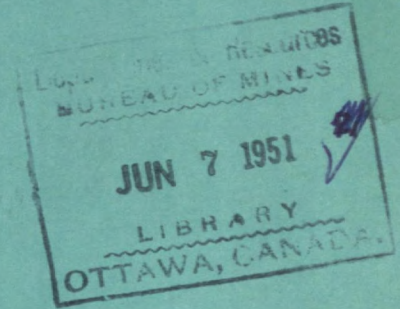


113-121

CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS
MINES BRANCH

OTTAWA



SURVEY OF THE COPPER RESOURCES OF CANADA

BY

W. R. McCLELLAND
MINERAL RESOURCES DIVISION

Memorandum Series No. 113

APRIL 1951

This document was produced
by scanning the original publication.

Ce document est le produit d'une
numérisation par balayage
de la publication originale.

CONTENTS

| | <u>Page</u> |
|--|-------------|
| I. Introduction | 1 |
| II. Canadian Copper-Producing Mines | 7 |
| Newfoundland | 7 |
| Quebec | 10 |
| Ontario | 18 |
| Manitoba | 22 |
| British Columbia | 25 |
| III. Non-Producing Copper Properties | 29 |
| Newfoundland | 29 |
| Nova Scotia | 37 |
| New Brunswick | 40 |
| Quebec | 42 |
| Ontario | 48 |
| Manitoba | 61 |
| Saskatchewan | 64 |
| Alberta | 64 |
| British Columbia | 65 |
| Yukon and Northwest Territories | 79 |
| IV. Copper Ore Reserves | 82 |
| Estimated Reserves of Producing Mines | 82 |
| Estimated Reserves of Non-Producing Properties | 83 |
| V. Concentrators, Smelters, and Refineries | 86 |
| VI. Conclusion | 88 |

MAPS AND GRAPHS

| | | |
|---------|--|----|
| Map 1 | Location of Principal Producing Copper Mines | 28 |
| Map 2 | Location of Principal Non-Producing Properties | 80 |
| Graph 1 | Copper Production in Canada 1900-1949 | 4 |
| Graph 2 | Copper Reserves | 84 |
| Graph 3 | Rated Concentrator Capacities | 86 |

SURVEY OF THE COPPER RESOURCES OF CANADA

by

W. R. McClelland

I. INTRODUCTION

Canada holds fourth position in the world output of copper and in 1950 produced 261,914 short tons of the metal, valued at \$122,552,157, a value that was exceeded only by gold in the Canadian output of metals and minerals for that year. About 40 per cent of the copper production is from the mines of The International Nickel Company of Canada Limited. Hudson Bay Mining and Smelting Company Limited and Noranda Mines Limited are in second and third positions respectively, together accounting for roughly 25 per cent of the production. Domestic consumption in 1950 amounted to approximately 110,000 tons, more than double the average annual domestic consumption in the five years (1935-39 inclusive) preceding World War II, and exports of virgin copper totalled 134,244 tons valued at \$59,665,730.

Copper thus occupies a high place in our national economy and is of great industrial and strategic importance. Canadian output during World War II was more than one-third of the total amount mined in the previous 50 years. Most of this production came from long-established mines. Since the war, however, several new deposits have been brought into production. The entrance of Newfoundland into confederation has added an important producing mine and other potential sources of ore to the copper resources of the Dominion. The rise in price of the metal and the strong demand in world markets has stimulated an active interest in exploration and prospecting, which has resulted

in new discoveries and in the re-examination of old mines and deposits that hitherto have been considered marginal. It is evident, therefore, that a review of the copper resources of Canada is of particular interest at present and the purpose of this survey is to present an overall picture of the growth of copper production in Canada, with a brief account of the principal copper occurrences, concentrators, smelters, and refineries.

Copper minerals are found in every province and in many parts of the Northwest Territories. The principal production has been confined to Ontario, British Columbia, Quebec, Manitoba, and Saskatchewan in the order named. In earlier years a small tonnage of ore was produced in Nova Scotia, New Brunswick, and the Yukon.

The first reported discovery of copper in Canada was at Cap d'Or, Nova Scotia, in 1604. In 1771 Samuel Hearne explored the Coppermine River area of the Northwest Territories for copper but was unsuccessful in finding the source of metal used by the natives of the region. It was not until 1847, when the Bruce mine in Algoma district, Ontario was discovered, that copper mining commenced in Canada. Here in 1848 the first Canadian copper smelter came into production. For many years copper mining was on a comparatively small scale and in 1886, the first year in which the statistics of Canadian copper output were compiled, the recorded production was only 1,752 tons. In 1865 the Eustis mine in the Eastern Townships, Quebec, was opened and was in continuous production between 1879 and 1939.

It was not until near the end of the last century that copper mining began to assume a major position in the mineral industry of the country. The building of the transcontinental line of the Canadian Pacific Railway led to the discovery of the vast copper-nickel deposits of the Sudbury area in 1883. Six years later

organized mining in this area was commenced. Metallurgical research, resulting in the development of the Orford and Mond processes for treating copper-nickel ores, made possible the commercial treatment of these ores and laid the foundation for the vast organization that accounts for about 40 per cent of the Canadian production of copper and more than 85 per cent of the world output of nickel. In the period between 1890 and 1901 there was great development in the opening of copper mines and the building of copper smelters. The Rossland camp in southern British Columbia came into production and a smelter was built at Trail to handle these ores. Mines were opened in the Boundary district and smelters were erected at Grand Forks and Greenwood in 1901. In the same year the Hidden Creek mine was discovered and the Britannia mine began shipments. This was a period of discovery and development that established copper as a major metal in the mineral economy of Canada. It sparked the urge for prospecting and exploration, and in 1915 the Flin Flon ore deposits on the Manitoba-Saskatchewan boundary were discovered. Six years later the Noranda mine was staked and in 1927 the smelter began operations.

In Newfoundland copper mining was very active during the latter half of the last century. The records of production are incomplete, but it is estimated that the total production of ore, matte and ingots amounted to about 2,000,000 tons during this period. In 1928 output from the Buchans mine was commenced.

Metallurgical advances have contributed to a very large extent to the growth of copper production in Canada. The development of selective flotation has played a major part in providing a method for the successful separation of the component minerals in copper-nickel and copper-zinc ores. Continued improvements in metallurgical methods have made possible the treatment of complex ores and increased the efficiency in concentration and smelting operations. In 1930 the

electrolytic copper refinery of Ontario Refining Company Limited at Copper Cliff, Ontario, commenced operation, and in the following year Canadian Copper Refiners Limited opened a similar refinery at Montreal East. Canada now became an important world producer of refined copper. A domestic source of refined copper has served to promote the domestic manufacture of fabricated and semi-fabricated copper.

The industrial expansion that took place during the war years created an increased demand for copper. In 1942, the peak year, domestic consumption was 183,000 tons, an amount more than three times greater than in any pre-war year.

The total recorded production of copper in Canada (excluding Newfoundland) up to the end of 1949 was 6,108,828 tons. The distribution of this production by provinces is shown in the following table:

Table I

| | <u>Tons</u> |
|------------------|------------------|
| Nova Scotia | 1,115 |
| Quebec | 1,090,730 |
| Ontario | 2,849,406 |
| Manitoba | 444,107 |
| Saskatchewan | 345,504 |
| British Columbia | 1,371,435 |
| Yukon | <u>6,531</u> |
| Total | <u>6,108,828</u> |

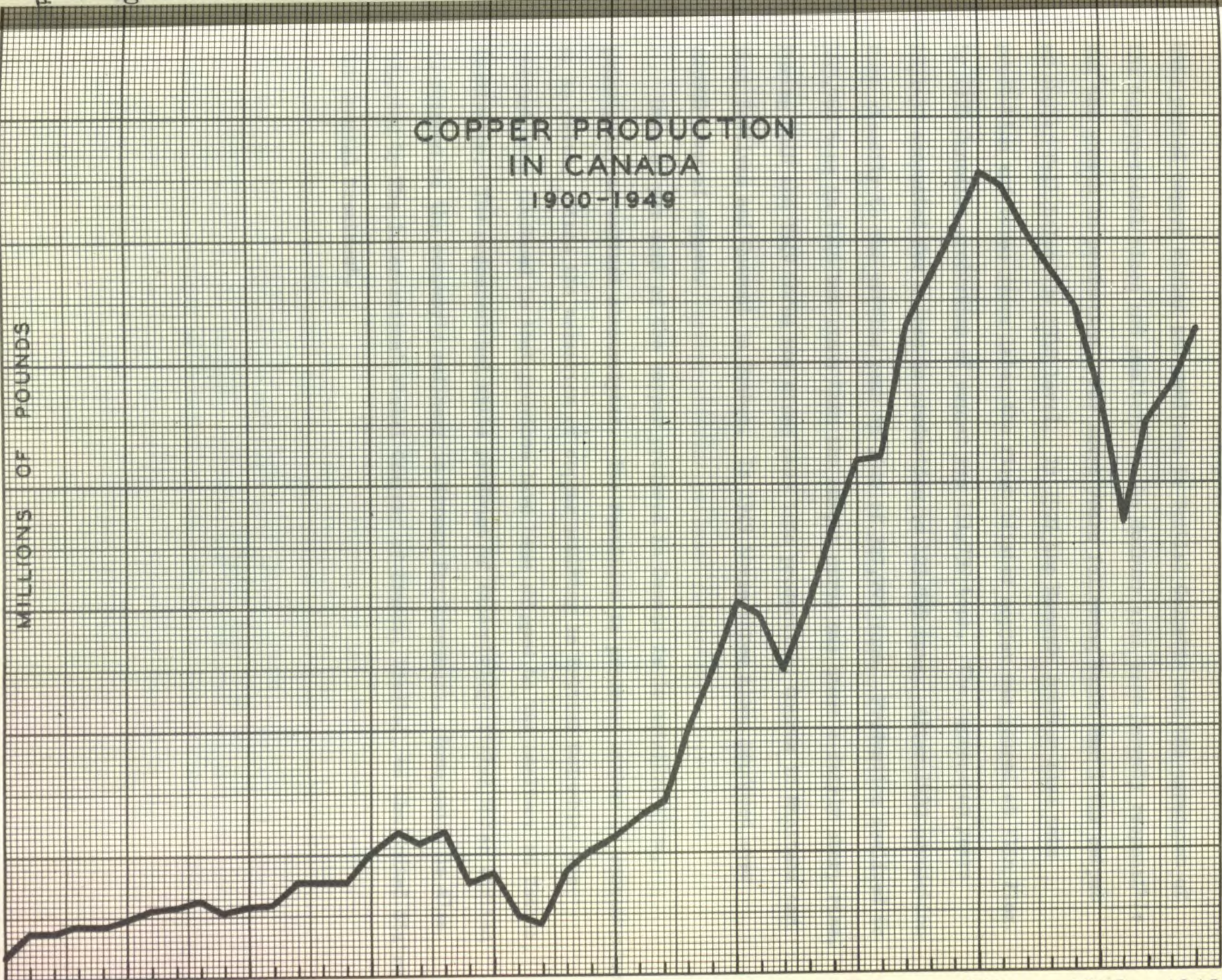
Up to the end of the last century the annual production never exceeded 9,000 tons. Graph No. 1 shows the yearly copper production from 1900 to 1949. In the first 18 years there was a gradual increase from 9,469 tons to 59,385 tons. Dur-

COPPER PRODUCTION IN CANADA 1900-1949

MILLIONS OF POUNDS

700
600
500
400
300
200
100
0

1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1949



this period copper mining and smelting in British Columbia and the expansion of the copper-nickel mines and smelters in the Sudbury area were largely responsible for the growth in production. For seven years following World War I the output of copper fell below the 1918 level. In 1927 the Noranda smelter came into production and three years later the first blister copper was poured at Flin Flon. By 1930 Canadian production of copper was 151,739 tons. The depression years 1931-32 accounted for a drop in production to 123,839 tons. After 1932 production rose steadily to the wartime peak in 1940 of 327,797 tons. Production declined to 183,968 tons in 1946 but since then the output curve has shown a fairly sharp rise. During 1948 and 1949 three new mines came into production, Cuprus in Manitoba and East Sullivan and Quemont in Quebec. In 1949 these three mines produced over 22,000 tons of copper.

Over 85 per cent of the copper produced in Canada is in metallic form, principally as refined electrolytic. The remainder is produced either as concentrates or as matte. Since the cessation of copper smelting in British Columbia, the concentrates produced in that province have been shipped to the smelters at Tacoma, Washington. The copper-nickel matte produced by Falconbridge Nickel Mines Limited is shipped to the company's refinery in Norway for treatment. Some matte is also exported by The International Nickel Company of Canada, Limited, to the United States for special treatment.

The breakdown of production for 1948 and 1949 is shown in the following table.

Table II

| | <u>1948</u> | <u>1949</u> |
|---|-------------|-------------|
| | <u>Tons</u> | <u>Tons</u> |
| Blister and anode copper | 212,817 | 224,422 |
| In ores, concentrate and copper matte exported | 21,548 | 30,672 |
| In nickel-copper matte exported | 6,367 | 8,363 |
| | <hr/> | <hr/> |
| Total | 240,732 | 263,457 |
| | <hr/> <hr/> | <hr/> <hr/> |

The general expansion in Canadian industry during the past ten years has influenced the growth of copper fabrication. The manufacture of wire, tubes, and sheets has made notable advances. In 1949 domestic consumption for all purposes was the equivalent of 38 per cent of the copper production.

The principal markets for the exportable surplus of Canadian copper are the United Kingdom and the United States, other markets being France, Netherlands, Switzerland, and India. Exports in semi-fabricated form such as rods, strips, sheets and tubing are increasing. The value of copper exports in these forms in 1950 was slightly over 7.5 million dollars.

The copper resources of Canada are large and widely distributed. Tables and charts at the end of this survey show estimates of the reserves of ore and the maps indicate the locations of the principal mines and occurrences of copper mine

II. CANADIAN COPPER-PRODUCING MINES

The copper of Canadian ores is associated with other base and precious metals. About 40 per cent of the copper produced is derived from copper-nickel ores and the remainder from copper-gold, copper-zinc, and copper-lead-zinc ores. Thirteen principal companies account for over 90 per cent of the Canadian production. Descriptions of the mining properties are given hereunder, arranged according to provinces from east to west. Numbers in brackets correspond to numbers on the map showing locations of the producing mines (page 28).

NEWFOUNDLAND

Buchans Mine (1)

This mine, operated by Buchans Mining Company, Limited, which is owned jointly by the Anglo-Newfoundland Development Company, Limited, and American Smelting and Refining Company, Limited, is five miles north of Red Indian Lake in the centre of the island. It is reached from Millerton Junction on the Canadian National Railway by a privately owned 37-mile branch line. By railway Buchans is 274 miles from Port-aux-Basques, 347 miles from St. John's, and 92 miles from the shipping port of Botwood.

The lead-zinc-copper orebodies occur principally in tuff, and to a lesser extent in andesitic agglomerate, in conglomerate, and in sheared quartz porphyry.

The deposits are of the mesothermal replacement type and the ore is a massive, intimate mixture of fine-grained sphalerite, galena, pyrite, chalcopyrite, and very little tetrahedrite. The gangue is composed of barite, in the proportion of 30 per cent, and some quartz and calcite.

The present workings embrace two orebodies, the Lucky Strike and the Oriental. During 1948-49 several new orebodies were discovered and delineated by deep drilling, northwest of the Lucky Strike orebody. A new 6-compartment, 10 ft. by 20 ft. vertical shaft required for this new development is under construction and will be sunk to a depth of 1700 feet.

The mine is serviced by two vertical shafts, the Lucky Strike 3-compartment shaft, 700 ft. deep, and the Oriental shaft which is connected on the bottom level with the Lucky Strike by a 7,000-foot haulage drift. Mining methods include glory-hole operation, cut-and-fill stopes, open stopes and square-set stopes.

The mill has a capacity of 1300 tons of ore per day. Selective flotation is employed to produce copper, lead, and zinc concentrates. In 1948, a total of 319,000 tons of ore was mined and milled. The approximate grade of the ore mined is copper 1.4%, lead 8.5%, zinc 17.4%, gold 0.05 oz. per ton, and silver 3.1 oz. per ton.

| <u>Year</u> | <u>Production (tons)</u> | | | |
|-------------|--------------------------|-----------------------|-----------------------|--------------------------|
| | <u>Copper Conc.</u> | <u>Lead Conc.</u> | <u>Zinc Conc.</u> | <u>Gravity Conc.</u> |
| 1934 | 1,308 | 46,500 | 162,396 | 434 |
| 1935 | 458 | 48,145 | 146,329 | 482 |
| 1936 | 12,650 | 41,282 | 126,176 | 624 |
| 1937 | 31,361 | 41,423 | 119,669 | 571 |
| 1938 | 32,865 | 47,119 | 122,084 | 365 |
| 1939 | 48,579 | 41,152 | 105,579 | 396 |
| 1940 | 40,850 | 46,588 | 117,213 | 421 |
| 1941 | 26,410 | 46,562 | 116,836 | 382 |

Production (tons) (Cont'd)

| <u>Year</u> | <u>Copper Conc.</u> | <u>Lead Conc.</u> | <u>Zinc Conc.</u> | <u>Gravity Conc.</u> |
|-------------|-------------------------|-----------------------|-----------------------|--------------------------|
| 1942 | 21,612 | 37,275 | 94,114 | 327 |
| 1943 | 21,899 | 46,281 | 108,737 | 390 |
| 1944 | 18,110 | 41,962 | 98,813 | 272 |
| 1945 | 17,570 | 39,567 | 93,567 | 268 |
| 1946 | 19,153 | 39,727 | 87,673 | 321 |
| 1947 | 16,137 | 34,216 | 70,403 | 167 |
| 1948 | 17,422 | 32,475 | 70,908 | 132 |
| 1949 | 16,066 | 32,085 | 71,325 | 138 |

Metal Content of 1949 Production

| | |
|--------|---------------|
| Gold | 11,847 ounces |
| Silver | 860,485 " |
| Copper | 4,575 tons |
| Lead | 21,847 " |
| Zinc | 43,411 " |

Ore Reserves

The estimated proved reserves at the end of 1949 was 4,000,000 tons, sufficient for about 14 years of operation. The grade averages; gold 0.05 oz. per ton, silver 3.1 oz. per ton, copper 1.4 per cent, lead 8.5 per cent, and zinc 17.4 per cent. The copper content of the ore reserves is 56,000 tons.

A new deposit of lead, zinc, and copper was reported early in 1950 and this will add considerably to the life of the mine.

(Ref: Geol. Survey Newfoundland, Bull. No. 20, Copper Deposits of Newfoundland, 1940, pp. 28-33.)

QUEBEC

Noranda (4)

The mine and smelter of Noranda Mines, Limited, are located at the town of Noranda, Rouyn township, Rouyn-Noranda county in western Quebec, and comprise three groups of claims covering 1,837 acres.

The deposit consists of lenticular bodies mineralized with chalcopryrite, pyrite, and pyrrhotite. The gold content of the ore is significant, a condition which enhances the economic status of the deposit. There are three main types of ore in the mine; direct smelting copper ore, concentrating ore, and silicious ore used as a flux in smelting.

The main lower "H" orebody is extensively developed to the 2,975-ft. level. There are six shafts on the property. Numbers 3, 4, and 5 are used in production, and No. 6 in exploration.

The concentrator and smelter each have a rated capacity of 3,500 tons per day. A considerable amount of custom ore and concentrates is handled by the smelter. The figures of production given below apply only to the Noranda mine.

Production

| | <u>1949</u> | <u>Total 1927-1949 (inc</u> |
|--------------------|-------------|-----------------------------|
| Ore hoisted (tons) | 1,257,202 | 31,089,039 |
| * Copper (tons) | 25,948.6 | 662,072.9 |
| Gold (ounces) | 185,418 | 4,776,958 |

* Copper in form of blister copper which is shipped to Canadian Copper Refiners, Limited, Montreal East, Quebec, in which company Noranda Mines Limited has a controlling interest.

