²Ont. Dept. Mines, files of the Statistics Branch.

³A. L. Parsons, op. cit., p. 302.

A little pyrite and small flakes of molybdenite were found in fragments of the latter on the dump. This appears to be a mineral occurrence of no economic importance.

NEPHELINE

Nepheline in recent years has largely replaced feldspar as a source of alumina in the ceramic industry, particularly in the manufacture of glass. Nepheline contains from 20 to 30 per cent. alumina, whereas feldspar contains only from 17 to 20 per cent.

Much research has been carried out with a view to recovering alumina from nepheline for use in the manufacture of aluminium. A process has been developed at the the Bureau of Mines, Ottawa, which would obtain alumina from nepheline syenite and, as by-products, potash and soda. It is not likely that this process will be used, however, as long as Canada can continue to import bauxite, the ore of aluminium, from British Guiana.

The distribution of the bodies of nepheline syenite and pegmatite is shown on the map accompanying this report, and a general description is given on pages 13 to 18.

The main producer of nepheline syenite is the American Nepheline Corporation, whose quarries situated on the southeast face of the Blue mountains in Methuen township, Peterborough county, have been in operation since 1936.

A small production from nepheline pegmatite bodies was recorded in the years 1938 and 1939 at two localities in Glamorgan township, Haliburton county, but since then the properties have been idle.

Haliburton County

GLAMORGAN TOWNSHIP

Concession III, Lot 32

The main nepheline occurrence in lot 32, concession III, Glamorgan township, is situated in the northeastern part of the lot about a quarter of a mile east of the farmhouse. Nepheline-poor pegmatite is exposed in an area about 5 chains in diameter and has been stripped over an area 80 feet in diameter.

The nepheline content of the pegmatite is very variable and may average 5 per cent. of the whole. The rock grades westward into syenite-pegmatite and contains inclusions of crystalline limestone. Locally zircon is abundant; two patches, several square feet in area, were observed containing 5 per cent. of that mineral in crystals ranging from one-tenth to one-half inch in diameter.

A pit 6 by 6 feet and 6 feet deep has been sunk in a biotite, nepheline-poor syenite or pegmatite containing much graphite on slips. This pit is 10 chains east and 5 chains south of the farmhouse.

A third occurrence of nepheline is found in the northeast corner of the south half of the lot. This occurrence consists of several small outcrops of nepheline-rich hornblende syenite gneiss and boulder-like outcrops of nepheline-rich pegmatite within an area 5 chains in diameter. These exposures occur in a hay field just south of a spruce swamp.

The amount of nepheline present in the main occurrence is so low that at the present time the deposit is of no economic importance.

Concession IV, Lot 30

Nepheline pegmatite was quarried by J. A. Fraser on the farm of T. Madill in lot 30, concession IV, Glamorgan township. Two quarries are located in a field, 2½ miles by road from Gooderham station on the Canadian National

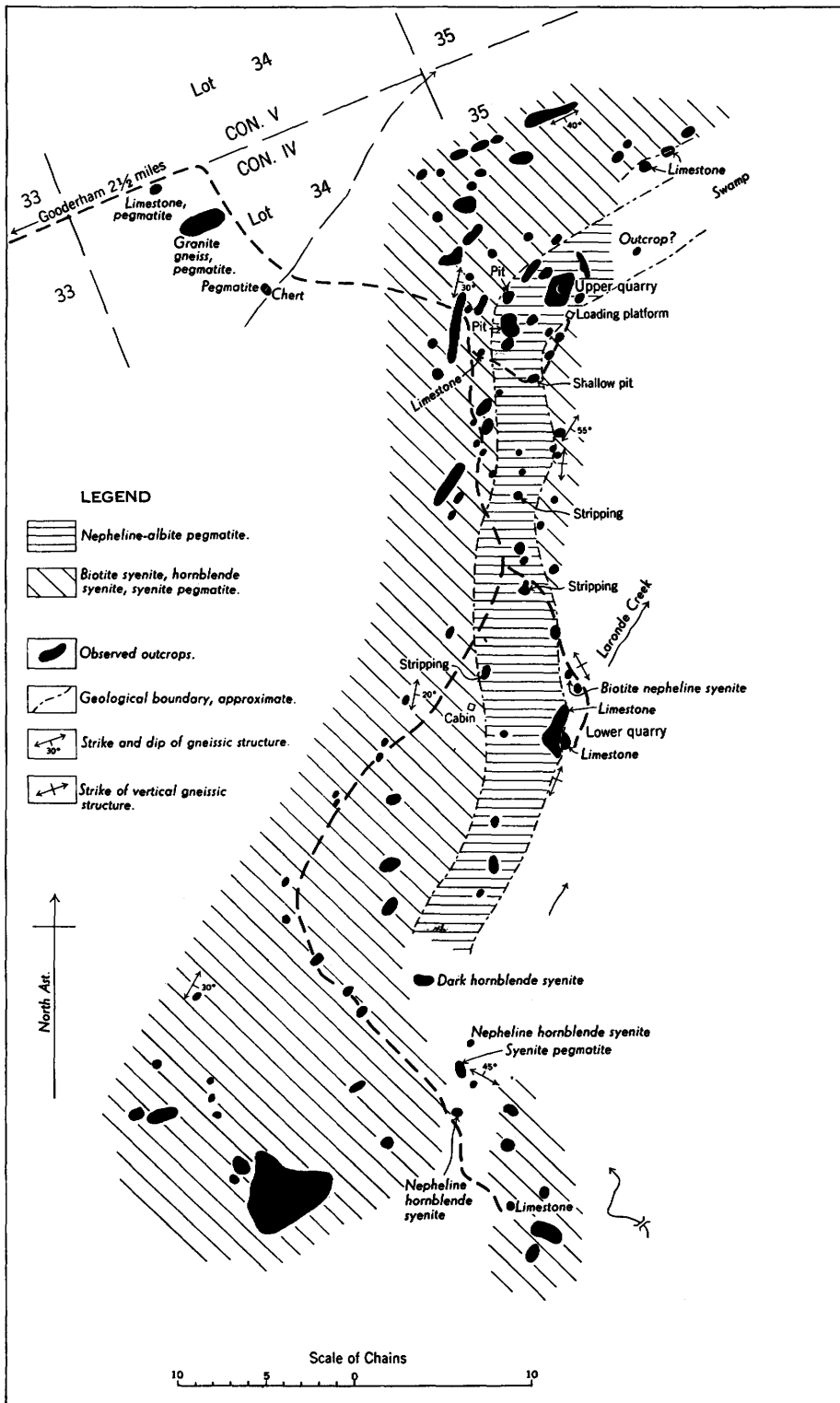


Fig. 8—Geological sketch map of the Gill property, lot 34, concession IV, Glamorgan township, Haliburton county.

railway. The quarries are connected and open to the west, having an east and west length of 335 feet. The lower quarry is 80 feet long and from 10 to 20 feet deep; the upper quarry is 225 feet long, from 10 to 30 feet wide, and from 5 to 25 feet deep. The rocks exposed in the quarries are a complex of interbedded nephelinized paragneiss and crystalline limestone intruded by sills and lenses of nepheline pegmatite and syenite-pegmatite (see photograph on page 16). The paragneiss is rich in biotite, and clusters of biotite flakes occur in the nepheline pegmatite. Stains due to the weathering of pyrite are abundant in the lower quarry and at the west end of the upper quarry. The minerals present in the



Nepheline pegmatite at the upper Gill quarry, lot 34, concession IV, Glamorgan township, Haliburton county. The nepheline, which contains blebs of carbonate, is replacing albite (lower right). The carbonate has weathered out leaving a pocked surface.

nepheline pegmatite are grey albite, nepheline, and lesser amounts of sodalite, biotite, hornblende, and zircon. In the pegmatite and nephelinized paragneiss the nepheline has been altered in many places to a pink or scarlet mineral (hydro-nephelite?), respectively.

Only the purer nepheline pegmatite can be considered of shipping grade, and the enormous dump at the quarries indicates that only a small percentage of the rock quarried was acceptable.

This property was known as the Gooderham-Nepheline, and shipments of nepheline pegmatite in 1937 and 1938 were 445 and 2,733 tons, respectively.¹ It is reported locally that some of the tonnage came from the Gill property in lot 34, concession IV, Glamorgan township. The property has been idle since 1938.

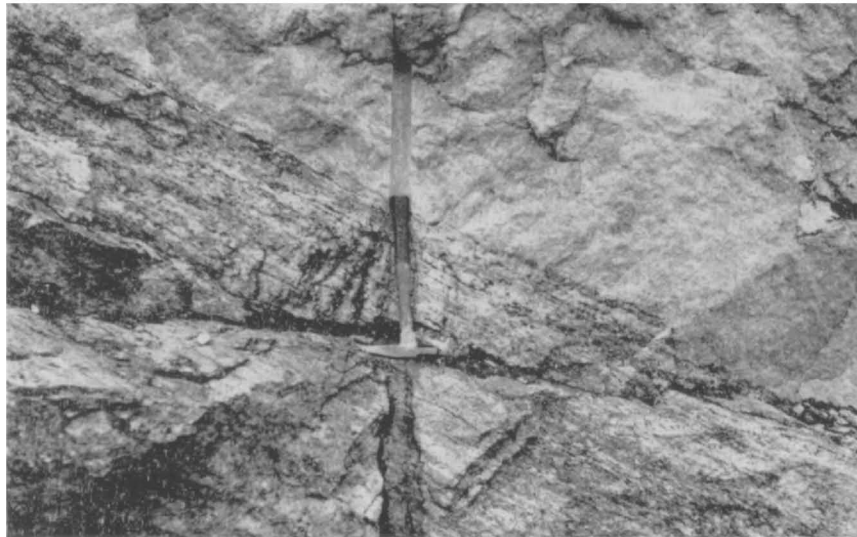
Concession IV, Lot 34

The Gill property is situated in lot 34, concession IV, Glamorgan township, 3 miles by road from Gooderham station on the Canadian National railway. It is reported locally that 6 cars were shipped from this property by Gooderham-Nepheline.

¹Ont. Dept. Mines, files of the Statistics Branch.

A geological sketch map (Fig. 8) shows the distribution of the outcrops of nepheline pegmatite and other rocks and the two quarries. The upper quarry is reported to be on the boundary line between lots 34 and 35. The distribution of the outcrops of nepheline pegmatite indicate that it occurs as a dike-like body or lens, trending north and south, and that it is from 200 to 300 feet wide and 2,500 feet long. At the north end the extension, if any, is covered by a large swamp. To the south the body appears to be cut off or to lens out judging from the distribution of other rock types.

A marked feature of the nepheline pegmatite of the Gill property is the presence of a brown-weathering carbonate, which occurs as numerous blebs in the nepheline (see photograph on page 73) and cuts it as veinlets. The latter can be seen at the lower quarry.



Nephelinized and albitized crystalline limestone underlain by biotite-nepheline-albite gneiss, north end of the lower Gill quarry, lot 34, concession IV, Glamorgan township, Haliburton county. The hammer handle is at the contact.

The upper quarry, which is 35 feet in diameter and 8 feet deep at the face, has been sunk in a stripped area 100 by 50 feet in dimensions. Several other shallow pits are indicated in Fig. 8. The nepheline pegmatite consists of dark-grey nepheline with blebs of carbonate, albite, and lesser amounts of biotite, green apatite, and zircon. Secondary minerals present are orange cancrinite, blue sodalite, and hydronephelite.

At the lower quarry nepheline pegmatite and associated biotite-nepheline-albite gneiss is seen in contact with coarse crystalline limestone containing biotite and metacrysts of nepheline and albite (see photograph above). The largest metacryst of albite found measured 1 by 3 inches. The limestone and gneiss at the north end of the quarry strike N. 10° W. and dip 20° E., but at the south end the dip is vertical. The nepheline pegmatite, therefore, underlies a curved shell of limestone and nephelinized paragneiss.

The future of this property will depend on the possible use of a nepheline pegmatite containing a variable amount of carbonate. At the present time this is probably an undesirable feature.

These claims lapsed in 1942. The distribution of the outcrops is shown in a geological sketch map covering a larger area (Fig. 9).

