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Box #2

INTRODUCTORY LETTER

To the Honourable Philip T. Kelly,
Minister of Mines.

Sir,—The undersigned has the honour to submit the Sixty-second Annual Report of the Department of Mines, issued in seven parts, as follows:

Part 1
Statistical Review of the Mineral Industry for 1952, by M. G. Arnoldi.
Mining Accidents, in 1952, by the Staff of the Mines Inspection Branch.
Classes for Prospectors, 1952–53, by W. D. Harding.

Part 2
Mining Operations in 1952, by D. J. Field.

Part 3
Natural Gas in 1952, by R. B. Harkness.
Petroleum in 1952, by R. B. Harkness.
Logs of Wells for 1952.

Part 4
Geology of the Mamainse Point Copper Area, with map No. 1953-1, by Jas. E. Thomson.

Part 5
Geology of the Brudenell-Raglan Area, with map No. 1953-2, by D. F. Hewitt.

Part 6
Geology of Sothman Township, with map No. 1953-3, by E. M. Abraham.

Part 7
Geology of the North Half of Holloway Township, with map No. 1953-4, by J. Satterly.

All parts, with accompanying geological maps as indicated above, are available on application to the Department.

Respectfully submitted,

H. C. Rickaby,
Deputy Minister of Mines.

Department of Mines,
Toronto, 1953.

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-SECOND ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXII, PART 1, 1953

Statistical Review of the Mineral Industry for 1952 - - - 1-66
Mining Accidents in 1952 - - - - - - - - - - 67-82
Classes for Prospectors, 1952-53 - - - - - - - - - 83-85

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO
Printed and Published by Baptist Johnston, Printer to the Queen's Most Excellent Majesty
1954

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Statistical Review of the Mineral Industry for 1952

By M. G. Arnoldi

GENERAL SUMMARY

Mineral Production

Ontario's mining industry reported a total production value for 1952 of $453,412,427, which is only slightly more than the previous year's total of $452,074,443. Although the extensive development programs initiated by some of the big companies are going on apace, the fact that the Canadian dollar is at a premium over the American dollar, and the United States is our biggest market tends to lower values even though the prices of most metals, with the exception of gold, are at their peak.

The metals as a group showed a recession from the 1951 total value of $367,084,537, the value for the year amounting to $362,615,447. The gold, platinum-metals, and iron-ore values were all less. Lead again appears on the list, for the first time since 1948, as do zinc and tungsten concentrates; the former was last reported in 1946, and the latter in 1945. There was a slight decrease in value for the non-metallic group, which totalled $23,694,663, in comparison with $24,072,501 for the previous year. Asbestos, graphite, gypsum, silica brick, and sulphur all made slight advances. The total production value for structural materials was $55,127,177, an increase of 9.3 percent over the $50,433,064 reported last year. Clay products reported total values of $11,975,200, which is a gain of 14.21 percent over the previous year's value of $10,484,341.

In June, 1952, legislation was passed repealing the government's right to seize private gold at $20.67 per ounce. As the price of gold in Canada is $35 per ounce, United States funds, and as the Canadian dollar is at a premium, all exchange equalization has now been eliminated. The value of gold from all sources was $87,540,620, a drop of 3.91 percent from the 1951 reported value of $91,105,477. The gold mines alone milled 9,999,455 tons of ore containing 2,469,796 ounces of gold, valued at $86,036,012. Compared with last year's figures of 10,205,570 tons of ore milled, containing 2,422,502 ounces of gold, which had a value of $89,613,997, it shows a drop in tons milled, an increase of 1.95 percent in gold content, and a decrease of 3.99 percent in value. There was a gain of 26.75 percent in the value of silver produced; it was $5,416,647 as against $4,273,241 for last year. Cobalt values amounted to $3,226,903, an increase of 61.37 percent; this originated from the silver-cobalt ores, from the nickel-copper ores of the International Nickel Company of Canada, Limited, in the form of cobalt oxide, and from Falconbridge Nickel Mines, Limited, in the form of cobalt metal. The nickel output increased slightly in both quantity and value, and copper, although down a little in quantity, showed a gain in value. The total value of nickel was $151,666,687, and that of copper was $70,981,618. The value of the platinum metals dropped 17.85 percent, from $22,490,536 in 1951 to $18,475,723 this year. Shipments of iron ore showed a decrease in value of 7.41 percent from $21,205,152 last year to $19,632,551 in 1952. Magnesium and calcium total values rose from $3,618,219 to $4,812,368.

SUMMARY OF MINERAL STATISTICS, 1952

Product	Quantity	Value[1]	Wage-earners	Wages
METALLIC				
Gold ..... oz.	2,513,701	$ 87,540,620	11,921	$ 37,608,664
Silver ..... oz.	6,491,124	5,416,647	(2)	(2)
Copper in matte exported[3] ..... lb.	18,832,005	4,802,161		
Copper, metallic and in concentrates, exported ..... lb.	231,883,170	66,179,457		
Nickel in matte,[3] in speiss, and in ore exported; metallic nickel; and nickel content of oxides and salts ..... lb.	281,117,072	151,666,687	17,607	64,507,609
Platinum metals ..... oz.	279,722	18,475,723		
Selenium ..... lb.	81,578	265,128		
Tellurium ..... lb.	5,710	9,707		
Cobalt in metal, oxides, salts, ores, and residues ..... lb.	1,421,923	3,226,903	[4]986	2,871,108
Iron ore[5] ..... tons	2,717,490	19,632,551	1,226	4,637,620
Calcium and magnesium	.....	4,812,368	.....	.....
Lead ..... lb.	1,803,455	291,979	53	158,597
Zinc ..... lb.	744,920	130,630		
Tungsten concentrates (WO_3) ..... lb.	50,734	164,886	.....	.....
Total	.....	$362,615,447	32,207	$110,823,201
NON-METALLIC				
Arsenic[6] ..... lb.	1,588,381	$ 71,477	.....	.....
Asbestos ..... tons	23,096	3,862,653	238	$ 873,364
Feldspar, crude and ground ..... tons	3,622	37,628	21	9,380
Fluorspar ..... tons	904	38,465	22	33,864
Graphite, crude and refined ..... tons	2,040	255,732	54	161,345
Gypsum ..... tons	278,992	1,060,429	207	673,234
Mica, amber ..... lb.	329,200	4,618	.....	.....
Mica, white ..... lb.	202,160	106,943	75	121,265
Mineral waters ..... gals.	2,370	440	.....	.....
Natural gas ..... M cu. ft.	8,302,190	9,946,024	984	2,744,053
Nepheline syenite ..... tons	82,681	1,111,950	92	242,745
Peat fuel ..... tons	30	300	2	96
Peat moss ..... lb.	3,878,249	69,013	20	11,650
Petroleum, crude ..... bbls.	191,814	641,400	104	175,295
Quartz crystals	.....	11,287	.....	.....
Quartzite and quartz ..... tons	1,429,806	1,495,245	153	343,101
Silica brick ..... M	1,161	246,108	43	145,426

Salt ..... tons	757,025	4,401,780	241	799,228
Sulphur[7] ..... tons	18,346	183,460	.....	.....
Talc ..... tons	12,454	149,711	21	36,983
Total	.....	$ 23,694,663	2,277	$ 6,371,029
STRUCTURAL MATERIALS				
Cement, Portland ..... bbls.	5,577,025	$ 14,142,060	570	$ 1,943,137
Hydrated lime ..... tons	86,816	1,580,916	377	1,094,388
Quicklime ..... tons	535,463	5,340,146		
Sand and gravel ..... tons	43,423,737	23,240,203	1,421	3,805,850
Sand-lime products[8]	.....	520,619	117	341,320
Stone: limestone, marble, trap, granite, sandstone, slate ..... tons	8,217,411	10,303,173	1,051	2,822,732
Total	.....	$ 55,127,117	3,536	$ 10,007,427
CLAY PRODUCTS				
Brick, face ..... number	204,319,054	$ 7,102,104		
Brick, common ..... number	14,158,781	484,274		
Brick, fancy and ornamental ..... number	9,007	726		
Brick, sewer	.....	5,687		
Tile, drain ..... number	27,408,940	1,506,992	1,604	$ 4,288,901
Tile, structural, roofing, and floor	.....	1,166,075		
Sewer pipe, copings, flue-linings, etc.	.....	1,321,499		
Pottery and other products	.....	280,224		
Haydite and clay	.....	107,619		
Total	.....	$ 11,975,200	1,604	$ 4,288,901
GRAND TOTAL	.....	$453,412,427	39,624	$131,490,558

[1]Canadian funds.
[2]Wage-earners and wages included with figures for silver-cobalt smelters and refineries([4]).
[3]Copper in matte valued at 25.5 cents per pound, and nickel at 52.8 cents.
[4]Wage-earners and wages for silver-cobalt smelters and refineries.
[5]The production value of pig iron from Ontario iron ores is no longer included in the above table, but the record of domestic ore smelted in Ontario furnaces may be found on page 46.
[6]Shipments from Ontario sources and not actual production figures.
[7]Tonnage given in sulphur content of sulphuric acid.
[8]No deduction made for lime used in manufacturing.

COMPARATIVE VALUE OF MINERAL PRODUCTION, 1948–52

Product	1948	1949	1950	1951	1952
METALLIC					
Gold (Canadian value)	$ 73,339,904	$ 85,269,362	$ 94,216,874	$ 91,105,477	$ 87,540,620
Silver	2,427,961	1,905,233	3,561,005	4,273,241	5,416,647
Platinum metals	16,896,808	19,885,049	17,822,766	22,490,536	18,475,723
Cobalt[1]	2,624,410	952,469	964,003	1,999,612	3,226,903
Nickel[2]	87,482,773	99,351,785	112,292,202	151,217,865	151,666,687
Copper, metallic and in matte	53,387,007	44,658,786	54,411,033	70,861,788	70,981,618
Selenium	217,978	178,026	154,176	267,005	265,128
Tellurium	15,293	15,707	11,419	11,594	9,707
Iron ore	7,482,860	13,192,781	17,562,059	21,205,152	19,632,551
Lead, in ore	62,037	.....	.....	.....	291,979
Magnesium, Calcium	1,723,266	1,041,218	1,545,011	3,618,219	4,812,368
Barium	7,988	.....	.....	.....	.....
Bismuth	10,724	.....	.....	34,048	.....
Zinc	.....	.....	.....	.....	130,630
Tungsten concentrates (WO_3)	.....	.....	.....	.....	164,886
Total	$245,679,009	$266,450,416	$302,450,548	$367,084,537	$362,615,147
NON-METALLIC					
Arsenic, white	$ 55,663	$ 8,797	$ 16,220	$ 94,406	$ 71,477
Asbestos	.....	.....	1,493,039	3,773,069	3,862,653
Barite	473	.....	.....	.....	.....
Beryllium ore	.....	.....	7,882	.....	.....
Feldspar, crude and ground	99,511	43,610	49,619	125,727	37,628
Fluorspar	344,834	187,875	262,643	223,398	38,465
Garnet rock	200	.....	240	.....	.....
Graphite, crude and refined	239,931	212,496	390,815	231,167	255,732
Gypsum	770,004	871,467	875,217	672,276	1,060,429
Mica, amber	37,674	21,651	28,299	3,904	4,618
Mica, white	.....	9,905	128,161	310,530	106,943
Mineral water	470	410	440	450	440
Natural gas	6,958,247	8,826,634	8,890,532	9,962,553	9,946,024
Nepheline syenite	506,462	623,002	842,886	1,114,943	1,111,950
Peat fuel	850	560	580	300	300

Peat moss	189,447	210,008	206,625	72,557	69,013
Petroleum, crude	608,109	901,143	892,335	677,905	641,400
Phosphate	.....	.....	712	94	.....
Quartz crystals	.....	.....	.....	1,407	11,287
Quartzite and quartz	1,019,997	1,020,411	1,027,791	1,496,404	1,495,245
Silica brick	133,424	148,258	174,372	204,831	246,108
Salt	3,265,654	3,477,583	4,639,867	4,789,990	4,401,780
Sulphur[3]	155,500	126,300	131,540	156,050	183,460
Talc and soapstone	164,462	160,757	182,048	160,540	149,711
Total	$ 14,550,912	$ 16,850,867	$ 20,241,863	$ 24,072,501	$ 23,694,663
STRUCTURAL MATERIALS					
Cement, Portland	$ 7,076,317	$ 9,155,613	$ 10,953,896	$ 12,494,677	$ 14,142,060
Lime, hydrated and quicklime	4,761,521	5,569,550	6,030,228	6,921,916	6,921,062
Sand and gravel	10,468,216	11,214,136	15,553,186	19,905,293	23,240,203
Sand-lime products[4]	386,516	444,218	729,328	714,528	520,619
Stone: limestone, granite, etc.	6,338,253	7,380,457	7,843,124	10,396,650	10,303,173
Total	$ 29,030,823	$ 33,763,974	$ 41,109,762	$ 50,433,064	$ 55,127,117
CLAY PRODUCTS					
Brick, face	$ 3,254,616	$ 4,311,743	$ 5,277,280	$ 6,214,362	$ 7,102,104
Brick, common	803,402	312,063	417,195	429,702	484,274
Brick, fancy and ornamental	184	604	510	1,179	726
Brick, sewer	14,574	24,868	16,352	19,768	5,687
Tile, drain	831,785	963,635	1,085,567	1,243,891	1,506,992
Tile, structural, roofing, and floor	872,694	867,511	1,165,915	1,210,981	1,166,075
Sewer pipe, copings, flue-linings, etc.	646,000	786,878	1,197,901	1,124,201	1,321,499
Pottery and other products	140,370	162,764	112,457	114,720	280,224
Haydite and clay	129	5,373	77,086	125,537	107,619
Total	$ 6,563,754	$ 7,435,439	$ 9,323,263	$ 10,484,341	$ 11,975,200
GRAND TOTAL	$295,824,498	$324,500,696	$373,215,436	$452,074,443	$453,412,427

[1]Cobalt in oxide, metallic cobalt, and cobalt content of residues marketed.
[2]Nickel in matte, oxide, and metallic nickel.
[3]Value of sulphuric acid produced.
[4]No deduction made for lime consumed in manufacturing.