Ore Reserves (1949)

| <u>Type of Ore</u> | <u>Tons</u> | <u>Copper %</u> | <u>Gold oz./ton</u> |
|--------------------|----------------|-----------------|---------------------|
| Sulphide | 17,507,000 | 2.24 | 0.187 |
| Fluxing | <u>957,000</u> | 0.09 | 0.121 |
| | 18,464,900 | | |
| No. 5 zone | 1,500,000 | 0.07 | 0.120 |

(Ref: Quebec Dept. of Mines, Geology of Quebec, Vol. III, 1949,
pp. 338-361: Noranda Mines, Ltd., annual reports.)

Normetal (7)

The Normetal mine, owned and operated by Normetal Mining Corporation, Limited, is in Desmeloizes township, Abitibi West county, western Quebec. It is 12 miles north of Dupuy on the C.N.R. transcontinental line to which it is connected by a company-owned branch line. The property comprises a group of 19 claims.

The deposit consists of lenses and disseminations of sphalerite and chalcopryrite lying in a shear zone. The veins are practically vertical. The deposit was discovered in 1925 and the first shaft was put down in 1927. Production was commenced ten years later.

The mine is developed by three shafts. No. 1, a two-compartment shaft, has a depth of 300 feet, No. 2, a three-compartment shaft, is sunk to 950 feet, and No. 3 shaft to 3,265 feet.

The concentrator has a daily capacity of 800 tons.

Production

| | <u>1949</u> | <u>1937-1949(inclusive)</u> |
|-------------------|-------------|-----------------------------|
| Ore milled (tons) | 292,235 | 2,422,262 |
| Copper (tons) | 7,585.8 | 67,951 |
| Zinc (tons) | 17,696 | 127,465.6 |
| Gold (ounces) | 4,725 | 42,810 |
| Silver (ounces) | 434,199 | 4,192,733 |

Note: Copper and zinc produced are the metal content of the respective concentrates. The gold and silver report with the copper concentrate.

Ore Reserves

Proved ore (1949) 1,452,800 tons

Grade, 3.53% copper, 7.71% zinc

(Ref: Quebec Dept. of Mines, Geology of Quebec Vol. III, 1949, pp. 439-441.)

Waite Amulet (5)

The producing copper-zinc property of Waite Amulet Mines Limited is located in Duprat and Dufresnoy townships, Rouyn-Noranda county, western Quebec, and comprises 2,250 acres. The property is divided into the wholly-owned Waite Amulet section and the Amulet Dufault section in which Waite Amulet Mines Limited, has a large controlling interest.

The deposits consist of large and small masses of sphalerite and chalcopyrite which occur in the Keewatin rhyolites.

The property was located in 1924 and development was carried out up to 1931. During four months of 1930, the mill treated 38,218 tons of ore. There was no

production between 1931 and 1937. Since 1937 there has been continuous operation.

The mines are developed by numerous shafts and underground workings. The "C" 3-compartment shaft in the original Amulet section extends to 275 feet with levels at 75, 150, and 250 feet, and the "F" 3-compartment shaft extends to 393 feet, with levels at 280 and 365 feet. At the Waite section there are two shafts; No. 1, 2-compartment, sunk to 1,021 feet, and No. 2 shaft to a depth of 1,200 feet. The Amulet Dufault workings are served by two shafts, the Central sunk to a depth of 1,383 feet, and the "A" 2-compartment shaft, 2,000 feet distant, sunk to 1,138 feet. These shafts are connected at the 1,000-ft. level.

The mill has a daily capacity of 1800 tons.

Production

| | <u>1949</u> | <u>1937-1949</u> (inclusiv |
|--------------------------------|-------------|----------------------------|
| Ore milled (tons) | 453,174 | 5,181,839 |
| Copper (tons) | 16,749 | 231,352.8 |
| Zinc (tons) | 20,321 | 217,561.5 |
| Gold (tons) | 8,856 | 135,005 |
| Silver (tons) | 426,666 | 4,578,491 |
| Pyrite concentrate (long tons) | 47,148 | -- |

Note: Copper and zinc produced represent metal content of respective flotation concentrates.

Ore Reserves (1949)

Waite Amulet

| <u>Orebody</u> | <u>Tons</u> | <u>Cu %</u> | <u>Zn %</u> | <u>Grade</u> <u>Au oz./ton</u> | <u>Ag. oz./ton</u> |
|----------------|---------------|-------------|-------------|-----------------------------------|--------------------|
| "F" shaft | 18,000 | 2.0 | 3.54 | 0.01 | 1.0 |
| "C" shaft | <u>30,000</u> | 1.1 | 10.0 | 0.01 | 1.7 |
| Total | 48,000 | | | | |

Amulet Dufault

| | | | | | |
|-----------|---------------|------|------|-------|-----|
| Lower "A" | 1,022,972 | 5.57 | 4.02 | 0.045 | 1.5 |
| Upper "A" | <u>79,212</u> | 1.8 | 6.5 | 0.07 | 1.6 |
| Total | 1,102,184 | | | | |

Combined total 1,150,184 tons.

(Ref: Quebec Dept. of Mines, Geology of Quebec, Vol. III, 1949, pp. 361-383)

Queмонт (6)

This mine is owned by Quemont Mining Corporation, Limited and is in Rouyn township, Rouyn-Noranda county, western Quebec. It adjoins the Noranda property on the northeast.

The deposit consists of massive sulphide bodies containing pyrite, chalcopyrite, and sphalerite. The ore contains appreciable gold.

The mine is developed by two shafts. No. 1, a 2-compartment shaft, was sunk in 1926 to 235 feet and was later deepened to 922 feet; No. 2 shaft, 5-compartment was sunk in 1947 and now has a depth of 2,600 feet, with levels at 180-ft. intervals.

The mill, with a rated capacity of 2,000 tons a day, was brought into operation in June, 1949.

Production (1949)

| | |
|---------------------------------------|---------|
| Ore treated (tons) | 346,014 |
| Copper in concentrate produced (tons) | 5,643.2 |
| Zinc in concentrate produced (tons) | 198 |
| Gold (ounces) | 42,081 |
| Silver (ounces) | 155,973 |

Ore Reserves (1949)

Proved reserves 9,229,500 tons

Grade: Copper 1.5%; zinc 2.78%; gold 0.170 oz./ton;
silver 0.95 oz./ton

(Ref: Quebec Dept. of Mines, P.R. No. 227, 1949, p. 131)

East Sullivan (3)

The property of East Sullivan Mines, Limited is in Bourlamaque township, Abitibi East county, western Quebec, and comprises 71 claims covering 3,500 acres.

The deposit comprises several large copper-gold orebodies, containing pyrite, chalcopryite, and sphalerite.

A 5-compartment shaft is sunk to 1,150 ft. with 7 levels at 150, 300, 450, 600, 750, 900, and 1,050 ft.

The mill has a rated capacity of 2,000 tons a day and came into production in January, 1949.

Production

| | <u>1949</u> |
|---------------------------------------|-------------|
| Ore treated (tons) | 768,746 |
| Copper in concentrate produced (tons) | 14,142 |
| Zinc in concentrate produced (tons) | 5,238 |
| Gold (ounces) | 12,447 |
| Silver (ounces) | 290,767 |

Ore Reserves (1949)

Proved reserves: 4,430,000 tons

Grades: Copper 1.95%, zinc 1.11%, gold 0.02 oz./ton;
silver 0.45 oz./ton.

(Ref: Quebec Dept. of Mines, Mining Industry of Quebec, 1948,
p. 56; company's annual reports).

Golden Manitou

The property of Golden Manitou Mines, Limited is in Bourlamaque township, Abitibi East county, western Quebec and embraces an area of 200 acres.

The main developed workings are in a zinc-lead deposit which has a small amount of copper. Recently a wide zone containing copper mineralization was discovered. It has been confirmed at depth by drilling and a substantial tonnage has been indicated.

At the end of 1949 the main shaft had a depth of 2,040 feet and underground developments on 13 levels comprised well over 5,000 feet of drifts and crosscuts.

The mill has a capacity of 1000 tons per day.

Production

| | <u>1949</u> | <u>1942-49 (inclusive)</u> |
|-------------------------------|-------------|----------------------------|
| Ore milled (tons) | 358,980 | 2,870,084 |
| Zinc in concentrates (tons) | 11,406 | 146,366 |
| Lead in concentrates (tons) | 1,081 | 4,933 |
| Copper in concentrates (tons) | 11.4 | 189 |
| Gold (ounces) | 10,454 | 92,429 |
| Silver (ounces) | 759,961 | 4,900,484 |

Ore Reserves

The copper content of the main orebody is very small.

Proved reserves (main orebody) at end of 1949 were 1,200,107 tons.

Grade, 5.88% zinc, 0.050 oz./ton gold, and 3.52 oz./ton silver.

The newly discovered copper ore zone has an indicated 735,000 tons averaging 1.9% copper, giving a gross copper content of 27,930,000 pounds.

(Ref: Quebec Dept. of Mines, Geology of Quebec, Vol. III, 1949, p. 441).

Moulton Hill (2)

This property, owned by Ascot Metals Corporation, Limited, is near the city of Sherbrooke and comprises 223 acres on lots 23 and 25, range III, Ascot township.

The deposit consists of veins and lodes in sericitic schists. The ore is composed of mixed sulphides, chalcopryrite, sphalerite, and galena. It also contains gold and silver.

The property was first worked from 1885 to 1895, when operations were suspended. Work was resumed in 1942. During 1944 and 1945 a total of 75,643 tons of ore was treated. The mine was again closed in 1945. In 1949 development work was resumed and

the original 442-ft. inclined shaft was deepened and three new levels at 100-ft. intervals were established. Drilling has indicated new ore shoots. A 400-ton capacity mill came into production August 1, 1950.

Ore Reserves

The estimated reserves are 229,800 tons, with an average grade of 0.8% to 1.0% copper, 1.2% lead, 5.0% zinc, and 1.00 oz./ton silver.

(Ref: Quebec Dept. of Mines, Copper Deposits in Eastern Townships, P.Q., 1950, p. 202)

ONTARIO

International Nickel (9)

The mines and smelters of The International Nickel Company of Canada Limited are situated in the Sudbury area. The properties of the company cover an area of 100,000 acres. The principal mines are the Frood-Stobie, Creighton, Garson, Murra Levack, and Crean Hill. In addition to large open pits at the Frood and Stobie mines there are 250 miles of underground workings serviced by twelve principal shafts as follows:

Frood-Stobie mine

No. 3 vertical shaft, 3,040 feet deep.

No. 4 vertical inside shaft extends 1,109 feet from the 28th level.

No. 6 vertical inside shaft extends 609 feet from the 28th level.

Creighton mine

No. 3 inclined shaft to a vertical depth of 1,946 feet.

No. 5 vertical shaft, 4,074 feet deep.

No. 6 inside vertical shaft extends 1,741 feet from the 52nd level to 5,562 feet below surface.

No. 7 inclined shaft to a vertical depth of approximately 2,000 feet.

Garson mine

A three-compartment shaft to 1,700 feet.

No. 2 vertical shaft extends 3,220 feet.

Levack mine

A five-compartment inclined shaft to a depth of 990 feet.

No. 2 vertical shaft extends to 3,050 feet.

Murray mine

No. 2 shaft extends to 3,450 feet.

International Nickel Company's deposits consist of massive bodies of copper, nickel and iron sulphides, the major minerals being pyrrhotite, chalcopyrite, and pentlandite. In addition to the major metals copper and nickel, the ores contain gold, silver, selenium, tellurium, platinum, palladium, rhodium, ruthenium, iridium, and cobalt, all of which are produced.

The concentrator at Copper Cliff has a rated capacity of 30,000 tons of ore a day. There is a smelter at Coniston and a smelter and copper refinery at Copper Cliff. The smelters have a combined annual capacity of 290,000 tons of copper-nickel matte and the copper refinery capacity is 168,000 tons of refined copper per year.

Production

| | <u>1949</u> | <u>1943-1949(inclusive)</u> |
|--------------------------|-------------|-----------------------------|
| Tons of ore milled | 9,984,891 | 73,354,193 |
| Copper (tons) | 110,537 | 772,533 |
| Nickel (tons) | 104,646 | 789,292 |
| Platinum metals (ounces) | 214,735 | 1,988,589 |
| Gold (ounces) | 34,146 | 338,924 |
| Silver (ounces) | 1,097,487 | 10,018,790 |

Ore reserves

At the end of 1949 the proved ore reserves were 251,805,000 tons. The combined nickel-copper content is 3.03% or 7,630,000 tons.

From the sales of copper and nickel over seven years it is found that copper represented 54% of the combined total. Assuming that this is an indication of the relative proportions of nickel and copper in the ore as mined, the copper content of the 1949 reserves are estimated to be 4,120,200 tons or a grade of 1.636%.

(Ref: Can. Min. Jour., Vol. 67, No. 5, May, 1946 pp.322-331:
Annual Reports of company.)

Falconbridge (8)

The properties of Falconbridge Nickel Mines Limited consist of 47,867 acres in Falconbridge, Levack, Garson, and McKim townships, Sudbury district. The deposits are typical of the Sudbury area ores and consists of copper, nickel, and iron sulphides.

The main producing property is the Falconbridge mine, which is developed by two principal shafts. No. 1, a 3-compartment shaft, has a depth of 2,848 feet with 15 levels, and No. 5 is a 5-compartment shaft sunk to 3,150 feet with 18 levels. There is also an internal shaft, No. 7, for opening levels below the 2,800-ft. horizon.

The McKim mine, which adjoins the Murray mine of International Nickel Company is developed by one shaft to a depth of 1,421 feet. In addition the company holds the Levack township property, the old Strathcona mine in Levack township, and the Mount Nickel property on the south rim of the Sudbury nickel basin.

The concentrator, with a monthly capacity of 70,000 tons, and the smelter, with an annual capacity of 15,000 tons of nickel and 7,000 to 8,000 tons of copper, are at Falconbridge. The matte is shipped to the company's refinery at Kristiansand, Norway.

Production

| | <u>1949</u> | <u>1939-49</u> (inclusive) |
|------------------|-------------|----------------------------|
| Ore mined (tons) | 941,929 | 7,842,200 |

Ore Reserves

At the end of 1949 estimated reserves were 14,791,000 tons, the grade being 1.72% nickel and 0.92% copper.

(Ref: C.I.M.M., "Structural Geology of Canadian Ore Deposits", 1948, pp. 618-626: annual reports of the company).

Bi-Ore (formerly White Lake Mine)(10)

This mine, operated by Bi-Ore Mines, Limited, is in the Mississauga Forest Reserve, Algoma district. It is 36 miles due north of Blind River and 51 miles by gravel road from Dean Lake station on the Canadian Pacific Railway. The claims were staked in 1926 and some development work and drilling were done by White Lake Mines, Limited, between 1929 and 1943. In 1944 Bi-Ore Mines, Limited, acquired the property, which comprises 18 claims.

The deposit is a mineralized fissure vein of quartz and calcite, the copper minerals being chalcopyrite and bornite.

The mine is developed by 2 adits. The mill of 300 tons per day capacity was destroyed by fire in December, 1949.

Production

Nine carloads of copper ore were shipped to The International Nickel Company of Canada Limited in 1943, and in 1948 Bi-Ore was producing 50 tons of copper concentrate (28 to 32% copper) per week.

Production figures for 1949 are not available.

Ore Reserves

In 1948 reserves were estimated at 355,000 tons with a grade of 5% copper. (Ref: Ont. Dept. of Mines, P.R. 1950-4, p.8; Ann. Report Vol. 48, Pt. 2, 1939, p. 10).

MANITOBA

Flin Flon (12)

The Flin Flon copper-zinc-gold property of Hudson Bay Mining and Smelting Company, Limited, comprising 343 claims covering 12,713 acres, is on the Manitoba-Saskatchewan boundary 85 miles northwest of The Pas. The shaft, mill, smelter, and zinc refinery are at Flin Flon, Manitoba. The underground workings extend into Saskatchewan.

The orebody lies in greenstone and is a fairly regularly shaped lens which plunges downwards and southward at approximately 30°. The minerals are chalcopryrite and sphalerite. Cadmium and selenium occur in minor amounts and are recovered as by-products in the treatment of the copper and zinc ores.

The mine is developed by three principal shafts. The Main, a 5-compartment shaft, extends to a depth of 2,219 feet with 8 levels. No. 3 shaft has a depth of 2,210 feet; and the South Main shaft extends to a depth of 4,083 feet. No. 3 winze 1000 feet south from No. 3 shaft, extends from the 2,210-foot level to 3,142 feet. The concentrator has a capacity of 6000 tons per day, and the copper smelter has a rated capacity of 60,000 tons of blister copper per year.

Production

| | <u>1949</u> | <u>1939-49(inclusive)</u> |
|--------------------|-------------|---------------------------|
| Tons of ore milled | 1,885,107 | 21,315,358 |
| Copper (tons) | 42,633 | 429,260 |
| Zinc (slab) (tons) | 49,174 | 535,177 |
| Cadmium (pounds) | 181,092 | 1,749,556 |
| Gold (ounces) | 121,286 | 1,643,074 |
| Silver (ounces) | 1,868,507 | 24,295,019 |

Ore Reserves

The ore reserves at the end of 1949 were estimated to be 20,157,000 tons, the grade being; copper 3.04%, zinc 4.34%, gold .084 oz./ton, silver 1.14 oz./ton.

Zinc plant residues amount to 830,000 tons the grading being; zinc 26.6%, copper 1.13%, gold 0.131 oz./ton, silver 3.96 oz./ton.

(Ref: Man. Dept. of Mines and Nat. Resources, Ann. Report

Mines and Minerals, 1948, pp. 70-75: annual reports of company.)

Cuprus (13)

The Cuprus mine is a copper-zinc-gold-silver property comprising the Thompson group and other claims, 13 miles by truck road southeast of Flin Flon. It is owned and operated by Cuprus Mines, Limited, in which Hudson Bay Mining and Smelting Company Limited owns a controlling interest.

The deposit consists of four lenticular copper-zinc orebodies in a mineralized schist zone, 3,000 feet long. The property was drilled in 1942 and came into production in October, 1948.

The mine is developed by a main 3-compartment shaft to a depth of 830 feet, with 7 levels. There is an auxiliary shaft 100 feet south of the main shaft sunk to

a depth of 125 feet. The concentrator has a capacity of 300 tons a day. Concentrates are trucked to Flin Flon for smelting.

| | <u>Production</u> | |
|------------------------------|-------------------|-----------------------|
| | <u>1949</u> | <u>1948-49 (incl)</u> |
| Tons of ore milled | 79,183 | 92,222 |
| Copper in concentrate (tons) | 2,772 | |
| Zinc in concentrate (tons) | 3,792 | |
| Gold (ounces) | 2,221 | |
| Silver (ounces) | 57,282 | |

Ore Reserves

The ore reserves at the end of 1949 were estimated to be 245,000 tons the grading being; copper 3.62%, zinc 6.8%, gold 0.045 oz./ton, silver 0.91 oz./ton.

(Ref: Man. Dept. of Mines & Nat. Resources, Ann. Report Mines and Minerals, 1948, p.65).

Sherritt Gordon (11.)

This mine is at Sherridon, 40 miles northeast of Flin Flon. It is operated by Sherritt Gordon Mines Limited, and is served by a 43-mile branch of the Canadian National Railway from Cranberry Portage.

The deposit consists of massive and disseminated sulphide replacements in fractured and sheared zones in the sedimentary gneisses. The orebody has been almost depleted. Mining is confined to the West orebody which is developed by No. 2 shaft to a depth of 480 feet and by No. 3 main inclined shaft, 2,105 feet on the incline.