On the north slope of a hill in lot 11, a T-shaped trench, the upright of the T being 25 feet long, 5 feet wide, and from 2 to 3 feet deep, and the bar of the T being 40 feet long, has been put down into nepheline pegmatite. Nepheline forms masses as much as 3 feet in diameter. It shows a marked schiller structure due to the orientation of films of biotite and is altered marginally to a white

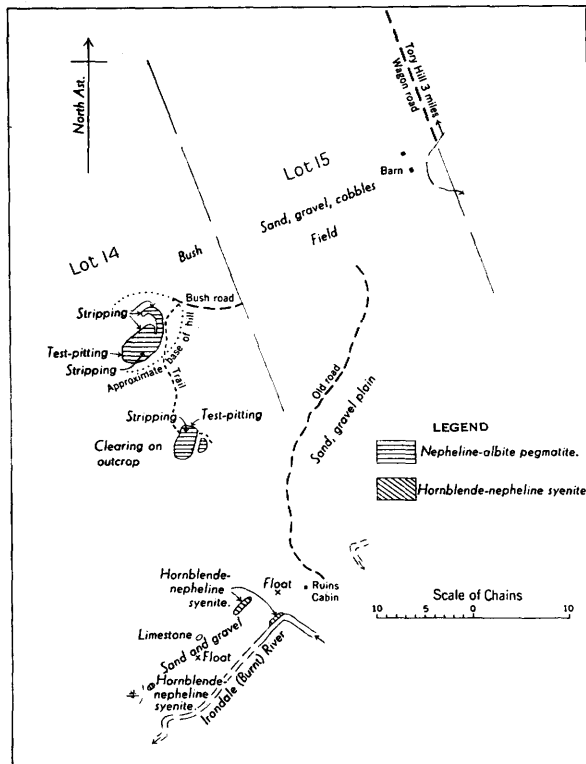


Fig. 10—Geological sketch map of the Mackay property, lot 14, concession IV, Monmouth township, Haliburton county.

cancrinite (?). A little carbonate is present. Other minerals present are biotite in books from 1 to 2 inches in diameter, a little green apatite, and, rarely, zircon.

On the north slope of the same hill about 7 chains west of the above trench in lot 10 a pit 25 by 15 feet and 3 feet deep exposes nepheline syenite and pink syenite-pegmatite. The relationship is obscure, but the syenite-pegmatite appears to intrude the nepheline pegmatite. The nepheline pegmatite contains, beside nepheline and feldspar, minor amounts of carbonate, yellow cancrinite, and sodalite.

Owing to the lack of outcrops it is impossible to tell how large a body of nepheline pegmatite is present. Gravels in the flat north of the hill consist of nepheline pegmatite fragments, but these do not necessarily indicate that a large body underlies that area. Only deep trenching, supplemented by diamond-drilling, will indicate the extent of the deposit. At the present time undeveloped and better exposed deposits are available in the same township.

Concession VI, Lot 14

The Mackay property (Fig. 10) is situated on lot 14, concession VI, Monmouth township, approximately $3\frac{1}{2}$ miles from Tory Hill station on the Canadian National railway.

Surface work in 1941, which was mostly stripping but included a little pitting, has exposed two masses of nepheline pegmatite. The northern mass is approximately 400 by 250 feet, and the southern mass 530 feet to the south is 230 feet in diameter. No exposures were seen in the interval, and the masses may represent two separate nepheline pegmatite bodies.

The northern mass of nepheline pegmatite contains from 10 to 50 per cent. nepheline and from 1 to 5 per cent. biotite; the remainder is albite. Zircon is present as an accessory mineral. In the southern mass sodalite, tourmaline



Nepheline-albite pegmatite in the southern mass on the Mackay property, lot 14, concession VI, Monmouth township, Haliburton county. In the photograph the albite is white and the nepheline grey.

and green apatite were noticed as accessory minerals. The best material would average 40 per cent. nepheline (see photograph above).

The work to date has indicated that a relatively small tonnage of nepheline pegmatite could be obtained from these two masses. Further development is required. From surface exposures, the nepheline pegmatite on this property appears to be freer of dark minerals than any other pegmatitic occurrences seen in the area. No carbonate was observed in the nepheline of either mass.

The mineral rights are at present owned by F. B. Brower and Alvar H. Simpson.

Concession VIII, Lots 10 and 11

F. B. Brower and Alvar H. Simpson own the mineral rights of lots 10 and 11, concession VIII, Monmouth township. Stripping and shallow trenching have been carried out on a nepheline gneiss belt in both lots (see Fig. 9 on page 75). The nepheline content of this belt, which extends southeast across lot 12, is very variable from band to band. Except for the occasional band that is composed almost exclusively of nepheline, the bands are very rich in biotite or hornblende,

or both. The contact phase adjacent to the crystalline limestone is a garnet-hornblende rock containing varying amounts of calcite and nepheline.

Chip samples of the nepheline-albite gneiss were taken at three of the stripings. Separation of the biotite and hornblende from the nepheline and albite by an electromagnetic separator even though pulls of 1, 6, and 15 amperes were used, was not obtained.

A bromoform separation was made by the Provincial Assay Office on 10 grams from a 1-pound sample cut from a 20-pound chip sample, ground to -28 mesh, which had been taken from the third stripping north from the road (see Fig. 9) across the strike of the gneissic structure for a distance of 70 feet, with the following results: black minerals, 59.1 per cent.; white minerals, 40.8 per cent.

Microscopic examination indicates a fairly clean separation. The black-mineral fraction consists mainly of a dark-brown mica with some hornblende and magnetite, and the white-mineral fraction of albite and altered nepheline. An analysis of the white-mineral fraction gave alumina, 27.36 per cent.; silica, 54.59 per cent.; and iron, 0.84 per cent. Whether a product of similar grade could be obtained by a high intensity magnetic separation is not known to the writer.

The future of such biotite- or hornblende-rich nepheline rocks for ceramic uses seems limited as long as large supplies of relatively pure nepheline syenite are available at low cost.

Peterborough County

METHUEN TOWNSHIP

Concession VI, Lot 21

The Canadian Flint and Spar Company, Limited, own two parcels of land, one consisting of claims E.O. 2,221, 2,222, 2,447, and 2,448, comprising parts of lots 20 and 21 in concession VI, and the other, claim E.O. 1,922, comprising parts of lots 18 and 19 in concessions VI and VII, Methuen township.

The work to date consists of extensive stripping and some pitting at the northeast end of the Blue mountains just northwest of Little Devil lake in lot 21, concession VI. The stripping is approximately 200 feet square and exposes a fine- to medium-grained, sugary-textured, ferromagnesian-poor nepheline syenite cut by a few stringers of nepheline pegmatite.

An analysis of the product that could be obtained from this body of nepheline syenite has been published by Davis,¹ and is reproduced below:—

	Per cent.
SiO ₂	60.06
Al ₂ O ₃	23.76 (24.25)
Fe ₂ O ₃.....	.05 (0.06)
CaO.....	1.00
MgO.....	.22
K ₂ O.....	5.00
Na ₂ O.....	8.92
Loss on ignition.....	.52
Total.....	99.52

Concession IX, Lot 14

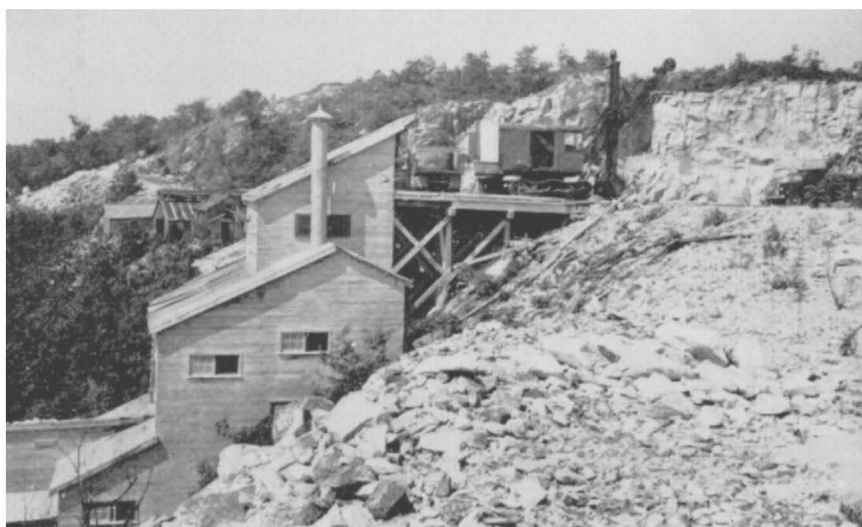
The American Nepheline Corporation, successors to Canadian Nepheline, Limited, which acquired the Blue Mountains nepheline syenite deposit from the Nepheline Company, Limited, operate a quarry on lot 14, concession IX, Methuen township, on the southeast face of the Blue mountains above Little

¹N. B. Davis, "Nepheline Syenites of Ontario," Jour. Can. Ceramic Soc., Vol. 6, 1937, p. 53.

Mountain lake. The rock is trucked for 4 miles to Stony lake, and then transported for 16 miles on scows to Lakefield. Material for Canadian use is ground in a mill at Lakefield. For American consumption crude rock is shipped by



View looking northeast along the southeast face of the Blue mountains and overlooking the quarries of the American Nepheline Corporation, lot 14, concession IX, Methuen township, Peterborough county, June, 1942. The crusher-house is just to the right of the shovel; Mountain lake, centre background; and former quarry sites to the left.

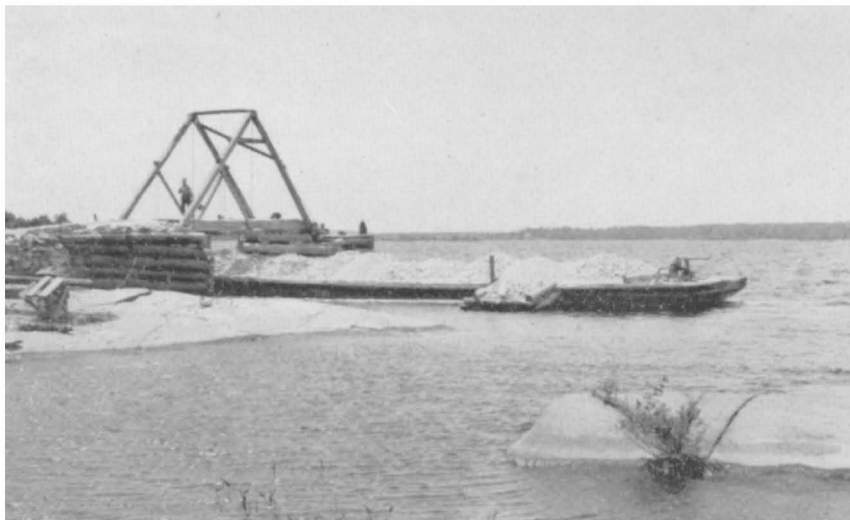


View looking west on the property of the American Nepheline Corporation on the Blue mountains, Methuen township, Peterborough county, June, 1942. The crusher-house is in the foreground; second quarry, on the right; and third quarry, left background.

train 50 miles to Cobourg and 60 miles by train ferry to Rochester, where the company's mill is located.

Production has been continuous since 1936, and three quarries have been

opened up in the course of operations. Quarry operations are confined to a period of about eight or nine months a year, a large stock pile being accumulated at the Lakefield dock each season to take care of winter mill requirements.



Unloading platform and scow laden with nepheline syenite at the east end of Stony lake, Burleigh township, Peterborough county, June, 1942. The nepheline syenite is from the Blue Mountains property of the American Nepheline Corporation.



Austin clam at dock, Lakefield, unloading nepheline syenite from scows, June, 1942. A 20,000-ton stock pile is built up each year at this dock for transhipment by rail to Cobourg and rail ferry to the mill of the American Nepheline Corporation at Rochester.

For further details of the operations the reader is referred to papers by Spence¹ and Nicholson.²

¹Hugh S. Spence, "Nepheline Syenite: a New Ceramic Raw Material from Ontario," *Mining Technology*, Vol. 2, No. 4, 1938; T.P. 951.

²C. M. Nicholson, "Developing Canada's Nepheline Syenite," *Can. Min. Jour.*, Vol. 61, 1940, pp. 135-146.

The properties of the American Nepheline Corporation in Methuen township consist of a block of 42 claims at the northeast end of the Blue mountains in concessions VI to VIII; a block of 7 claims at the southeast end in concessions IX to XII; lot 14 and the east half of the east half of lot 15 in concession IX; the west 50 acres of lot 15 and the southeast quarter of lot 17 in concession VIII; and the northwest quarter of lot 16 in concession VII.

Chemical analyses of the two products produced have been published by Nicholson,¹ and are reprinted below.

	No. 1	No. 2
	per cent.	per cent.
SiO ₂	60.24	60.44
Al ₂ O ₃	24.05	23.66
Fe ₂ O ₃.....	.06	.60
TiO ₂.....	.002	.....
CaO.....	.15	.30
MgO.....	.02	.04
K ₂ O.....	5.01	5.04
Na ₂ O.....	10.03	9.40
Loss on ignition.....	.46	.70
Total.....	100.022	100.18

Sample No. 1—Lakefield nepheline syenite, grade A.

Sample No. 2—Lakefield nepheline syenite, grade B.

The geology of the Blue mountains is described on page 14 of this report.

PEAT

The only attempts to work any of the peat deposits of the area for fuel were made about 40 years ago near Victoria Road, Victoria county. Recent operations have been for the sale of peat moss.