TOTAL MINERAL PRODUCTION

Year	Exchange equalization or discount	Metallics	Non-metallics	Structural materials	Clay products	Total
Before 1891[1]		$ 9,520,269				$ 9,520,269
1891–99		9,072,635		$44,790,920		53,863,555
1900		2,565,286		6,733,338		9,298,624
1901		5,016,734		6,814,352		11,831,086
1902		6,257,499		7,134,135		13,391,634
1903		5,242,575		7,628,018		12,870,593
1904		4,906,677		6,665,970		11,572,647
1905		10,201,010		7,653,286		17,854,296
1906		13,353,080		9,035,303		22,388,383
1907		14,550,835	$ 3,020,537	$ 3,876,275	$ 3,571,726	25,019,373
1908		16,754,986	2,629,749	3,396,406	2,856,476	25,637,617
1909		22,928,496	2,825,751	4,028,206	3,198,922	32,981,375
1910		28,161,678	3,141,658	4,380,000	3,630,559	39,313,895
1911		29,102,867	3,674,926	4,935,609	4,263,395	41,976,797
1912		34,799,734	4,009,643	4,701,170	4,831,056	48,341,603
1913		37,507,935	4,296,450	5,866,775	5,561,151	53,232,311
1914		33,345,291	4,339,703	4,505,368	4,105,597	46,295,959
1915		44,109,679	4,655,250	3,609,371	1,871,379	54,245,679
1916		55,002,918	4,982,140	3,734,065	1,584,699	65,303,822
1917		56,831,857	7,702,942	4,962,284	2,596,749	72,093,832
1918		66,178,059	7,815,062	4,297,401	2,018,450	80,308,972
1919		41,590,759	6,308,182	7,208,413	3,776,562	58,883,916
1920	$ 1,376,275	48,281,553	8,141,796	11,921,019	4,735,154	74,455,797
1921	1,359,636	28,777,581	6,636,217	13,967,386	5,183,125	55,923,945
1922	208,621	40,290,157	7,591,913	13,640,166	6,944,218	68,675,075
1923	280,196	44,076,660	8,511,786	13,139,757	6,269,140	72,277,539
1924	196,750	52,130,314	7,555,283	12,398,465	5,137,865	77,418,677
1925	−2,838	62,495,472	7,488,034	12,451,174	5,148,626	87,580,468
1926	−595	59,218,297	7,842,632	12,681,308	5,356,469	85,098,111
1927		62,631,255	7,638,605	14,160,552	5,853,035	90,283,447
1928	2,811	71,267,003	7,822,641	14,815,814	6,177,664	100,085,933
1929	157,456	83,967,446	8,621,427	18,541,687	6,830,162	118,118,178
1930	36,703	83,356,365	8,492,263	16,571,626	5,221,214	113,678,171
1931	1,926,221	72,452,544	7,642,308	11,995,556	3,552,799	97,569,428
1932	6,134,157	63,997,017	7,361,897	7,295,917	1,690,505	86,479,493
1933	16,486,437	78,877,928	7,094,636	6,335,977	1,024,579	109,819,557
1934	29,287,439	99,985,594	7,553,571	7,766,563	1,261,006	145,854,173
1935	32,169,797	110,718,768	7,766,657	7,555,508	1,370,225	159,580,955
1936	34,139,926	131,091,593	8,933,036	8,931,899	1,573,936	184,670,390
1937	37,028,708	167,814,485	10,055,177	13,241,244	2,033,845	230,173,459
1938	42,070,230	155,835,230	9,949,317	10,012,203	2,083,496	219,950,476
1939	48,322,783	161,208,555	11,470,739	10,705,629	2,341,617	234,049,323
1940	58,154,794	176,072,441	12,514,093	13,950,607	2,513,884	263,205,819
1941	56,925,914	181,989,098	12,349,030	15,462,605	3,087,616	269,814,263
1942	49,280,883	183,359,295	12,406,382	13,767,041	2,549,487	261,363,088
1943	37,751,307	168,494,248	12,502,624	12,708,296	2,453,829	233,910,304
1944	30,874,701	155,066,073	11,075,707	13,391,477	2,347,396	212,755,354
1945	28,975,884	159,234,509	10,909,496	14,481,105	3,107,189	216,708,183
1946	28,762,356	127,729,390	10,205,701	20,187,881	4,321,499	191,206,827
1947	27,785,522	179,873,883	11,909,819	25,186,051	5,278,438	250,033,713
1948	30,044,272	215,624,013	14,550,912	29,030,823	6,563,754	295,824,498
1949	36,597,022	229,853,394	16,850,867	33,763,974	7,435,439	324,500,696
1950	42,935,140	159,605,408	20,241,863	41,109,762	9,323,263	373,215,436
1951	40,183,893	326,900,644	24,072,501	50,433,064	10,484,341	452,074,443
1952		362,615,447	23,694,663	55,127,117	11,975,200	453,412,427
Total	$719,452,401	$4,951,903,243		$1,344,638,240		$7,015,993,884

[1]Prior to 1891, when the Ontario Bureau (now Department) of Mines was established, it is estimated that metals of a value of $9,520,269 were produced. No estimate has been made of the output of non-metallics up to 1891.

In the non-metallic group, asbestos, graphite, gypsum, silica brick, and sulphur were all higher, but the total value of all the non-metallics, which was $23,694,663, was slightly lower than for the previous year.

Structural materials as a whole gained 9.3 percent, with a value of $55,127,177 as compared with $50,433,064 in 1951. Sand and gravel made the greatest advance.

The total value of clay products amounted to $11,975,200, or a gain of 14.21 percent.

Metal Production

The aggregate metal production of Ontario mines from the earliest records up to the end of 1952 was valued at $5,671,355,644. The value of production in 1952, amounting to $362,615,447, was 79.97 percent of the total value of Ontario's mining industry.

METAL PRODUCTION TO DECEMBER 31, 1952

Metal or Product	To December 31, 1951	1952	To December 31, 1952
Gold	$1,377,090,729	$ 87,540,620	$1,464,631,349
Exchange equalization	719,452,719	.....	719,452,719
Nickel, including nickel oxides and salts	1,602,901,330	161,666,687	1,754,568,017
Silver	298,506,783	5,416,647	303,923,430
Copper[1]	797,217,320	70,981,618	868,198,938
Pig iron, from domestic ore	98,257,508	.....	98,257,508
Cobalt[2]	40,146,552	3,226,903	43,373,455
Platinum metals	255,820,232	18,475,723	274,295,955
Iron ore[3]	92,981,736	19,632,551	112,614,287
Lead	4,978,579	291,979	5,270,558
Zinc, in ore and concentrates	994,893	130,630	1,125,523
Molybdenum	224,110	.....	224,110
Bismuth	263,613	.....	263,613
Selenium	3,876,148	265,128	4,141,276
Tellurium	241,957	9,707	251,664
Chromite	55,090	.....	55,090
Tungsten, in concentrates	510,767	164,886	675,653
Magnesium	15,210,865	4,812,368	20,023,233
Calcium			
Barium	9,266	.....	9,266
Total	$5,308,740,197	$362,615,447	$5,671,355,644

Dividends.—During 1952, dividends were paid by 27 gold, 2 nickel-copper, and 3 silver-cobalt mining companies. Investment or holding companies, of which there are several, have been excluded in the case of gold and nickel-copper companies but not in the case of silver-cobalt companies.

DIVIDENDS PAID BY METAL-MINING COMPANIES TO DECEMBER 31, 1952

Industry	To end of 1951	1952	To end of 1952
Gold	$ 579,918,706	$15,463,263	$ 595,381,969
Nickel-copper	669,372,803	41,608,768	710,981,571
Silver-cobalt	102,794,788	1,215,330	104,010,118
Total	$1,352,086,297	$58,287,361	$1,410,373,658

[1]Includes small quantities of copper sulphate.

[2]Includes metal, oxide, salts, and cobalt content of residues exported.

[3]Value of ore shipped to all points.

Metal Prices and Exchange

The following table is a computation of the average exchange rate of the United States dollar in Canadians funds, the pound sterling in Canadians funds, the price of silver and copper on the New York market, and the price of gold in Canadian dollars per fine ounce.

Month	Average exchange rate U.S. dollars in Canadian funds	Pound sterling in Canadian funds	Silver, cents per ounce		Copper, cents per pound; New York export, U.S. funds	Gold in Canadian dollars per fine ounce
			New York market, U.S. funds	In Canadian funds		
1951						
January	1.052	2.945	88.709	92.515	24.425	36.810
February	1.049	2.938	90.160	95.125	24.425	36.725
March	1.047	2.933	90.160	94.685	24.425	36.650
April	1.059	2.968	90.160	95.750	24.425	37.072
May	1.064	2.979	96.160	96.425	25.471	37.245
June	1.069	2.994	88.439	94.939	27.374	37.423
July	1.061	2.969	90.160	96.031	27.425	37.118
August	1.056	2.955	90.160	95.750	27.425	36.962
September	1.055	2.954	90.160	95.400	27.425	36.944
October	1.051	2.941	88.147	93.680	27.425	36.783
November	1.044	2.921	88.000	92.175	27.425	36.530
December	1.025	2.866	88.000	90.812	27.425	35.887
Average (12 months)	1.053	2.947	89.868	94.441	26.258	36.846
1952						
January	1.005	2.795	88.000	88.900	27.425	35.190
February	1.009	2.784	88.000	88.375	27.425	35.032
March	1.024	2.786	88.000	88.031	27.425	34.850
April	0.981	2.755	88.000	86.719	27.425	34.340
May	0.984	2.755	85.405	84.600	27.908	34.432
June	0.979	2.727	82.750	81.437	34.586	34.261
July	0.969	2.702	82.886	80.675	34.815	33.926
August	0.961	2.681	83.250	80.346	34.904	33.648
September	0.960	2.671	83.250	80.187	34.824	33.594
October	0.964	2.694	83.250	80.475	34.751	33.750
November	0.973	2.735	83.250	81.469	34.681	34.171
December	0.971	2.724	83.250	81.032	34.780	33.971
Average [1] (12 months)	0.982	2.734	84.941	83.520	31.746	34.263

Diamond-Drilling

There were 23 reporting diamond-drilling operators; the footage drilled by them during the year amounted to 2,227,145 feet, compared with 2,019,948 feet during the previous year. These companies employed, in Ontario, 1,035 men to whom they paid $2,959,444 in salaries and ages. The industry purchased, for all their operations both in this province and others, 142,590 carats of borts worth $1,159,326 and 73 carats of carbons and other stones worth $27,079. Ready-set bits were purchased to the value of $1,448,173.

[1] Computed from daily quotations.

Prospecting

The number of mining claims staked during the year was 16,009. This was an increase from the 13,403 reported for the previous year. The Sudbury division led in recording the largest number, followed by Port Arthur, Sault Ste. Marie, and Timiskaming, in that order.