The concentrator has a capacity of 3,000 tons per day. The copper concentrates are shipped to Flin Flon and the zinc concentrates are exported.

The East mine was completely mined out in 1946.

Production

| | <u>1949</u> | <u>1939-49</u> (inclusive) |
|-------------------------------|-------------|----------------------------|
| Tons of ore milled | 432,524 | 6,670,057 |
| Copper in concentrates (tons) | 9,479 | 138,563 |
| Zinc concentrates (tons) | 5,064 | 66,660 |
| Gold (ounces) | 5,247 | 78,625 |
| Silver (ounces) | 172,317 | 2,503,416 |

Ore Reserves

The ore reserves at the end of 1949 were 396,400 tons, the grading being; copper 2.44%, zinc 1.88%, gold 0.019 oz./ton, silver 0.58 oz./ton.

(Ref: Man. Dept. of Mines & Nat. Resources, Ann. Report, 1948, p. 86; Geological Survey of Canada, Economic Geol. Series No. 8, 1930, p. 214; annual reports of company).

BRITISH COLUMBIA

Copper production in British Columbia is now confined to two principal mines. Several small properties have been operating intermittently, but the production from these sources is relatively small.

Britannia Mines (15)

The properties of Britannia Mining and Smelting Company Limited are at Britannia Beach, on Howe Sound about 7 miles from its head. The company's holdings comprise 25,000 acres. A daily steamship service provides transportation between Britannia Beach and Vancouver. Recently a road was built to Squamish, the eastern terminus of the Pacific Great Eastern Railway at the head of Howe Sound. The mine is reached by a 3-foot gauge electric railway from Britannia Beach a little over 5 miles in length.

The deposit was discovered in 1888 and mining began in the early part of this century. The present company was formed in 1908. The deposit comprises six distinct orebodies which occur as intersecting or parallel bands of lenses in or near a shear zone of quartz porphyry and quartz diorite. The principal metallic minerals are chalcopyrite, pyrite, and sphalerite. Barite is plentiful as a gangue mineral in the sphalerite ores at the west end of the shear zone.

Development of the property has been carried on through five main groups, all connected and developed as a unit by a series of adits driven into the mountain side and supplemented by internal shafts, winzes, raises, and drifts. There are over 100 miles of underground workings in the mine.

The main haulage level comes out just above the mill which is at Britannia Beach. The mill has a capacity of 6,000 tons per day, but currently treats half that amount.

The mine water contains about 1 gram per litre of copper and a recovery of about 400 tons in the form of cement copper is obtained yearly.

Production

In addition to the copper and zinc concentrates which are shipped to American Smelting and Refining Company, Tacoma, Washington, and The Consolidated Mining and Smelting Company of Canada, Limited, Trail, B.C., respectively, a pyrite concentrate is produced. This is stockpiled and disposed of when markets are available. Copper concentrates average approximately 25% copper.

| | <u>1949</u> |
|----------------------------------|-------------|
| Tons of ore mined | 880,580 |
| Copper in concentrates (tons) | 8,969 |
| Zinc in concentrates (tons) | 6,657 |
| Cadmium in concentrates (pounds) | 70,000 |
| Gold (ounces) | 9,966 |
| Silver (ounces) | 82,921 |

Up to 1948 approximately 35,000,000 tons of ore was mined, yielding 375,000 tons of copper.

Ore Reserves

The proved ore reserves at the end of 1949 were estimated to be 4,000,000 tons averaging 1.5% copper and 1.0% zinc.

(Ref: B.C. Dept. of Mines Ann. Reports).

Copper Mountain (14)

The

The Copper Mountain property of Granby Consolidated Mining, Smelting & Power Company Limited, comprising 100 claims, is about 9 miles south of Princeton, Similkameen Mining Division, in southern British Columbia. A standard gauge railway connects Copper Mountain with Allenby $8\frac{1}{2}$ miles distant, and Princeton, a further $5\frac{1}{2}$ miles.

The deposit, which is low grade, is in a fracture zone and the ore occurs as veinlets following small, steep-dipping tension fractures. The copper minerals are bornite and chalcopyrite.

Copper was first discovered in the area in 1884, but there was little development work until 1905. For the next 17 years development was intermittent and production was commenced in 1925. Except for a six-year period (1931-1936) the property has been in continuous operation.

The mine is opened by No. 1 and No. 2 vertical shafts and by No. 2 and No. 6 adit levels. No. 1 shaft extends from the surface to the main haulage level, No. 6, 775 feet from surface. Several levels below No. 6 are reached by No. 2 underground shaft. Present mining is by a system of cave stoping. Mechanization has been developed to the greatest degree practicable and mining costs per ton of ore shipped are among the lowest of any metal mining in the world.

The Allenby concentrator has a rated capacity of 5,000 tons of ore per day, the grade of concentrate being 26% copper.

Production

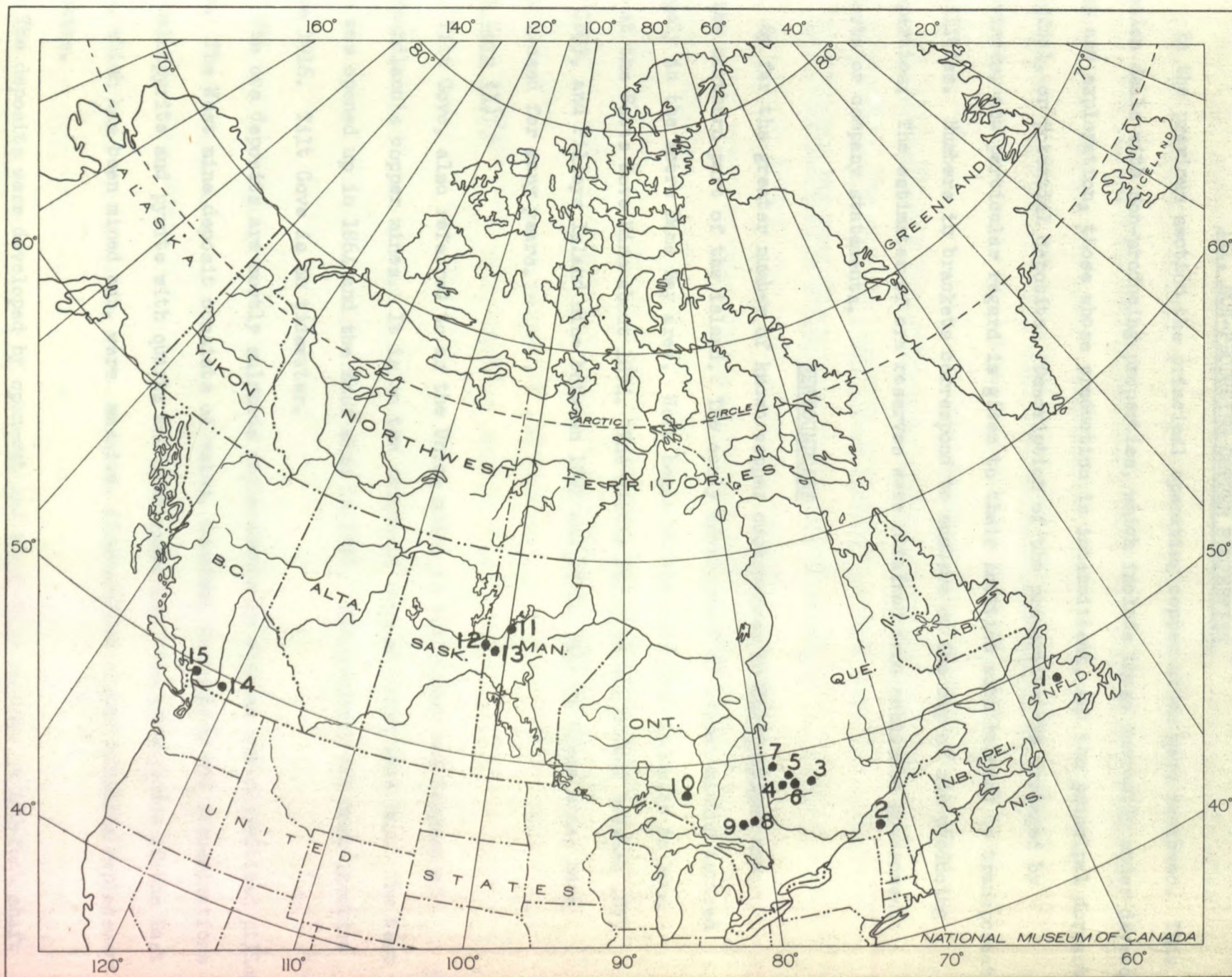
| | <u>1949</u> | <u>1937-49</u> (inclusive) |
|-------------------------------|-------------|----------------------------|
| Tons of ore milled | 1,803,916 | 12,207,226 |
| Copper in concentrates (tons) | 17,847 | 166,688 |
| Gold (ounces) | 11,904 | |
| Silver (ounces) | 255,931 | |

Ore Reserves

Estimated ore reserves at the end of 1949 totalled 7,524,000 tons grading, 1.1 to 1.20% copper.

(Ref: B.C. Dept. of Mines Ann. Reports).

LOCATION OF PRINCIPAL PRODUCING COPPER MINES



III. NON-PRODUCING COPPER PROPERTIES

In the previous section the principal operating copper mines were reviewed. This section deals with non-producing properties, which include those currently under development and exploration, those whose production is intermittent, and the principal dormant, marginal, or potential deposits. Description of the properties is arranged by provinces, and particular regard is given to their location with respect to transportation facilities. Numbers in brackets correspond to numbers on the map of non-producing properties. The estimates of ore reserves were obtained from published government reports or company statements.

NEWFOUNDLAND

By far the greater number of known copper occurrences in Newfoundland are in the northern part of the island. The early development of copper mining centred largely in the Notre Dame Bay area. Work began at the Tilt Cove deposits in 1864 and at the Betts Cove Mine about 1874. The little Bay mine was worked between 1877 and 1893, and Pilley's Island mine between 1891 and 1908. All of these mines have been closed for many years.

Tilt Cove (1)

Tilt Cove, also referred to as the Union mine, is the oldest and largest of Newfoundland's copper mines. It is on the northwest side of Notre Dame Bay. The West mine was opened up in 1864 and the East mine in 1886. The property has been inactive since 1916. Tilt Cove is on tidewater.

The ore deposits are mostly sulphide replacements in sheared and chloritized pillow lava. The West mine deposit consists of veins, bunches, stringers, and disseminations of chalcopyrite and pyrite with quartz and some ankerite. The three lodes of the East mine, which has been mined out, were massive, fine-grained copper sulphide replacement deposits.

The deposits were developed by open-cut and glory-hole mining. A 480-foot shaft was sunk on the West mine. A smelter was in operation at the property for several years.

Production

The Geological Survey of Newfoundland states that 1,491,136 tons of ore, 78,000 tons of matte, and 5,416 tons of ingots were produced.

Ore Reserves

There is considerable divergence of opinion as to the amount of ore remaining in the Tilt Cove mines. The East mine is considered to be mined out, so available ore is confined to the West mine and the dumps.

Dr. F.R. Tegengren (Private report, 1929) estimates 2,160,000 tons of 2 to 3% ore between sea level and the 480-foot level, and a possible 1,000,000 tons below.

Olaf N. Rove, in Bulletin No. 20, "Copper Deposits of Newfoundland", 1940, estimates the ore reserve position as follows:

| | | | |
|-----------|---|----------------|--------------|
| West Mine | - | 1,500,000 tons | Grade 1% Cu. |
| Dump | - | 110,000 " | " 2% Cu. |
| East Mine | - | 25,000 " | " 3% Cu. |
| Dump | - | 145,000 " | " 1½% Cu. |

(Ref: Geol. Survey Nfld. Bulletin No. 20, Copper Deposits Nfld., 1940, pp. 104-108, 119, 147-149, 168).

Betts Cove (2)

The Betts Cove property is a few miles south along the coast from Tilt Cove, Notre Dame Bay. The mine was opened in 1875 and was operated until 1883. Smelting works were erected in 1877.

The deposit is composed of lenticular masses of pyrite and chalcopyrite which in some places contain bands of slightly later sphalerite. These lenses occur in shear zones of chlorite schist.

The old workings are now badly caved-in. Two attempts were made to re-open the property, one in 1900 when a tunnel was driven for 450 feet from near water level to tap the bottom of the deposit, and another in 1906 when machinery was installed to pump water the workings.

The total production was 130,682 tons of ore and matte. The ore shipped is said to have graded 10% copper.

No estimates of reserves are available. There are three ore dumps said to be much smaller than at Tilt Cove.

(Ref: Geol. Survey Nfld., Bull. No. 20, 1940, pp. 23-25).

Little Bay (3)

The Little Bay mine is a quarter of a mile south of Indian Bight in Green Bay, Notre Dame Bay. The mine was opened in 1878 and was worked continuously until 1893. Since then there has been intermittent operation and development. The last recorded activity was in 1921-22 when eight holes were drilled.

The ore occurs as veins and disseminations in an extensive shear zone. The most abundant sulphide is pyrite, followed by chalcopyrite.

The mine was developed by 9 shafts, 6 or 7 of which ranged in depth from 100 to 1,400 feet. The underground workings were extensive. A smelter was operated near the shipping pier.

The total production is estimated to have been in excess of 200,000 tons of ore grading between 2½% and 10% copper.

The eastern portion of the mine is said to have collapsed, so extraction of any ore remaining would be difficult if not impracticable. Drilling in the vicinity of the main lode in 1921-22 indicated about 300,000 tons of 2 to 4% copper ore. The dumps were thoroughly sampled in 1926 and contain an indicated 216,000 tons averaging 1.48% copper.

(Ref: Geol. Survey Nfld., Bull. No. 20, 1940, pp. 51-57).

Crescent Lake

The Crescent Lake mine, also known as the Roberts Arm mine, is on the north shore of Crescent Lake about 2 miles west of the small settlement of Roberts Arm. Mining

began in 1878 and was continued for about two years.

The deposit is in a quartz vein in basalt flows and breccias, the ore being chalcopryrite and pyrite. Five other veins are reported in the vicinity. Three inclined and two vertical shafts were sunk on the vein, the deepest being 250 feet.

About 2,000 tons of ore averaging 12% copper was shipped.

Ore Reserves

It is estimated that the average copper content at the surface over the whole thickness of the vein does not exceed 2 to 3 %. If dimensions and tenor were to persist in depth, then each 100 feet measured down the vein would yield 10,000 tons of ore.

(Ref: Geol. Survey Nfld. Bull. No. 20, 1940, pp. 91-94).

Terra Nova (4)

The property is a half mile from the head of Baie Verte, White Bay District. The deposit was discovered before 1862, but little information is available on the early operations. It was closed in 1915.

The deposit occurs in a drag fold structure. The ore consists of massive, fine grained pyrite with minor amounts of pyrrhotite and chalcopryrite. The mine was developed by several shafts and extensive underground workings.

The total production is not known. In the two years 1903 and 1904 a total of 30,312 tons of ore was produced. The ore is said to have averaged 2.41% copper.

There is little possibility of ore being recovered from the mine itself. The dump, however, contains 20,000 tons averaging 2.5% copper.

(Ref: Geol. Survey Nfld., Bull. No. 20, 1940, pp. 13-21, 149).

Pilleys Island (5)

Pilleys island is about half a mile from the mainland of Newfoundland and is in the central part of Notre Dame Bay. The mine lies at tidewater. The deposit contains three separate lenses so closely abutting and conforming to each other as to make one large continuous lenticular orebody extending from the surface to a point about 700 feet on the length of the dip. The ore is massive chalcopyrite. Two of the lenses contain non-cupriferous pyrite, and the third is composed of cupriferous pyrite.

The mine was developed by numerous shafts and levels. Operations were carried on between 1891 and 1899, and between 1901 and 1908.

Total production was 525,000 tons, of which 25 per cent was cupriferous pyrite containing from 2 to 3% copper.

Ore Reserves

| | |
|-------------------------------|---------------------|
| Determined cupriferous pyrite | 226,061 tons |
| non-cupriferous pyrite | <u>202,920</u> " |
| Total | 428,981 tons |
| Probable extension No. 2 lens | |
| (non-cupriferous) | <u>174,920</u> tons |
| Total | 603,901 tons |

Grade of cupriferous pyrite:

Copper 3 to 3.5%; iron 40 to 43%; sulphur 44 to 48%.

Grade of non-cupriferous pyrite:

Copper 0 to 0.24%; iron 42%; sulphur 46 to 50%.

(Ref: Geol. Survey Nfld. Bull. No. 20, 1940, pp. 70-81, 148).

York Harbour (6)

York Harbour is on the west coast, south of the Bay of Islands, in Humber district.

The mine was opened in 1897 and was worked intermittently until 1913. The ore occurs as lenses, as cobbles, and as a cement or ramifying veinlets in the brecciated lavas, the minerals being chalcopyrite and sphalerite.

The main shaft is 485 feet deep with several levels. There are several other shallower shafts and an adit.

Total production amounted to about 30,000 tons.

The estimated reserves are 23,000 tons containing from 2.51 to 4.8% copper and from 4.09 to 19.3% zinc.

(Ref: Geol. Survey Nfld., Bull. No. 20, 1940, pp. 139-140).

There are several copper deposits which have been explored and partly developed but have not produced any ore, the following being among the more important so far discovered.

Gregory River Prospects (7)

These deposits are about 5 miles inland from Shoal Point, which is about halfway between Bay of Islands and Bonne Bay on the west coast. The nearest harbour is about 10 miles to the south.

The area contains numerous copper lodes which were discovered in 1920. They were prospected for several years, but no attempt has been made to develop the deposits.

The most important occurrences are within a rugged area, $2\frac{1}{2}$ miles from east to west, and less than $1\frac{1}{2}$ miles from north to south. The mineral-bearing veins occur in fissures and shear zones in gabbroic rocks. Chalcopyrite and bornite occur in small amounts.

Trenching has been done on several of the lodes whose sizes and grade are given in the following table from records furnished to the Newfoundland Geological Survey by Reid Newfoundland Company, Limited.

| <u>Vein or Lode</u> | <u>Average Width</u> (feet) | <u>Length Proven</u> (feet) | <u>Average Assay</u> (copper) |
|---------------------|--------------------------------|--------------------------------|-------------------------------------|
| Jumbo | 35 | 250 | 14% over 10 ft. 9.3% over 30 ft. |
| Mitchell | 30 | 25 | 18.4% over 6 ft. |
| Hall | 6 | 530 | 5% |
| Palmer | 5 | 710 | 5% |
| Court A | 5 | 200 | 15% |
| Court B | 6 | 160 | 7% over 6 ft. |
| No. 6 | 4 | 20 | 4% |
| No. 7 | 3½ | 30 | 4% |
| No. 9 | Unknown | 30 | 5% over 5 ft. |

No estimate of ore reserves is available. The lodes contain small pockets of rich chalcopyrite ore which might warrant small-scale operations.

(Ref: Geol. Survey Nfld. Bull. No. 20, 1940, pp. 135-138).

Gull Pond or Gull Lake (8)

Most of this deposit, which was discovered in 1905, underlies the waters of Gull Pond. It is 15 miles south of Halls Bay and 20 miles north of the railway at Badger. A motor road connecting Halls Bay and Badger is three miles east of the property.

The deposit lies in a northeast-southwest belt of andesitic flows and tuffs with interbedded silicified tuffs and cherts. The orebody comprises an irregular lens, or lenses in echelon, at Mineral Point, extending under the surface of the lake. Drilling has indicated a somewhat continuous body about 1,100 feet long and 50 to 55 feet wide on the average, and 575 feet deep. The sulphides, predominantly chalcopyrite, pyrrhotite, and pyrite, are typically found in a gangue of cordierite, fibrous amphibole, biotite, quartz, and a little magnetite.