Victoria County

BEXLEY TOWNSHIP

Concession I, Lots 3, 4

CARDEN TOWNSHIP

Concession X, Lots 3, 4

The Victoria Road peat bog, about 1 mile north of Victoria Road station on the Canadian National railway, is situated in lots 3 and 4, concession I, Bexley township, and lots 3 and 4, concession X, Carden township.² A good road crosses its east side.

The approximate area of the bog is 67 acres, and the approximate content 638,700 cubic yards. The estimated workable volume is 400,000 cubic yards, from which an estimated possible production of fuel with 25 per cent. moisture is 54,000 tons.³

An experimental plant for the manufacture of peat fuel was built about 1905 by D. H. and E. V. Moore near Victoria Road.⁴

¹C. M. Nicholson, "Developing Canada's Nepheline Syenite," Can. Min. Jour., Vol. 61, 1940, p. 144.

²E. Nystrom and S. A. Anrep, "Investigation of the Peat Bogs and Peat Industry of Canada during the Season 1908-9," Mines Branch, Can. Dept. Mines, No. 30, 1909, pp. 18, 19, map on p. 22.

³B. F. Haanel, "Final Report of the Peat Committee," Mines Branch, Can. Dept. Mines, No. 641, 1928, p. 38.

⁴Ont. Bur. Mines, Vol. XIV, 1905, pt. 1, p. 23.

Leverin¹ reports as follows on the deposit:—

The peat has been classified as well humified fuel peat. The bog was once worked for peat fuel, the Victoria Road bog being in fact one of the earlier Canadian ventures for peat fuel on a manufacturing basis. Recent development reveals only two feet of fuel peat, well humified, overlying six feet of only partially humified moss of sphagnum and hypnum origin. The bog cannot be effectively drained below 4 to 5 feet except at considerable expense, wherefore in excavating at that drainage level equal quantities of both kinds of peat would be produced.

The bog is at present worked on a small scale to produce top-moss, humus, and peat moss. The working face at a depth of eight feet is kept dry by pumping.

The humus is obtained from the two-foot humified stratum cut in brick form, dried first on the bog, then broken up and dried on a drying platform, and finally in a rotary dryer. The humus is finely ground and is sold as a very dry powder.

The moss is cut in sods of the usual size, 5 by 5 by 18 inches, is dried on the bog, stacked, shredded, and bagged. The owner expects to produce 500 tons of peat products in 1941.

ELDON TOWNSHIP

A deposit of peat on the route of the Trent Valley canal system in Canal lake, 3 miles west of Victoria Road station, Eldon township, was worked in 1900 and 1901 by the Trent Valley Peat Fuel Company, Limited, of Peterborough. The bog covers about 10 square miles in one large muskeg on both sides of the canal. The water lies flush with the surface of the mass, and the depth of the peat is from 4 to 50 feet.²

PYRITE

Disseminated pyrite is not uncommon in many of the rock types of the area and is partly the cause of the rusty weathering so frequently seen in the paragneiss group. Occurrences of massive pyrite or pyrrhotite that might be considered as commercial sources of sulphur are rare, and only one deposit has been brought to the writer's attention.

Peterborough County

GALWAY TOWNSHIP

Concession XVIII, Lot 10

A pyrite deposit on the farm of Robert Hughes is situated in the south central part of lot 10, concession XVIII, Galway township. One shallow pit was excavated on the deposit by Hughes in 1929, but most of the workings were made under the direction of P. E. Hopkins late in 1929. This work is reported³ to have consisted of 35 pits excavated at 15-foot intervals and a trench 50 feet in length. The pits were from 3 to 6 feet deep. The writer found only 14 pits during his visit in 1942. As many of these were in low swampy ground they were filled with water and leaves, and several others on higher ground were partially caved in. The pits were spaced at various distances over a length of 225 feet in a direction approximately northwest and southeast. The westernmost pit seen exposed crystalline limestone, which dips about 10° S.E. No sulphides were present. In a pit 25 feet to the southeast sulphides were seen in place on the north wall. Pyrite occurs in masses as much as 1½ inches in diameter in a dark groundmass containing 50 to 75 per cent. pyrrhotite. From samples on the dump the wall rock appears to be a silicified crystalline limestone. Samples from the dumps around water-filled pits 125 to 225 feet from the first pit consist of pyrrhotite containing nodules of pyrite and a little magnetite.

¹H. A. Leverin, "Peat Moss Deposits in Eastern Canada," Bur. Mines and Geology, Can. Dept. Mines and Resources, Memorandum Series, No. 80, March, 1941, pp. 61, 62.

²Ont. Bur Mines, Vol. XII, 1903, p. 209.

³P. E. Hopkins, private communication.

Hopkins¹ reports that the pits exposed massive unaltered sulphides, which underlie a gossan capping ranging in thickness from 1 to 4 feet, over an area 110 feet in length and 50 feet or more in width. Owing to the flat angle at which the deposit is apparently dipping, an apparent width of 50 feet does not represent the true width of the deposit. From the data available, the true width of the deposit is calculated to be about 10 feet.

Nine representative samples of the unaltered sulphides taken by P. E. Hopkins from the various pits were analysed by the Provincial Assay Office, Toronto, and gave an average sulphur content of 42.43 per cent. The deposit contains no gold or nickel and only a very small silver content.

RADIOACTIVE MINERALS

Radioactive minerals, principally pitchblende, have been found in the pegmatites in Cardiff and Monmouth townships, Haliburton county, and in one instance in a deposit of the apatite-fluorspar-calcite pegmatite type near Wilberforce. Although considerable development has been carried out there has been no commercial production to date of radium or uranium from any of the deposits.

Haliburton County

CARDIFF TOWNSHIP

Concession XII, Lot 9

For a description of a radium occurrence at Canada Radium Mines, Limited, in lot 9, concession XII, Cardiff township, see the account under Feldspar on page 28 of this report.

Concession XII, Lot 10

Ellsworth² has described an occurrence of ellsworthite from lot 10, concession XII, Cardiff township. A shaft, 8 feet square, had been sunk to a reported depth of 30 feet on a reddish calcite vein 1½ to 5 feet wide. The vein contains black mica and apatite. The ellsworthite crystals occur embedded in calcite or in some cases weathered loose in cavities.

This lot is now part of the property owned by Canada Radium Mines, Limited.

Concession XXI, Lots 4 and 5

Uraninite was first discovered in 1922 by W. M. Richardson on lot 4, concession XXI, Cardiff township. Further prospecting revealed the presence of uraninite at a number of places in an area 250 feet wide and 3,100 feet long. Ontario Radium Corporation, Limited, was organized to develop the showings and was succeeded by International Radium and Resources, Limited, and later by Wilberforce Minerals, Limited. The holdings consist of lots 4 and 5, concession XXI, and lots 4, 5, 6, concession XXII, Cardiff township. Most of the development on the property was carried out in the years 1929, 1930, and 1931, and consists of surface trenching, an adit about 600 feet long in the side and 50 feet below the top of a hill, and drifting and raising from this adit. A shaft has been sunk 50 feet from the top of the hill to the adit. The deposit has been described in papers by Spence and Carnochan,³ Carnochan,⁴ and Ellsworth.⁵

¹Information taken from a private report by P. E. Hopkins.

²H. V. Ellsworth, "Rare-element Minerals of Canada," Geol. Surv. Can., Econ. Geol. Series No. 11, 1932, pp. 227, 228.

³Hugh S. Spence and R. K. Carnochan, "The Wilberforce Radium Occurrence," Trans. Can. Inst. Min. and Met., Vol. 33, 1930, pp. 34-73.

⁴Hugh S. Spence and R. K. Carnochan, "The Wilberforce Radium Occurrence," Mines Branch, Can. Dept. Mines, 1930, No. 719, pp. 1-23.

⁵R. K. Carnochan, "Concentration of a Radium Ore from Cardiff Township, Haliburton County, Ontario," Mines Branch, Can. Dept. Mines, No. 720, 1929, pp. 166-170.

⁶H. V. Ellsworth, op. cit., pp. 213-227.

Much of the information that follows is taken from Ellsworth's report,¹ which contains two sketch maps of the property, one of which is reproduced as Fig. 11. Ellsworth describes showings from 14 pits scattered in a northeast and southwest direction at intervals in a length of 3,100 feet. The country rock in the neighbourhood of the deposits is mainly a pink and grey granite or granite gneiss, which at the mouth of the adit strikes N. 45° E. and dips 27° S.E., but towards the east end the rock is a biotite-scapolite gneiss.

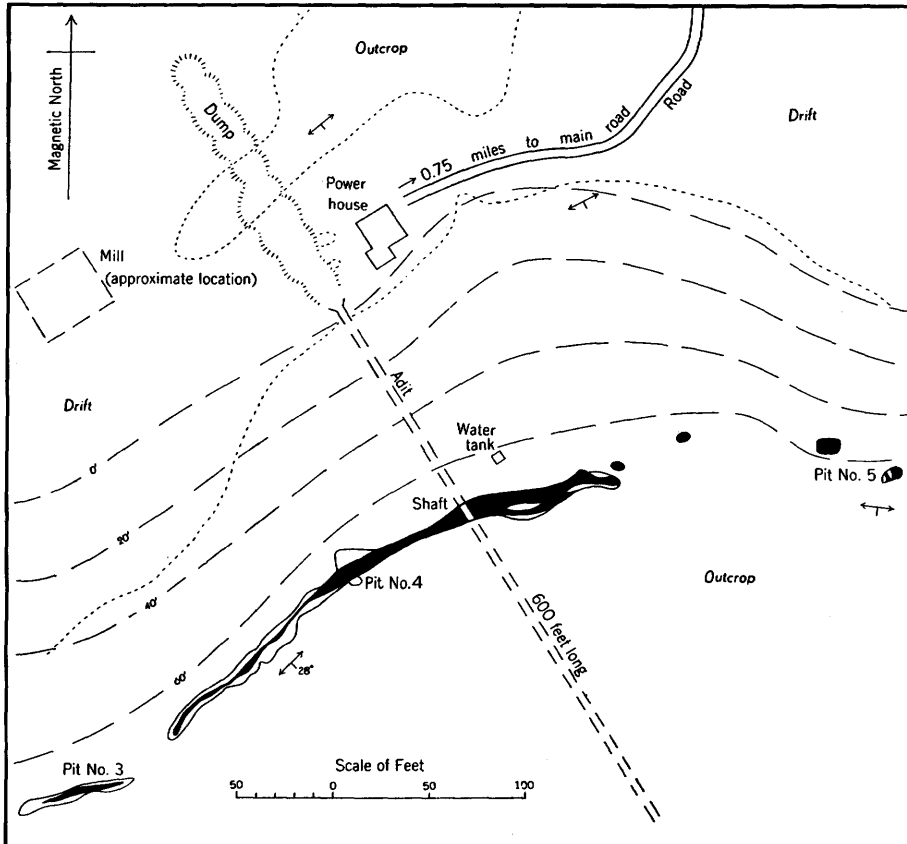


Fig. 11—Sketch map of the main workings of Wilberforce Minerals, Limited, in lots 4 and 5, concession XXI, Cardiff township, Haliburton county. Vein material is shown in solid black. (Slightly modified after Ellsworth.)

The uraninite occurs in a series of roughly parallel, long, narrow, vein-shaped bodies trending about N. 55° E. and dipping 30° to 35° S. These vein-shaped bodies pinch and swell, ranging in width from a few inches to 12 feet. One of these bodies has an exposed length of 275 feet.

The vein-like bodies are composed chiefly of interbanded strongly sheared calcite and purple fluor spar and minor amounts of feldspar, black hornblende, apatite, and magnetite. In some places crystals of such typical pegmatite minerals as uraninite, allanite, zircon, molybdenite, and titanite occur. Quartz is reported by Ellsworth from only 4 of the 14 pits.

From the information available it is apparent that the percentage of urani-

¹H. V. Ellsworth, op. cit., pp. 214, 215.

nite present is low, and insufficient bulk sampling has been carried out to show the actual amount of radium per ton of rock present. A test shipment of 36 tons of selected (?) ore from No. 4 pit was sent to the Ore Testing Laboratory, Mines Branch, Ottawa, for concentration tests. This ore contained about 0.33 milligrams of radium per ton.

In the United States in 1940 sales of radium in small lots were made at \$30 per milligram. At that price the above ore would be valued at \$9.90 per ton. It has yet to be proved that any tonnage of ore of such grade is present.

MONMOUTH TOWNSHIP

Concession XII, Lot 15

Uraninite is reported to have been found by C. Earle on lot 15, concession XII, Monmouth township. Several pits have been opened up. The main pit, 10 by 20 feet and 10 feet deep, is situated 3 chains east of the boundary line between lots 14 and 15 and 24 chains south of the road on the boundary line between concessions XII and XIII. A second pit, 10 by 15 feet and 4 feet deep, is 70 feet at N. 70° E. from the main pit; and a third pit, 10 by 15 feet and 3 feet deep, is 75 feet from the second in the same direction. A fourth pit is 150 feet south of the main pit and near the lot boundary.