MINING CLAIMS RECORDED AND CANCELLED IN ONTARIO, 1907–52

Year	Number recorded	Number cancelled[1]	Year	Number recorded	Number cancelled	Year	Number recorded	Number cancelled
1907....	13,996	.....	1922....	5,686	1,490	1937....	15,292	11,445
1908....	4,634	.....	1923....	6,092	2,328	1938....	9,047	8,978
1909....	9,746	.....	1924....	5,222	2,804	1939....	6,772	9,086
1910....	5,792	.....	1925....	4,751	2,460	1940....	4,667	7,242
1911....	9,001	361	1926....	13,496	5,322	1941....	4,254	10,514
1912....	3,104	.....	1927....	15,554	5,537	1942....	3,593	9,028
1913....	4,320	442	1928....	15,046	3,662	1943....	5,232	3,057
1914....	1,913	7,913	1929....	8,207	8,090	1944....	12,527	2,376
1915....	2,519	1,093	1930....	3,886	8,887	1945....	16,362	3,657
1916....	2,470	1,911	1931....	5,779	10,885	1946....	23,763	6,003
1917....	1,936	602	1932....	4,945	15,425	1947....	12,913	18,116
1918....	1,534	304	1933....	8,077	4,813	1948....	9,029	13,932
1919....	2,918	1,481	1934....	16,888	5,041	1949....	14,420	11,829
1920....	2,160	2,203	1935....	9,460	9,240	1950....	14,233	17,735
1921....	2,459	1,791	1936....	17,280	6,653	1951....	13,403	9,265
						1952....	16,009	13,789

The following table shows the number of miners' licences issued and renewed, and the number of mining claims recorded and cancelled, in each mining division, for the year 1952.

MINERS' LICENCES AND MINING CLAIMS, 1952

Mining division	Miners' licences		Mining claims	
	Issued	Renewed	Recorded	Cancelled
Fort Frances	21	73	373	314
Kenora	103	179	993	926
Larder Lake	148	357	846	1,752
Montreal River	64	128	578	817
Patricia[2]	103	117	285	2,208
Porcupine	113	208	541	516
Port Arthur and Kowkash	332	394	3,563	1,856
Red Lake	75	147	931	1,005
Sault Ste. Marie	196	271	1,500	848
Sudbury	568	338	4,481	2,064
Timiskaming	143	355	1,257	1,004
At Toronto	457	2,180	661	479
Total	2,323	4,747	16,009	13,789

[1]Data on claims cancelled are not available for 1907, 1908, 1909, 1910, and 1912. These figures include cancellations of claims in eastern Ontario, and Parry Sound district for the years 1951 and 1952 only.

[2]In January, 1950, a recording office was opened at Red Lake and a new Patricia mining division was established with a recording office at Sioux Lookout.

MINING CLAIMS RECORDED IN THE DIFFERENT MINING DIVISIONS, 1907 AND 1946–52

Mining division	1907	1946	1947	1948	1949	1950	1951	1952
Fort Frances	.....	262	186	304	193	206	400	373
Kenora	.....	479	449	406	999	918	1,609	993
Larder Lake	3,813	3,563	1,927	818	1,747	1,186	1,237	846
Montreal River	866	1,164	809	512	481	668	975	578
Parry Sound[1]	102	.....	.....	.....	.....	.....	208	167
Patricia[2]	.....	.....	.....	.....	.....	3,112	624	285
Porcupine	.....	1,322	1,067	418	441	729	366	541
Port Arthur and Kowkash[3]	317	4,014	1,624	1,098	1,416	2,199	2,047	3,563
Red Lake	.....	3,476	1,519	345	1,018	785	801	931
Sault Ste. Marie	291	470	489	1,573	3,774	911	1,111	1,500
Sudbury	456	6,115	3,199	1,442	3,121	2,104	2,213	4,481
Timiskaming	7,860	1,248	799	1,094	622	1,011	1,391	1,257
At Toronto	.....	1,650	780	1,019	608	404	421	494
Total	13,996	23,763	12,848	9,029	14,420	14,233	13,403	16,009

METALLIC MINERALS

Gold

General Summary

Gold production in 1952 amounted to 2,513,701 ounces, valued at $87,540,620, which was an increase of 2.05 percent in quantity and a decrease of 3.91 percent in value over the previous year's figures of 2,462,976 ounces, valued at $91,105,477. This is the combined output of the gold mines; the nickel-copper mines of the Sudbury district; New Ryan Lake Mines, Limited, a copper-gold-silver producer; and Matarrow Lead Mines, Limited, a silver-lead-zinc operation. The last two are in the Matachewan district.

The value of the total production from the gold mines alone, which included 408,731 ounces of silver valued at $336,265, amounted to $86,372,277 and shows a drop of 4.05 percent.

There were 41 producing mines, which reported 10,032,166 tons of ore raised and 9,999,455 tons milled, giving an average grade of $8.63 per ton. The mines employed 1,200 salaried employees, who were paid $5,387,956 in salaries, and 11,921 wage-earners, who were paid $37,608,664 in wages, or an average of $3,155 per year. The total cost of fuel and electricity came to $4,277,165, and process supplies to $16,039,269. Some of these producing mines carry on prospecting activities in a search for new mines, and they spent $588,609 in the province alone to do so. Diamonds for diamond-drilling and ready-set bits cost them $168,394. There were seven active, but non-producing, mines, which reported costs as follows: $29,705 to salaried employees, $234,788 to 71 wage-earners, $30,726 for fuel and electricity, and $79,834 for process supplies.

[1]The office at Parry Sound was closed in 1921, and records are now kept at the Ontario Department of Mines, Toronto. Since 1951, the records for Parry Sound and eastern Ontario are kept separately.

[2]In January, 1950, a recording office was opened at Red Lake, and a new Patricia mining division established with a recording office at Sioux Lookout.

[3]In 1945, the records for Kowkash were transferred to Port Arthur, and their figures are combined.

Dividends paid during the year by the gold mining industry amounted to $15,463,263, and the total dividends to date make up a grand total of $595,381,969.

Sample shipments and clean-up material were reported by Curtin Prospecting Syndicate in the Sudbury district, Howey Consolidated Gold Mines, Limited, in Patricia portion of Kenora district, Magnet Consolidated Mines, Limited, in Thunder Bay district, Russell C. Cone in Kenora and Rainy River districts, and G. Calverley and E. M. Hartling in Algoma district. During the year, the New Jason, Hasaga, and Chesterville mines ceased operations.

Production

The following tables show the annual production by mines in each area, the production by areas in 1952, and the total gold production from 1886 to the end of 1952.

PORCUPINE GOLD BELT, PRODUCTION, 1910–52[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Amca	1937	.....	$ 1,298	.....	$ 1,298
Amalgamated Goldfields	1923, 1926, 1928, 1934	500	$ 1,966	500	$ 1,966
Aunor	1940–45	899,968	$ 10,892,170		
	1946	167,705	2,079,300		
	1947	172,489	2,040,691		
	1948	176,564	2,001,122		
	1949	176,090	2,281,978		
	1950	177,371	2,485,760		
	1951	175,977	2,413,346		
	1952	178,827	2,698,488	2,124,991	$ 26,892,855
Bonetal	1941–51	352,254	$ 1,921,134	352,254	$ 1,921,134
Bonwhit	1951	8,068	$ 113,735		
	1952	67,009	902,615	75,077	$ 1,016,350
Broulan Reef	1939–45	710,017	$ 5,929,812		
	1946	75,791	578,553		
	1947	94,645	567,913		
	1948	117,625	889,787		
	1949	143,145	1,053,370		
	1950	143,511	2,018,693		
	1951	169,120	1,919,449		
	1952	137,666	1,261,242	1,591,520	$ 14,218,819
Buffalo Ankerite	1926–45	3,846,675	$ 26,272,168		
	1946	234,379	1,388,974		
	1947	210,045	1,284,528		
	1948	186,635	1,096,470		
	1949	129,313	1,181,373		
	1950	106,900	1,120,460		
	1951	118,995	927,620		
	1952	117,795	649,180	4,950,737	$ 33,920,773
Canusa	1927, 1928, 1933, 1935	315	$ 14,840	315	$ 14,840
Clifton	1914, 1922–24	.....	$ 30,575	.....	$ 30,575
Concordia	1935	230	$ 580	230	$ 580

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table III in pocket.

PORCUPINE GOLD BELT, PRODUCTION, 1910–52—*Continued*

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Coniaurum	1928–45	2,543,345	$ 21,346,125		
	1946	114,385	1,040,181		
	1947	116,220	983,325		
	1948	129,175	1,189,741		
	1949	141,730	1,226,328		
	1950	133,995	1,204,033		
	1951	126,295	1,178,866		
	1952	129,325	1,018,762	3,434,470	$ 29,187,361
Consolidated West Dome Lake	1915–20, 1924–27, 1929, 1930	188,488	$ 1,120,306	188,488	$ 1,120,306
Davidson	1918–20	9,371	$ 53,914	9,371	$ 53,914
Delnite	1937–45	988,144	$ 6,726,601		
	1946	92,731	629,375		
	1947	101,927	999,725		
	1948	124,835	1,184,625		
	1949	149,087	1,410,083		
	1950	153,165	1,492,946		
	1951	139,278	1,493,931		
	1952	158,794	1,802,159	1,907,961	$ 15,739,445
De Santis	1926, 1933, 1939–42	196,928	$ 1,366,707	196,928	$ 1,366,707
Devon	1940	2,333	$ 1,632	2,333	$ 1,632
Dome	1910–45	14,774,567	$144,186,528		
	1946	573,400	5,448,935		
	1947	592,200	5,601,804		
	1948	620,800	5,463,596		
	1949	639,300	5,494,834		
	1950	680,000	6,097,497		
	1951	688,000	6,135,843		
	1952	687,400	5,803,685	19,258,667	$ 184,232,722
Faymar	1940–42	119,181	$ 853,292	119,181	$ 853,292
Gillies–Lake Porcupine	1929–31, 1935–37	54,502	$ 462,482	54,502	$ 462,482
Goldhawk	1947	636	$ 1,862	636	$ 1,862
Gold Reef	1915, 1917	128	$ 2,135	128	$ 2,135
Hallnor	1938–45	889,338	$ 16,229,361		
	1946	112,357	1,935,928		
	1947	112,272	1,471,663		
	1948	127,059	1,585,075		
	1949	129,745	1,716,024		
	1950	131,760	1,867,063		
	1951	138,424	1,817,719		
	1952	134,236	1,869,107	1,775,191	$ 28,491,940
N. A. Hermiston	1946	.....	$ 1,056	.....	$ 1,056
Hill Gold	1918	25	$ 635	25	$ 635

PORCUPINE GOLD BELT, PRODUCTION, 1910–52—*Continued*

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Hollinger	1910–45	44,174,517	$363,272,275		
	1946	1,048,646	9,224,462		
	1947	1,021,955	8,469,907		
	1948	1,127,523	9,277,749		
	1949	1,120,203	9,958,306		
	1950	1,127,616	11,008,743		
	1951	933,081	8,981,784		
	1952	1,068,778	10,405,207	51,622,319	$ 430,598,433
Hoyle	1941–44, 1946–49	725,494	$ 2,689,438	725,494	$ 2,689,438
J. Huddlestone and P. Clyne	1923, 1925	.....	$ 3,257	.....	$ 3,257
Hughes	1926	.....	$ 30	.....	$ 30
Hugh-Pam	1948	1,207	$ 1,586		
	1949	6,255	12,168		
	1950	8,298	93,817		
	1951	7,740	51,752		
	1952	26,053	280,610	49,553	$ 439,933
Mace	1911, 1912, 1914–18, 1923–39, 1941	1,565,218	$ 9,827,448	1,565,218	$ 9,827,448
Marbuan	1926–35	317,769	$ 1,154,663	317,769	$ 1,454,663
McIntyre	1912–45	16,905,741	$161,901,207		
	1946	613,200	6,110,561		
	1947	630,270	6,563,223		
	1948	673,950	6,851,517		
	1949	716,910	7,367,942		
	1950	741,410	7,695,125		
	1951	754,470	7,662,620		
	1952	760,230	7,255,921	21,796,181	$ 211,408,116
McLaren-Porcupine	1933–35, 1937	876	$ 6,819	876	$ 6,819
Moneta	1938–43	314,829	$ 5,589,356	314,829	$ 5,589,356
Munro Croesus	1915–18, 1923, 1931, 1932, 1934–36, 1948	5,333	$ 326,894	5,333	$ 326,894
Nakhodas	1940–42, 1944	44,028	$ 252,792	44,028	$ 252,792
Naybob	1932, 1933, 1935, 1937–43, 1948	247,146	$ 1,843,425	247,146	$ 1,843,425
Newray	1913–15, 1917, 1918	14,804	$ 184,001	14,804	$ 184,001
Night Hawk Peninsular	1924–27, 1940, 1944	99,688	$ 580,462	99,688	$ 580,462