There has been no underground development except a shaft which was sunk to a depth of 80 feet at the southwest end of the deposit. Surface work includes 20 drilled holes and a geophysical survey.

The indicated reserves are 2,160,000 tons with an average grade of 2.62% copper. The Gull Pond deposit is one of the most promising of the undeveloped properties in Newfoundland. The waters of Gull Pond would have to be drained as the main orebody is under the lake. Road connections to both railway and tidewater are within a few miles of the property.

(Ref: Geol. Survey Nfld. Bull. No. 20, 1940, pp. 36-46, 149).

Victoria (9)

The Victoria mine is on the southeast shore of Red Indian Lake, about 10 miles southeast of Buchans mine. The property is owned by Anglo-Newfoundland Development Company, Limited.

The known ore occurs in a folded structure associated with an east-west shear zone. The mineralized zone consists of lenses and stringers.

The main prospect has been developed by two shafts, one inclining to the north and the other to the east. About 200 feet of drifts have been driven from these shafts. The ore ranges from 2 to 5 feet in thickness with grade from 5 to 10% copper.

About 600 feet northwest, the Brook inclined shaft has been sunk in a northerly direction to a vertical depth of 100 feet, and about 100 feet drifting has been done. The ore appears to be a lens-like body and ranges from 1 to 5 feet in thickness. Channel samples indicate a grade of 5% copper. The sulphide minerals are pyrite and chalcopyrite, with minor amounts of sphalerite.

No estimate of ore reserves has been made.

(Ref: Geol. Survey Nfld. Bull. No. 20, Copper Deposits Nfld.

1940, pp. 130-131).

Rambler (10)

This property is about 6 miles southwest of Mings Bight and is about the same distance by a trail from South Brook, Baie Verte.

The deposit is composed of an irregular lens of silicified chlorite schist which contains pyrite and a little chalcopyrite. It was discovered in 1905 and in 1907 a shaft was sunk to a depth of 65 feet. Crosscuts were driven north and south for distances of 20 and 30 feet respectively. A zone of mineralization 600 feet north of the shaft yielded encouraging gold assays. The property was drilled by Siscoe Gold Mines, Limited in 1946 and 1947.

An estimated 330,000 tons of ore is indicated by drilling. This grades 0.43 oz./ton gold, 1.5% copper, and 1.57% zinc.

(Ref: Geol. Survey Nfld. Bull. No. 20, 1940, pp. 81-85).

NOVA SCOTIA

Several of the numerous occurrences of copper in Nova Scotia have been worked to a limited extent. They are all small and only a few thousand tons of ore have been produced.

Stirling (11)

The Stirling mine is in Richmond county, Cape Breton Island, 7 miles from Loch Lomond and 5½ miles from Framboise Cove. It is 45 miles by road from Sydney.

The deposit occurs in a shear zone which traverses greenstones. The ore is composed of fine-grained sulphides-sphalerite, pyrite, galena, and chalcopyrite.

The property was prospected as a source of copper in 1904. Development of the deposit as a producer of zinc was started in 1917 and by 1926 a 2-compartment shaft had been completed to a depth of 400 feet, which was subsequently extended to 600 feet. In 1930 a 300-ton daily capacity mill was erected, but active operation did not commence until 1935. The mine was closed in 1938 and the mill equipment was later dismantled and sold.

Work at the property was resumed in 1950 by Mindamar Metals Corporation Limited.

Production to 1938 amounted to 23,265 tons of zinc concentrates and 9.325 tons of combined copper-lead concentrates.

The estimated reserves are in excess of 200,000 tons, averaging 8.0% zinc, 2.0% lead, and 1.0% copper, above the 600-foot level.

(Ref: N.S. Dept. of Mines, Ann. Report 1947, pp. 111-116).

Coxheath (12)

The Coxheath property is in Cape Breton county, 12 miles from Sydney. The mine was first opened about 1878 and was operated intermittently between 1883 and 1893. The mine was re-opened in 1929, but operations were suspended in 1930.

Chalcopyrite occurs in fissures in altered andesite. There are five parallel veins within 400 feet. Crossing this formation is another break known as the Mount vein, which has been traced on the surface for 1,000 feet.

The mine is developed by 3 shafts, 60 feet, 477 feet, and 100 feet deep respectively. No. 2, the main shaft, is 477 feet deep. A total of 1,950 tons of ore is reported to have been mined.

Ore Reserves

In 1947 the Nova Scotia Department of Mines made topographical, geological, and geophysical surveys of the area and the main underground workings were dewatered, surveyed, and sampled. These workings have approximately 7,000 feet of drifts, cuts, and raises.

The "C" vein shows up on the 120, 140, and 190-foot levels. Between the 120 and 140-foot levels on the northeast side of the shaft old sampling indicated 60 feet of ore averaging 1.85% copper over an average width of 5 feet. On the southwest side of the shaft, new sampling on the 140-foot level indicates 110 feet of ore running 2.5% copper and having an average width of 5.5 feet. No ore zones are evident on the 190-foot level.

The "B" vein occurs on the 190, 260, and 340-foot levels. On the 190-foot level, the vein was stoped for 100 feet along its strike. Old sampling in this area indicated 125 feet of ore containing 2.14% copper over an average width of 4.5 feet. Northeast of the main crosscut on the 260-foot level new sampling indicates 137 feet of ore containing 4.29% copper over an average width of 4.1 feet. On the other side of the crosscut on the same level new sampling shows 93 feet of ore containing 2.20% copper over an average width of 4.3 feet.

The results of the recent work do not indicate a large body of ore.

(Ref: N.S. Dept. of Mines Ann. Report 1949, pp. 104-107).

Colonial Copper (13)

At Horseshoe Cove, Cape d'Or, Cumberland county, native copper occurs as nodules and small grains in a belt of brecciated volcanic trap.

The deposit was worked intermittently between 1901 and 1907 during which period three shafts were sunk, the deepest being 330 feet, and about 1000 feet of underground development was carried out. In 1907, a total of 1,971 tons of ore was mined. Little copper appears to be present.

(Ref: N.S. Dept. of Mines, Ann. Report 1928, Pt. 1, pp. 385-387).

Polsons Lake (14)

This deposit occurs in fissure veins cutting slate at Polsons or Copper Lake in the southwest corner of Antigonish county, about 18 miles by road from the town of Antigonish. Chalcopyrite is the copper mineral.

A small shaft was sunk in 1876 and in 1910 another shaft was put down 180 feet. Production of 200 tons of ore was reported in 1908. Although the property has been worked intermittently over a number of years, it has never reached the stage of a developed mine.

(Ref: N.S. Dept. of Mines, Ann. Report 1928, Pt. 1, pp. 362-363, 390-391).

Cheticamp (16)

This occurrence is at Faribault brook, Inverness county, Cape Breton Island. The ore occurs in zones or beds at different horizons, the highest being 1300 feet above sea level.

In 1864 a shaft was sunk to 106 feet and an adit was driven for 379 feet. Samples across the width of the deposit assayed from 2.4 to 5.0% copper. The last reported activity was between 1902 and 1905. There is no record of any production.

(Ref: N.S. Dept. of Mines, Ann. Report 1928, Pt. 1, p. 391).

McCullough Prospect (15)

This occurrence is one mile south of Tatamagouche, Colchester county. Nodules and seams of chalcocite occur in beds of sandstone. The mineralized zone has a depth of $7\frac{1}{2}$ feet and sampling has indicated an average copper content of 2.8%. The beds dip at an angle of 8 degrees and the copper-bearing seams occur on both limbs of a syncline.

Some surface work was done in 1950 and numerous samples were analysed. Further work is planned to determine the extent of the deposit.

NEW BRUNSWICK

There are a number of small occurrences of copper in New Brunswick, none of which has been developed beyond the production of a few hundred tons.

St. Stephen (17)

Near St. Stephen, Charlotte county, is an occurrence of nickeliferous pyrrhotite and chalcopyrite. Drilling has indicated an orebody in the form of an inverted pyramid 15,000 square feet at the surface and extending to a depth of 250 feet. The body occurs near the contact of altered slates and intrusive masses of gabbro.

In 1947 The International Nickel Company of Canada Limited obtained a lease

large area and has carried out an extensive geological and geophysical survey, the results of which have not been disclosed.

The original occurrence referred to above contains an estimated 150,000 tons of ore.

(Ref: N.B. Dept. of Lands and Mines, Ann. Report 1938, p. 70).

Annidale or Dick (18)

This property is in Springfield parish, Kings county, about 12 miles north of the village of Norton.

The deposit, which is a complex system of veins containing chalcopyrite, was first opened in 1897. Some twenty years later four shafts were sunk and 100 feet of underground work was carried out. A small shipment of ore was made in 1916 which averaged 10.09% copper and 1.19 oz./ton silver. In 1947 a geophysical survey was made of the area.

(Ref: Geological Survey of Canada, Summ. Report 1926-C, pp. 96-99).

Middle Landing Property (19)

The deposit is on the west bank of the Nipisiguit River, Bathurst parish, Gloucester county, 15 miles south of Bathurst.

Chalcopyrite and pyrite occur in a mineralized zone of highly altered and sheared sediments. The zone extends westerly from the river and has been examined over a length of 250 feet. Trenches reveal irregular veins of quartz with scattered chalcopyrite. Two pits expose widths of 3 feet and 12 feet, respectively, of disseminated copper mineralization. Copper content across the mineralized section in the two pits averages about 5%.

In 1946, 14 holes totalling 2,908 feet were drilled.

(Ref: N.B. Dept. of Lands and Mines, Ann. Rept. 1947, p. 108).

QUEBEC

Eastern Township Area

Suffield

The property is on lots 2B and 3A, range XI, Ascot township, Sherbrooke county about 4 miles south of the city of Sherbrooke. The present owner is Suffield Metals Corporation, Limited.

The ore deposits are in quartz porphyry close to the sedimentary contact and mineralized zone has been indicated by drilling for a length of more than 1500 feet. The minerals are sphalerite, chalcopyrite, and galena.

The deposit was discovered about 1858 and was first worked between 1863 and 1898. It was re-opened in 1898. A mill was erected in 1906, but it was never operated, development was intermittent up to 1915 when operations ceased. The mine had been developed by a 400-foot shaft and several hundred feet of drifting at the time it closed. During 1950 more than 15,000 feet of drilling was done and a new 3-compartment vertical shaft was under construction.

The ore indicated by drilling in 1950 is estimated to be 1,226,638 tons with following average grades: copper 1.01%, zinc 5.19%, lead 0.42%, gold 0.014 oz. per ton and silver 1.92 oz. per ton.

(Ref: F.E. Hall and H.G. Way, Report on Property, 1950).

Silver Star, King, and Howard

These old properties are near the Suffield and are on lots 4C - 4D, 4A, and 4B respectively, range XI, Ascot township. The orebodies are similar to the Suffield and consist of mixed sulphides of copper, lead, and zinc. They have been inactive many years and in 1950 were acquired by Suffield Metals Corporation, Limited.

(Ref: Que. Dept. of Mines, "Copper Deposits in Eastern Townships, P.Q." 1915).

Weedon mine (20)

This property is on lot 22, range II, Weedon township, Wolfe county and is 5 miles by road from Weedon on the Quebec Central Railway.

The deposit, discovered in 1909, consists of a lenticular orebody on a contact of chlorite and sericite schists. The ore comprises both massive and disseminated chalcopyrite and pyrite.

The mine was developed by three inclined shafts, the deepest of which was 700 feet, and seven levels were developed. It was operated continuously between 1910 and 1921, during which period 588,389 tons of ore averaging 3.5% copper was produced.

The mine was investigated in 1942 when the indicated recoverable ore was estimated to be 202,500 tons grading from 1.5 to 3.0% copper.

(Ref: Que. Dept. of Mines, "Copper Deposits in Eastern Townships, P.Q." 1915, pp. 271-279).

Western Quebec Area

The occurrences in this area are largely mixed sulphides with some gold and silver, though there are a few deposits in which copper minerals occur without any zinc sulphides. This is the principal metal-producing area in Quebec and there is always the possibility of further discoveries. In fact a fairly large copper body was disclosed recently by drilling on the Golden Manitou property.

Eldona mine (21)

The property consists of 20 claims in Rouyn township, near the town of Noranda. It is under development as a gold mine and is opened by a 3-compartment shaft to a depth of 700 feet with levels at 375, 500, and 700 feet.

Drilling below the 500-foot level showed intersections assaying up to 1.27% copper. At the east end of the station on the 700-foot level a 5-foot width averaged 1.44% copper, 2.24% zinc, 6.13 oz./ton silver and 0.03 oz./ton gold.

(Ref: Que. Dept. of Mines, Mineral Industry of Quebec, 1948, p. 65).

Jay mine (22)

The property covers several lots in ranges I and II, Dalquier township, Abitibi East county. It is about 4 miles from Amos on the Canadian National Railway. Chalcopyrite is the predominating sulphide and occurs as high-grade stringers and disseminations in the adjoining rock.

A shaft was sunk in 1926 to 500 feet and some underground development was done. In 1927, about 32 tons of ore running 5% copper and 4 oz. per ton silver was shipped. Work was suspended in 1928. A reserve of 13,850 tons, averaging 4.8% copper is reported.

(Ref: Que. Dept. of Mines, Geol. of Quebec, Vol.III, 1949, p.103).

Joliet - Quebec (23)

The property comprises 990 acres in Rouyn township, Rouyn-Noranda county, and adjoins both the Noranda and Quemont properties. The deposit is a highly siliceous low copper-bearing ore. In 1946 a 3-compartment shaft was sunk to 628 feet and 100 feet of lateral work was done on the 300 and 600-foot levels.

There is an indicated reserve of 1,000,000 tons containing 1.0% copper and 0.1 oz. per ton gold.

In 1949, Noranda obtained a lease on approximately 25 acres to a depth of 1,000 feet. It was proposed to drift from the north boundary of Noranda through the center of the Joliet-Quebec property to the leased area.

(Ref: Que. Dept. of Mines, op. cit., p. 155).

Macdonald (24)

The Macdonald property comprises 36 claims, covering 2,130 acres in Dufresnoy township about 5 miles east of Waite Amulet. The deposit is a massive sulphide body in which pyrite predominates. Sphalerite and chalcopyrite also occur, the latter in small amounts. The copper content is small. The mine is developed by a 3-compartment shaft.

shaft to a depth of 950 feet.

(Ref: Que. Dept. of Mines, op. cit., p. 119).

Mic Mac (25)

The property is in Bousquet township, Rouyn-Noranda county and comprises over 1000 acres. It was operated primarily as a gold mine, but several thousand tons of copper concentrate were produced annually. Development of the deposit began in 1938 and production continued from 1942 to 1946. The shaft is down 1,150 feet. During the four years 1943-1946, a total of 2,535,700 pounds of copper was produced.

The mine was closed in 1946, but drilling done in 1949 in a zone 1500 feet from the shaft indicated a possible new orebody.

United **Mic Mac** Mines Ltd. is the present owners.

(Ref: Que. Dept. of Mines, op. cit., p. 183).

Fleming Property (26)

The property is in Louvicourt township, Abitibi East county. The deposit consists of quartz veins and silicious zones with disseminated chalcopyrite. The property has been drilled and indicated ore reserves above the 200-foot horizon are estimated to be 325,000 tons with a grade of 1.32% copper. The C.N.R. crosses the northwest corner of the property.

(Ref: Que. Dept. of Mines, op. cit., p. 276).

Rainville or Jacques Cartier claims (27)

This group of 15 claims is half a mile south of the Val d'Or-Senneterre highway in Bourlamaque township, Abitibi East county. Chalcopyrite occurs in veins in rhyolite.

Prior to 1947 the zone was investigated by drilling. Intersections made by 16 holes spaced at regular intervals along a continuous length of 1,650 feet averaged 1.36% copper for an approximate true width of 16 feet. The drilling indicated roughly 2,000 tons per vertical foot to the 200-foot horizon.

(Ref: company report).

Chibougamau Area

The recently completed highway from St. Felicien on Lake St. John to Lake Chibougamau has removed the transportation difficulties that hitherto have retarded development and exploration in this area.

(Ref: Que. Dept. of Mines, Geol. of Quebec, Vol. III, 1949, pp. 57-67).

Opemiska (28.)

The property consists of 48 claims and is 5 miles north of Presqu'ile Lake and 20 miles west of Lake Chibougamau in Brongniart township, Abitibi East county. The ore is copper-gold.

During 1936 and 1937, a 3-compartment shaft was sunk to a depth of 546 feet and 5,147 feet of drifting and crosscutting was done on the 150, 275, and 525-foot levels. Operations were suspended in 1937.

The ore reserves are estimated to be 283,000 tons, averaging 7.4% copper and 0.13 oz./ton gold.

(Ref: Que. Dept. of Mines, op. cit.).

Cache Bay (29.)

The property is in Obalski and McKenzie townships, Abitibi East county, and comprises 25 claims. The present owners are Obalski (1945) Limited. The ore, which is copper-gold, occurs in veins in a mineralized zone. A 3-compartment shaft was sunk to a depth of 75 feet and the deposit has been drilled. The drilling indicated 111,900 tons with an average grade of 1.34% copper and about 0.30 oz. per ton gold.

(Ref: Que. Dept. of Mines, op. cit.).

Cedar Bay Claims (30)

These claims are in Obalski township on Dore Lake and reasonably near the new St. Felicien-Chibougamau highway. The deposit has been drilled. The total indicated reserve is 470,000 tons averaging 1.64% copper.

(Ref: Que. Dept. of Mines. op. cit.).

Merrill Island (31)

The deposit is in shear zones on Merrill Island in Dore Lake, Obalski township. Drilling to the 250-foot level has indicated 2,000,000 tons averaging 1.52% copper, 0.013 oz. per ton gold, and 0.18 oz. per ton silver.

(Ref: Que. Dept. of Mines, op. cit.).

Merrill Island water claims (31)

These claims are under Dore Lake west of Merrill Island. Ore reserves proved and indicated by drilling to the 240-foot level are estimated to be 103,500 tons averaging 1.98% copper and 0.105 oz. per ton gold.

(Ref: Que. Dept. of Mines, op. cit.).

Gaspe Area

Copper Mountain (32)

The Copper Mountain or Gaspe Copper property of Noranda Mines, Limited, is in the northwest corner of Holland township, North Gaspe county. It comprises 34 claims which extend from the top of Copper Mountain across the valley and up the western slope of Needle Mountain. The deposit is composed of narrow veinlets and disseminated chalcopyrite mineralization. Present access to the property is by road from Gaspe, a distance of 60 miles.

Copper was first discovered in the area in 1909 and the first claims were staked in 1921. Noranda Mines Limited acquired the claims and commenced drilling in 1940. By the end of 1950 in excess of 50,000,000 tons averaging about 1.2% copper had been indicated by drilling.

(Ref: Que. Dept. of Mines, op. cit., p. 391: company annual reports).

ONTARIO

Southern Ontario

McGown mine (33)

The property is on Lot 146, concession B, Foley township, Parry Sound district, and is about $1\frac{1}{2}$ miles from Parry Sound. It was first worked about 1897 but has been idle since 1910. Three types of mineralization occur: disseminated chalcopyrite and bornite in quartz veins; lenses of chalcocite and bornite in gneiss; and massive sulphides. The gold values are low. The mine is developed by four shafts, the deepest being 238 feet. About 167 tons of ore was shipped to Orford Copper Company in 1899. No record of the reserves is available, although the grade is reported to have been good.

(Ref: Ont. Dept. of Mines, Ann. Report, Vol. 51, P. 2,
1942, pp. 31-32).

Nickel Cliff

The property is in Armour township, Parry Sound District, on lot 17, concession VIII. Pyrrhotite and chalcopyrite occur as disseminations or massive sulphide lenses in amphibolite or norite. A 32-foot shaft was sunk in 1900-1901 and some drilling done in 1903 and 1904. The deposit appears to be small.