The rocks exposed consist of a medium- to coarse-grained pink and brownish-green pegmatite with accessory magnetite and a medium-grained hornblende syenite-pegmatite cut by a 4- to 5-foot hornblende-apatite-calcite-feldspar vein striking N. 70° E. and dipping 45° S. Accessory minerals are sphene and scapolite. No uraninite was seen by the writer. The calcite-bearing part of the vein was opened up by the main pit.

It is understood that the mineral rights of this lot are held by F. B. Brower and Alvar H. Simpson.

Concession XII, Lot 17

On the west side of the road between Tory Hill and Essonville in lot 17, concession XII, Monmouth township, a trench 180 feet long, from 6 to 10 feet wide and a few feet deep, exposes a hornblende syenite-pegmatite containing apatite and a little calcite. No uraninite or rare-element minerals were found by the writer. A variety of rare-element minerals are reported by the owners, F. B. Brower and Alvar H. Simpson.

Concession XIII, Lot 14

A pit 4 by 7 feet and 4 feet deep has been sunk 1 chain north of the south boundary of lot 14, concession XIII, Monmouth township. The pit was put down on a lens of calcite, apatite, and hornblende about 3 feet wide and 15 feet long in hornblende pegmatite. Minute grains of a radioactive (?) mineral were found in fragments of the pegmatite on the dump. A 6- to 8-inch vein of coarse hornblende and calcite, striking N. 80° E., cuts fine-grained, pink granite 20 feet north of the above-mentioned pit.

STONE

A number of quarries have been opened up in both the pre-Cambrian and Paleozoic rocks for crushed stone, building and monumental stone, lime, and miscellaneous uses. The rock types quarried are mainly Paleozoic and pre-Cambrian limestones and to a lesser extent granite, pegmatite, amphibolite, anorthosite, gabbro, and basalt.

Analyses and descriptions of many of the limestone occurrences are given in a report by Goudge.¹ The analyses have been reprinted in the section of this report on Limestone and Dolomite (see page 51).

Haliburton County

CARDIFF TOWNSHIP

Concession XI, Lot 31

A small quarry has been opened up on the north side of the road adjacent to a stream in lot 31, concession XI, Cardiff township, on an exposure of white to cream crystalline limestone containing locally clusters of tremolite crystals. No shipments appear to have been made, and the site is quite unsuited for a quarry operation.

DYSART TOWNSHIP

Block W, Haliburton

A large quarry, now idle, was formerly operated by Bolender Brothers in block W, Haliburton, Dysart township, for the production of terrazzo chips, poultry grit, stucco dash, and artificial stone in a small plant at this location. Material is now obtained from a limestone deposit in Guilford township (see page 87 of this report). The Dysart deposit, known as the White Star mine, has been described and illustrated by Goudge.²

The quarry, which is 160 feet long, has been worked back 120 feet into the north side of a hill of coarsely crystalline white dolomite in which are numerous elongated masses of diopside (Plate XIII A, page 85), streaks of serpentinous limestone, and zones in which many flakes of black and brown mica are present. The dolomite band has an exposed width of 250 feet. It strikes N. 80° E. and dips southerly into the hillside at an angle of 30 degrees.

An analysis (No. 20) is given on page 52 of this report.

GLAMORGAN TOWNSHIP

Concession IV, Lot 23

In 1941, a small quarry for test shipments was opened up by the Ritchie Cut-Stone Company, Limited, in a black massive gabbro on lot 23, concession IV, Glamorgan township. The quarry operations show that the rock breaks with a very irregular fracture. A well-defined jointing is absent. A mill block lying in the quarry, despite the fact it was drilled at closely spaced intervals, had broken irregularly. The deposit would not appear to have commercial possibilities. The company reports³ that the rock took a very good polish and was very black, and would make a good monumental stone if it could be quarried in suitable sizes.

Concession VI, Lot 2

Marble was obtained about the year 1890 for monumental purposes from a quarry in lot 2, concession VI, Glamorgan township, but the output was very small. The marble occurs along the north edge of a hill, forming a belt about 20 feet wide. The rock is a white crystalline dolomite containing flakes of mica or disseminated brown spots.⁴

Tombstones made from this marble may be seen in the cemetery at Gelert.⁵

¹M. F. Goudge, "Limestones of Canada," Pt. IV, Ontario, Bur. Mines, Can. Dept. Mines and Resources, No. 781, 1938, pp. 83-88, 134-141, 146-152, 196-203.

²Ibid, p. 84 and plate XIII A on p. 85.

³Personal communication.

⁴W. A. Parks, "Report on the Building and Ornamental Stones of Canada," Vol. I, Mines Branch, Can. Dept. Mines, No. 100, 1912, p. 319. (Listed in error as concession V.)

⁵F. D. Adams and A. E. Barlow, op. cit., p. 195.

GUILFORD TOWNSHIP**Concession IV, Lot 25**

Bolender Brothers operate a quarry in lot 25, concession IV, Guilford township, just north of the road and a quarter of a mile west of Eagle Lake village.

In August, 1942, the quarry was 60 feet square with a 25-foot face and is situated on the southwest slope of a ridge rising 100 feet above the general level. The rock is a coarse, white crystalline dolomite. On the 25-foot quarry face the dolomite is traversed by 4 bands of black biotite schist, representing metamorphosed beds of shale, pinching and swelling from a few inches to lenses 1 foot thick. The bedding strikes N. 55° W. and dips 45° S.W. This schist is discarded in the quarrying. In 1942 about 20 tons a day was being trucked to Bolender Brothers own crushing plant in Haliburton and the product sold for poultry grit and stucco dash under the trade name White Star.

An analysis of the crushed material from this quarry furnished by the owners is silica, 11.60 per cent.; iron oxide and alumina, 0.20 per cent.; calcium carbonate, 50.28 per cent.; magnesium carbonate, 37.82 per cent.

A small test quarry has been opened up in white crystalline limestone on the west side of the road from Eagle Lake village to Redstone lake in this same lot.

MINDEN TOWNSHIP**Concession III, Lot 5**

Just southeast of the road in lot 5, concession III, Minden township, there is an abandoned quarry, which is 70 feet wide and has a 25-foot face 200 feet long. The rock exposed is a flat-lying, pink pegmatitic granite gneiss containing a few narrow bands of biotite or hornblende gneiss. The quarry is owned and was operated by the Orillia Water, Light and Power Commission, Orillia. The crushed stone was used for concrete aggregate in the construction of the dam for the power plant on the Gull river.

Concession V, Lot 22

An abandoned quarry to the north of the highway in lot 22, concession V, Minden township, exposes a sugary, white, impure anorthosite cut by pink syenite dikes and containing inclusions of micaceous crystalline limestone. The crushed rock was used for road metal.

Concession XIII, Lot 18

An abandoned quarry to the north of the road, just east of Carnarvon, in lot 18, concession XIII, Minden township, was operated as a source of road metal. The rock is a complex of impure, white crystalline limestone containing abundant phlogopite and tremolite and inclusions of amphibolitic rock, which constitute 25 per cent. of the exposure. Stringers of quartz-calcite-tremolite-pyrrhotite vein the complex.

MONMOUTH TOWNSHIP**Concession VIII, Lot 7**

Allan Hadley reopened in 1935 a small quarry, which was first operated in 1912, in a fine-grained, pink granite in lot 7, concession VIII, Monmouth township, adjacent to the south side of the Gooderham-Tory Hill road. The quarry is 40 feet by 50 to 75 feet and from 15 to 20 feet deep. Jointing occurs at intervals from 2 to 6 feet apart trending N. 20° E. and dipping 80° W. Joints were also

observed trending N. 50° E and N. 65° W. The rock is cut by irregular stringers of pegmatite and black seams of quartz and biotite. Some pyrite was observed. Owing to the uneven splitting and the presence of stringers, much of the rock quarried was waste. F. W. Chubb reports that selected material was shipped to monument-makers in Toronto, and a shipment was made for granite paving stones. Total shipments were about 150 tons. Tombstones of this material may be seen at St. John's cemetery, Toronto, and in the cemetery at Gooderham.

SNOWDON TOWNSHIP

Concession XIV, Lot 22

Bolender Brothers, of Haliburton, opened up a small quarry in a medium-grained, dark-green amphibolite 5 chains north of the road in lot 22, concession XIV, Snowdon township. The quarry is 40 by 25 feet with a 6-foot face. The owners report that the quarry was operated for several weeks during 1939 and 1940 to secure rubble for the milling of chips to be used for stucco dash and ornamental concrete. About 80 tons of granules were sold. The quarry is now idle.

Muskoka District

DRAPER TOWNSHIP

Concession XIII, Lots 3, 4

Muskoka Quarries, Limited, operated a granite quarry in 1921 on parts of lots 3 and 4, concession XIII, Draper township.¹ The land is now the property of the Town of Bracebridge. There is no recorded production.

MUSKOKA TOWNSHIP

Gravenhurst

Gravenhurst Crushed Granite Company, Limited, operated a quarry in biotite granite gneiss in the town of Gravenhurst for the production of crushed stone in the years 1915, 1918, and 1921.

Gravenhurst, Lot 8

The National Potash Corporation, Limited, operated a quarry at Muskoka Wharf in lot 8 of the town of Gravenhurst from 1917 to 1919, producing crushed rock for road metal. The rock is a biotite gneiss containing stringers of feldspar. The company planned to recover potash from the feldspar and built a plant for this purpose. It was unsuccessful.

Ontario County

MARA TOWNSHIP

Concession VIII, Lot 14

The following description of a limestone quarry near Millington is taken from Goudge's report:²—

On or about lot 14, concession VIII, Mara township, on the northeast side of the highway, the Trenton limestone is but lightly covered with soil and has been quarried for road metal. When seen in 1934, the quarry was nearly full of water and only 4 feet of fine-grained, light bluish grey, hard limestone in flat beds 2 to 6 inches thick, was visible. Thin partings of dark grey shale occur between the beds, all of which are rather uneven and have rough surfaces.

An analysis (No. 9) of this limestone is given on page 53.

¹Ont. Dept. Mines, Vol. XXXI, 1922, pt. 1, p. 43.

²M. F. Goudge, op. cit., p. 138.

Concession A, Lot 13

Goudge has described a limestone quarry near Gamebridge, and the information below is reprinted from his report:¹—

A short distance west of Gamebridge station on the Canadian National railway, a quarry was formerly worked in Trenton limestone on lot 13, concession A, Mara township, by Gamebridge Limestone Products Company, for the production of crushed stone and agricultural limestone. . . . Twenty-one feet of flat-lying strata are exposed in the quarry, which is about 150 feet in diameter. The top 13 feet is fine- to medium-grained, nodular, brownish grey, fossiliferous limestone in beds 1 to 7 inches thick separated by seams of shale. Many of the fossils are silicified, and 4 feet from the top is a bed in which are many small nodules of hard, blue chert. The remaining 8 feet exposed consists of thin beds of fine-grained, nodular limestone interbedded with thick seams of calcareous shale.

An analysis (No. 10) of the top 12 feet is given on page 53.

RAMA TOWNSHIP

Concession A, Lot 11

A small quarry in Paleozoic limestone is located on the north side of the road in lot 11, concession A, Rama township.

Front Concession, Lots 20, 21, 22, 23, and 24

Longford Quarries, Limited, operated limestone quarries in the eastern parts of lots 20 to 24, Front concession, Rama township. Goudge has written a very detailed description of these deposits, and the information that follows is from his report.² Eight analyses are reprinted on page 53.

The property is between the Canadian National railway track and the west shore of Lake St. John, just north of Longford station. It was acquired in 1936 from the Lake St. John Quarry Company, Limited, and includes the quarries in the Black River formation formerly worked for building stone by the Longford Quarry Company, Limited, as well as two of the quarries farther north that were worked for crushed stone and for flux.

The production of the buff and grey magnesian limestone, known to the trade as "Rama" stone, was begun here in 1933 by Lake St. John Quarry Company, Ltd. The stone takes a good polish and is marketed for use as marble, as well as for exterior building stone. . . . These strata were not reached by previous operators as they lie from 3 to 12 feet below the floors of the old quarries, and elsewhere are covered by 25 feet of nearly flat-lying, high-calcium limestone, that forms a bluff along the shore of the lake. The dense-textured, white-weathering high-calcium limestone is well known by the name of "Longford" stone throughout central and eastern Ontario, where, until 20 years ago, it was extensively used as a building stone. . . .

Rama stone has been used for the exterior facing of the head office of the Imperial Bank at Toronto, and also for exterior trim in the post offices at Weston, West Toronto, Georgetown, Brussels, Cannington, Burk's Falls, and Kingsville in Ontario. As a polished marble it is to be seen in the Montreal postal terminal building, and in the post offices at Notre Dame de Grace (Montreal), Fort William, and Guelph, as well as in a number of buildings in Toronto.