PORCUPINE GOLD BELT, PRODUCTION, 1910–52—*Continued*

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Northcrown	1913–18, 1920, 1921	226,180	$ 2,893,730	226,180	$ 2,893,730
Northern Turnbull	1934	30	$ 172	30	$ 172
Pamour	1936–45	4,638,859	$ 21,543,402		
	1946	386,686	1,318,202		
	1947	299,633	957,106		
	1948	412,352	1,330,830		
	1949	584,190	2,057,424		
	1950	605,081	2,216,794		
	1951	581,746	2,053,929		
	1952	611,270	1,936,097	8,119,817	$ 33,413,784
Paymaster	1922, 1926–28, 1934–45	2,011,633	$ 14,778,533		
	1946	140,015	1,152,103		
	1947	138,085	1,169,650		
	1948	158,123	1,198,196		
	1949	180,745	1,318,554		
	1950	186,055	1,443,185		
	1951	174,416	1,391,177		
	1952	174,454	1,361,208	3,163,526	$ 23,812,606
Porcupine Lake	1937–40, 1944	10,821	$ 50,100	10,821	$ 50,100
Porcupine Pet	1914, 1915	.....	$ 10,551	.....	$ 10,551
Porphyry Hill	1913, 1915	46	$ 6,236	46	$ 6,236
Preston East Dome	1938–45	1,514,783	$ 16,460,272		
	1946	230,899	1,513,129		
	1947	225,812	1,825,703		
	1948	237,405	1,863,733		
	1949	237,623	2,031,518		
	1950	238,657	2,169,153		
	1951	233,516	2,233,200		
	1952	239,500	2,343,095	3,158,195	$ 30,439,803
Ross	1936–45	692,023	$ 5,762,685		
	1946	70,309	509,992		
	1947	65,397	465,371		
	1948	106,058	718,997		
	1949	100,346	722,143		
	1950	110,752	789,039		
	1951	112,006	779,430		
	1952	110,331	774,191	1,367,222	$ 10,521,848
Schumacher	1915–18	112,124	$ 564,984	112,124	$ 564,984
J. Spence	1932	155	$ 2,738	155	$ 2,738
Tommy Burns	1917	21	$ 289	21	$ 289
Miscellaneous	1925, 1927–38, 1942–46, 1948–52	68	$ 615,676	68	$ 615,676
Total	1910–45	98,686,956	$845,980,271		
	1946	3,952,840	33,303,325		
	1947	3,925,751	32,923,648		
	1948	4,356,812	35,135,980		
	1949	4,501,091	38,047,087		
	1950	4,582,185	41,943,114		
	1951	4,397,645	39,373,609		
	1952	4,601,668	40,365,229	129,004,948	$1,107,072,263

LARDER LAKE GOLD AREA, PRODUCTION, 1911–52[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
American Eagle	1911	50	$ 900	50	$ 900
Barry-Hollinger	1918, 1925–36, 1944–46	267,741	$ 1,622,118	267,741	$ 1,622,118
Beaverhouse Lake	1913, 1914, 1919–30, 1934, 1935, 1941–44	131,585	$ 808,080	131,585	$ 808,080
Briscoe-Bryce	1948	.....	$ 45	.....	$ 45
Britcana	1937	21	$ 702	21	$ 702
Caramora Porcupine	1948	.....	$ 1,154	.....	$ 1,154
Cathroy-Larder	1941–44, 1947	22,250	$ 118,750	22,250	$ 118,750
Chesterville	1939–45	1,314,546	$ 6,598,892		
	1946	225,458	$ 1,029,230		
	1947	295,408	$ 1,195,098		
	1948	310,564	$ 1,313,134		
	1949	300,547	$ 1,002,619		
	1950	320,759	770,309		
	1951	313,948	781,552		
	1952	179,209	616,747	3,260,439	$ 13,307,581
Detroit Syndicate	1911	50	$ 200	50	$ 200
Gold Hill	1927, 1928	4,416	$ 13,649	4,416	$ 13,649
Kerr-Addison	1911, 1938–45	3,903,522	$ 29,600,902		
	1946	531,695	3,855,258		
	1947	780,153	5,257,179		
	1948	889,711	5,838,584		
	1949	1,560,195	10,379,403		
	1950	1,582,974	12,211,504		
	1951	1,612,707	12,432,241		
	1952	1,649,836	12,565,071	12,510,793	$ 92,140,142
Miller Independence	1918, 1935, 1936	36	$ 5,135	36	$ 5,135
New Telluride	1931, 1932, 1937, 1940, 1950	126	$ 2,088	126	$ 2,088
Omega	1913, 1927, 1928, 1936–48	1,615,081	$ 7,788,606	1,615,081	$ 7,788,606
Raven River	1937–39	40,514	$ 266,441	40,514	$ 266,441
Total	1911, 1913, 1914, 1918–45	7,161,061	$ 46,239,660		
	1946	862,078	5,328,834		
	1947	1,109,513	$ 6,593,108		
	1948	1,200,275	7,154,415		
	1949	1,860,742	11,382,022		
	1950	1,903,733	12,981,941		
	1951	1,926,655	13,213,793		
	1952	1,829,045	13,181,818	17,853,102	$ 116,075,591

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table I in pocket.

KIRKLAND LAKE GOLD BELT, PRODUCTION, 1910–52[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Baldwin Kirkland	1929, 1938	81	$ 1,247	81	$ 1,247
Bidgood Kirkland	1934–49, 1951	586,367	$ 5,917,133	586,367	$ 5,917,133
Bourkes Syndicate	1918, 1936–38	1,298	$ 8,935	1,298	$ 8,935
Gold Pyramid	1911	175	$ 650	175	$ 650
Golden Summit	1936, 1937, 1945	737	$ 3,738	737	$ 3,738
Kirkland Golden Gate	1913, 1933, 1935–44, 1947	101,503	$ 1,051,162	101,503	$ 1,051,162
Kirkland Lake Gold	1919–45	1,693,557	$ 20,065,519		
	1946	91,443	1,094,837		
	1947	91,171	1,613,857		
	1948	93,882	1,378,354		
	1949	102,426	1,589,690		
	1950	114,826	1,490,850		
	1951	124,944	1,549,739		
	1952	120,543	1,540,202	2,432,792	$ 30,323,048
Lake Shore	1918–45	12,003,092	$201,199,712		
	1946	310,968	4,744,166		
	1947	309,717	4,745,200		
	1948	344,542	5,111,049		
	1949	379,079	5,849,538		
	1950	370,267	5,379,668		
	1951	359,489	5,125,030		
	1952	263,595	3,094,159	14,340,749	$ 235,248,522
Macassa	1933–45	1,235,628	$ 20,584,411		
	1946	87,383	1,325,491		
	1947	97,507	1,381,202		
	1948	103,650	1,432,427		
	1949	126,511	1,718,842		
	1950	128,710	1,653,942		
	1951	135,440	1,648,999		
	1952	139,660	1,533,857	2,054,489	$ 31,279,171
Moffat Hall	1934–35	16,388	$ 166,569	16,388	$ 166,569
Morris Kirkland	1936–38, 1940–42	127,253	$ 621,544	127,253	$ 621,544
Ontario-Kirkland	1922	6,496	$ 10,082	6,496	$ 10,082
Swastika	1910, 1911, 1913	2,190	$ 11,457	2,190	$ 11,457
Sylvanite	1927–45	2,530,095	$ 30,932,458		
	1946	154,562	1,693,581		
	1947	151,140	1,450,334		
	1948	167,440	1,565,036		
	1949	171,442	1,738,606		
	1950	170,552	1,833,687		
	1951	171,017	1,722,843		
	1952	171,868	1,866,401	3,688,116	$ 42,802,946

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table II in pocket.

KIRKLAND LAKE GOLD BELT, PRODUCTION, 1910–52—*Continued*

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Teck-Hughes	1917–45	6,325,387	$ 81,349,991		
	1946	91,302	1,093,701		
	1947	71,360	1,049,025		
	1948	73,885	1,010,737		
	1949	120,415	1,339,528		
	1950	160,535	1,604,147		
	1951	197,860	1,823,513		
	1952	218,930	1,445,716	7,259,674	$ 90,716,358
Toburn	1913–18, 1922–45	879,654	$ 13,922,166		
	1946	40,753	483,496		
	1947	41,849	512,484		
	1948	45,809	500,670		
	1949	46,432	524,869		
	1950	42,594	531,459		
	1951	40,525	576,107		
	1952	41,300	581,241	1,178,915	$ 17,632,492
Trout Creek	1931	1	$ 1,662	1	$ 1,662
Upper Canada	1938–45	510,450	$ 7,693,108		
	1946	99,431	1,054,925		
	1947	109,556	1,215,028		
	1948	119,279	1,288,654		
	1949	120,896	1,338,437		
	1950	138,969	1,508,607		
	1951	151,568	1,573,070		
	1952	177,468	1,694,416	1,427,617	$ 17,366,245
Wright-Hargreaves	1913, 1921–45	6,419,349	$ 107,271,249		
	1946	174,314	3,147,009		
	1947	183,059	3,007,888		
	1948	187,790	3,077,238		
	1949	197,940	3,078,685		
	1950	194,496	3,112,917		
	1951	182,210	3,004,993		
	1952	189,770	2,719,091	7,728,928	$ 128,419,070
Miscellaneous	1925, 1928, 1929, 1933, 1934, 1937, 1938, 1941–46, 1952	.....	$ 130,995	.....	$ 130,995
Total	1910, 1911, 1913–45	32,307,598	$489,626,817		
	1946	1,077,790	14,916,970		
	1947	1,092,316	15,430,524		
	1948	1,180,044	15,759,921		
	1949	1,288,886	17,361,328		
	1950	1,320,949	17,115,277		
	1951	1,363,053	17,027,072		
	1952	1,323,134	14,475,117	40,953,800	$ 601,713,026

MATACHEWAN AND WEST SHININGTREE GOLD AREAS, PRODUCTION, 1922–52

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Ashley	1932–36, 1946	157,636	$ 1,622,245	157,636	$ 1,622,245
Atlas	1933	12	$ 201	12	$ 201
Matachewan Consolidated	1934–45	1,836,001	$ 7,767,766		
	1946	228,890	894,145		
	1947	250,679	991,282		
	1948	256,252	943,481		
	1949	239,030	788,777		
	1950	246,622	719,179		
	1951	259,092	865,923		
	1952	164,407	510,551	3,474,973	$ 13,481,104
Ronda	1939	24,592	$ 97,644	24,592	$ 97,644
Tyranite	1939–42	223,810	$ 1,166,640	223,810	$ 1,166,640
White Rock	1922, 1933	17	$ 1,406	17	$ 1,406
Young-Davidson	1934–45	3,228,845	$ 11,828,120		
	1946	208,619	669,359		
	1947	253,059	846,731		
	1948	250,509	782,449		
	1949	324,265	1,016,359		
	1950	318,194	1,191,445		
	1951	307,254	694,218		
	1952	287,265	873,243	5,178,010	$ 17,901,924
Miscellaneous	1948	.....	$ 14	.....	$ 14
Total	1922, 1932–45	5,470,913	$ 22,483,177		
	1946	431,509	1,564,349		
	1947	503,738	1,838,013		
	1948	506,761	1,725,944		
	1949	563,295	1,805,136		
	1950	564,816	1,910,624		
	1951	566,346	1,560,141		
	1952	451,672	1,383,794	9,059,050	$ 34,271,178

ALGOMA DISTRICT, PRODUCTION, 1893–1952[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Agawa	1939, 1940	8,612	$ 22,397	8,612	$ 22,397
G. Calverley	1952	50	$ 4,400	50	$ 4,400
Cline Lake	1938–42, 1947, 1948	331,842	$ 2,369,053	331,842	$ 2,369,053
Darwin	1902, 1903, 1907, 1908, 1910, 1923, 1925, 1930, 1935–37, 1940, 1943, 1944	54,528	$ 546,852	45,528	$ 546,852

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table IV in pocket.