(Ref: Ont. Dept. of Mines, op. cit., pp. 33-35).

Wilcox

The property is in Cowper township, Parry Sound District and embraces the south half of lots 18-22, concession IV. The deposit comprises several disconnected mineralized lenses in biotite gneiss at intervals over a length of 2500 feet from the shore of Georgian Bay. It was developed by three shafts, the deepest being 175 feet. Approximately 192,000 pounds of copper was produced in 1903-04. Nine holes were drilled in 1939, four of which over a 340-foot length indicated 2.5% copper in 10 feet of core, 3.0% copper in 20 feet, 2.1% copper in 5 feet and 4.1% copper in 1.2 feet.

(Ref: Ont. Dept. of Mines, op. cit., pp. 22-26).

Eldorado copper mine (34)

The old **Eldorado** mine is in Madoc township, Hastings county, near Eldorado village. The copper orebody, chalcopryrite and chalcocite, was overlain by a hematite gossan to a depth of 75 feet. The orebody is in a contact fissure between limestone and granite. The hematite was worked by open cut and a shaft was sunk on the copper orebody from the 75-foot level to a depth of 300 feet. In 1906 about 234,000 pounds of copper matte containing 109,000 pounds of copper was produced. The ore is reported to have averaged from 4 to 10% copper.

(Ref: Ont. Dept. of Mines, Ann. Report, Vol. 15, 1906, p. 90;

Vol. 16, 1907, p. 76).

Clarendon or Picamine property

This property is on lots 1 and 2, concessions VIII and IX, Palmerston township, Frontenac county and in 1949 was owned by Picamine Copper Gold Mines, Limited. Chalcopryrite occurs in two main vein systems. **Nine** or more quartz veins 1 to 4 feet wide are reported. Development consists of numerous shallow pits. The best zones might average 3.5 to 4.0% copper across narrow widths.

(Ref: Report of War Metals Advisory Committee).

Nipissing District

Trebor mine, (formerly Cuniptau) (35)

The property comprises 63 claims in Strathy township, Nipissing district, 4 miles from the village of Timagami on the Ontario Northland Railway. Between 1932 and 1936 it was developed by Cuniptau Mines Limited and a 50-ton blast furnace was operated for a few months. The deposit consists of a basin-shaped body of peridotite in which the chalcopyrite and pyrrhotite are disseminated. There are also several lenses of massive sulphide in small veins. The mine is developed by a 240-foot shaft and 2000 feet of lateral work. From 3,318 tons of ore milled in 1936, 99,284 pounds of copper, 65,434 pounds of nickel, 37.0 ounces of gold, 91.0 ounces of silver, 82.7 ounces platinum, and 196.3 ounces palladium were obtained. A total of 39,417 feet of drilling was done in 1949.

As of June 1949, northwest of the diabase, 369,000 tons averaging 1.42% combined nickel and copper was indicated. Southwest of the diabase is an indicated 2,500,000 tons of low-grade nickel-copper ore. The sulphides contain platinum and other precious metals.

(Ref: Ont. Dept. of Mines, Ann. Report Vol. 44, Pt. 7,
1935 pp. 54-55; Vol. 51, 1942, p. 24).

Sudbury District

Denison (36)

The mine is on the west half of lot 12, concession II, Denison township, the present owners being North Denison Mines, Limited. The deposit includes two mineralized areas in a norite dyke. In the shaft area, a pipe-like ore shoot, 400 feet long on the surface, has been followed by drilling to a depth of 1125 feet. Mineralization is

chalcopyrite and nickeliferous pyrrhotite, typical of deposits in the Sudbury area. Operations were begun in 1937 and by the end of 1939 a 3-compartment shaft had been sunk to 972 feet and six levels were developed to 950 feet. A geophysical survey was made and drilling was done in 1946.

Estimated ore reserves to a depth of 1100 feet after a 30% allowance for sorting are 382,925 tons averaging 0.93% copper and 1.0% nickel.

(Ref: Ont. Dept. Mines, Ann. Report Vol. 49, Pt. 1, 1940, p. 226).

Moose Lake (37)

The Ontario Nickel Mines property is in McLennan township on lot 11, concession IV and on the east rim of the Sudbury basin. Lenses of sulphide occur in a band of quartz-diorite breccia which lies between the norite and footwall granite. Sulphide bodies are of the massive type, with typical Sudbury area mineralization. The mine is developed by ^a/265-foot shaft and 3000 feet of drifting to the east and northwest orebodies. Seven thousand feet of surface and 15,000 feet of underground drilling has been done. In 1945 a total of 2,427 tons of ore was shipped, averaging 3.25% nickel and 0.64% copper.

Ore reserves in 1947 were 813,000 tons averaging 0.50% copper and 1.30% nickel. Of this, 360,000 tons averages 0.58% copper and 1.60% nickel.

(Ref: Ont. Dept. Mines Ann. Report, Vol. 56, Pt. 2, 1947,
p. 104).

Nickel Offsets (38)

The property is in Foy and Bowell townships. The sulphides are in a band of quartz-diorite breccia that averages 200 feet in width. The mine is developed by two 3-compartment shafts, No. 1, 1130 feet deep with 4 levels, and No. 2, 1106 feet deep with 4 levels. In 1943-44, a total of 10,311 tons of ore averaging 3.26% copper, 4.25% nickel and containing cobalt and platinum metals was shipped. The mine was being

actively developed in 1949.

Estimated reserves are 357,600 tons averaging 1.45% copper and 1.91% nickel. A lens on the 155-foot level in 1944 contained 100,000 tons over a 25-foot width averaging 1.75% copper, 1.95% nickel, 0.025% cobalt and \$2.20 per ton platinum metals.

(Ref: Annual reports of company).

Errington mine (39)

The mine is in Creighton and Balfour townships and was active during the period 1926-1931. Mineralization is in a major fault zone along a slate-tuff contact. The ore is an intimate mixture of copper, lead, zinc, and iron sulphides. There are a number of ore shoots. The mine is developed by two shafts, No. 1 down to the 500-foot level and No. 2 with levels at 300 feet, 500 feet, and 1500 feet.

From 1928 to 1930, a total of 2,156,626 pounds of copper was produced in concentrates, as well as concentrates of lead and zinc.

The estimated reserve above the 500-foot level is 3,500,000 tons averaging 1.05% copper, 1.0% lead, and 4.55% zinc.

(Ref: Ont. Dept. of Mines, Ann. Report Vol. 38, Pt. 3, 1929, pp. 41-46).

Vermillion Lake (40)

The property is in Fairbank township and adjoins the Errington property on the west. The mineralized zone is about a mile in length and lies under Vermillion lake. Mineralization and ore are of the same character as at the Errington mine. The deposit is not developed, but 88 holes have been drilled, totalling 63,913 feet.

About 1,000,000 tons of ore averaging 1.50% copper, 1.0% lead, 4.7% zinc, and 1.60 ounces per ton silver are indicated to a depth of 400 feet below the surface of the lake.

(Ref: Ont. Dept. of Mines, op. cit.).

Shakespeare Property (21)

The property is in Shakespeare township on the N.E. 1/4 lot 2, concession V and is owned by Falconbridge Nickel Mines Limited. The deposit consists of a mineralized zone in quartz diorite. Mineralization consists of disseminated pyrrhotite, pentlandite, and chalcopyrite with precious metals present in about the same proportion as in Sudbury ores.

No development has been done, but geophysical surveys and some drilling have been carried out. The deposit is an extensive low-grade orebody and it is reported that it could be developed by open cut mining.

Estimated reserves are 3 to 5 million tons, averaging 0.47% copper and 0.43% nickel.

(Ref: Ont. Dept. of Mines, Ann. Report Vol. 38, Pt. 7, 1929, pp. 25-26).

Massey mine

The mine is in section 16 of Salter township, on the north shore of Lake Huron. Ore deposits occur in bands of greywacke and arkose that run through the quartzite.

It was developed by three shafts and an adit. There are 7 levels to 700 feet. It was worked from 1900 to 1906 and from 1915 to 1927, during which 633,264 pounds of copper was produced.

The mine is reported to contain 60,000 tons, probably grading 2.0 to 2.5% copper.

(Ref: Geological Survey of Canada Memoir 143, 1925, pp. 129-130).

Hermine mine

The mine is in Salter township and has been idle for about 40 years. The main vein is in granite and diabase and extends for over 2000 feet along the strike. The maximum width is 30 feet. The ore is low grade but silicious and would be suitable for fluxing.

The mine was developed by three shafts, No. 3 the deepest being 435 feet deep, with four levels. Between 1903-1910 a total of 13,134 tons of ore was raised,

representing a production of 1,015,950 pounds of copper.

No figures are available on reserves.

(Ref: Ont. Dept. of Mines, Vol. 22, Pt. 1, 1913, pp. 155-160;

Vol. 38, Pt. 7, 1929, pp. 30-31).

Timiskaming District

Amity Copper

The mine is in Pacaud township on the south 1/2 of Lot 5, concession VI, near Boston Creek station, Ontario Northland Railway. It has been closed since 1930. Mineralization is confined to a band of iron formation, averaging 4 feet wide. Ore is principally chalcopryrite, but bornite is abundant in places. The mine is developed by a 2-compartment shaft to a depth of 1020 feet and 2238 feet of lateral work has been done on 5 levels to 600 feet. During 1928-29 and 1932 fifteen carloads of ore containing 68,325 pounds of copper were shipped.

Indicated ore to 1000 feet is 25,000 tons averaging 5% copper.

(Ref: Ont. Dept. of Mines, Vol. 38, Pt. 6, 1929, p. 101).

Patterson

The property adjoins the Amity mine in Pacaud township on lot 4, concession VI. The mine has been idle since 1929. The deposit comprises several sulphide bands enriched with chalcopryrite. There is a 3-compartment shaft with 4 levels to a depth of 500 feet and 2655 feet of lateral work. Production consisted of 9 cars of sorted ore averaging 8% copper.

Combined with the adjoining Trethewey-Ossian the possible ore is estimated to be 25,000 tons with a grade of 4 to 5% copper.

(Ref: Ont. Dept. of Mines, Vol. 38, Pt. 6, 1929, p. 102).

Trethewey-Ossian

The mine adjoins the Patterson on the north 1/2 lot 3, concession V, Pacaud township. It has been idle since 1928. The deposit is a continuation of the sulphide band on the Patterson property and has been traced for 2000 feet. A 2-compartment shaft has been sunk to a depth of 140 feet, with 167 feet of drifting on the 125-foot level. No production is reported. The possible reserves are included with the Patterson mine. Some surface pits show high-grade chalcopryrite.

(Ref: Ont. Dept. of Mines, Vol. 38, Pt. 6, p. 102).

Ryan Lake property

The property is in Powell township near the village of Matachewan. At the main showing chalcopryrite occurs in stringers and disseminations throughout a sheared zone in altered Keewatin lavas. The zone is 800 feet long and open. The property has been drilled and the erection of a 25-30 ton mill is planned. Initial mining will be open cut.

Approximately 200,000 tons of ore averaging 2.99% copper has been indicated to a depth of 370 feet.

(Ref: Northern Miner, April 27, 1950, p. 29).

Cochrane District

Kam-Kotia (42)

The property is in Robb township about 22 miles by road from Timmins. The deposit is a replacement and stockwork body of chalcopryrite and other sulphides along a sheared zone in altered Keewatin volcanics. It is developed by a shaft 150 feet deep, with drifting on the 150-foot level, and an open pit.

It was operated by Wartime Metals Corporation during 1942-44 and produced by open-cut mining almost 200,000 tons of ore with a copper content of 5,804,061 pounds.

Ore reserves were as follows:

Copper orebody: 825,000 tons. Grade: 1.95% copper, 0.20% zinc.

Zinc orebody: 600,000 tons. Grade: 0.50% copper, 4.0% zinc.

(Ref: Ont. Dept. of Mines, Vol. 53, Pt. 4, 1944, pp. 17-26).

Algoma District

Bruce Mine (43)

The mine is in Plummer Additional township at the village of Bruce Mines. The deposit was discovered and first worked in 1847. The ore occurs in quartz veins in diabase. There are four veins on the property, the main vein having a known length of 8000 feet, with stopes extending for 2000 feet along the lode. The mine was developed by 10 shafts with extensive lateral work. The deepest level is 527 feet. No definite production figures are available but the value up to 1916 is estimated to have been between \$3,500,000 to \$7,000,000. In the years 1918-1921 inclusive, 93,000 tons of silicious copper ore was shipped to the Coniston smelter for fluxing purposes.

Indicated ore reserves (1942) above the 150-foot level are 40,000 tons averaging 2% copper, and below the 150-foot level, 30,000 tons averaging 1.75% copper.

(Ref: Geological Survey of Canada Memoir 143, 1925, p. 125).

Cheney Mine (44)

The property is in Gould township on lots 6 to 8, concession V. It is about 25 miles from Thessalon on the C.P.R. The deposit consists of a quartz-chalcopryrite vein with excellent ore in certain sections, grading 5% to 15% copper across 2 feet 4 inches. The main vein has been traced for 4780 feet. A 150-foot shaft has been sunk in the vein and 1625 feet of drifting and 860 feet of crosscutting has been done on the 150-foot level. In 1916 a total of 33,468 pounds of copper was produced.

Ore reserves (1942) were 24,000 tons averaging 4.0% copper.

(Ref: Ont. Dept. of Mines, Vol. 38, 1929, pp. 10-15).

Mother Lode Copper Prospect

The property is in Montgomery township on lots 2-6, concession V and lots 6-8, concession VI. The main North vein system has been traced at intervals for 18,000 feet, open at both ends. It is up to 20 feet wide. The South vein, parallel and 500 feet from the main vein, has been traced 2500 feet up to 20 feet wide. The ore is spotty chalcopryrite in quartz. The only development is some surface work. No reserves have been estimated, but assays run mostly between 1 and 5% copper across widths of 4 to 14 feet.

(Ref: Ont. Dept. of Mines, P.R. 1950-4, 1950, p. 8).

Northern Ontario Copper Mine

The mine is on the north half of section 13 in Thompson township, near Dean Lake on the Canadian Pacific Railway. Chalcopryrite ore occurs in two parallel quartz veins, 600 feet apart. There is a 3-compartment shaft, 130 feet deep with 200 feet of drifting on the 117-foot level. About 1500 tons of ore was raised in 1906, with a copper content of 120,000 pounds. The reserves are not stated, but grade is reported to be from 4.5 to 12.5% copper.

(Ref: Ont. Dept. of Mines Vol. 15, 1906, p. 69; Vol. 16,

Pt. 1, 1907, p. 70).

Rock Lake

The mine is in Aberdeen township on the south half of lot 3, concession I. The deposit consists of disconnected quartz-carbonate-chalcopryrite veins extending at intervals over a length of 900 feet southeast from the shaft. It is reported that these veins also extend northwest for a long distance. Some are fault fissure veins up to

10 feet in width. The copper content is spotty, averaging 1.0% on the surface. Development includes two adits and a 420-foot shaft, with lateral work on the 100 and 200-foot levels. Between 1899 and 1903, about 43,300 tons of ore was raised having a copper content of 1,524,000 pounds.

No estimate of reserves is available.

(Ref: Geological Survey of Canada Memoir 143, 1925, p. 126).

Glenrock

This property, formerly known as the Ranson mine, is in Anderson and Chesley townships and comprises 24 claims totalling 960 acres. The deposit consists of quartz-chalcopyrite veins in a sheared zone along a granite-dabase contact. About 1902 a shaft inclined at 65° was sunk to a depth of 214 feet, with a level at 200 feet. No production is reported. A bulk sample of 480 pounds was submitted to the Bureau of Mines, Ottawa, in 1947 for testing. This assayed 9.84% copper and 0.085 oz. per ton gold.

(Ref: Ont. Bur. Mines, Vol. 13, Pt. 1, 1904, p. 81).

Taylor

The property is in Anderson township on the north half of lots 2, 3 and 4, concession V and the south half of lots 3 and 4, concession VI. It adjoins the Glenrock property on the west. A quartz-chalcopyrite vein in a shear extends along the north contact of the diabase dyke with granite and has been traced for 900 feet and still open. Width is 2 to 15 feet. There are four shafts and an adit. Workings are now badly caved in. No production is reported and the average copper content of the ore is probably low. The mine is accessible by **nine** miles of rough road / ^{from} Glendale on the Algoma Central Railway.

(Ref: Ont. Dept. of Mines, Vol. 11, 1902, p. 272, Vol. 13,

Pt. 1, 1904, p. 82).

Superior Copper

The mine is in Marne township and township 24, Range XI, concession I. Achigan is the nearest station on the Algoma Central Railway. The deposit comprises quartz-chalcopyrite veins and lenses along granite-diorite contact. Between 1901-1907, a total of 652,000 pounds of copper was produced. There are six shafts on the property, No. 6 being 400 feet deep with levels every 100 feet. There is 875 feet of drifts. To the third level of No. 6 shaft is an estimated 10,000 tons of ore averaging 4% copper and 75% silica.

(Ref: Ont. Dept. of Mines, Vol. 11, 1902, p. 274; Vol. 17, 1908, p. 79).

Mamainse Copper Property

The property is in Ryan township near Mamainse Point and Sand Bay on east shore of Lake Superior. Native copper and chalcocite occur in Keweenawan amygdaloidal flows and interbedded conglomerate striking northerly and dipping gently westerly. Drilling in 1949 disclosed disseminated chalcocite replacements in fractured zones. Three shafts, 320, 280 and 60 feet respectively, were sunk between 1882-84. Copper was first reported in this area in 1798. There is no record of any production. It is reported that "interesting" copper values were obtained in the drilling done in 1949.

(Ref: Ont. Dept. of Mines, Vol. 35, Pt. 2, 1926, pp. 81-85).

Thunder Bay District

Tip Top Copper

The mine is in Haines township, 7 miles southwest of Kashabowie. The deposit is composed of sulphide replacement bodies at or near the contact of greenstone and sericite schist. It was developed by 4 shafts, the main one being 400 feet deep with four levels. Considerable drilling was done in 1948. During the three active periods 1903, 1906-07, and 1916-17, a total of 1,312,979 pounds of copper was produced. Sections

of drill core obtained in 1948 are reported to run 4.0% copper.

(Ref: Ont. Dept. of Mines, Vol. 20, Pt. 1, 1911, pp. 209-213;

Vol. 27, Pt. 1, 1918, p. 170).

Andowan Mines (Shebnor) (46)

The property is near Kashabowie. Mineralization is of the replacement type along a sheared and fractured zone which has been traced for over 3000 feet and is up to 60 feet wide. Copper, gold, and silver values occur in the mineralized zones. Development is limited to surface work and to approximately 10,000 feet of drilling. Some drill intersections gave 1.84% copper in 20.5 feet of core, 1.3% in 11 feet, 2.15% in 9.3 feet, and 2.2% in 17.3 feet.

(Ref: Ont. Dept. of Mines, P.R. 1950-4, 1950, p. 10).

Shebandowan Lake (Cross Claims) (45)

The property is in Hagey township on Southwest Bay, Lower Shebandowan Lake. The deposit comprises a series of sulphide lenses connected by very narrow widths of sulphides in sheared peridotite. These lenses vary from 800 to 1600 feet in length and extend over a linear distance of about 4000 feet. Considerable drilling has been done. Surface sampling indicates nickel up to 3% and 2% copper with cobalt in varying amounts under 1.0%.

(Ref: Ont. Dept. of Mines, Vol. 29, Pt. 1, 1920, pp. 225-235).

Kenora and Rainy River Districts

Cameron-Earngey Claims

The claims are on the mainland just east of Eagle Passage on Bigstone Bay, Lake of the Woods. The deposit, comprising a network of pyrite and chalcopyrite, is in a sheared zone in Keewatin greenstone. The zone is heavily mineralized for 75 feet along the strike. Some surface work and trenching has been done.