Up to 1913, when the furnaces of the Canada Iron Corporation at Midland closed down, stone from this quarry was used for fluxing purposes.³

There were no operations in 1940. Longford Quarries, Limited, surrendered its charter, and the property was purchased by Queenston Quarries, Limited. The latter company did not operate the quarries in 1941 or 1942.

Front Concession, Lots 26 and 27

The Midland Iron and Steel Company, Limited, worked a Paleozoic limestone quarry near Longford in the eastern parts of lots 26 and 27, Front con-

¹M. F. Goudge, op. cit., pp. 138, 140.

²Ibid, pp. 135-138.

³Ont. Bur. Mines, Vol. XXV, 1916, pt. 1, p. 148.

cession, Rama township, from October, 1918, to August, 1919. The product was used for flux in the Midland blast furnaces.¹

Rama Island

From 1912 to 1916 and again in 1919, Granite Crushed and Dimension, Limited, operated a granite quarry near Washago on Rama island, Rama township, for road metal and crushed stone.²



Mill block, 3 by 4 by 5 feet, of porphyritic biotite granite in the quarry of the Stoney Lake Granite Quarries, Limited, on lot 32, concession XII, Dummer township, Peterborough county.

Peterborough County

BELMONT TOWNSHIP

Concession VI, Lots 6 and 7

The Ontario Rock Company, Limited, quarry both limestone and trap rock on lots 6 and 7, concession VI, Belmont township, 3 miles east of Havelock. A spur line, three-quarters of a mile long, connects the crushing plant with the main line of the Canadian Pacific railway.

The trap quarry is situated to the northeast of the crushing plant in lots 6 and 7, concession VI. The trap is a green, fine-grained basalt, which is in part amygdaloidal and has been described previously in this report (see page 12). In 1941 over 80,000 tons of this material was sold as crushed stone of various sizes for use as road metal and railway ballast. The capacity of the crushing plant is 600 tons of half-inch size per 24 hours.

The coyote or tunnel method of blasting was introduced by G. W. Rayner and has been used since 1921³ by the company to secure rock for crushing purposes.

¹Ont. Bur. Mines, Vol. XXIX, 1920, pt. 1, p. 130.

²Ibid, p. 126.

³G. W. Rayner, personal communication.

Descriptions of this method of blasting have been published in two bulletins of Canadian Industries, Limited.¹ Depending on market requirements, one blast may be sufficient for one or two years' operations. H. L. Scott² reports that the largest blast at the quarry was made in 1922 when 30 tons of 40 per cent. dynamite was used, resulting in an estimated break of 200,000 tons of rock. In recent years the blasts have been smaller; that in 1943 broke an estimated 50,000 tons of rock, 8,265 tons of 60 per cent. dynamite being used.

Goudge³ describes the limestone quarry as follows:—

The limestone quarry is 600 yards south of the trap rock quarry and is opened in the face of an escarpment about 30 feet high which is covered with 1 foot or more of soil. The limestone is of Black River age and is in flat-lying beds up to 3 feet in individual thickness. The top 5 feet exposed in the quarry is dark brown, very fine-grained, high-calcium limestone mottled in an irregular manner with yellowish earthy material. This mottling is not observable in the remainder of the stone, which toward the base becomes dense-textured and lighter in colour and contains much secondary calcite. At the base of the quarry shaly beds are seen.

The limestone quarry is only operated for short periods each year. In 1941 slightly over 10,000 tons of crushed stone was sold for road metal and railway ballast. The capacity of the crushing plant is 1,500 tons of 2-inch size per 24 hours. An analysis (No. 30) of this limestone is given on page 53.

DOURO TOWNSHIP

Concession VII, Lot 16

A quarry in Trenton limestone was formerly operated by the Canada Cement Company, Limited, in connection with Plant No. 7 at Lakefield, just southeast of the village on the south half of lot 16, concession VII, Douro township. Goudge⁴ describes the quarry as follows:—

It is of the side-hill type and is opened along the side of a low escarpment facing northwest and trending N. 75° E. The present face is 400 yards long and attains in places a height of 40 feet which will be increased somewhat as the quarry is worked farther into the hill. Only a few inches of soil cover the limestone, which is thinly bedded, fine to medium in grain, of a dark blue-grey colour, and is interbedded with blue-grey calcareous shale, the shale being most prevalent in the lower half of the quarry face where it is about equal in amount to the limestone.

The following analyses supplied by the company as being representative of successive 10-foot sections of the deposit from the surface to a depth of 50 feet are quoted by Goudge⁵ and reproduced below:—

	0-10 feet	10-20 feet	20-30 feet	30-40 feet	40-50 feet
SiO ₂	10.30	11.90	12.58	13.74	12.20
Fe ₂ O ₃ and Al ₂ O ₃	4.50	3.82	4.70	5.94	5.00
CaO.....	46.02	44.50	43.53	42.42	44.29
MgO.....	1.41	1.66	1.99	1.90	1.72
Loss on ignition.....	37.20	36.80	36.34	35.12	35.56
Total.....	99.43	98.68	99.14	99.12	98.77

DUMMER TOWNSHIP

Concession XII, Lot 32

The Stoney Lake Granite Quarries, Limited, of Lakefield, operated two small quarries in the east half of lot 32, concession XII, Dummer township. The rock is a medium-grained, light- to medium-red, porphyritic biotite granite pos-

¹Canadian Industries, Limited, Explosives Bulletin, No. 52, June, 1931, and No. 64, August, 1937.

²H. L. Scott, Superintendent, Ontario Rock Company, Limited, personal communication.

³M. F. Goudge, op. cit., p. 151.

⁴Ibid, p. 148.

⁵Ibid.

sessing a well-developed sheeting, which allows the removal of mill blocks up to 3 by 4 by 5 feet in dimensions (see photograph on page 90). In 1940 about 3,000 cubic feet of mill blocks were sold to the Ritchie Cut-Stone Company, Limited, of Toronto. This stone was used for monumental purposes and to a lesser extent as facing material on buildings in Ottawa and London. No sales were reported for 1941, but 2,500 cubic feet of mill blocks was quarried. The property is owned by R. G. Kilbon and F. S. Coyle, of Lakefield.

SMITH TOWNSHIP

Concession XVI, Lot 44

A quarry in Paleozoic limestone in lot 44, concession XVI, Smith township, is recorded by Miller.¹

Victoria County

ELDON TOWNSHIP

Portage Road, North Side, Lot 49

Goudge² describes the quarry of the Kirkfield Crushed Stone Company, Limited, in Trenton limestone in lot 49, Portage Road, North side, Eldon township, as follows:—

This company operates a quarry for the production of crushed stone, asphalt filler, and agricultural limestone a short distance north of where the Coboconk branch of the Canadian National railway crosses the Trent canal, about $1\frac{1}{2}$ miles northeast of Kirkfield. The quarry is of the pit type, is 300 yards in diameter, and is 40 feet deep. All the stone is brownish in colour, rather hard, and thin-bedded and thin seams of blue-weathering, calcareous shale occur at intervals of 2 to 9 inches. . . . As is shown by the analysis of the samples taken in this quarry, the rock in the top 17 feet is somewhat purer than that beneath [see analyses Ncs. 12 and 12A on page 54 of this report] Drilling by the former owner indicated a depth of 200 feet of limestone on the property.

SOMERVILLE TOWNSHIP

Concession III, Lot 17

Goudge³ records an abandoned quarry in the south half of lot 17, concession III, Somerville township, close to the track of the Canadian National railway. The quarry exposes 20 feet of light-coloured, fine-grained to dense-textured Black River calcium limestone, in horizontal beds from 4 to 20 inches thick.

Concession IV, Lot 12

A quarry in lot 12, concession IV, Somerville township, extends south into the Paleozoic limestone escarpment just southeast of the highway, $1\frac{3}{4}$ miles south of Burnt River village.

Concession VI, Lot 13

Britnell and Company, Limited, formerly operated a quarry in lot 13, concession VI, Somerville township. It is not now in operation. Goudge⁴ describes it as follows:—

The quarry extends for 400 yards in a southwesterly direction along a low ridge of Black River limestone and has a width of 100 yards. It is 20 feet deep and an additional 4 feet of stone is exposed in a pit near the centre.

Two analyses (Nos. 16 and 16A) of this limestone are quoted on page 54 of this report. The quarry ceased operations in 1922.

¹W. G. Miller, Ont. Bur. Mines, Vol. XIII, 1904, pt. 2, p. 98.

²M. F. Goudge, op. cit., pp. 196-198.

³Ibid, pp. 201, 202.

⁴Ibid, p. 201.

Concession IX, Lot 8

Goudge¹ describes an occurrence of limestone in lot 8, concession IX, Somerville township, as follows:—

On the southern part of lot 8, concession IX, Somerville township, 3 miles northeast of Burnt River, are large exposures of medium-grained to coarsely crystalline, white and bluish white, calcium limestone of Grenville age. Some bands up to 50 feet in width consist of relatively pure limestone containing only a small amount of graphite and silicate minerals, but interbedded with this are bands of impure calcium limestone containing masses of quartz and various silicate minerals and also much graphite. Some of this impure stone is rusty on the weathered surface. . . . A small quarry was once opened here with the intention of producing marble.

Two analyses (Nos. 17 and 17A) of this limestone are quoted on page 54.

Front Concession, Lot 36

Goudge² describes the quarry of the Toronto Brick Company, Limited, in Black River limestone in lot 36, Front concession, Somerville township, as follows:—

The quarry is opened along the edge of the escarpment and is 500 feet long and extends back 250 feet from the edge and in it 20 feet of limestone is exposed, of which the top 8 feet is rather thinly bedded, but the remainder is in beds up to 18 inches in thickness. These beds are at the same geological horizon as those quarried by the Canada Lime Company. . . . Only one kiln has been operated by this company in recent years. The entire output of lime . . . is shipped in burlap bags to the company's brick plant in Toronto where it is used in the making of sand-lime brick.

The quarry is now idle. The lime kilns were closed down late in 1934. For an analysis (No. 14) of the limestone see page 54.

Front Concession, Lot 37

The operations of the Canada Lime Company, Limited, at Coboconk, in lot 37, Front concession, Somerville township, are described by Goudge³ as follows:—

The quarry and lime plant of this company are situated along the escarpment of Black River limestone on the eastern outskirts of the village. The quarry is of the side-hill type and extends for 600 feet along the escarpment and has been worked back for 300 feet from the edge. In it 29 feet of fine-grained to dense, brown, oolitic high-calcium limestone . . . is exposed.

Three analyses (Nos. 13, 13A, and 13B) are quoted on page 54 of this report.

¹M. F. Goudge, *op. cit.*, p. 202.

²*Ibid*, pp. 199-201.

³*Ibid*, p. 199.

APPENDIX I

Recent Developments on Fluorspar Showings

Owing to recent developments on some fluorspar occurrences near Wilberforce, the writer was instructed to examine two of these during the field season of 1943; the results of his examination are set out in the following descriptions.

CARDIFF TOWNSHIP, HALIBURTON COUNTY

Concession XVII, Lot A, North Half

In 1943, Cardiff Fluorite Mines, Limited, successors to the Burnt River Syndicate, were actively developing a number of occurrences of fluorspar in the north half of lot A, concession XVII, Cardiff township, under the direction of A. H. Smith. The occurrences were examined in July and September, 1943. The showings are about half a mile southeast of G. Barnes' farm, which is 3 miles by road southeast of Wilberforce.

The showings and workings are on the top of a bush-covered rock ridge rising some 200 feet above the Irondale (Burnt) river, which lies just to the west.

The north stripping, 65 feet long and 60 feet wide, is on the east slope of the ridge. It exposes a coarse hornblende syenite-pegmatite containing some remnants of gneiss, and in the lower half of the stripping numerous weathered pockets are seen to be lined with crystals of red apatite, pyroxene, some feldspar, and more rarely scapolite. These pockets indicate that an apatite-fluorspar-calcite mineralization is in the form of irregular lenses or pods in the pegmatite, which measure from a few inches to 6 by 5 by 4 feet.

Openings have been made at a number of places between the north and south showings disclosing fluorspar in pegmatite, or fluorspar aggregate. None of these occurrences is of any appreciable size.

The south stripping, which is 250 feet S. 20° W. from the north stripping, is about 65 feet square. It is also on the east slope of the ridge. The slope is 40 degrees. The rocks exposed are hornblende syenite gneiss, which strikes N. 15° E. and dips vertically, and pegmatite. In the latter are numerous areas of an aggregate, composed of calcite, fluorspar, and red or green apatite, which range in size from a few feet to 20 by 25 feet. The largest lens appears to dip 30° E. It is apparent that the fluorspar mineralization here forms lenses or pods of no great length or thickness.