ALGOMA DISTRICT, PRODUCTION, 1893–1952—*Continued*

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Deep Lake	1936–38, 1943	2,790	$ 57,180	2,790	$ 57,180
P. Edward	1929, 1933, 1941	46	$ 694	46	$ 694
Edwards	1937	1,573	$ 16,977	1,573	$ 16,977
Golden Reed	1908	3	$ 125	3	$ 125
Havilah	1893, 1894, 1900, 1910, 1911	6,589	$ 26,535	6,589	$ 26,535
Hiawatha	1937, 1939, 1940	1,931	$ 6,826	1,931	$ 6,826
Kremzar	1940	.....	$ 96	.....	$ 96
Magino	1934–39, 1942, 1952	116,627	300,467	116,627	$ 300,467
Minto	1929–39, 1942, 1944	184,600	$ 1,140,457	184,600	$ 1,140,457
Norgold	1926, 1932, 1936–38, 1940	23,211	$ 84,576	23,211	$ 84,576
Norwalk	1904, 1910	820	$ 1,412	820	$ 1,412
Parkhill	1904, 1929, 1931–38, 1940, 1942–44	125,778	$ 1,691,795	125,778	$ 1,691,795
Shenango	1936, 1937, 1945	.....	$ 2,457	.....	$ 2,457
S. B. Smith	1935, 1936	9,228	$ 60,251	9,228	$ 60,251
Soo Mining and Prospecting Syndicate	1933	60	$ 282	60	$ 282
Stanley	1936	1,963	$ 2,936	1,963	$ 2,936
Ranson	1939	774	$ 5,938	774	$ 5,938
Regnery	1937, 1940–43, 1945	13,479	$ 124,353	13,479	$ 124,353
G. L. White	1936	.....	$ 1,124	.....	$ 1,124
Total	1893, 1894, 1900, 1902–4, 1907, 1908, 1910, 1911, 1923, 1925, 1926, 1929–45, 1947, 1948, 1952	875,504	$ 6,462,440	875,504	$ 6,462,440

THUNDER BAY DISTRICT, PRODUCTION, 1897–1952[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
R. Anderson	1943	.....	$ 116	.....	$ 116
Ardeen	1932–36, 1942	143,724	$ 962,326	143,724	$ 962,326
Bankfield Consolidated	1937–42, 1944–47	231,009	$ 2,424,545	231,009	$ 2,424,545
Brenbar	1941, 1949	46	$ 5,160	46	$ 5,160
Cook Lake	1937	32	$ 918	32	$ 918
Mary J. Coveney	1924	.....	$ 114	.....	$ 114
Elmos	1942	3,947	$ 39,168	3,947	$ 39,168
Empress	1897	1,100	$ 2,378	1,100	$ 2,378
Gold Range	1941	.....	$ 668	.....	$ 668
Hard Rock	1938–51	1,458,375	$ 10,057,426	1,458,375	$ 10,057,426
Harkness-Hays	1920, 1929, 1932, 1935, 1936	78	$ 5,879	78	$ 5,879
Jellicoe	1939–41, 1947, 1948	16,948	$ 231,014	16,948	$ 231,014
Leitch	1936-45	245,789	$ 6,838,465		
	1946	28,692	894,563		
	1947	30,417	848,156		
	1948	31,822	958,416		
	1949	31,926	1,002,335		
	1950	31,736	966,137		
	1951	29,988	918,893		
	1952	36,276	1,006,535	466,646	$ 13,433,500
Little Long Lac	1934–45	1,035,871	$ 15,192,936		
	1946	67,850	728,518		
	1947	78,216	745,539		
	1948	95,830	889,595		
	1949	102,570	898,743		
	1950	115,797	1,059,777		
	1951	101,731	991,319		
	1952	99,607	806,347	1,697,472	$ 21,312,774
MacLeod-Cockshutt	1938–45	1,380,003	$ 13,610,180		
	1946	158,434	1,194,689		
	1947	207,260	1,517,054		
	1948	176,221	1,411,610		
	1949	180,793	1,560,532		
	1950	261,103	2,084,741		
	1951	366,547	2,574,598		
	1952	411,777	2,365,504	3,142,138	$ 26,318,908
Magnet Consolidated	1938–43	201,206	$ 4,037,464		
	1946	26,018	340,757		
	1947	22,224	303,610		
	1948	21,140	286,741		
	1949	22,262	245,977		
	1950	44,771	333,014		
	1951	22,291	180,199		
	1952	.....	2,873	359,912	$ 5,730,635

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table V in pocket.

THUNDER BAY DISTRICT, PRODUCTION, 1897–1952—*Continued*

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Maloney Sturgeon	1937	1	$ 2,549	1	$ 2,549
Maylac	1946, 1947	1,518	$ 28,079	1,518	$ 28,079
J. B. McMartin	1934, 1935	3,525	$ 86,756	3,525	$ 86,576
Northern Empire	1934–41, 1949	425,866	$ 5,380,514	425,866	$ 5,380,514
North Shores	1923, 1929, 1932, 1933, 1935–37, 1941	3,808	$ 73,716	3,808	$ 73,716
W. Pauloski	1951	.....	$ 5,802	.....	$ 5,802
A. Pilon and M. Richards	1921	30	$ 1,122	30	$ 1,122
St. Anthony	1905–7, 1911–13, 1917, 1918, 1920, 1921, 1929, 1930, 1934–41	331,069	$ 2,165,292	331,069	$ 2,165,292
Schreiber Pyramid	1937	150	$ 2,680	150	$ 2,680
Sand River	1937–42	157,870	$ 1,863,840	157,870	$ 1,863,840
Sturgeon River	1936–42	145,123	$ 2,728,905	145,123	$ 2,728,905
Talmora Long Lac	1948	2,687	$ 14,000	2,687	$ 14,000
Tashota	1931, 1935–38, 1940, 1941	51,234	$ 441,644	51,234	$ 441,644
Theresa	1935, 1938, 1941, 1943, 1945, 1950	7,436	$ 35,024		
	1951	2,013	36,365		
	1952	13,181	64,894	22,630	$ 136,283
Tombill	1938–42	190,622	$ 2,589,984	190,622	$ 2,589,984
M. C. Williams	1940	20	$ 500	20	$ 500
Miscellaneous	1942, 1948	.....	$ 3,125	.....	$ 3,125
Total	1897, 1905–7, 1911–13, 1917, 1918, 1920, 1921, 1923, 1924, 1929–45	5,333,654	$ 65,542,912		
	1946	384,521	3,905,263		
	1947	439,918	4,110,057		
	1948	409,736	3,936,131		
	1949	466,571	4,266,290		
	1950	627,771	4,984,327		
	1951	634,568	5,059,187		
	1952	560,841	4,246,153	8,857,580	$ 96,050,320

KENORA DISTRICT, PRODUCTION, 1885–1952[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Baden-Powell	1902–5	163	$ 4,952	163	$ 4,952
Big Master	1902, 1903, 1905, 1942, 1943	14,470	$ 75,115	14,470	$ 75,115
Black Jack	1893	50	$ 300	50	$ 300
Britannia	1899	20	$ 110	20	$ 110
Cameron Island (Damascus)	1898, 1906, 1934–36	1,287	$ 163,871	1,287	$ 163,871
Camp Bay	1904–6	1,417	$ 7,559	1,417	$ 7,559
Cedar Island (Cornucopia)	1896, 1932, 1935, 1936	17,050	$ 174,146	17,050	$ 174,146
Champion (Bad)	1900, 1925, 1926	231	$ 2,220	231	$ 2,220
Clark	1935	87	$ 1,250	87	$ 1,250
Combined	1904	37	$ 220	37	$ 220
J. G. Cross	1937	.....	$ 107	.....	$ 107
Crown Point	1900	150	$ 900	150	$ 900
Darkwater	1936, 1937	13	$ 1,086	13	$ 1,086
Eldorado	1904	30	$ 251	30	$ 251
Elora	1936, 1937, 1939	13,766	$ 49,017	13,766	$ 49,017
Empire	1908	300	$ 1,800	300	$ 1,800
Glass Reef	1900	.....	$ 171	.....	$ 171
Gold Hill	1886, 1893	220	$ 19,610	220	$ 19,610
Gold Panner	1900	100	$ 900	100	$ 900
Gold Rock	1929	300	$ 726	300	$ 726
Grace	1902, 1907, 1908	415	$ 865	415	$ 865
Kenricia	1939, 1940	22,344	$ 97,518	22,344	$ 97,518
Laurentian	1906–9	19,950	$ 141,140	19,950	$ 141,140
Lunward	1948	.....	$ 32	.....	$ 32

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, p. 21.

KENORA DISTRICT, PRODUCTION, 1885–1952—*Continued*

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Martin Kenty	1947	.....	$ 42	.....	$ 42
Mikado	1896–1902, 1910, 1911, 1931	57,813	$ 421,070	57,813	$ 421,070
Minerva	1885	28	$ 1,372	28	$ 1,372
Olympia	1906, 1911 1912, 1915	1,598	$ 4,782	1,598	$ 4,782
Quarry Island	1899	176	$ 1,063	176	$ 1,063
Regina	1895–99, 1902, 1904, 1905, 1936, 1941–43	36,828	$ 229,552	36,828	$ 299,552
Royal Sovereign	1902	.....	$ 122	.....	$ 122
Rush Bay (Golden Horn)	1904, 1906, 1907	615	$ 1,120	615	$ 1,120
Sakoose (Golden Whale)	1899–1901	8,028	$ 58,758	8,028	$ 58,758
Sandybeach Lake	1941, 1942	.....	$ 478	.....	$ 478
Straw Lake Beach	1938–41	33,662	$ 429,477	33,662	$ 429,477
Sultana	1894–1902, 1904–6, 1949	77,481	$ 431,138	77,481	$ 431,138
Treasure	1898	34	$ 529	34	$ 529
Twentieth Century	1902, 1903	8,688	$ 43,586	8,688	$ 43,586
Van Houten	1940, 1945, 1947	800	$ 9,269	800	$ 9,269
Vermilion Lake (Botham)	1930, 1935	43	$ 575	43	$ 575
Wabigoon–Contact Bay	1905, 1916–18, 1920, 1923, 1929	1,839	$ 7,936	1,839	$ 7,936
Wendigo	1900, 1936–43, 1951	206,054	$ 2,510,076	206,054	$ 2,510,076
Miscellaneous[1]	1940–42	476	$ 10,851	476	$ 10,851
Total	1885–1952	526,563	$ 4,975,662	526,563	$ 4,975,662

[1] Mint sundries, etc.

PATRICIA PORTION OF KENORA DISTRICT, PRODUCTION, 1911–52[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Berens River	1939–48	560,607	$ 8,801,845	560,607	$ 8,801,845
Bobjo	1929	.....	$ 11,510	.....	$ 11,510
Campbell Red Lake	1949	71,317	$ 884,014		
	1950	139,742	2,234,322		
	1951	173,143	2,562,874		
	1952	178,930	2,863,202	563,132	$ 8,544,412
Car Lake Syndicate	1929, 1936	307	$ 5,809	307	$ 5,809
Central Patricia	1934–51	1,729,248	$ 22,920,236	1,729,248	$ 22,920,236
Cochenour Willans	1939–45	316,682	$ 5,359,408		
	1946	59,570	802,750		
	1947	60,747	739,450		
	1948	75,581	1,193,813		
	1949	83,891	1,071,227		
	1950	71,171	1,445,050		
	1951	70,531	1,312,202		
	1952	67,361	1,244,456	805,534	$ 13,168,356
W. D. Cooper and P. A. Barry	1935, 1936	.....	$ 5,591	.....	$ 5,591
Gold Eagle	1937–42	180,095	$ 1,496,844	180,095	$ 1,496,844
Hasaga	1938–45	761,803	$ 4,824,649		
	1946	82,427	299,101		
	1947	61,171	303,801		
	1948	135,212	780,853		
	1949	142,129	701,059		
	1950	143,035	598,610		
	1951	133,191	533,928		
	1952	56,314	204,397	1,515,282	$ 8,246,398
Howey	1930–41, 1945	4,630,779	$ 13,249,096		
	1952	.....	4,254	4,630,779	$ 13,253,350
Hudson Patricia	1936, 1937	11,228	$ 65,166	11,228	$ 65,166
J-M Consolidated	1934–40, 1947, 1948	105,357	$ 972,275	105,357	$ 972,275
N. McDonald	1924	.....	$ 126	.....	$ 126
R. McDonald	1923	.....	$ 124	.....	$ 124
McKenzie Red Lake	1935–45	754,326	$ 9,375,912		
	1946	69,201	595,398		
	1947	76,867	693,499		
	1948	75,967	713,112		
	1949	73,720	854,747		
	1950	79,677	918,596		
	1951	80,823	873,083		
	1952	83,288	739,010	1,293,874	$ 14,763,357
McMarmac Red Lake	1940–44, 1947, 1948	152,978	$ 1,762,760	152,978	$ 1,762,760

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table VI in pocket.