(Ref: Ont. Dept. of Mines, Vol. 39, Pt. 3, 1930, p. 69).

Rexora Property (47)

The property is on the north shore of Werner Lake about 30 miles by air from Minaki on the Canadian National Railway. Several lenticular bodies of copper-nickel mineralization with associated platinum-palladium values occur at intervals over a length of three miles. Main mineralized zone is 100 feet by 60 feet. The deposit has been drilled, and an 80-foot section of hole No. 2 averaged 1.33% nickel and 0.62% copper. The property was optioned to Falconbridge Nickel Mines, Limited, in January, 1949. (Ref: The Precambrian, April, 1949, p. 53).

MANITOBA

The most important copper resources in Manitoba are in the western part of the province but there are occurrences in the southeastern, east central, and northern parts. In general the mineralization is largely of the mixed type such as copper-nickel or copper-zinc. Estimated reserves additional to those of the producing mines are at present limited to a small number of deposits.

Lac du Bonnet Mining Division

Maskwa and Oiseau Areas

The deposits are about 15 miles north and east of Pointe du Bois. The orebodies are composed of disseminated sulphides in volcanic rocks, the principal minerals being chalcopyrite, pyrrhotite, pentlandite, and pyrite. The deposits have been drilled.

Ore reserves are as follows: Maskwa area, indicated ore 300,000 tons, with an average grade of 1.17% copper and 0.78% nickel; Oiseau area, ore above 325-foot level, 400,000 tons, with an average grade of 0.35% copper and 1.31% nickel.

(Ref: Man. Dept. of Mines and Nat. Resources, Prelim.

Report 48-7, 1949, p. 13).

Athapapuskow Mining Division

Bob Lake Property (49)

The property is 3 miles northeast of the Sherritt Gordon concentrator. Three known lenses of rather massive sulphides occur on echelon in a sheared contact zone in gneiss. Chalcopyrite and sphalerite are disseminated in massive pyrite and pyrrhotite. The deposits have been drilled.

The indicated reserve of the three lenses is 2,380,000 tons, with an average grade of 1.33% copper, 1.18% zinc, 0.01 oz. per ton gold, and 0.27 oz. per ton silver.

(Ref: Departmental Records).

The C.R. and C.U. Groups

The former group is on the west side of Schist Lake, 5 miles from Flin Flon, and the latter is east of the northwest arm of Schist Lake, 6 miles from Flin Flon. The deposits are mineralized zones in which chalcopyrite occurs as disseminated blebs in the sheared porphyry. Little work has been done, but the copper indications are interesting.

(Ref: Prospectus, 1949, Canus Petroleum Corp., Ltd.).

Sourdough Group (Stanmac) (48)

The claims are on Lake Athapapuskow, 11 miles from Flin Flon. A sulphide ore zone containing chalcopyrite and sphalerite is indicated by a magnetic anomaly. Drilling done in 1949 indicated 900 tons of ore per vertical foot. Assays from two sections 200 feet apart, averaged 1.75% copper, 2.86% zinc, 0.057 oz. per ton gold, and 1.40 oz. per ton silver. Drilling results in 1950 were reported to be poor.

(Ref: Northern Miner, April 14, 1949.).

Thompson Lake

East of Sourdough Bay, Athapapuskow Lake, a mineralized zone was disclosed by drilling in 1949. A fairly good grade of copper sulphide has been indicated. Drilling has indicated an orebody of moderate size.

(Ref: Northern Miner, May 4, 1950, p. 17.)

Herb Lake Mining Division

Dickstone Copper (50)

The property is in the File Lake area, between Morton and North Star Lakes, 31 miles southeast of the Sherritt Gordon mine and 25 miles from Heming Lake station on the Canadian National Railway. Chalcopyrite and pyrrhotite with small amounts of sphalerite occur in a heavily sheared zone that cuts fine-grained andesite. The ore is relatively massive and coarse-grained. The deposit has been drilled and trenches have been cut at regular intervals for 200 feet. The indicated orebody has a surface length of 800 feet with a width of 6 feet.

The ore shoot is reported to contain 200,000 tons of ore, containing 3.15% copper, and a small content of zinc and precious metals.

(Ref: Geological Survey of Canada Memoir 250, 1949, p. 54, 55).

Granville Lake Mining Division

Lynn Lake (Sherritt Gordon) (51)

The property, consisting of 352 claims, is about 120 miles north of Sherridon. The deposit comprises a number of orebodies mineralized with chalcopyrite and nickeliferous pyrrhotite. The deposit was discovered in 1945 and has been actively developed. Extensive drilling has been done and a 5-compartment shaft was completed to 1,000 feet. In 1949 the estimated reserve indicated by drilling was placed at 10,365,000 tons grading 0.681% copper and 1.443% nickel.

A massive sulphide body containing chalcopyrite and sphalerite, known as the "Z" deposit, occurs near the nickel-copper deposits. A total of 6,386 feet of drilling has been done on this deposit and an indicated 153,000 tons of copper-zinc ore was disclosed. The average grade is 1.113% copper, 3.491% zinc, and 0.016 oz. per ton gold.

(Ref: Sherritt Gordon Mines, Ltd., ann. reports).

Granville Lake Area

There are numerous occurrences of copper and copper-nickel sulphides in the Barrington Lake and Farley Lake areas of northern Manitoba. Considerable drilling, has been done but so far no large deposits have been disclosed except those at Lynn Lake.

SASKATCHEWAN

Apart from the Flin Flon deposit which extends into Saskatchewan from Manitoba, there are no copper reserves outlined. There are numerous occurrences in the northern part of the province at such points as Rottenstone Lake, Reindeer Lake, and the Fond du Lac area, Lake Athabaska.

ALBERTA

Alberta has no known copper deposits of present economic interest.

There is a small deposit at Eldon, (52) near Lake Louise, which occurs in a fairly continuous vein about 1600 feet above the Canadian Pacific Railway main line. It contains a good grade lead-zinc ore and a medium to high-grade copper ore, but the tonnage is small. The deposit was worked during 1916-17, when a 230-foot adit was driven into the mountain and about 650 feet of underground development was done. A shipment of 46 tons was made in 1917. The copper ore is reported to have assayed 7.2% copper, 0.03 oz. per ton gold, and 1.5 oz. per ton silver. The zinc ore ran 31.3 to 42.8% zinc, 4 to 7.6% lead, and from a trace to 2.0 oz. per ton silver.

(Ref: Departmental Files).

BRITISH COLUMBIA

The following survey covers the most important of the potential sources at present idle or under development. Copper in British Columbia is in many cases associated with zinc or other base metals and usually with varying amounts of gold and silver. There is only one occurrence of copper-nickel ore of interest.

Present high base metal prices have resulted in a revival of exploratory activity and many small former producing mines are being developed or investigated.

Alberni Mining Division

JJJ or Hayes (62)

The property consists of seven Crown-granted mineral claims, on the side of Alberni Inlet, Vancouver Island, just below Nahmint River and 18 miles by boat from Port Alberni. The deposit consists of lenticular bodies of magnetite and chalcopyrite lying in parallel shear veins up to 6 feet wide and associated with limestone. The claims extend from the beach to an elevation of about 2,000 feet.

The deposit was developed extensively about 50 years ago when 5,000 feet of underground work was carried out. Two thousand tons of 8.0% copper ore was produced up to 1928. The British Columbia Department of Mines Report for that year stated that the property has considerable prospective merit. Some activity was reported during 1947.

(Ref: B.C. Dept. of Mines, Ann. Report, 1928, p. 367).

Victoria Mining Division

Sunloch and Gabbro properties (60)

The properties are a few miles up the Jordan River valley from the village of Jordan River on the southwest coast of Vancouver Island. Jordan River is 45 miles from Victoria by good highway. The ore occurs in shear zones in basalt which are parallel to the flow structure. Considerable development was done from 1917 to 1920. There are

three adits and a total of 3,776 feet of drifting and crosscutting.

In 1949 Hedley Mascot Gold Mines Limited, began an extensive drilling program and about 11,000 feet of drilling has been done. The ore reserves indicated by drilling are 477,000 tons with an average grade of 3.6% copper.

(Ref: B.C. Dept. of Mines, Ann. Report, 1949, p. 222).

Twin "J" mine (61)

The property comprises several groups totalling 28 Crown-granted claims on Mount Sicker, 9 miles from Duncan, Vancouver Island. There are two parallel orebodies, both of which contain chalcopyrite and sphalerite, and which lie along two main drag-folds in a narrow band of sediments. The ore is a fine-grained replacement in tuffs and graphitic schists. The deposits have been developed extensively and were worked between 1898 and 1910. They were re-opened in 1943-44 by Wartime Metals Corporation under contract. In 1948 Base Metals Mining Corporation, Limited, acquired a controlling interest and resumed development.

Between 1898 and 1909 a total of 253,000 tons of ore was mined. In 1944, concentrates containing 17,341 pounds of copper and 1,493,604 pounds of zinc were produced. In 1947 about 8,300 tons of ore was milled which yielded 174,000 pounds of copper and 536,000 pounds of zinc.

In 1943 reserves were estimated at 100,000 tons with an average grade of 2.0% copper, 7.0% zinc, and small values in silver and gold.

(Ref: B.C. Dept. of Mines, Ann. Report, 1944, p. 67).

Nanaimo Mining Division

Coast Copper (63)

The mine is in the north central part of Vancouver Island on Elk Lake. It is 16 miles from Jeune Landing on the west coast and 25 miles from Port McNeill on the east coast.

The property is owned by Coast Copper Company Limited, in which The Consolidated Mining and Smelting Company of Canada, Limited, holds a controlling interest.

The showings were discovered in 1911 and underground development was started several years later. The ore occurs in a series of interbedded limestones and andesite flows or sills, and is a replacement in limestone along the contact. Two types of ore occur in the deposit, in one of which copper is the principal metal and in the other, iron. The mine is opened by two adit levels and the total development, comprising drifting, crosscutting, raising, and sinking, is 28,555 feet. Over 27,000 feet of drilling has been done.

Ore reserves are as follows:

| <u>Copper Ore</u> | <u>Tons</u> | <u>% Cu.</u> | <u>Oz./ton Au.</u> | <u>Width</u> |
|-------------------|----------------|--------------|--------------------|--------------|
| Partly developed | 82,000 | 8.38 | 0.666 | 5.7 ft. |
| Possible | <u>418,000</u> | 3.20 | 0.050 | 6.4 ft. |
| Total | 500,000 | 3.24 | 0.053 | 6.3 ft. |

The iron orebody is estimated to contain from 1,000,000 to 1,500,000 tons containing about 1% copper and 34% iron.

(Ref: Geological Survey of Canada Summary Report 1929, Pt. A, p. 113).

Little Billie (Vananda)

The mine is on the northeastern coast of Texada Island and about half a mile from the village of Vananda. It is one of four copper-gold properties in this vicinity which produced intermittently between 1896 and 1929. The deposit is of the replacement type. The replacement rocks, containing green and brown garnet, are mineralized with bornite and chalcopyrite and constitute the orebodies, which are tabular in shape.

The shaft is down 480 feet with development on five levels. Between 1896 and 1916 inclusive, 6,269 tons of ore was mined and yielded 301,679 pounds of copper, 1,610 ounces of gold, and 7,088 ounces of silver. Operations were resumed in 1948, but milling was discontinued in 1949. Development work is being carried on.

Ore reserves are estimated (1949) at 73,800 tons grading 1.2% copper and 0.16 oz. per ton gold.

(Ref: B.C. Dept. of Mines, Ann. Report, 1949, p.66).

Marble Bay (59).

The mine is about a quarter mile from the shore of Marble Bay, Texada Island. The orebody lies in a zone of brecciation in crystalline and semi-crystalline limestone. Bornite is the principal copper mineral, with chalcopryite in lesser amount. The mine has been developed to a depth of 1600 feet. Total shipments of ore from 1898 to 1919 inclusive, amounted to over 300,000 tons.

(Ref: Geological Survey of Canada Memoir 58, 1914, pp. 48-56).

Vancouver Mining Division

Cambrian Chieftain

The deposit is 4 miles northeast from the head of Fender Harbour on the Seechelt Peninsula. The property comprises 7 claims and is 6 miles by truck road from Fender Harbour, where shipping is available. Mineralization is of the replacement type and consists chiefly of chalcopryite in bands and lenticular masses of streaks and disseminations along the granite-limestone contact. It has been traced for approximately 2500 feet. A limited amount of development has been done consisting of open-cuts, shallow pits, and some drilling. In 1949, 374 tons of ore averaging 14% copper, 7.73 oz./ton silver, and 0.08 oz./ton gold was shipped.

(Ref: B.C. Dept. Mines, Ann. Report 1937, p. F28).

New Westminster Mining Division

Pacific Nickel (57).

The property, which has been idle for many years, is 7½ miles from Choate, a station on the main line of the Canadian Pacific Railway. It comprises 101 claims and fractions.

The deposit consists of masses of nickeliferous pyrrhotite with some chalcopyrite irregularly distributed in hornblende. Over 12,000 feet of tunnelling, 1000 feet of raising, and 94,000 feet of drilling has been done. During 1936-37, a total of 5,618.0 tons of ore was produced.

Indicated reserves in 1940 were 1,000,000 tons grading 0.50% copper and 1.10% nickel.

(Ref: Geological Survey of Canada, Memoir 190, 1936.)

A. M. Group

This group comprises 8 claims and fractions 6 miles east of Mile 28 on the Hope-Princeton highway. The deposit is in a breccia zone and the copper mineral is chalcopyrite. It is developed by 6 adit crosscuts totalling 2006 feet, with 484 feet of drifting on No. 6 level. Surface and intermittent work was carried out between 1930-1938. Work was resumed in 1948. Ore reserves are estimated at 200,000 tons with an average grade of 1.4% copper and 0.02 oz. per ton gold.

(Ref: B.C. Dept. of Mines Ann. Report, 1938, p. F10).

Lucky Four Group (56)

The property comprising this group includes about 116 mineral claims, on the summit of the Cheam range, 15 miles due south of Laidlaw on the Canadian National Railway. The occurrences are at an elevation of from 5000 to 6000 feet. The deposit was discovered in 1916. Early development was limited to stripping and to trenching an adit 200 feet long. An extensive drilling program is planned. A surface sample across an open cut assayed 7.2% copper and 2 oz. per ton silver.

(Ref: B.C. Dept. of Mines, Prelim. Report. Dec. 17, 1949.)

Kamloops Mining Division

O.K. or Chataway Group

The property is in the Highland Valley area about 28 miles from Ashcroft and has been idle since 1918. A vein from 3 to 17 feet wide, mineralized with chalcopyrite occurs in a well-defined shear in granodiorite, and structural conditions appear to favour persistence in depth. Work begun in 1916 included cutting of a 500-foot tunnel, shaft-sinking to a depth of 195 feet, and erection of a 50-ton concentrator.

During 1916-17 about 10,000 tons of 3.6% copper ore was milled. There is no record of reserves, but it is reported to have reasonably good prospects for development.

(Ref: B.C. Dept. of Mines, Ann. Report 1922, p. 140).

Greenwood Mining Division

Granby Mines

The mines are at Phoenix in the Boundary District and were at one time the largest copper producers in British Columbia. The orebodies were essentially limestone replacements, but were bottomed at comparatively shallow depths. Between 1904 and 1918 the deposit was developed extensively by tunnels and glory holes. The underground and surface plants were dismantled in 1920.

Up to the closing of operations in 1919 a total of 13,678,901 tons of ore was produced by The Granby Consolidated Mining, Smelting, and Power Company, Limited. In 1936 other interests took an option and later acquired the property and resumed operations producing 43,860 tons of ore from 1936 to 1942, inclusive. The ore contained gold and silver.

It is understood that when the mine was closed in 1919 there remained about 600,000 tons of recoverable mixed ore distributed over a wide area and averaging from 1.5 to 2.0% copper.

(Ref: B.C. Dept. of Mines, Ann. Report, 1904-1920, 1936-1946).

Mother Lode and Sunset Mines (54)

These adjoining mines are about three miles from the town of Greenwood. The property consists of eight Crown-granted claims. The orebody is altered limestones and the ore occurs in three general types: a calcite body containing chalcopryrite and pyrite, sometimes massive and sometimes scattered in small crystals; a silicate body containing both iron and copper sulphides; and an excessively hard magnetite with silica and chalcopryrite.

Extensive development by open-cut and underground workings began in 1896 and production was started in 1900. Between that year and 1918, when the mines were closed, 3,892,640 tons of ore was produced.

The estimated reserve (1941) of proved and indicated ore grading 1.3% copper, 0.05 oz per ton gold, and 0.25 oz. per ton silver, is as follows:

| <u>Mine</u> | <u>Proved</u> | <u>Probable</u> | <u>Dump Ore</u> | <u>Total</u> |
|-------------|----------------|-----------------|-----------------|------------------|
| Mother Lode | 1,000,000 | 2,500,000 | 450,000 | 3,950,000 |
| Sunset | <u>500,000</u> | <u>750,000</u> | <u>-</u> | <u>1,250,000</u> |
| | 1,500,000 | 3,250,000 | 450,000 | 5,200,000 |

It is stated that open-cut methods would be suitable for mining the two orebodies, particularly during the first few years of operation.

(Ref: B.C. Dept. of Mines, Ann. Report, 1904, p. 214).

Trail Creek Mining Division

Velvet (53)

The mine is 13 miles from Rossland. The ore consists of gold-bearing chalcopryrite and occurs in veins in a zone over 400 feet wide. The mine was worked over a period of many years, the last reported production having been in 1942. Development is by a main 3-compartment shaft, an inclined raise, two short shafts and eight levels. Two thousand

feet of drilling was done in 1946. Production for the three years 1940-42 was 23,612 tons. No estimate of reserves are available.

(Ref: B.C. Dept. of Mines, Ann. Reports 1897-1946).

Nicola Mining Division

Copperado (55)

This property, (also known as the Turlight group), consists of four Crown-granted claims and 20 additional claims. It is east of Mill Creek, 5 miles northeast of the town of Nicola, at an elevation of 3000 feet.

Chalcopyrite and bornite occur in a quartz vein 5 feet wide near a contact of greenstone and granodiorite. The mine is developed by a shaft to 200 feet with levels at 50, 100 and 200 feet, and in 1947 several carloads of copper ore, grading about 9% copper, were shipped to the Tacoma smelter. The ore is high in silica and commands a favourable smelting rate. The property is currently under development.

No estimates of reserves are available.

(Ref: Geological Survey of Canada, Memoir 249, 1948, p. 130).

Lillooet Mining Division

Chalco Group (58)

This group of claims is adjacent to Cadwallader and Piebiter Creeks, Bridge River district, about 8 miles by road and trail from Pioneer Mine Post Office, at an elevation of 5710 feet. The four main showings consist of lenses of mineralized lime-silicate rock that occur in laminated quartz-hornblende schist at widely spaced intervals for a distance of 300 feet. The showings indicate chalcopyrite and scheelite. Development is limited to two short adits and several open cuts. Assays across widths up to 9 feet show from 3 to ^{5.7%} copper and 0.3 to 1.8% tungstic oxide.

(Ref: B.C. Dept. of Mines, Ann. Report, 1948, pp. 97-102).

Skeena Mining Division

Ecstall Property (66)

This property is about 4 miles from the east side of Ecstall river on Red Gulch creek, a tributary of the Ecstall river at the head of tidewater. It is within a few miles of tidewater and is favourably situated for water transportation. Port Essington is about 18 miles north of the deposit. Additional claims are on the west side of the river.