Just south of the south stripping a small stripping exposes an area, 13 by 8 feet, of calcite-fluorspar mineralization with an exposed thickness of 3 feet. This is probably another small lens.

At 45 feet in a direction N. 70° W. from the south end of the south stripping several small pits have exposed a 1- to 1½-foot vein of calcite and fluorspar striking N. 10° E. and dipping 45° E. At 240 feet N. 70° W. from the south stripping a vein of calcite and fluorspar is exposed in the cliff face overlooking the Irondale river. This vein was traced northwards for 120 feet and ranges in width from 1 to 4 feet. To the south the vein is exposed as irregular lenses in the face of the cliff at intervals for 100 feet. One of the lenses that could be examined was 8 by 8 feet and 2 feet thick and contained about 30 per cent. fluorspar. The vein appears to cut the gneissic structure and has various dips from flat to steep.

Concession XVIII, Lot 2

Cardiff Fluorite Mines, Limited, has also taken over the assets of Cardiff Fluorspar Mining Syndicate, Limited, which held the North Godfrey claim in lot 2, concession XVIII, Cardiff township. In May and June, 1943, 17 holes,

from 31 to 85 feet long and aggregating 1,000 feet, were drilled under the direction of J. K. McFarlane. The showings in the old workings as seen in 1942 are briefly described on page 32 of this report. No work was in progress at the property in either July or September, 1943.

The drilling indicates two mineralized lenses. The fluor spar mineralization in these lenses occurs (1) as an aggregate of calcite and fluor spar and (2) as stringers and blebs in phlogopite-pyroxene-rich crystalline limestone. One lens is about 60 by 90 feet with a maximum thickness of 15 feet and may average 7 feet. The second lens is about 60 by 120 feet and has a maximum thickness of 15 feet. Insufficient data are available to determine its average thickness. These lenses plunge at low angles (25° to 30° ?) to the southeast.

APPENDIX II
Reference List by Townships to the Mineral Occurrences in
the Haliburton Area

TOWNSHIP	CONCESSION AND LOT	METAL, MINERAL, OR ROCK	FOR DESCRIPTION SEE PAGE
HALIBURTON COUNTY			
CARDIFF	V, 11	Molybdenum	60
	VI, 22	Garnet	35
	VII, 22	Garnet	35
	IX, 6	Molybdenum	61
	IX, 18	Molybdenum	61
	X, 11	Molybdenum	61
	X, 14	Molybdenum	61
	XI, 12	Molybdenum	63
	XI, 27	Molybdenum	63
	XI, 28	Mica	56
	XI, 31	Stone	86
	XII, 9	Feldspar; fluorspar; radium	28; 32; 83
	XII, 10	Radium	83
	XIV, 18	Graphite; molybdenum	40; 63
	XV, 18	Graphite	40
	XVII, A	Fluorspar	94
	XVIII, 2	Fluorspar	32, 94
	XIX, 22	Apatite	20
	XX, 3	Molybdenum	63
	XXI, 4	Radium	83
	XXI, 5	Fluorspar, radium	83
	XXI, 8	Fluorspar	32
	XXI, 9	Fluorspar	33
	XXII, 7	Mica	56
XXII, 8	Fluorspar	33	
XXII, 9	Fluorspar	34	
XXII, 11	Graphite	41	
XXII, 13	Fluorspar	34	
XXII, 24	Graphite	41	
DYSART	Haliburton, block W.	Stone	86
GLAMORGAN	III, 32	Nepheline	71
	IV, 23	Stone	86
	IV, 25	Old workings	—
	IV, 30	Nepheline	71
	IV, 34	Nepheline	73
	IV, 35	Iron	44
	V, 32	Molybdenum	64
	VI, 2	Stone	86
	VI, 29	Old workings	—
	VI, 31	Feldspar	29
	VI, 32	Feldspar	29
	XIII, 30	Iron	45
	XIII, 33	Mica	56
	XIII, 34	Mica; molybdenum	56; 65
	XV, 27	Iron	45
XV, 28	Mica	56	
GUILFORD	IV, 25	Stone	87
HARCOURT	I, 3	Molybdenum	65
	IX, 11-13	Garnet	35
LUTTERWORTH	II, 7, 8	Molybdenum	66
	IV, 12	Corundum	22
	V, 23	Molybdenum	66
	VI, 5	Iron	45

TOWNSHIP	CONCESSION AND LOT	METAL, MINERAL, OR ROCK	FOR DESCRIPTION SEE PAGE
MINDEN.....	III, 5.....	Stone.....	87
	V, 22.....	Stone.....	87
	XIII, 18.....	Stone.....	87
MONMOUTH.....	VI, 11.....	Nepheline.....	75
	VI, 14.....	Nepheline.....	77
	VIII, 7.....	Stone.....	87
	VIII, 10, 11.....	Nepheline.....	77
	X, 13.....	Mica.....	57
	X, 16.....	Mica.....	57
	X, 34.....	Old workings.....	—
	XI, 12.....	Molybdenum.....	66
	XI, 15.....	Apatite.....	20
	XI, 26.....	Feldspar.....	30
	XII, 14.....	Molybdenum.....	66
	XII, 15.....	Radium.....	85
	XII, 17.....	Radium.....	85
	XII, 22.....	Mica.....	57
	XII, 23.....	Mica.....	57, 58
	XIII, 13.....	Molybdenum.....	67
	XIII, 14.....	Radium.....	85
	XIII, 32.....	Graphite.....	41
	XIV, 10.....	Molybdenum.....	67
	XIV, 11.....	Old workings.....	—
	XIV, 35.....	Graphite.....	42
	XV, 10.....	Molybdenum.....	67
	XV, 11.....	Molybdenum.....	67
	XV, 12.....	Molybdenum.....	67
	XV, 17.....	Molybdenum.....	68
	XV, 30.....	Feldspar.....	30
	XV, 33.....	Molybdenum.....	68
XV, 35.....	Graphite; mica.....	42; 58	
XVI, 31.....	Molybdenum.....	69	
XVI, 32.....	Molybdenum.....	69	
XVI, 34, 35.....	Graphite.....	43	
XVII, 32.....	Molybdenum.....	69	
SNOWDON.....	I, 17.....	Iron.....	45
	I, 20.....	Iron.....	45
	II, 19.....	Iron.....	46
	III, 19.....	Old workings.....	—
	III, 20.....	Old workings.....	—
	IV, 26.....	Iron.....	46
	V, 33.....	Iron.....	46
	XIV, 22.....	Stone.....	88

MUSKOKA DISTRICT

BRUNEL.....	XIV, 16.....	Feldspar; mica.....	30; 58
CHAFFEY.....	I, 8.....	Clay.....	21
	V, 32.....	Old workings.....	—
	X, 13.....	Mica.....	58
	X, 18.....	Diatomite.....	25
	X, 19, 20.....	Diatomite.....	25
DRAPER.....	X, 3, 4.....	Diatomite.....	25
	XIII, 3, 4.....	Stone.....	88
	XIII, 5.....	Clay.....	21
MACAULAY.....	VI, 30.....	Diatomite.....	25
MORRISON.....	West Muskoka Road, 33-36.	Diatomite.....	26

TOWNSHIP	CONCESSION AND LOT	METAL, MINERAL, OR ROCK	FOR DESCRIPTION SEE PAGE
MUSKOKA	Gravenhurst	Stone	88
STEPHENSON	II, 26, 27	Feldspar	30
	XIII, 24	Old workings	—
	XIII, 24-26	Diatomite	26
	XIV, 23	Diatomite	26
	XIV, 24	Diatomite; feldspar	26; 31
	XIV, 25, 26	Diatomite	26
STISTED	I, 22, 23	Diatomite	26
	II, 22, 23	Diatomite	26
	II, 25, 26	Diatomite	27
	VIII, 7, 8	Diatomite	27
	XI, 19	Diatomite	27

ONTARIO COUNTY

MARA	VIII, 14	Stone	88
	A, 13	Stone	89
RAMA	A, 11	Stone	89
	Front concession, 20-24 ..	Stone	89
	Front concession, 26, 27 ..	Stone	89
	Rama island	Stone	90

PARRY SOUND DISTRICT

McMURRICH	I, 18	Old workings	—
	II, 15	Old workings	—
PERRY	I, 3	Diatomite	28

PETERBOROUGH COUNTY

ANSTRUTHER	I, 38	Graphite	43
BELMONT	I, 7, 8	Iron	47
	I, 19	Garnet; gold; iron	35; 36; 48
	I, 20	Gold	36
	II, 17	Garnet	35
	IV, 20	Iron	48
	V, 8	Copper	21
	V, 15	Iron	49
	VI, 6, 7	Stone	90
CHANDOS	II, 28	Iron	49
	X, 10	Old workings	—
DOURO	VII, 16	Stone	90
DUMMER	X, 31	Old workings	—
	XII, 32	Stone	91
GALWAY	IX, 18	Lead	49
	X, 17	Lead	49
	XIII, 16	Graphite	43
	XIV, 16	Old workings	—
	XVIII, 10	Pyrite	82
	A, 20	Lead	50
HARVEY	XVIII, 31	Marl	55

TOWNSHIP	CONCESSION AND LOT	METAL, MINERAL, OR ROCK	FOR DESCRIPTION SEE PAGE
METHUEN	I, 2	Lead	50
	VI, 21	Nepheline	78
	VII, 15	Mica	59
	VII, 16	Mica	59
	VIII, 14, 15	Corundum	23
	IX, 13	Corundum; mica	23; 59
	IX, 14	Corundum; mica; nepheline	23; 59; 78
	IX, 15	Corundum	23
	X, 14	Corundum	23
SMITH	XVI, 44	Stone	92

VICTORIA COUNTY

DALTON	XII, 25	Old workings	—
BEXLEY	I, 3, 4	Peat	81
CARDEN	X, 3, 4	Peat	81
ELDON	Canal lake. Portage Road, North Side, 49.	Peat	82
		Stone	92
LAXTON	XI, 5	Molybdenum	70
SOMERVILLE	III, 17	Stone	92
	IV, 12	Stone	92
	V, 2	Lead	50
	VI, 13	Stone	92
	VII, 1	Lead	51
	IX, 8	Stone	93
	XI, 1	Garnet	35
	A, 3	Molybdenum	70
	Front concession, 36	Stone	93
Front concession, 37	Stone	93	

INDEX, PART II

A	PAGE		PAGE
Access.....	2	Beaver meadows.	
Acknowledgments.....	2	Diatomite, notes and analyses.....	24, 25
Adams, F. D.....	3	Bell, L. V.....	37
Affenby molybdenite occurrence.....	67	Belmont iron m.....	44
Agglomerate.....	12	Garnets.....	35
Agricultural land.....	5	Report on.....	48
Air-Lite Silica Co., Ltd.....	25	Belmont lake.....	12
Albite.....	14, 16, 18, 32	Basalt, analysis.....	9
In nepheline pegmatite, notes and photo.....	77	Limestones, analyses.....	54
Replaced by nepheline, photo.....	73	Belmont tp.	
Alcock, F. J.....	3	Copper.....	21
Alkali syenite.....	8, 9	Garnets.....	35
Analysis.....	18	Gold deposits.....	36-40
Petrography.....	13-18	<i>see also</i> Cordova g. m.....	47-49
Replacement by, photos showing.....	14, 15	Iron deposits.....	98
Allanite.....	31, 84	Mineral occurrences listed.....	8-11
Alumina.		Rocks.....	9
Recovery of, from nepheline.....	71	schist, analysis.....	90, 91
American Molybdenites, Ltd.....	69	Stone quarries.....	53
American Nepheline Corp.....	2, 14, 59, 71	limestone, analyses.....	59
Properties, report and photos.....	13, 78-81	Bennett's mica m.....	81, 82
Amphibolite.....	9, 11, 12	Bexley tp., peat.....	9-11
Quarried.....	88	Biotite gneiss.....	88
Amygdaloidal lava.....	9, 12, 90	Quarried.....	74
Analyses.		Biotite-nepheline-albite gneiss, photo..	84
Alkali syenite.....	18	Biotite-scapolite gneiss.....	5
Diatomite.....	24	Black river.....	52, 53, 55
Dolomite.....	53-55, 87	Analyses.....	89, 91-93
Limestones.....	53-55	Quarried.....	44
cement.....	91	Blairton iron m.....	47, 48
Magnetite.....	48	Report on.....	45
titaniferous.....	44	Blue, Archibald.....	4
Nepheline syenite.....	15, 78, 81	Blue mountains.....	21
Anderson molybdenite prospect.....	66	Corundum.....	14
Anorthosite.....	8, 12, 13	Map, coloured, geological.... <i>facing</i>	59
Quarried for road metal.....	87	Mica.....	14, 78-81
Anson tp.....	6	Nepheline syenite.....	15, 78
Anstruther tp.....	5, 10	analyses.....	13, 79
Graphite.....	43	quarries, photos.....	4
Anticlinal fold, photo.....	16	"Blueberry barrens".....	8, 55
Apatite.....	16, 31-34	Bog lime.....	55
Deposits described.....	19, 20	Bolender Brothers.....	86-88
Separation of, from fluorspar.....	31, 32	Bolton, L. L.....	3
Arkose.....	8	Bracebridge.....	7, 10, 25
Artificial stone.....	86	Brick-clay.....	20, 21
Ashworth.....	27	British Molybdenite, Ltd.....	64
Austin swamp.....	28	Britnell and Co., Ltd., quarry.....	92
Ayrhart, J. E.....	59, 60	Limestone, analysis.....	55
B		Brodie, J. A.....	5, 6
Bailey, G.....	25	Brough Lake Molybdenite, Ltd.	
Baker, M. B.....	21	Property, report and sketch map....	61-63
Balsam lake.....	4, 5	Brower, F. B.....	77, 85
Banding.		Brummell, H. P. H.....	24
In nepheline syenite.....	16	Brunel tp.	
In paragneiss, notes and photo.....	10	Feldspar; mica.....	30
Barlow, A. E.....	3	Bruton tp.....	7, 12
Barnes, G.....	32, 42, 94	Buckhorn lake.....	5
Barrette lake.....	18	Buck's village.....	7
Basalt.....	8, 9	Building stone.....	89
Analyses, various.....	9	Burleigh tp.....	5, 6, 10
Quarried.....	90	Corundum.....	22
Basic intrusives.....	12	Burnt river.....	5, 44
<i>See also</i> Diorite; Gabbro; Peridotite.		Burnt River.	
Basic volcanics.....	8, 9	Limestone, analysis.....	55
<i>See also</i> Basalt.		quarries.....	92, 93
		Burnt River Syndicate.....	94