PATRICIA PORTION OF KENORA DISTRICT, PRODUCTION, 1911–52—*Continued*

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Madsen Red Lake	1938–45	994,652	$ 8,860,277		
	1946	121,649	1,088,277		
	1947	142,136	1,135,793		
	1948	151,686	1,239,131		
	1949	233,376	2,226,209		
	1950	282,050	2,496,224		
	1951	302,227	2,282,931		
	1952	304,251	2,316,155	2,532,027	$ 21,645,253
New Dickenson	1948	1,465	$ 5,194		
	1949	43,522	293,352		
	1950	46,234	788,443		
	1951	90,572	1,374,497		
	1952	102,442	1,551,161	284,235	$ 4,012,647
New Jason	1934, 1936–42	152,661	$ 2,251,974		
	1946	9,956	77,931		
	1947	18,532	199,920		
	1949	13,509	241,185		
	1950	38,654	493,476		
	1951	36,441	468,215		
	1952	6,820	74,192	276,573	$ 3,806,893
Pickle Crow	1935–45	1,032,480	$ 22,097,870		
	1946	73,209	1,390,576		
	1947	87,227	1,356,687		
	1948	107,319	1,631,195		
	1949	117,372	1,776,736		
	1950	108,176	1,783,108		
	1951	105,645	1,690,082		
	1952	108,275	1,407,074	1,739,703	$ 33,133,328
Red Crest	1935, 1936	591	$ 9,721	591	$ 9,721
Red Lake Gold Shore	1936, 1937, 1939	86,333	$ 747,577	86,333	$ 747,577
G. A. Rowan	1933	.....	$ 368	.....	$ 368
Sachigo River	1938–42	46,416	$ 1,957,084	46,416	$ 1,957,084
G. Singleton	1933	.....	$ 137	.....	$ 137
Sol D'Or	1933–36	458	$ 8,770	458	$ 8,770
Starratt Olsen	1948	33,501	$ 148,545		
	1949	108,030	814,189		
	1950	136,801	1,202,286		
	1951	151,187	912,853		
	1952	155,690	901,468	585,209	$ 3,979,341
J. Tingley	1911	30	$ 57	30	$ 57
Uchi	1939–43	757,074	$ 4,391,733	757,074	$ 4,391,733
Miscellaneous	1949, 1950	.....	$ 2,600	.....	$ 2,600
Total	1911, 1923, 1924, 1929–45	11,480,689	$100,336,317		
	1946	555,745	6,244,038		
	1947	579,963	5,864,292		
	1948	784,843	8,001,217		
	1949	1,032,683	10,226,231		
	1950	1,131,209	12,825,918		
	1951	1,228,567	12,910,286		
	1952	1,063,371	11,305,369	17,857,070	$ 167,713,668

SUDBURY DISTRICT, PRODUCTION, 1897–1952[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
A. Alkins, claims	1945	.....	$ 148	.....	$ 148
Bousquet	1936–38, 1945, 1948	17,129	$ 164,823	17,129	$ 164,823
Crystal	1897, 1898, 1908	730	$ 4,998	730	$ 4,998
Curtin Prospecting Syndicate	1952	.....	$ 640	.....	$ 640
Ensign	1905–7, 1944, 1945, 1948	8,590	$ 56,290	8,590	$ 56,290
Gomak	1936	1,387	$ 3,446	1,387	$ 3,446
Greenray	1951	.....	$ 1,616	.....	$ 1,616
Halcrow Swayze	1935	211	$ 1,372	211	$ 1,372
Jerome	1941–43	335,060	$ 2,195,651	335,060	$ 2,195,651
Kenty	1947	.....	$ 42	.....	$ 42
Lebel Oro	1910, 1911, 1913–16, 1932, 1934, 1937–39	221,070	$ 1,352,164	221,070	$ 1,352,164
Mac-Auer	1935	45	$ 293	45	$ 293
McMillan	1934–37	60,139	$ 370,672	60,139	$ 370,672
New Golden Rose	1937–41, 1943, 1944	144,237	$ 1,666,563	144,237	$ 1,666,563
Pileggi Mining Syndicate	1947, 1948	.....	$ 2,386	.....	$ 2,386
Renabie	1947	25,743	$ 166,798		
	1948	100,072	843,083		
	1949	155,049	1,193,450		
	1950	157,948	1,411,611		
	1951	88,736	873,040		
	1952	169,674	1,406,672	697,222	$ 5,894,654
Tionaga	1938, 1939	6,653	$ 81,059	6,653	$ 81,059
C. T. Young	1932	10	$ 725	10	$ 725
Miscellaneous	1948	.....	$ 49	.....	$ 49
Total	1897, 1898, 1905–8, 1910, 1911, 1913–16, 1932, 1934–45	795,261	$ 5,891,892		
	1947	25,743	168,456		
	1948	100,072	850,214		
	1949	155,049	1,193,450		
	1950	157,948	1,411,611		
	1951	88,736	874,656		
	1952	169,674	1,407,312	1,492,483	$ 11,797,591

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, p. 20.

RAINY RIVER DISTRICT, PRODUCTION, 1895–1952[1]

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Barker	1898	70	$ 490	70	$ 490
Big Turtle River	1929	19	$ 245	19	$ 245
Central Canada	1934	350	$ 742	350	$ 742
Russell Cone	1948, 1949, 1951, 1952	.....	$ 3,778	.....	$ 3,778
Elizabeth	1912	50	$ 400	50	$ 400
Foley	1897, 1898, 1933–35	5,568	$ 52,658	5,568	$ 52,658
Gold Winner	1900	15	$ 70	15	$ 70
Golden Crescent (A.D. 2)	1897	192	$ 1,543	192	$ 1,543
Golden Star	1898–1901, 1934, 1938, 1941	19,345	$ 170,616	19,345	$ 170,616
Hammond Reef	1897	977	$ 3,857	977	$ 3,857
Harold Lake	1895, 1896	1,131	$ 11,236	1,131	$ 11,236
Independence (Bennett tp.)	1898	125	$ 1,906	125	$ 1,906
Lucky Coon	1899, 1935, 1936	10	$ 249	10	$ 249
Manitou	1896	12	$ 413	12	$ 413
Olive	1897–1900, 1937, 1941, 1942	7,255	$ 80,636	7,255	$ 80,636
Saundary	1934	13	$ 435	13	$ 435
W. E. Stone	1919, 1920	2	$ 319	2	$ 319
Sunbeam	1904	650	$ 4,875	650	$ 4,875
Upper Seine (Sawbill)	1897–99, 1940, 1941	5,368	$ 21,785	5,368	$ 21,785
White Lilly	1933	65	$ 53	65	$ 53
Miscellaneous[2]	1935	.....	$ 263	.....	$ 263
Total	1895–1952	41,217	$ 356,569	41,217	$ 356,569

[1]For historical data on the various mines, see Vol. LVIII,.1949, pt. 1, p. 18.
[2]Mint sundries, etc.

SOUTHEASTERN ONTARIO, PRODUCTION, 1891–1952

Mine	Year	Quantity, tons	Value	Total quantity, tons	Total value
Atlas Arsenic	1900,1902, 1903	6,114	$ 44,667	6,114	$ 44,667
Bannockburn	1895	.....	$ 58	.....	58
Big Dipper	1907, 1909	52	$ 340	52	$ 340
Boerth	1900	.....	$ 208	.....	$ 208
Cleveland	1908	239	$ 5,475	239	$ 5,475
Cobalt Frontenac	1919, 1922	.....	$ 1,364	.....	$ 1,364
Cook Land	1901, 1902, 1904	1,483	$ 6,989	1,483	$ 6,989
Cordova (Belmont)	1892, 1893 1898–1903 1912–15, 1917 1939, 1940	560 70,185 16,491 33,434	$ 5,450 289,517 45,480 134,101	120,670	$ 474,548
Craig	1905, 1906	1,850	$ 5,760	1,850	$ 5,760
Crescent	1891, 1892	1,700	$ 6,780	1,700	$ 6,780
Deloro (Canadian Goldfields)	1897–1902	39,143	$ 213,973	39,143	$ 213,973
Gatling Pearce	1893	.....	$ 1,918	.....	$ 1,918
Gilmour	1909, 1910	550	$ 3,669	550	$ 3,669
Ledyard	1893, 1894	55	$ 236	55	$ 236
Little Doris	1898	400	$ 2,500	400	$ 2,500
Old Diamond (Mayboro)	1941	300	$ 2,310	300	$ 2,310
Sophia	1900	1,500	$ 850	1,500	$ 850
Sovereign	1900	262	$ 861	262	$ 861
Star of the East	1905, 1907	976	$ 1,941	976	$ 1,941
Miscellaneous[1]	1937	.....	$ 238	.....	$ 238
Total	1891–1952	175,294	$ 774,685	175,294	$ 774,685

GOLD PRODUCTION BY AREAS, ONTARIO'S GOLD-MINING INDUSTRY, 1885–1952

Area	Year	Quantity, tons	Value	Total quantity, tons	Total value
Southeastern Ontario	1891–95, 1897–1910, 1912–15, 1919, 1922, 1939–41	175,294	$ 774,685	175,294	$ 774,685

[1] In 1937, a total of 6.795 fine ounces, worth $238, was shipped to the Ontario Refining Company from Arden in Frontenac county by G. E. Fielding. This shipment could not be credited to any particular property.

GOLD PRODUCTION BY AREAS, ONTARIO'S GOLD-MINING INDUSTRY, 1885–1952—*Continued*

Area	Year	Quantity, tons	Value	Total quantity, tons	Total value
Larder Lake area	1911, 1913, 1914, 1918–21, 1923–45	7,161,061	$ 46,239,660		
	1946	862,078	5,328,834		
	1947	1,109,513	6,593,108		
	1948	1,200,275	7,154,415		
	1949	1,860,742	11,382,022		
	1950	1,903,733	12,981,941		
	1951	1,926,655	13,213,793		
	1952	1,829,045	13,181,818	17,853,102	$ 116,075,591
Kirkland Lake belt	1910, 1911, 1913–45	32,307,598	$489,626,817		
	1946	1,077,790	14,916,970		
	1947	1,092,316	15,430,524		
	1948	1,180,044	15,759,921		
	1949	1,288,886	17,361,328		
	1950	1,320,949	17,115,277		
	1951	1,363,953	17,027,072		
	1952	1,323,134	14,475,117	40,953,770	$ 601,713,026
Porcupine belt	1910–45	98,686,956	$845,980,271		
	1946	3,952,840	33,303,325		
	1947	3,925,751	32,923,648		
	1948	4,356,812	35,135,980		
	1949	4,501,091	38,047,087		
	1950	4,582,185	41,943,114		
	1951	4,397,645	39,373,609		
	1952	4,601,668	40,365,229	129,004,948	$1,107,074,263
Matachewan area	1922, 1932–45	5,470,913	$ 22,483,177		
	1946	431,509	1,564,349		
	1947	503,738	1,838,013		
	1948	506,761	1,725,944		
	1949	563,295	1,805,136		
	1950	564,816	1,910,624		
	1951	566,346	1,560,141		
	1952	451,672	1,383,794	9,059,050	$ 34,271,178
Sudbury district	1897, 1898, 1905–8, 1910, 1911, 1913–16, 1932, 1934–45	795,261	$ 5,891,892		
	1947	25,743	168,456		
	1948	100,072	850,214		
	1949	155,049	1,193,450		
	1950	157,948	1,411,611		
	1951	88,736	874,656		
	1952	169,674	1,407,312	1,492,483	$ 11,797,591
Algoma district	1893, 1894, 1900, 1902–4, 1907, 1908, 1910, 1911, 1923, 1925, 1926, 1929–45	875,454	$ 6,457,727		
	1947	.....	2,700		
	1948	.....	642		
	1952	50	1,371	875,504	$ 6,462,440

GOLD PRODUCTION BY AREAS, ONTARIO'S GOLD-MINING INDUSTRY, 1885–1952—*Continued*

Area	Year	Quantity, tons	Value	Total quantity, tons	Total value
Thunder Bay district	1897, 1905–7, 1911–13, 1917, 1918, 1920, 1921, 1923, 1924, 1929–45	5,333,654	$ 65,542,912		
	1946	384,521	3,905,263		
	1947	439,918	4,110,057		
	1948	409,736	3,936,131		
	1949	466,571	4,266,290		
	1950	627,771	4,984,327		
	1951	634,568	5,059,187		
	1952	560,841	4,246,153	8,857,580	$ 96,050,320
Rainy River district	1895–1901, 1904, 1913, 1919, 1920, 1929, 1933–38, 1940–42	41,217	$ 352,791		
	1948	.....	356		
	1949	.....	1,035		
	1951	.....	1,016		
	1952	.....	1,371	41,217	$ 356,569
Kenora district	1915–18, 1920, 1923, 1926, 1929–45	525,763	$ 4,964,743		
	1947	800	8,227		
	1948	.....	32		
	1949	.....	2,335		
	1951	.....	325	526,563	$ 4,975,662
Patricia portion of Kenora district	1911, 1923, 1924, 1929–45	11,480,689	$100,336,317		
	1946	555,745	6,244,038		
	1947	579,963	5,864,292		
	1948	784,843	8,001,217		
	1949	1,032,683	10,226,231		
	1950	1,131,209	12,825,918		
	1951	1,228,567	12,910,286		
	1952	1,063,371	11,305,369	17,857,070	$ 167,713,668
Miscellaneous	1899–1902, 1923, 1926, 1935–43	955	$ 85,488		
	1948	.....	2,287		
	1949	.....	115	955	$ 87,890
Total	1885, 1886, 1891–1945	162,854,815	$1,588,736,480		
	1946	7,264,483	65,262,779		
	1947	7,677,742	66,939,025		
	1948	8,538,543	72,567,139		
	1949	9,868,317	84,285,029		
	1950	10,288,611	93,172,812		
	1951	10,205,570	90,020,085		
	1952	9,999,455	86,372,277	226,697,536	$2,147,355,626

Dividends

The following tables show the yearly dividends and bonuses paid by gold-mining companies, the yearly dividends and bonuses paid according to areas, and the total dividends and bonuses paid to December 31, 1952.