The deposits are composed of extensive lenticular bodies of high grade iron pyrite, containing lesser amounts of copper and zinc. Development has been carried on over a number of years. To the end of 1940, the workings consisted of a 2,780-foot adit, seven crosscuts totalling 864 feet, and a raise at 60°, about 600 feet in length,

A large exploration program carried out some years ago, indicated 5,000,000 tons having the following analysis: copper 0.80%, zinc 2.30%, lead 0.20%, iron 42.75%, sulphur 49.35%, gold 0.02 oz. per ton, silver 0.71 oz. per ton. The ore is in two lenses. In the western part of the north lense there was^{an} indicated 650,000 tons averaging copper 1.91%, zinc 2.30%, iron 42.0%, sulphur 49.0%, gold 0.03 oz. per ton, silver 1.0 oz. per ton.

(Ref: B.C. Dept. of Mines, Ann. Report, 1940, p. 86; Mines Branch, Ottawa, Bull. 167, 1912, p. 86).

Ikeda Mines

The property is on Ikeda Cove in the southern part of Moresby Island, the second largest island of the Queen Charlotte group. It has been idle since 1920. Ikeda Cove forms a land-locked harbour which has a depth of eight fathoms at low tide. There are 59 claims in the property with a total area of about 1800 acres.

The deposit is of the replacement type and the country rock is dolomitic limestone and porphyritic diorite. Most of the development has been on the Lily claim and

consists of four adits with drifts and crosscuts. Total production amounted to 9,685 tons which averaged about 8% copper.

Estimates of the ore reserves vary. The lowest is 98,000 tons, and the highest, 1,700,000 tons, the average grade being about 2% copper.

(Ref: B.C. Dept. of Mines, Ann. Report, 1918, p. 38).

Omenica Mining Division

Richmond Group (64)

This property, comprising 19 claims, is on McDonald (Copper) Island at the mouth of Hagan Arm in the northern part of Babine Lake. It is reached by boat from Topley Landing, a distance of 9 or 10 miles. A 26-mile road connects Topley Landing with Topley on the Canadian National Railway, Prince Rupert line.

The orebody is a large mass of diorite porphyry, with chalcopyrite and bornite disseminated through, and in the fractures of, the porphyry. Two adits were driven into the deposit and four open cuts were made a number of years ago. In 1929, five drill holes totalling 4,013 feet were put down by The Consolidated Mining and Smelting Company of Canada, Limited.

The chief zone of copper mineralization is at Bare Hill in the centre of the Richmond mineral claim. The hill is the highest point on MacDonal Island and rises to 350 feet above Babine Lake. The mineralized zone can be traced for 2 miles, but drilling indicated that the best values were in a block of ground about 500 feet by 500 feet and 400 feet deep which contains possibly 8,000,000 tons of ore averaging about 0.8% copper.

(Ref: B.C. Dept. of Mines, Ann. Report, 1927, p. 149).

Rocher de Boule (65)

This mine is in the Juniper Basin at the head of Juniper Creek, about 10 miles from Skeena Crossing on the Canadian National Railway and was operated from 1913 to 1918, inclusive.

The ore, consisting of chalcopyrite and some galena, occurs in fissure veins in granodiorite. There are three main veins. The mine was developed by several tunnels, opencuts, and crosscuts. A total of 39,833 tons was shipped from April, 1915 to the end of 1918. The 200,000 tons of proved ore averages 8% copper.

There are several other properties in the Juniper Basin which could possibly be consolidated into a large tonnage operation.

(Ref: B.C. Dept. of Mines, Ann. Report, 1914, pp. 172, 184).

Portland Canal Mining Division

George Copper

The mine is on the south side of Bear River, about 18 miles above Stewart and has been idle since 1929. The property comprises 12 Crown-granted claims.

The deposit consists of several veins and an extensive mineralized zone 70 to 80 feet wide lying very flat and striking North 70° East. The ore mineral is chalcopyrite with which gold is associated. Underground workings are limited to an adit 130 feet long. Between 1915 and 1927 work was largely confined to surface exploration. Over 8,000 feet of drilling and other surface exploration was done prior to 1929.

The average grade of the possible (400,000 tons) ore is 2.9% copper and .058 oz. per ton gold.

(Ref: Geological Survey of Canada, Memoir 175, 1935, p. 117).

Hidden Creek (Anyox) (67)

The Hidden Creek or Anyox property consisting of 14 claims is on Granby Bay, Observatory Inlet, north of Prince Rupert. For a time this property was one of the largest copper producers in the British Empire. It was acquired from Hidden Creek Copper Company in 1910 by ^{The} Granby Consolidated Mining, Smelting, and Power Company Limited. The smelter was blown in during March, 1914, and the mine and smelter continued in operation until 1935 when the property was closed.

The ore, composed of chalcopyrite, pyrite, and pyrrhotite, occurs in irregular replacement shoots, elliptical in section, and varies in width from 50 to 240 feet, and in length from 880 to 1600 feet. The mine was developed extensively by a system of tunnels to a vertical depth of 1,200 feet below the outcrop. A total of 24,797,382 tons of ore was mined from which 685,051,503 pounds of blister copper was produced.

The Consolidated Mining and Smelting Company of Canada, Limited acquired the property in 1937, but after several years of drilling and exploration it ceased all activity. Some further drilling was done by Ventures Limited in 1942.

The estimate of remaining ore in the mine is 3,500,000 tons, averaging 1% copper.

(Ref: Geological Survey of Canada Memoir, 32, 1913, p. 84; B.C. Dept. of Mines Ann. Reports).

Maple Bay Groups

These groups consist of the Bluebell, Comstock, Eagle, and Princess Alexandria properties. They are on Maple Bay, 9 miles due west of Anyox on the west side of the peninsula which lies between Portland Canal and Observatory Inlet.

The deposit consists of quartz veins mineralized with chalcopyrite and pyrite with small amounts of pyrrhotite in amphibolite. The showings have been developed by adits. Some drilling has been done, and 4000 tons of ore was mined in 1916.

In 1941 the reserve of possible ore was estimated at 108,400 tons averaging 3.21% copper over a width of from 8 to 13 feet.

(Ref: Geological Survey of Canada Memoir 175, 1935, p. 100).

Outsider Group

The property is at the northern end of Maple Bay on the peninsula between Portland Canal and Observatory Inlet. The mine has been idle since 1926.

The deposit consists of large replacement quartz veins. The principal vein is 2 to 12 feet wide and has been traced for 3000 feet on the surface. It is developed by four adits totalling 2000 feet. At the 900-foot level a winze has been sunk and some drifting

has been done on the 800-foot level. During 1906-08 inclusive, 16,000 tons of ore averaging 2.9% copper was mined. Between 1922 and 1926, about 96,000 tons of ore was shipped to the Anyox smelter.

Estimated reserves are 89,000 tons with an average grade of 1.6% copper.

(Ref: Geological Survey of Canada Memoir 175, p. 102).

Silverado Group

The property comprising this group is on the east side of the mouth of Bear River, south of the glacier opposite the town of Stewart.

The ore is silver-copper, composed of grey copper, silver, and galena, and occurs in a vein 6 to 18 inches wide lying horizontally in grey andesite. A tunnel was driven into the vein and some stoping was done. Small shipments were made in 1921. The low-grade ore assayed 3.62% copper and 299.36 oz./ton silver, and the high grade, 7.76% copper and 696.6 oz./ton silver.

No estimate of ore reserves is reported.

(Ref: Geological Survey of Canada Memoir 175, p. 146).

Atlin Mining Division

Big Bull (Manville) (68)

This property is about 2 miles due north of Tulsequah, at the base of Mount Manville. It comprises eighteen claims and two fractions and is reached by road from Tulsequah or by a $3\frac{1}{2}$ -mile water route. It is a copper-lead-zinc orebody with some gold and silver and occurs as lenticular lenses in an altered sheared zone. Early development consisted of an adit 1,950 feet long with crosscuts on either side, and considerable drilling. The Consolidated Mining and Smelting Company of Canada, Limited is developing the property.

(Ref: Geological Survey of Canada Memoir 248, 1948, pp. 61-63).

Tulsequah Chief (68)

This property, comprising 20 surveyed claims, is on the east bank of the Tulsequah River nearly 9 miles north of its confluence with the Taku River.

The ore, comprising chalcopryrite, sphalerite, and galena with gold and silver, occurs in two replacements shear zones in altered and pyritized rhyolite in a formation of dense-textured andesitic fragmentals and flows. Ore shoots vary from 3 to 24 feet in width.

The property is developed by two tunnels, A, at an altitude of 1690 feet and B, at an altitude of 1500 feet. The Consolidated Mining and Smelting Company of Canada, Limited is developing the property toward production.

The estimated reserves are 489,000 tons with an average grade as follows:

| | | |
|--------|---|------------------------|
| Copper | - | 1.83% |
| Gold | - | 0.108 to 0.167 oz./ton |
| Silver | - | 3.74 to 7.5 " " |
| Lead | - | 1.55% |
| Zinc | - | 8.67% |

(Ref: B.C. Dept. of Mines, Ann. Report, 1948, pp. 63-64).

Maid of Erin

This claim, first staked in 1900, is on the western slope of Mineral Mountain, 2 1/4 miles northwest of, and about 1500 feet higher than the hairpin bend in the Haines Road at Rainy Hollow. The property is 50 miles from Haines and accessible via the Haines Road which extends from Haines, Alaska, at tidewater, to a point beyond Whitehorse on the Alaska Highway. It has been idle since 1928.

The deposit is a replacement in which the ore minerals form small veinlets in skarn. The minerals are bornite, chalcocite, chalcopryrite, black sphalerite, wittichenite (copper bismuth sulphide), and silver. It has been developed by several open cuts, an inclined and vertical shaft, and two short adits.

Between 1911 and 1922 a total of 157 tons of sorted ore was produced, containing 77,658 pounds of copper and 5,849 ounces of silver. Samples range from 4.7 to 28.5% copper and 6.8 to 60.7 ounces per ton silver.

(Ref: B.C. Dept. of Mines, Bull. No. 25, 1948, p. 42).

YUKON AND NORTHWEST TERRITORIES

A few occurrences of copper have been reported in Yukon and the Northwest Territories, but only those near Whitehorse, Yukon, have so far been developed to the stage of production.

Whitehorse Copper Belt (69)

The copper-bearing area is from 4 to 6 miles from the town of Whitehorse, Yukon. There are several groups of claims, among which the most important are the Pueblo, Tamarack-Carlisle, Copper King, War Eagle, and Le Roi.

The deposits are of the contact metamorphic type and consist usually of disconnected lenses situated near the contacts of limestones and intrusives. The ore is a specular hematite impregnated with cuprite, bornite, and chalcopyrite.

During 1916-1917, the Pueblo claims were developed by a 500-foot vertical two-compartment shaft with levels at 100-foot intervals. The Carlisle-Tamarack claims were developed by a shaft to a depth of 130 feet. The Pueblo property produced 140,000 tons of ore averaging 3.5% copper, 0.6 oz./ton silver, and 50% iron. The Carlisle-Tamarack property produced 1,000 tons of ore averaging 25.5% copper and 4.92 oz./ton silver.

In 1947 the area was re-staked into 68 claims and Noranda Mines Limited began a program of exploration which included 10,000 feet of drilling.

No estimate of reserves has been published.

(Ref: Geological Survey of Canada, Summ. Report 1927, Pt. A, pp. 14-18).

Outpost Islands (70)

On Outpost Islands in Great Slave Lake, about 65 miles south of Yellowknife, a deposit of chalcopyrite, scheelite, and gold occurs in veins and fractures in sheared quartz-mica schists. Ore shoots average 25 inches in width.

The deposit was developed primarily for its gold content by two shafts; No. 1, 550 feet with 5 levels, and No. 2, 125 feet with 1 level. The value of production of gold, tungsten, and copper between 1940 and 1942 was \$427,660.

Ore reserves are as follows: dump ore (tailings) 10,000 tons, positive ore 7,000 tons, probable ore 10,000 tons, total 27,000 tons.

(Ref: Marwood Mining Corporation Limited, Engineer's Report, 1950).

Taltheilei Narrows (71)

Several groups of claims straddle Taltheilei Narrows at the outlet of McLeod Bay, east arm of Great Slave Lake, Mackenzie District. The occurrences are on the mainland and on Pethei Peninsula as well as on Gap Island. The deposits are of the replacement type.

The more important groups are: the Jet group on Gap Island, 7 miles northeast of the Narrows, with a mineralized zone 2200 feet long, 225 feet wide at the north end and 100 feet wide at the south end; the Copper group on Pethei Peninsula 25 miles north of the Narrows; and the Per group immediately on the north side of the Narrows.

No development work has been done.

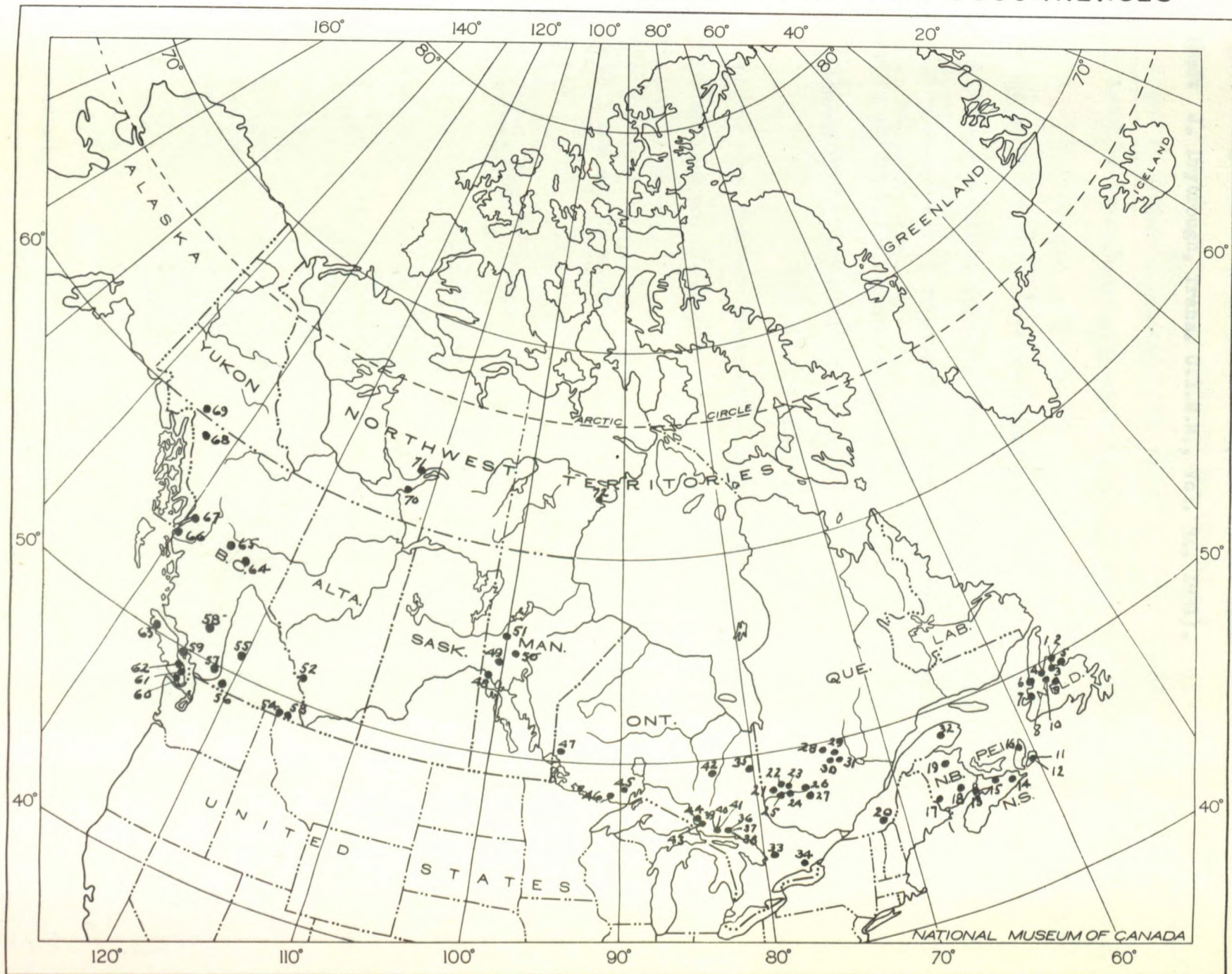
(Ref: Northern Miner, Jan. 27, 1949).

Rankin Inlet (72)

A deposit of nickel-copper ore occurs on Rankin Inlet, northwest coast of Hudson Bay. Drilling of the property between 1930 and 1937 disclosed an estimated 120,000 tons of ore averaging 1.22% copper, 4.62% nickel, 0.11 oz./ton platinum metals, and 30,000 tons averaging 8% nickel and 0.2 oz./ton platinum metal.

LOCATION OF PRINCIPAL NON-PRODUCING COPPER OCCURRENCES

LOCATION OF PRINCIPAL NON-PRODUCING COPPER OCCURRENCES



MAP NO. 2

SURVEY OF THE COPPER RESOURCES OF CANADA

NATIONAL MUSEUM OF CANADA

The showing is too remote for development at present.

(Ref: J. Drybrough, Trans. C.I.M.M., Vol. 34, 1931).

IV. COPPER ORE RESERVES

There has been a gradual increase in the total Canadian reserves of copper ore in recent years. The average grade of the total ore reserve is between 1 and 2 per cent copper.

The following tables show the estimated ore reserves of the producing mines (Table III) and those of a number of deposits some of which are under active development, some idle mines, and others undeveloped prospects (Table IV). The reserves shown for the producing mines indicate in general the proved ore as published by the operating companies. The estimates for non-producing mines and prospects is necessarily limited to those for which such estimates are available.

There are a large number of known copper occurrences on which insufficient exploration or drilling has been done to determine the probable or possible ore tonnage.

TABLE III

Estimated Ore Reserves of Canadian Copper-Producing Mines at the end of 1941.

(1949 production of copper in brackets).

| <u>Mine</u> | <u>Type of Ore</u> | <u>Grade % Copper</u> | <u>Ore-tons</u> | <u>Content of Copper, tons</u> |
|-----------------------------|--------------------|-----------------------|---------------------------|--------------------------------|
| Buchans | Cu-Pb-Zn-Ag | 1.4 | 4,000,000 | 56,000 (4,575) |
| Noranda | Cu-Au | 2.12 | 18,464,900 ⁽¹⁾ | 392,000 (25,948) |
| Normetal | Cu-Zn | 3.53 | 1,452,800 | 51,300 (7,586) |
| Waite Amulet | Cu-Zn | 5.13(Av) | 1,150,200 | 59,000 (16,749) |
| Queмонт | Cu-Zn | 1.5 | 9,229,500 | 138,400 (5,643) |
| East Sullivan | Cu-Zn | 1.95 | 4,430,000 | 86,400 (14,142) |
| Golden Manitou | Cu-Pb-Zn | 1.9 | 735,000 ⁽²⁾ | 14,000 (11) |
| Ascot Metals ⁽⁴⁾ | Cu-Pb-Zn-Ag | 1.0 | 229,800 | 2,200 |
| International Nickel | Cu-Ni | 1.636 ⁽³⁾ | 251,805,000 | 4,120,000 (3) (110,537) |
| Falconbridge | Cu-Ni | 0.92 | 14,791,000 | 136,000 (5,314) |
| Bi-ore | Cu | 5.0 | 355,000 | 17,700 |
| Flin Flon | Cu-Zn | 3.04 | 20,157,000 | 613,000 (42,633) |
| Cuprus | Cu-Zn | 3.62 | 245,000 | 8,800 (2,772) |
| Sherritt Gordon | Cu-Zn | 2.44 | 396,400 | 9,600 (9,479) |
| Britannia | Cu-Zn | 1.5 | 4,000,000 | 60,000 (8,969) |
| Copper Mountain | Cu | 1.15 | 7,524,000 | 86,500 (17,847) |
| | | | <u>338,965,600</u> | <u>5,850,900</u> |

- (1) Includes 950,000 tons fluxing ore (copper 0.09%).
- (2) This represents a new copper zone at present undeveloped. The copper content of the main Golden Manitou zinc ore-body is very low.
- (3) This is an approximate figure.
- (4) Started production in 1950.