C	PAGE
Calcite veins.	
Apatite in	19
Fluorspar in	31-34, 94, 95
Galena in	49
Mica in	57
Radioactive minerals in	83-85
Cameron lake	5
Canada Cement Co., Ltd.	91
Canada Iron Corp.	89
Canada Lime Co., Ltd.	54, 93
Canada Radium Mines, Ltd.	83
Canadian Diatomite and Silica Co.	28
Canadian Flint and Spar Co., Ltd.	78
Canadian Industries, Ltd.	91
Canadian Kieselguhr Co., Ltd.	26, 27
Canadian Land and Emigration Co. of London, Eng.	7
Canadian Land and Immigration Co. of Haliburton, Ltd.	7, 65
Canadian Molybdenite Mines, Ltd.	67, 68
Canadian Multi-Cell, Ltd.	26, 27
Canadian Nepheline, Ltd.	78
Canadian Radium Mines, Ltd. Feldspar mg., notes and photo	28, 29
Canal lake	82
Cancrinite	16, 74, 76
Carbonate. In nepheline pegmatite	74
Veins. <i>See</i> Calcite veins.	
Carden tp., peat	81, 82
Cardiff Fluorite Mines, Ltd.	94
Cardiff Fluorspar Mg. Synd., Ltd.	94
Cardiff Molybdenite Mines, Ltd.	63
Cardiff tp. <i>See also</i> Wilberforce.	
Apatite	20
Corundum	22
Feldspar	28, 29
Fluorspar	31-34, 94
Garnet	53
Graphite	40, 41
Limestone, analysis	52
quarry	86
Mica	56
Mineral occurrences listed	96
Molybdenite	60-64
Radioactive minerals	83, 84
Rocks	9-11
Carnochan, R. K.	83
Carr, R.	45, 46
Cavendish tp.	5, 18
Cement, limestone for	91
Cenozoic deposits	8, 19
Chaffey tp. Brick-clay	21
Diatomite, notes and analysis	24, 25
Mica	58
Mineral occurrences listed	97
Cheddar	29
Chlorite schist	8, 9
Chubb, F. W.	2, 57, 58, 88
Clark, W. E.	34
Clay	8, 20, 21
Clear lake	5
Clyde tp.	7
Coboconk	8, 55, 93
Coe, W.	45, 46
Conglomerate	8-11
Consolidated Lead Mines, Ltd.	50
Consolidated Mining and Smelting Co. Gold mg. <i>See</i> Cordova g. m.	2

	PAGE
Copper	21
Cordova gold m.	1
Report, plan and sections	36-40
Cordova river	5
Corundum, deposits	21-23
Coyle, F. S.	92
Croft corundum property	23
Crowe lake	47
Crowe river	5
Crown Corundum and Mica Co.	23
Crown King lead prospect	51
Crystalline limestone. <i>See</i> Limestone, crystalline.	
Cup lake	40

D

Dalton tp.	99
Daly, R. A.	9
Davis, N. B.	78
Davis lake	66
Diabase	8, 18, 19
Diatomite	8
Deposits, description and analyses	24-28
Diatomite Products, Ltd.	26, 27
Dickson, R.	63
Diorite	8, 9, 12
Gold deposits in	37
Dixon mica m.	56
Dixon molybdenite m.	63
Dolomite	8, 9, 11
Notes and analyses	51-55
Quarries	86, 87
Dominion Diatomite, Ltd.	28
Dominion Molybdenites, Ltd.	69
Dougherty, E. Y.	64
Doughty, A. G.	8
Douro tp., limestone	90, 91
Downing, S. C.	6
Drainage	4, 5
Draper tp. Brick-clay	21
Diatomite, notes and analyses	24, 25
Granite quarry	88
Mineral occurrences listed	97
Dudley tp.	7, 12
Apatite	19
Dummer tp.	11
Copper reported	21
Granite quarry, notes and photo	90-92
Limestone, analyses	53
Mineral occurrences listed	98
Dwyer, P. J.	29, 34
Dysart tp.	6, 7
Apatite	20
Dolomite, analysis	52
quarry	86
<i>See also</i> Haliburton.	

E

Eagle Lake	87
Eardley-Wilmot, V. L.	3
Earle, C.	85
East river	5
Eels brook	5
Eldon tp. Limestone, analysis	54
quarry	92
Peat	82
Elliott, R.	70

	PAGE		PAGE
Ellsworth, H. V.....	4, 83	Gneiss— <i>Continued</i>	
Ellsworthite.....	31, 83	<i>See also</i> Biotite, Hornblende, Nepheline-albite, Syenite gneisses.	
Evans, Alex.....	61	Gold.....	1
Explorations, early.....	3, 4	Deposits described.....	36-40
Eyre tp.....	7	Gooderham.....	13, 15
		Limestone near.....	52
F		Nepheline syenite.....	16, 71
Fairy lake.....	30	Gooderham-Nepheline property.....	73
Farquart lake.....	65	Goudge, M. F.....	3
"Feather amphibolite".....	11	Granite.....	8, 9
Feldspar.....		Petrography.....	13, 18
Deposits described.....	28-31	Quarried.....	87-91
Fenelon Falls.....	8	Granite Crushed and Dimension, Ltd.....	90
Fish.....	6	Granite gneiss.....	9, 13
Fishtail lake.....	35	Quarried.....	87, 88
Flaherty, F.....	49	Graphic granite pegmatite.....	28, 29
Fluorspar.....		Graphite.....	
Deposits described.....	31-34, 94, 95	Deposits described.....	40-43
Fluorspar, fetid.....	34	Gravenhurst.....	7, 88
Flux, limestone for.....	89	Greens mountain.....	4, 12
Forests.....	5, 6	Greywacke.....	9
Formations, table of.....	8, 9	Guilford tp.....	7
Foye, W. G.....	17	Dolomite quarry, notes and analysis.....	87
Fraser, J. A.....	71	Guillet, Edwin C.....	2, 8
Fraser nepheline syenite quarry.....		Gull river.....	5
Notes and photos.....	16, 17	Falls, photo.....	4
Furnace Falls.....			
Dolomite, analysis.....	52	H	
		Haanel, B. F.....	81
G		Hadley, Allan.....	87
Gabbro.....	8, 9, 12, 44	Haliburton.....	2, 7
Magnetite in.....	47	Limestone quarry.....	86
Monumental stone.....	86	Haliburton, Judge T. C.....	7
<i>See also</i> Anorthosite.		Haliburton co.....	5-7
Galway tp.....		Mineral occurrences listed.....	96, 97
Galena.....	49, 50	<i>See also</i> Anson, Bruton, Cardiff, Dudley, Dysart, Glamorgan, Guilford, Harcourt, Lutterworth, Minden, Monmouth, Snowden tps.	
Gold occurrences.....	36	Hall, S. W.....	30
Graphite.....	43	Hamilton Molybdenum Alloys Co., Ltd.....	66
Mineral occurrences listed.....	98	Hammond, F. C.....	31
Pyrite.....	82, 83	Harburn tp.....	7
Game.....	6	Harcourt tp.....	7, 12
Gamebridge Limestone Products Co.....	53, 89	Apatite.....	20
Gardiner, H. F.....	8	Garnets.....	35
Garnet, deposits.....	34-36	Molybdenite.....	65, 66
Garnetiferous gneiss.....	9, 10, 35, 36	Harvey tp.....	5
<i>See also</i> Paragneiss.		Marl.....	55
Genesee Feldspar Co., Inc.....	31	Hastingsite.....	14
Geology, general.....	8-19	Havelock.....	
Gibson, A.....	20, 57	Quarry near.....	90
Gibson, T. W.....	44	limestone, analysis.....	53
Gill nepheline property.....	17	Havelock tp.....	7
Report, sketch map, and photos.....	72-74	Heath, W. H.....	7
Glacial deposits.....	4, 5, 8, 19	Hematite, specular.....	49
Glacial Lake Algonquin.....	5, 19, 20	Henry molybdenite occurrence.....	67
Glamorgan tp.....		Hewitt, D. F.....	2
<i>See also</i> Gooderham; Greens mtn.		High Falls.....	7
Feldspar.....	29	Highland Grove.....	15
Iron deposits.....	44, 45	Historical notes.....	6-8
Limestone, analyses.....	52	Hopkins, A. Y.....	50, 66
Mica.....	56	Hopkins, P. E.....	2, 50, 82, 83
Mineral occurrences listed.....	96	Hopkins lead m.....	49, 50
Molybdenite.....	64, 65	Hornblende gneiss.....	9-11
Nepheline syenite.....	71-74	Molybdenite in.....	67, 68
<i>see also</i> Fraser quarry.		Hornblende schist.....	8, 9
Stone quarries.....	86	Hornblende syenite gneiss.....	71
Gneiss.....	8, 13	Hornblende syenite-pegmatite.....	31, 33
Hybrid, notes and photos.....	12, 13		
Quarried.....	87		
Sedimentary. <i>See</i> Paragneiss.			

	PAGE
Horscroft molybdenite m.....	70
Howe, C. D.....	6
Howland iron m.....	44, 46
Hughes, Robert.....	82
Huntsville.....	6
Diatomite near.....	26, 28
Feldspar near.....	30
Historical note.....	7
Huntsville Brick Works.....	21
Hutchison Bros.....	21
Hybrid gneisses.....	9, 10, 13
Banded, photo.....	12
Hydronephelite.....	16, 73, 74

I

Ilmenite.....	31
Imperial Corundum Co.....	23
Imperial iron m.....	44, 46, 47
Indians.....	6
Industrial Minerals Corp. of Can., Ltd.....	30, 33
International Radium and Resources, Ltd.....	83
Intrusives.....	9
Petrography.....	12-19
Iron, deposits described.....	44-49
Irondale.....	52
Irondale river.....	5, 44, 94

J

Jamieson, R.....	8
Johnston, A.....	23
Johnston, W. A.....	3
Johnston molybdenite deposit.....	68
Joiner, W. E.....	61
Joiner molybdenite property. Report and sketch map.....	63, 64

K

Kasshabog lake.....	23, 59
Kawartha lakes.....	5, 8
Keith, M. L.....	14, 15, 18
Keweenaw diabase.....	8, 18
Kilbon, R. G.....	92
Kirkfield Crushed Stone Co., Ltd.....	54, 92
Knight, C. W.....	3

L

Lake Algonquin, glacial.....	5, 19, 20
Lake Muskoka.....	4
Lake of Bays.....	19
Lake St. John Quarry Co., Ltd.....	89
Lake Simcoe.....	4
Lakefield.....	7
Nepheline syenite stock pile, photo..	80
Land and Immigration Co., Ltd.....	7, 65
Landon, F.....	8
Laxton tp., molybdenite.....	70
Lead, deposits described.....	49-51
Ledyard gold m.....	36
Ledyard iron m. See Belmont iron m.....	27
Lee lake.....	82
Leverin, H. A.....	67
Lillico, R. J.....	66, 67
Lillico molybdenite m.....	66, 67
Lime, limestone for.....	93
See also Marl deposits.	