PORCUPINE BELT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1912–52

Mine	Years	Value	Total
Aunor	1941–50	$ 3,860,000.00	
	1951	440,000.00	
	1952	360,000.00	$ 4,660,000.00
Broulan Reef	1940–45, 1949, 1950	$ 1,622,572.83	
	1951	481,118.35	
	1952	536,502.78	$ 2,640,193.96
Buffalo Ankerite	1933–41, 1943–45	$ 2,763,008.68	$ 2,763,008.68
Coniaurum	1932, 1937–50	$ 3,905,607.25	
	1951	110,669.72	
	1952	55,334.86	$ 4,071,611.83
Delnite	1940–43, 1949, 1950	$ 804,267.09	
	1951	119,150.68	
	1952	119,150.68	$ 1,042,568.45
Dome	1915–17, 1920–50	$ 70,065,880.45	
	1951	1,460,001.00	
	1952	1,362,667.60	$ 72,888,549.45
Hallnor	1939–50	$ 9,120,000.00	
	1951	520,000.00	
	1952	560,000.00	$ 10,200,000.00
Hollinger	1912–50	$127,258,000.00	
	1951	885,600.00	
	1952	1,180,800.00	$129,324,400.00
McIntyre	1917–50	$ 50,623,471.43	
	1951	2,405,970.00	
	1952	2,397,990.00	$ 55,427,431.43
Moneta	1938–47	$ 1,526,316.00	$ 1,526,316.00
Naybob	1941	$ 190,912.36	$ 190,912.36
Pamour	1938–46, 1949, 1950	$ 4,250,000.00	
	1951	200,000.00	
	1952	150,000.00	$ 4,600,000.00
Paymaster	1938–46, 1949	$ 949,198.10	$ 949,198.10
Porcupine Crown	1914–17	$ 840,000.00	840,000.00
Preston East Dome	1940–50	$ 4,965,000.00	
	1951	180,000.00	
	1952	240,000.00	$ 5,385,000.00
Rea	1915	$ 12,000.00	$ 12,000.00
Vipond	1927	$ 67,500.00	$ 67,500.00
Totals	1912–50	$282,823,734.19	
	1951	6,802,509.75	
	1952	6,962,445.92	$296,588,689.86

KIRKLAND LAKE BELT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1915–52

Mine	Years	Value	Total
Kirkland Lake Gold	1934–50	$ 5,318,817.16	
	1951	159,800.97	
	1952	159,800.97	$ 5,638,419.10
Lake Shore	1918–50	$101,460,000.00	
	1951	700,000.00	
	1952	600,000.00	$102,760,000.00
Macassa	1934–47, 1949, 1950	$ 8,013,313.66	
	1951	321,368.16	
	1952	294,587.48	$ 8,629,269.30
Sylvanite	1930–50	$ 10,112,967.00	
	1951	395,940.00	
	1952	263,960.00	$ 10,772,867.50
Teck-Hughes	1926–50	$ 44,536,296.32	
	1951	721,071.60	
	1952	721,071.60	$ 45,978,439.52
Tough-Oakes	1915, 1916	$ 398,625.00	$ 398,625.00
Toburn	1934–46	$ 2,349,500.00	$ 2,349,500.00
Upper Canada	1940–50	$ 2,307,241.83	
	1951	163,744.56	
	1952	163,744.47	$ 2,634,730.86
Wright-Hargreaves	1922–28, 1930–50	$ 48,097,500.00	
	1951	715,000.00	
	1952	660,000.00	$ 49,472,500.00
Totals	1915, 1916, 1918–50	$222,594,261.47	
	1951	3,176,925.29	
	1952	2,863,164.52	$228,634,351.28

LARDER LAKE AREA, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1940–52

Mine	Years	Value	Total
Chesterville	1940–43, 1947–49	$ 876,457.30	$ 876,457.30
Kerr-Addison	1940–50	$ 18,164,355.84	
	1951	3,784,240.80	
	1952	3,784,240.80	$ 25,732,837.44
Totals	1940–50	$ 19,040,813.14	
	1951	3,784,240.80	
	1952	3,784,240.80	$ 26,609,294.74

MATACHEWAN AREA, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1939–52

Mine	Years	Value	Total
Matachewan Consolidated	1940, 1946–49	$ 498,475.04	$ 498,475.04
Young-Davidson	1939–46, 1948–51	$ 427,523.24	$ 427,527.24
Total	1939–44, 1946–51	$ 973,707.44	$ 973,707.44

THUNDER BAY DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1935–52

Mine	Years	Value	Total
Hard Rock	1939–43	$ 926,922.94	$ 926,922.94
Leitch	1937–50	$ 2,852,154.95	
	1951	233,000.40	
	1952	233,000.40	$ 3,318,155.75
Little Long Lac	1936–46	$ 3,976,965.00	
	1951	110,460.00	
	1952	110,460.00	$ 4,197,885.00
MacLeod-Cockshutt	1940–44, 1949, 1950	$ 1,713,394.00	
	1951	286,249.00	
	1952	429,373.50	$ 2,429,016.50
Magnet	1940–43	$ 855,000.00	$ 855,000.00
Northern Empire	1935, 1937–43, 1946, 1948–50	$ 1,720,000.00	
	1951	48,000.00	
	1952	100,000.00	$ 1,868,000.00
Sturgeon River	1940–42	$ 219,980.64	$ 219,980.64
Tombill	1939–42	$ 454,000.00	$ 454,000.00
Totals	1935–50	$ 12,718,417.53	
	1951	677,709.40	
	1952	872,833.90	$ 14,268,960.83

PATRICIA PORTION OF KENORA DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1934–52

Mine	Years	Value	Total
Berens River	1941–42, 1946	$ 520,000.00	$ 520,000.00
Campbell Red Lake	1952	$ 199,975.00	$ 199,975.00
Central Patricia	1936–47, 1949	$ 4,575,000.00	$ 4,575,000.00
Cochenour Willans	1940–44, 1946–50	$ 1,893,959.20	
	1951	355,398.60	
	1952	236,932.40	$ 2,486,290.20
Gold Eagle	1942	$ 237,450.51	$ 237,450.51
Howey	1934–45, 1947–50	$ 2,760,000.00	$ 2,760,000.00
Madsen Red Lake	1940–50	$ 2,483,464.88	
	1951	349,952.80	
	1952	104,985.84	$ 2,938,403.52
McKenzie Red Lake	1936–44, 1949, 1950	$ 2,978,249.89	
	1951	88,200.00	$ 3,066,449.89
McMarmac Red Lake	1943	$ 82,000.20	$ 82,000.00
New Jason	1941	$ 119,960.20	$ 119,960.20
Pickle Crow	1936–50	$ 9,818,425.00	
	1951	313,685.00	
	1952	313,685.00	$ 10,445,795.00
Totals	1934–50	$ 25,468,509.88	
	1951	1,107,236.40	
	1952	980,578.24	$ 27,556,324.52

ALGOMA DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1941–52

Mine	Years	Value	Total
Cline Lake	1941	$ 64,200.20	$ 64,200.20
Total	1941	$ 64,200.20	$ 64,200.20

KENORA DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1940–52

Mine	Years	Value	Total
Wendigo	1940–42, 1944, 1945	$ 686,440.24	$ 686,440.24
Total	1940–42, 1944, 1945	$ 686,440.24	$ 686,440.24

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES BY AREAS, 1912–52

Year	Porcupine	Kirkland Lake and Larder Lake	Northwestern Ontario	Total
1912	$ 270,000.00			$ 270,000.00
1913	1,170,000.00			1,170,000.00
1914	1,410,000.00			1,410,000.00
1915	2,212,000.00	$ 132,875.00		2,344,875.00
1916	4,326,000.00	265,750.00		4,591,750.00
1917	1,699,542.45			1,699,542.45
1918	1,773,042.45	100,000.00		1,873,042.45
1919	2,086,028.30	100,000.00		2,186,028.30
1920	3,176,928.45	80,000.00		3,256,928.45
1921	4,222,990,20	120,000.00		4,342,990.20
1922	4,938,013.56	492,500.00		5,430,513.56
1923	5,186,271.54	366,250.00		5,552,521.54
1924	5,887,722.00	586,250.00		6,473,972.00
1925	7,083,842.06	1,150,000.00		8,233,842.06
1926	8,510,673.23	2,368,464.40		10,879,137.63
1927	8,453,572.73	3,351,071.60		11,804,644.33
1928	7,164,113.29	5,685,286.40		12,849,399.69
1929	4,955,599.54	5,066,286.40		10,021,855.94
1930	5,195,427.51	5,938,276.40		11,133,703.91
1931	5,227,596.87	8,875,123.60		14,102,720.47
1932	6,145,412.60	10,011,761.40		16,157,174.00
1933	7,572,357.79	10,561,761.40		18,134,119.19
1934	11,931,487.01	13,930,381.29	$ 500,000.00	26,361,868.30
1935	9,946,024.58	14,584,641.49	420,500.00	24,951,166.07
1936	11,021,671.80	16,989,799.66	1,652,900.00	29,664,371.46
1937	12,169,515.61	20,259,963.51	2,714,950.00	35,144,429.12
1938	12,769,209.68	16,299,276.70	3,095,650.10	32,164,136.48
1939	14,201,733.86	15,940,988.92	3,661,785.52	33,804,508.30
1940	15,790,180.65	13,923,696.12	5,127,737.80	34,841,614.57
1941	16,502,343.41	14,134,988.75	4,913,538.85	35,550,871.01
1942	12,274,518.21	9,385,700.83	4,279,842.81	25,940,061.85
1943	11,797,596.96	8,296,861.08	2,447,702.39	22,542,160.43
1944	10,234,169.02	6,983,162.18	2,326,896.93	19,544,228.13
1945	9,494,013.19	5,974,189.44	1,226,213.78	16,694,416.41
1946	8,571,576.05	5,756,141.70	1,338,060.84	15,665,778.59
1947	6,858,213.02	4,813,753.15	1,287,447.29	12,959,413.46
1948	6,519,774.95	4,657,360.65	1,138,036.12	12,315,171.72
1949	6,791,356.14	6,639,665.72	1,552,460.32	14,983,482.18
1950	7,283,215.48	7,812,846.82	2,180,029.30	17,276,091.60
1951	6,802,509.75	6,961,166.09	1,832,469.04	15,596,144.88
1952	6,962,445.92	6,647,405.32	1,853,412.14	15,463,263.38
Total	$296,588,689.86	$255,243,646.02	$43,549,633.23	$595,381,969.11

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES TO DECEMBER 31, 1952

Name of company	Date of incorporation	Authorized capital dollars or shares	Dividends and bonuses paid to end of 1951	Dividends and bonuses paid during 1952	Rate per share, 1952	Total dividends and bonuses paid to Dec. 31, 1952	Date when last dividend or bonus was paid
Aunor Gold Mines, Ltd.	May 19, 1939	$2,000,000	$ 4,300,000.00	$ 360,000.00	18c.	$ 4,660,000.00	Dec. 1, 1952
Berens River Mines, Ltd.	July 2, 1936	$2,000,000	520,000.00	.....	.....	520,000.00	Dec. 23, 1946
Broulan Porcupine Mines, Ltd.	Mar. 18, 1936	$3,000,000	1,360,472.53	.....	.....	1,360,472.53	Apr. 2, 1951
Broulan Reef Mines, Ltd.	June 30, 1951	$5,500,000	308,745.60	536,502.78	9c.	845,248.38	Dec. 31, 1952
Buffalo Ankerite Gold Mines, Ltd.	Oct. 5, 1932	$1,000,000	2,763,008.68	.....	.....	2,763,008.68	Jan. 11, 1945
Campbell Red Lake Mines, Ltd.	July 18, 1944	$4,000,000	.....	199,975.00	5c.	199,975.00	Dec. 31, 1952
Central Patricia Gold Mines, Ltd.	Apr. 20, 1931	$2,500,000	4,575,000.00	125,000.00	5c.	4,700,000.00	June 30, 1952
Chesterville Larder Lake Gold Mining Co., Ltd.	Mar. 20, 1907	$2,000,000	876,457.30	.....	.....	876,457.30	May 16, 1949
Cline Lake Gold Mines, Ltd.	Aug. 5, 1936	$2,000,000	64,200.20	.....	.....	64,200.20	Feb. 28, 1941
Cochenour Willans Gold Mines, Ltd.	Apr. 19, 1936	$3,000,000	2,249,357.80	236,932.40	8c.	2,486,290.20	Dec. 30, 1952
Coniaurum Mines, Ltd.	July 4, 1929	3,000,000	4,016,276.97	55,334.86	2c.	4,071,611.83	May 19, 1952
Consolidated Howey Gold Mines, Ltd.	Mar. 12, 1926	$2,000,000	2,760,000.00	.....	.....	2,760,000.00	Dec. 31, 1949
Delnite Mines, Ltd.	Oct. 23, 1934	$3,000,000	923,417.77	119,150.68	4c.	1,042,568.45	Oct. 1, 1952
Dome Mines, Ltd.	July 7, 1923	$2,000,000	71,525,881.45	1,362,667.60	70c.	72,888,549.05	Oct. 30, 1952
Gold Eagle Gold Mines, Ltd.	Feb. 13, 1934	$3,000,000	237,450.51	.....	.....	237,450.51	Oct. 21, 1942
Hallnor Mines, Ltd.	Apr. 6, 1936	$2,000,000	9,640,000.00	560,000.00	28c.	10,200,000.00	Dec. 1, 1952
Hard Rock Gold Mines, Ltd.	Jan. 6, 1934	$3,000,000	926,922.94	.....	.....	926,922.94	June 21, 1943
Hollinger Consolidated Gold Mines, Ltd.[1]	May 25, 1916	$25,000,000	128,143,600.00	1,180,800,00	24c.	129,324,400.00	Dec. 29, 1952
Kerr-Addison Gold Mines, Ltd.	Apr. 9, 1936	$5,000,000	21,948,596.64	3,784,240.80	80c.	25,732,837.44	Dec. 30, 1952
Kirkland Lake Gold Mining Co. Ltd.	Nov. 19, 1915	$5,000,000	5,478,618.13	159,800.97	3c.	5,638,419.10	Nov. 1, 1952
Lake Shore Mines, Ltd.	Feb. 25, 1914	$2,000,000	102,160,000.00	600,000.00	30c.	102,760,000.00	Aug. 1, 1952
Leitch Gold Mines, Ltd.	July 23, 1935	$3,000,000	3,085,155.35	233,000.00	8c.	3,318,155.75	Nov. 14, 1952
Little Long Lac Gold Mines, Ltd.	Jan. 26, 1933	2,000,000	4,087,425.00	110,460.00	6c.	4,197,885.00	Apr. 15, 1952
Macassa Mines, Ltd.	Apr. 12, 1926	$3,000,000	8,334,681.82	294,587.48	11c.	8,629,269.30	Dec. 15, 1952
McIntyre Porcupine Mines, Ltd.[2]	Mar. 16, 1911	$4,000,000	53,029,441.43	2,397,990.00	$3.00½	55,427,431.43	Dec. 1, 1952
McKenzie Red Lake Gold Mines, Ltd.	Feb. 1, 1933	$3,000,000	3,066,449.89	.....	.....	3,066,449.89	Dec. 7, 1951
MacLeod-Cockshutt Gold Mines, Ltd.	Sept. 22, 1933	$3,000,000	1,999,643.00	429,373.50	15c.	2,429,016.50	Dec. 19, 1952