TABLE IV

Estimated Ore Reserves of the Principal Marginal, Dormant, or Non-Producing Copper Mines or Prospects.

(Tonnages and grade shown have been obtained from government and company reports. Properties or mines under development are indicated (*)).

Mine or Prospect

| <u>Mine or Prospect</u> | <u>Type of Ore</u> | <u>Grade % Copper</u> | <u>Ore-Tons</u> | <u>Content of Copper, tons</u> |
|-------------------------------|--------------------|-----------------------|-----------------|--------------------------------|
| <u>NEWFOUNDLAND</u> | | | | |
| <u>Tilt Cove</u> | Cu. | | | |
| West Mine(Upper levels) | | 1.0 | 1,500,000 | 15,000 |
| Dump | | 2.0 | 110,000 | 2,200 |
| East Mine | | 3.0 | 25,000 | 750 |
| Dump | | 1.5 | 145,000 | 2,175 |
| <u>Little Bay</u> | Cu. | 3.0(Av) | 300,000 | 9,000 |
| Indicated near Main lode dump | | 1.48 | 216,000 | 3,195 |
| <u>Crescent Lake</u> | Cu. | 2.5 | 30,000 | 750 |
| <u>Terra Nova (dump)</u> | Cu. | 2.5 | 20,000 | 500 |
| <u>Rambler</u> | Cu-Zn-Au | 1.5 | 330,000 | 4,950 |
| <u>Pilleys Island</u> | Cu-Fe | 3.0 | 226,000 | 6,780 |
| <u>York Harbour</u> | Cu-Zn | 3.65 | 23,000 | 840 |
| <u>Gull Pond*</u> | Cu. | 2.62 | 2,160,000 | 56,500 |
| Total Newfoundland | | | 5,085,000 | 102,640 |

NOVA SCOTIA

| | | | | |
|-----------------------|----------|-----|---------|-------|
| <u>Stirling Mine*</u> | Cu-Pb-Zn | 1.0 | 400,000 | 4,000 |
|-----------------------|----------|-----|---------|-------|

TABLE IV (Cont'd)

Mine or Prospect

Type of Ore Grade % Copper Ore-Tons Content of Copper, tons

QUEBEC

| | | | | |
|----------------|-------------|---------|------------|---------|
| Sheffield* | Cu-Pb-Zn-Au | 1.01 | 1,226,640 | 12,300 |
| Woodon Mine | Cu. | 1.5-3.0 | 202,500 | 4,400 |
| Jay Mine* | Cu-Au | 4.8 | 13,850 | 660 |
| Joliet-Quebec* | Cu-Au | 1.0 | 1,000,000 | 10,000 |
| Fleming | Cu. | 1.32 | 325,000 | 4,290 |
| Rainville | Cu. | 1.36 | 400,000 | 5,400 |
| Opemiska | Cu-Au | 7.4 | 283,000 | 20,900 |
| Cache Bay | Cu-Au | 1.34 | 111,900 | 1,500 |
| Cedar Bay | Cu-Au | 1.64 | 470,000 | 7,700 |
| Merrill Island | Cu-Au | 1.52 | 2,000,000 | 30,400 |
| Water Claims | Cu-Au | 1.98 | 103,500 | 2,000 |
| Gaspe Copper* | Cu. | 1.17 | 48,000,000 | 516,600 |
| Total Quebec | | | 54,136,390 | 616,150 |

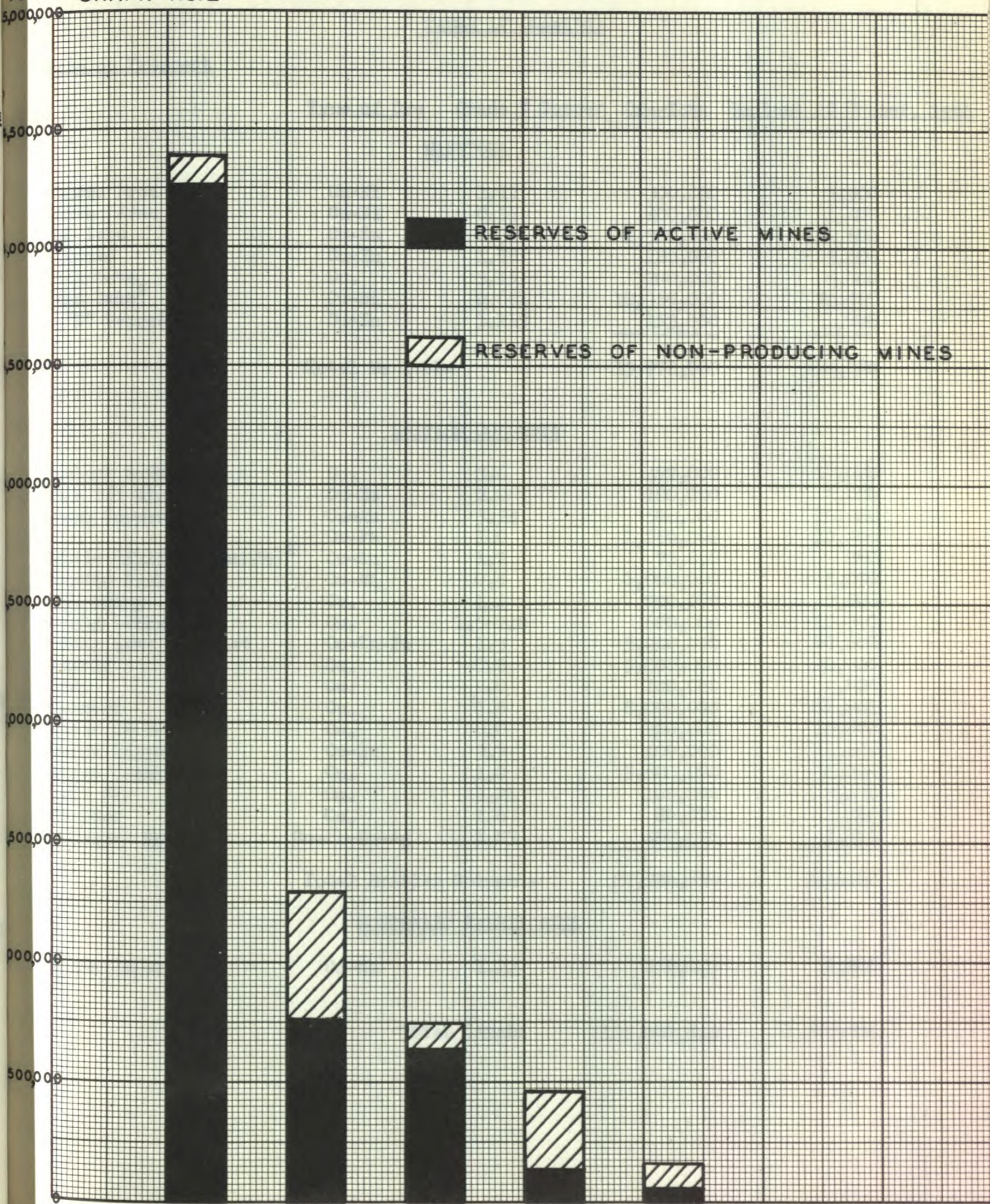
ONTARIO

| | | | | |
|-----------------------------------|----------|--------------------------|----------------------|----------|
| Trebor Mine* | Cu-Ni | 1.42(Cu-Ni) low grade | 369,000 2,500,000 | 2,600(?) |
| Denison | Cu-Ni | 0.93 | 382,900 | 3,500 |
| Moose Lake | Cu-Ni | 0.5 | 813,000 | 4,000 |
| Nickel Offsets | Cu-Ni | 1.45 | 357,000 | 5,200 |
| | | 1.75 | 100,000 | 1,750 |
| Errington | Cu-Pb-Zn | 1.05 | 3,500,000 | 36,700 |
| Vermillion Lake | Cu-Pb-zn | 1.50 | 1,000,000 | 15,000 |
| Shakespeare | Cu-Ni | 0.47 | 4,000,000 | 18,800 |
| Massey | Cu. | 2.0-2.5 | 60,000 | 1,300 |
| Amity Mine | Cu-Au | 5.0 | 25,000 | 1,250 |
| Patterson and Tretheway-Ossian | Cu-Au | 4.0-4.5 | 25,000 | 1,060 |
| Ryan Lake* | Cu. | 2.99 | 200,000 | 5,900 |
| Kam-Kotia | Cu-Zn | 1.95 | 825,000 | 16,000 |
| (Zinc orebody) | | 0.50 | 600,000 | 3,000 |
| Bruce Mine | Cu. | 1.95 | 70,000 | 1,300 |
| Cheney Mine | Cu. | 4.0 | 24,000 | 960 |
| Superior Copper | Cu. | 4.0 | 10,000 | 400 |
| Total Ontario | | | 14,860,900 | 118,720 |

CANADA

COPPER RESERVES IN COPPER CONTENT (TONS)

TONS GRAPH NO.2



DATE: 1950

TABLE IV (Cont'd)

Mine or Prospect

Type of Ore Grade % Copper Ore-Tons Content of Copper, tons

MANITOBA

| | | | | |
|------------------------|-------|-------|------------|---------|
| Maskwa Area | Cu-Ni | 1.17 | 300,000 | 3,500 |
| Oiseau Area | Cu-Ni | 0.35 | 400,000 | 1,400 |
| Bob Lake | Cu-Zn | 1.33 | 2,380,000 | 31,600 |
| Stanmac | Cu-Zn | 1.75 | 180,000 | 3,100 |
| Dickstone | Cu. | 3.15 | 200,000 | 6,300 |
| Lynn Lake [*] | Cu-Ni | 0.681 | 10,365,000 | 70,500 |
| "Z" Deposit | Cu-Zn | 1.113 | 153,000 | 1,700 |
| Total Manitoba | | | 13,978,000 | 118,100 |

BRITISH COLUMBIA

| | | | | |
|--------------------------------------|-------------|---------|------------|---------|
| Sunlock & Gabbro [*] | Cu. | 3.6 | 477,000 | 17,000 |
| Twin "J" Mine [*] | Cu-Zn | 2.0 | 100,000 | 2,000 |
| Coast Copper | Cu-Au | 3.24 | 500,000 | 16,200 |
| | Cu-Fe | 1.0 | 1,250,000 | 10,200 |
| Little Billie (Wananda) [*] | Cu-Au | 1.2 | 73,850 | 880 |
| Pacific Nickel | Cu-Ni | 0.5 | 1,000,000 | 5,000 |
| A.M. Group | Cu. | 1.4 | 200,000 | 2,800 |
| Granby (Phoenix) | Cu. | 1.5-2.0 | 600,000 | 10,500 |
| Mother Lode & Sunset | Cu-Zn-Fe | 1.3 | 5,200,000 | 67,600 |
| Ecstall | Cu. | 0.8 | 5,000,000 | 40,000 |
| Ikeda | Cu. | 2.0 | 100,000 | 2,000 |
| Richmond | Cu. | 0.8 | 8,000,000 | 64,000 |
| Rocher de Boule [*] | Cu. | 8.0 | 200,000 | 16,000 |
| George Copper | Cu-Au | 2.9 | 400,000 | 11,600 |
| Hidden Creek | Cu. | 1.0 | 3,500,000 | 35,000 |
| Maple Bay | Cu. | 3.21 | 108,000 | 3,400 |
| Outsider | Cu. | 1.6 | 89,000 | 1,400 |
| Tulsequah Chief [*] | Cu-Pb-Zn-Ag | 1.83 | 489,000 | 8,900 |
| Total British Columbia | | | 27,286,850 | 314,480 |

NORTHWEST TERRITORIES

| | | | | |
|--------------|-------|------|-------------|-----------|
| Rankin Inlet | Cu-Ni | 1.22 | 150,000 | 1,800 |
| TOTAL CANADA | | | 125,897,140 | 1,275,890 |

V. CONCENTRATORS, SMELTERS, AND REFINERIES

Concentrators

The total rated daily capacity of the operating copper concentrators in Canada is approximately 65,375 tons. Capacities of individual concentrators, and their location, are shown in Table V.

TABLE V

Rated Daily Milling Capacities of Concentrators

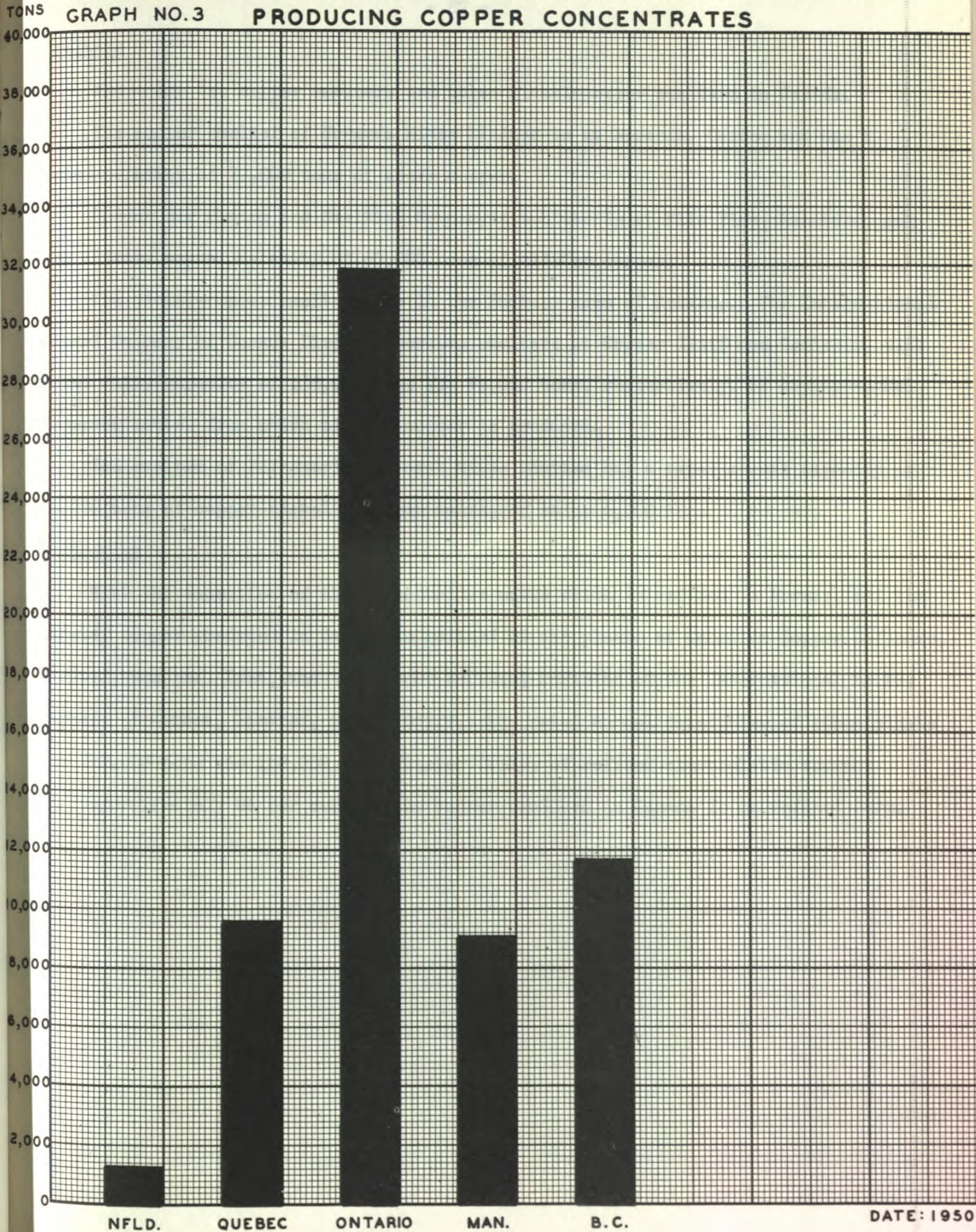
| <u>Location & Operator</u> | <u>Tons per day</u> | <u>Type of Ore Treated</u> |
|--|-----------------------|----------------------------|
| <u>Newfoundland</u> | | |
| Buchans Mining Co. Ltd. | 1,300 | Copper-lead-zinc |
| <u>Quebec</u> | | |
| Noranda Mines Ltd. | 4,000 | Copper-gold |
| East Sullivan Mines Ltd. | 2,500 | Copper-zinc-gold |
| Queмонт Mining Corp. Ltd. | 2,100 | Copper-zinc-gold |
| Waite Amulet Mines Ltd. | 1,800 | Copper-zinc-gold |
| Normetal Mining Corp. Ltd. | 800 | Copper-zinc |
| Ascot Metals Corp. Ltd. | 400 | Copper-lead-zinc |
| <u>Ontario</u> | | |
| International Nickel Co. Ltd. | 30,000 ⁽¹⁾ | Copper-nickel |
| Falconbridge Nickel Mines Ltd. | 1,800 | Copper-nickel |
| <u>Manitoba</u> | | |
| Hudson Bay Mining & Smelting Co., Ltd. | 6,000 | Copper-zinc |
| Sherritt Gordon Mines Ltd. | 2,800 | Copper-zinc |
| Cuprus Mines Ltd. | 300 | Copper-zinc |
| <u>British Columbia</u> | | |
| Granby Consol. Mining, Smelting and Power Co. Ltd. | 5,000 | Copper |
| Britannia Mining and Smelting Co., Ltd. | 6,500 | Copper-zinc |
| Brooklyn Stemwinder Gold Mines Ltd. | 75 | Copper-gold |

(1) An additional 12,000-ton capacity concentrator is under construction.

CANADA

RATED DAILY MILLING CAPACITY OF CONCENTRATORS

GRAPH NO.3 PRODUCING COPPER CONCENTRATES



DATE: 1950

Smelters

There are two copper smelters and three nickel-copper smelters in Canada.

The copper smelter of Noranda Mines Limited is at Noranda, Quebec and has a rated capacity of 73,000 tons of anode copper.

Hudson Bay Mining and Smelting Company's smelter is at Flin Flon, Manitoba, and has a rated annual capacity of 60,000 tons of blister copper.

The nickel-copper smelters are in the Sudbury area of Ontario. The International Nickel Company of Canada Limited operates smelters at Copper Cliff and Coniston, with rated daily capacity of 235,000 tons and 55,000 tons, respectively, of copper-nickel Bessemer matte, from which blister copper is produced.

The smelter of Falconbridge Nickel Mines Limited has a rated annual capacity of 18,000 tons of copper-nickel Bessemer matte, of which 6,000 tons is copper.

Refineries

With the exception of the Falconbridge matte which is refined in Norway, all the blister copper produced in Canada is refined at the plants of Canadian Copper Refiners, Limited, Montreal East, and the Copper Refining Division of The International Nickel Company of Canada, Limited, Copper Cliff. The rated annual capacities of these plants are 112,000 tons and 168,000 tons, respectively, of refined electrolytic copper.

Approximately 86 per cent of the copper produced in Canada is in refined form.

VI. CONCLUSION

The figures of ore reserves given in this report indicate that the copper resources of Canada are ample to assure a production at the present rate for a considerable period. Although some of the producing mines are nearing depletion, at least two new major low-grade copper deposits are under development, namely Lynn Lake in Manitoba, and Gaspé Copper in Quebec. These two deposits will add hundreds of thousands of tons of contained copper to the active reserves, with a possibility of additional tonnages as development progresses. The International Nickel Company of Canada Limited is opening a large low-grade body of ore which will be treated in a 12,000-ton daily capacity concentrator now under construction.

The possibility of new discoveries is by no means exhausted and the current price of copper coupled with an urgent demand is providing a strong incentive for exploration and development. It seems safe to assume that, with the present reserves of ore and the ore potentialities of unexplored areas, copper will continue to maintain a leading position in the mineral economy of Canada for many years.