	PAGE
Limestone (Paleozoic).....	8, 19
Economic notes and analyses.....	51-55, 91
quarries.....	89, 92
see also Black River, Trenton limestones.	
Limestone, crystalline (pre-Cambrian). Analyses.....	53, 54
Graphite in.....	41-43
Nephelized.....	73, 74
Petrography.....	11
Photos.....	16, 17, 74
Quarries.....	86, 87, 93
Limonite, concretionary.....	46
Lindeman, E.....	3
Little Bear lake.....	65
Little Devil lake.....	78
Little Mountain lake.....	23, 79
Longford Quarries, Ltd.....	53, 89
Longford tp.....	7
Lovesick lake.....	5
Lutterworth tp.....	6
Corundum.....	22
Iron mg.....	45
Mineral occurrences listed.....	96
Molybdenite.....	66
Lynn mica m.....	59

M

Macaulay tp., diatomite.....	25, 26
McColl, Alex.....	57, 75
McCue lake.....	57
MacDougall, B. E.....	40, 41, 63, 69
McFarlane, J. K.....	95
McKay, Allan.....	31
Macklem, F. P.....	28
McLean tp., diatomite.....	24
McMahon, F.....	63
McMurrich tp.....	98
Madawaska river.....	5
Madill, T.....	71
Madill, William.....	67
Madill corundum property.....	23
Magnesian limestone. See Dolomite.	
Magnetite. Deposits, notes and analyses.....	44-46
Garnet associated with.....	35, 45
Maps, geological, coloured. Blue mountains.....	facing 14
Haliburton area (No. 52a).....	in pocket
Map, key.....	1
Maps, sketch. Brough molybdenite property.....	62
Gill nepheline property.....	72
Joiner molybdenite property.....	facing 64
Mackay nepheline property.....	76
Nepheline rocks, Monmouth tp.....	75
Uraninite deposits, Cardiff tp.....	84
Mara tp.....	7
Stone quarries.....	88, 89
limestone, analyses.....	53
Marble.....	86
See also Limestone, crystalline.	
Marl deposits.....	55
Martin Siding.....	26
Mathews-McMahon molybdenite pros- pect.....	63
Methuen tp.....	4, 6
Corundum.....	22, 23
Galena.....	50
Mica.....	59, 60

	PAGE		PAGE
Methuen tp.— <i>Continued.</i>		Muskoka Quarries, Ltd.	88
Mineral occurrences listed	99	Muskoka river	5
Rocks	8-10		
granite batholith	18	N	
nepheline syenite	13, 78-81	National Graphite Co.	41
quarry, photo	13	National iron m.	44, 45
<i>See also</i> Blue mountains.		National Potash Corp., Ltd.	88
Mica, deposits described	55-60	Natural resources	5, 6
Middleton, J. E.	8	Need, T.	8
Midland Iron and Steel Co., Ltd.	89	Nepheline	16
Mill blocks, granite	92	Alumina content	71
Photo	90	Nepheline-albite gneiss	16, 18, 78
Millar's phosphate mine	20	Replaced by alkali syenite, photos	14, 15
Miller, W. G.	3	Nepheline-albite pegmatite, photo	77
Miller corundum property	23	Nepheline Co., Ltd.	78
Millington	88	Nepheline pegmatite	15, 16, 71-77
Mills, S. Dillon	65	Carbonate in	74
Minden	7	Photos	16, 73, 77
Falls near, photo	4	Nepheline syenite	76, 78-81
Minden tp.	7, 12	Alteration in	15
Stone quarry	87	Analyses	15, 78, 81
Mineral occurrences.		Jointing in, photo	13
Listed	96-99	Petrology	13-18
Reports on	19-95	Quarries, photos	13, 79
Mississauga river	5	Nepheline syenite gneiss	16
Molybdenite	1	New York Graphite Co.	41
Deposits described	60-71	New York iron m.	44, 45
Molybdenum	60	Nicholson, C. M.	80, 81
Molybdenum Products Co.	69	Ninatigo lake	5
Monmouth tp.	6	North Godfrey fluorspar claim	94
Apatite	20	Northern Diatomite, Ltd.	26
Feldspar	30	Novar	28
Graphite	41-43		
Mica	57, 58	O	
Mineral occurrences listed	97	Oakley tp., diatomite	24
Molybdenite	66-70	O'Brien, M. J. molybdenite mg.	61
Radioactive minerals	85	Ontario co.	
Rocks	10, 11	Stone quarries	88-90
nepheline	15, 17, 75-78	limestones, analyses	53
distribution, map showing	75	Ontario Feldspars, Ltd.	30
photos	14, 15, 17, 77	Ontario Radium Corp., Ltd.	83
Stone quarries	87, 88	Ontario Rock Co., Ltd.	53, 90, 91
limestone, analysis	52	Ordovician rocks	8, 19
<i>See also</i> Tory Hill; Wilberforce.		<i>See also</i> Limestone (Paleozoic).	
Montgomery, F. K.	33	Orillia	6, 7
Montgomery, R. J.	20	Orillia Water, Light and Power Comm.	87
Monumental stone	88, 92	Orr, F. O.	61
Monzonite	64	Orr-Kidd molybdenite prospect	60
Moore, D. H.	81	Osterhause's mica m.	59
Moore, E. V.	81	Otter creek.	
Moore lake	66	Nepheline gneiss, notes and photos	14-16
Moose lake	5	Oxtongue river	5
Moraines	5		
Morrison, T.	32, 42, 43	P	
Morrison tp., diatomite	26	Padwell, G., molybdenite property	67, 68
Morrow, R.	25	Paleozoic rocks	8, 19
Mountain lake	60	<i>See also</i> Limestone (Paleozoic).	
Mud Turtle lake	70	Paragneiss	8, 9, 16, 17
Mumford	15, 41	Graphite in	41
Murray, A.	3	Nephelinized	17, 18, 73, 74
Muscovite mica	56, 58-60	Petrography and photo	10
Muskoka, origin of name	7	<i>See also</i> Garnetiferous gneiss.	
Muskoka Diatomite, Ltd.	26	Paraschist	14
Muskoka district.		Parks, W.	43
<i>See also</i> Bracebridge; Brunel, Chafey, Draper, Ridout, Stephenson tps.		Parks, W. A.	3
Diatomite	24, 25	Parry and Mills	44
Mineral occurrences listed	9	Parry Sound dist.	28, 98
Rocks	13, 19	Paudash Lake Molybdenite Mines, Ltd.	61
Stone quarries	88		

	PAGE		PAGE
Paxton iron m.	44, 45	Road metal	87, 88, 90
Peat	8	Roads	2, 7
Deposits described	81, 82	Robinson, A. H. A.	44
Diatomaceous	28	Robson, F. E.	26
analyses	24	Rorke, L. V.	6
Pegmatite	8, 18	Round lake	26
Feldspar in	28, 29	Russell, A. J. H.	70
Molybdenite in	60-68		
Radioactive minerals in	83-85	S	
<i>See also</i> Nepheline, Syenite pegmatites.		Sand	8
Peridotite	8, 9, 12, 13	Sarginson, A.	56, 63
Magnetite in	46	Scapolite	34, 84, 94
Peristerite	57	Scott, H. L.	91
Perry tp., diatomite	28	Sedimentary rocks	8, 9
Peterborough co.	5, 6	Gneiss. <i>See</i> Paragneiss.	
Gold deposits	36-40	Petrography	10, 11
Marl	55	Shale	8
Mineral occurrences listed	98, 99	Shallberg Molybdenite Co.	64
Stone quarries	90-92	Sharpe, J. F.	5, 6
limestones, analyses	53, 54	Shortt, A.	8
<i>See also</i> Anstruther, Belmont, Burleigh, Douro, Dummer, Galway, Harvey, Methuen tps.		Silver	36
Phlogopite mica	55-58	Simpson, Alvin H.	77, 85
Pigeon lake	5	Slocombe lake	26, 27
Pine Lake (Pusey) iron m.	44	Smith, A. H.	94
Pitchblende	83	Smith tp., limestone	92
Pleistocene	8, 19	Snowdon tp.	6
Ponton, D.	70	Dolomite, analysis	52
Porphyritic granite	18, 91	Iron deposits	45-47
Photo	90	Mineral occurrences listed	97
Poultry grit	86, 87	Quarry	88
Powell and Anderson molybdenite prospect	61	Sodalite	16, 73, 74, 77
Pre-Cambrian	9, 8-19	Somerville tp.	
Limestones, analyses	52-55	Garnet	35, 36
Pusey, C. J.	44-46	Gold prospect	36
Pusey iron m.	44	Lead mg.	50, 51
Pyrite		Limestone quarries	92, 93
Deposit	82, 83	Mineral occurrences listed	99
Gold in	40	Molybdenite	70, 71
Pyroxenite, molybdenite in	69, 70	Southby, H.	24, 25
Pyrrhotite	36, 40, 82	Specular hematite	49
		Spence, Hugh S.	3
Q		Spence lake, diatomite	24, 25
Quartz diabase	18, 19	Sphene. <i>See</i> Titanite.	
Quartzite	8, 9	Squaw river	5
Queenston Quarries, Ltd.	89	Stephenson tp.	
		Diatomite	26
R		Feldspar	30
Radioactive minerals	83-85	Mineral occurrences listed	98
Railway ballast	90	Stevens, C. H.	21
Rama tp.	7	Stisted tp.	
Limestones, analyses	53	Diatomite	26-28
quarries	89, 90	analyses	24
Raven lake		Stone	85-93
Hybrid gneiss, photo	12	Stoney Lake Granite Quarries, Ltd.	90, 91
Rayner, G. W.	90	Stony lake	4, 5, 18, 79
Recent deposits	8	Limestone, analysis	53
Redstone river	5	Photo	80
Replacement nepheline deposits	17, 18	Stormy lake	45
Of nepheline gneiss, photos	14, 15	Stucco dash	86, 87
Richardson, W. M.	83	Sturgeon lake	5
Riddell, A.	63	Sulphur. <i>See</i> Pyrite.	
Ridout tp.		Summerville Lead Mines, Ltd.	50
Diatomite occurrence	24	Syenite.	
Hybrid gneiss, banded, photo	12	<i>See</i> Alkali syenite; Nepheline syenite.	
Ritchie Cut-Stone Co., Ltd.	86, 92	Syenite gneiss.	
		Fluorspar veins in	33
		Mica in	59
		Syenite-pegmatite	17, 18, 71, 76
		Corundum in	21-23
		Feldspar in	30

	PAGE		PAGE
Syenite-pegmatite— <i>Continued.</i>		Victoria co.....	8
Fluorspar associated with.....	31	Mineral occurrences listed.....	99
Graphite in.....	41	Molybdenite.....	70, 71
		Peat.....	81, 82
T		Stone quarries.....	92, 93
Terrazzo chips, stone for.....	86	limestone, analyses.....	54, 55
Tett, B.....	23	See also Somerville tp.	
Titanite.....	20, 30, 69, 84	Victoria iron m.....	44, 45
Tomahawk Iron Mines, Ltd.....	49	Victoria lead m.....	50, 51
Tonkin-Dupont Graphite Co., Ltd.....	43	Virginia Graphite Co.....	43
Topography.....	4, 5	Volcanics.....	9
Toronto Brick Co., Ltd.....	55, 93		
Toronto Iron Co.....	44	W	
Tory Hill.....	57, 58	Walker, T. L.....	3
Nepheline syenite near.....	16	Wallis, J.....	8
Rocks near.....	18	Ware, L. H.....	21
Tory Hill Marble and Mica Co., Ltd.....	56, 65	Warsaw.....	53
Tourists.....	6	Washago.....	90
Trap quarry.....	90	Water power.....	6
Treasure Hill molybdenite m.....	61	Watson Brick Co.....	21
Trent Valley Peat Fuel Co., Ltd.....	82	White, J. H.....	6
Trenton limestone.		White Mica Mining Synd., Ltd.....	59
Analyses.....	53, 54	White Star quarry.....	86
Quarried.....	88, 89, 91, 92	Dolomite, analysis.....	52
Tripp fluorspar deposit.....	32	White Valley Chemicals, Ltd.....	55
Tuff.....	12	White Valley Mines, Ltd.....	55
Tynan's farm, diatomite.....	24	Wilberforce.....	13, 15
		Fluorspar near.....	32-34, 94, 95
U		Graphite near.....	40, 43
Uglow, W. L.....	50, 51	Limestone, analysis.....	52
Union Creek lead m.....	50	Molybdenite near.....	64, 69, 70
United Molybdenite Corp., Ltd.....	64	Nepheline syenite.....	16
Uraninite.....	31, 83-85	Radioactive minerals near.....	83
		Wilberforce Minerals, Ltd.....	32, 83, 84
V		Wilberforce Molybdenite Co., Ltd.....	68
Vanadium.....	44	Wilbermere lake.....	32, 42
Vanclleaf, D.....	25	Wilson, M. E.....	3
Vennor, H. G.....	50		
Ventures, Limited.....	2, 64	Z	
		Zircon.....	16, 71, 84