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES TO DECEMBER 31, 1952—*Continued*

Name of company	Date of incorporation	Authorized capital dollars or shares	Dividends and bonuses paid to end of 1951	Dividends and bonuses paid during 1952	Rate per share, 1952	Total dividends and bonuses paid to Dec. 31, 1952	Date when last dividend or bonus was paid
McMarmac Red Lake Gold Mines, Ltd.	July 21, 1939	$3,000,000	$ 82,000.20	.....	.....	$ 82,000.20	May 10, 1943
Madsen Red Lake Gold Mines, Ltd.	Mar. 8, 1935	$3,000,000	2,833,417.68	$ 104,985.84	3c.	2,938,403.52	Dec. 22, 1952
Magnet Consolidated Mines, Ltd.	Apr. 23, 1936	$3,000,000	855,000.00	.....	.....	855,000.00	Dec. 10, 1943
Matachewan Consolidated Mines, Ltd.	July 10, 1933	4,000,000	498,475.04	.....	.....	498,475.04	June 14, 1949
Moneta Porcupine Mines, Ltd.	Oct. 14, 1910	$3,000,000	1,526,316.00	.....	.....	1,526,316.00	Dec. 15, 1947
Naybob Gold Mines, Ltd.	Jan. 3, 1934	$5,000,000	190,912.36	.....	.....	190,912.36	Oct. 15, 1941
New Jason Mines, Ltd.	Nov. 9, 1938	$3,000,000	119,960.20	.....	.....	119,960.20	Dec. 30, 1941
Northern Empire Mines, Co., Ltd.	July 28, 1932	$500,000	1,768,000.00	100,000.00	25c.	1,868,000.00	Dec. 19, 1952
Pamour Porcupine Mines, Ltd.	Mar. 7, 1934	5,000,000	4,450,000.00	150,000.00	3c.	4,600,000.00	Dec. 15, 1952
Paymaster Consolidated Mines, Ltd.	Feb. 15, 1930	$9,000,000	949,198.10	.....	.....	949,198.10	Nov. 15, 1949
Pickle Crow Gold Mines, Ltd.	Jan. 8, 1934	$3,500,000	10,132,110.00	313,685.00	10c.	10,445,795.00	June 30, 1952
Porcupine Crown Mines, Ltd.	May 25, 1913	$2,000,000	840,000.00	.....	.....	840,000.00	July 15, 1917
Porcupine Reef Gold Mines, Ltd.	Oct. 4, 1935	$4,000,000	434,473.05	.....	.....	434,473.05	Apr. 2, 1951
Preston East Dome Mines, Ltd.	Jan. 7, 1911	$3,000,000	5,145,000.00	240,000.00	8c.	5,385,000.00	July 15, 1952
Rea Consolidated Gold Mines, Ltd.	Apr. 5, 1911	$1,000,000	12,000.00	.....	.....	12,000.00	1915
Sturgeon River Gold Mines, Ltd.	Aug. 22, 1934	$3,000,000	219,980.64	.....	.....	219,980.64	Apr. 30, 1942
Sylvanite Gold Mines, Ltd.	June 13, 1913	$3,300,000	10,508,907.50	263,960.00	8c.	10,772,867.50	July 2, 1952
Teck-Hughes Gold Mines, Ltd., The	Mar. 2, 1923	$5,000,000	45,257,367.92	721,071.60	15c.	45,978,439.52	Oct. 1, 1952
Toburn Gold Mines, Ltd.	Jan. 24, 1931	$2,000,000	2,349,500.00	.....	.....	2,349,500.00	Nov. 22, 1946
Tombill Gold Mines, Ltd.	Oct. 7, 1935	$2,000,000	454,000.00	.....	.....	454,000.00	Dec. 23, 1942
Tough-Oakes Gold Mines, Ltd.	July 15, 1913	$3,000,000	398,625.00	.....	.....	398,625.00	Dec. 27, 1916
Upper Canada Mines, Ltd.	Apr. 4, 1929	$3,500,000	2,470,986.39	163,744.47	5c.	2,634,730.86	Nov. 28, 1952
Vipond Consolidated Mines, Ltd.	July 17, 1922	$2,500,000	67,500.00	.....	.....	67,500.00	Apr. 15, 1927
Wendigo Gold Mines, Ltd.	Oct. 5, 1933	$2,000,000	686,440.24	.....	.....	686,440.24	May 1, 1945
Wright-Hargreaves Mines, Ltd.	June 16, 1916	5,500,000	48,812,500.00	660,000.00	12c.	49,472,500.00	Oct. 1, 1952
Young-Davidson Mines, Ltd.	Apr. 8, 1926	$3,000,000	475,232.40	.....	.....	475,232.40	Feb. 15, 1951
Total	.....	.....	$579,918,705.73	$15,463,263.38	.....	$595,381,969.11	.....

[1]The dividends of Acme Gold Mines, Limited, have been consolidated with those of Hollinger Consolidated Gold Mines, Limited.
[2]Dividends are expressed in Canadian funds.

Gold-Milling Plants

The rated daily capacity of gold-milling plants in Ontario was estimated at 32,910 tons in 1952. The daily operating average reported to the Statistics Branch of the Department totalled 28,142 tons, and the capacity of idle plants was 1,150 tons.

TONNAGE OF GOLD-MILLING PLANTS IN ONTARIO, 1952

Area and mine	Rated daily capacity	Daily operating average	Idle plants
	tons	tons	tons
LARDER LAKE AREA:			
Chesterville	900	530	.....
Kerr-Addison	4,000	4,507	.....
KIRKLAND LAKE BELT:			
Kirkland Lake Gold	400	329	.....
Lake Shore	1,500	720	.....
Macassa	400	381	.....
Sylvanite	600	469	.....
Teck-Hughes	600	598	.....
Toburn	175	113	.....
Upper Canada	500	484	.....
Wright-Hargreaves	1,200	518	.....
PORCUPINE BELT:			
Aunor	300	490	.....
Broulan Reef	650	377	.....
Buffalo Ankerite (2 mills)	1,200	322	.....
Coniaurum	500	353	.....
Delnite	520	434	.....
Dome	1,850	1,904	.....
Hallnor	400	366	.....
Hollinger	3,900	3,574	.....
McIntyre Porcupine	2,400	2,197	.....
Pamour	1,600	1,675	.....
Paymaster Consolidated	600	476	.....
Preston East Dome	800	656	.....
Ross (Hollinger)	300	307	.....
MATACHEWAN AND WEST SHININGTREE AREAS:			
Matachewan Consolidated	1,000	458	.....
Young-Davidson	1,050	825	.....
SUDBURY DISTRICT:			
Renabie	450	463	.....
THUNDER BAY DISTRICT:			
Hard Rock	.....	.....	600
Leitch	120	99	.....
Little Long Lac	300	272	.....
MacLeod-Cockshutt	1,200	1,128	.....
Magnet	.....	.....	150
Theresa	100	107	.....
PATRICIA PORTION:			
Campbell Red Lake	400	489	.....
Central Patricia	.....	.....	400
Cochenour Willans	225	184	.....
Hasaga	400	215	.....
McKenzie Red Lake	240	227	.....
Madsen Red Lake	800	831	.....
New Dickenson	280	280	.....
New Jason	150	64	.....
Pickle Crow	400	295	.....
Starratt Olsen	500	425	.....
Total	32,910	28,142	1,150

Labour Statistics

The following figures summarize labour statistics for the gold-mining industry, as reported to the Ontario Department of Mines:

AVERAGE YEARLY WAGE, GOLD-MINING INDUSTRY, 1951 AND 1952

Area or district	1951			1952		
	Number of wage-earners	Wages paid	Average wages per annum	Number of wage-earners	Wages paid	Average wages per annum
Porcupine belt	6,409	$18,906,509	$2,950	6,430	$20,327,115	$3,161
Kirkland Lake area	2,557	7,498,070	2,932	2,384	7,401,749	3,105
Larder Lake area	917	2,827,636	3,084	872	2,847,528	3,266
Matachewan area	235	670,060	2,851	248	835,814	3,370
Sudbury district	128	339,499	2,652	142	407,086	2,867
Algoma district	.....	.....	.....	.....	.....	.....
Thunder Bay district	721	2,177,517	3,020	543	1,716,022	3,160
Patricia portion	1,448	4,401,233	3,040	1,302	4,073,350	3,129
Kenora and Rainy River districts	.....	.....	.....	.....	.....	.....
Southeastern Ontario	.....	.....	.....	.....	.....	.....
Operating but non-producing	139	318,121	2,289	71	234,788	3,307
Total	12,554	$37,138,645	$2,958	11,992	$37,843,452	$3,156

World Output

The figures for the output by the leading gold-producing countries from 1948 to 1952, inclusive, in the following table are from the Year Book of the American Bureau of Metal Statistics, 1952.

OUTPUT BY THE LEADING GOLD-PRODUCING COUNTRIES, 1948–52

Country	[1]1948	[1]1949	[1]1950	[1]1951	1952
NORTH AMERICA:	fine ounces	fine ounces	fine ounces	fine ounces	fine ounces
Canada	3,529,608	4,123,518	4,441,227	4,392,751	4,471,939
Newfoundland	12,252				
Mexico	339,183	405,540	408,112	393,420	459,391
United States	2,099,178	1,996,435	2,375,130	1,996,493	1,937,818
Total North America	5,980,221	6,525,493	7,224,469	6,782,664	6,869,148
CENTRAL AMERICA AND WEST INDIES	270,000	242,000	108,000	150,000	125,000
SOUTH AMERICA:					
Brazil[2]	130,243	119,179	131,700	141,397	141,600
Chile	164,126	179,140	185,538	173,674	177,050
Colombia	335,260	359,475	379,412	430,723	422,240
Ecuador	70,196	80,982	83,071	.....	.....
Peru	111,160	113,753	147,968	158,270	140,081
Guiana—British	16,518	21,098	13,740	14,689	24,223
—Dutch	4,177	3,794	4,546	6,494	.....
—French	13,625	14,757	12,249	12,056	7,234
Venezuela	49,730	61,377	34,462	2,861	4,797
Other South America	*14,700	*21,500	*14,000	*16,300	.....
Total South America	909,735	975,055	1,006,686	956,464	.....

[1]The compilations contain some preliminary data, and conjectural figures (*) have been inserted where necessary.

[2]Beginning in 1945, mined gold only; production of alluvial gold unknown.

OUTPUT BY THE LEADING GOLD-PRODUCING COUNTRIES, 1948–52—*Continued*

Country	1948	1949	1950	1951	1952
EUROPE	300,000	400,000	400,000	400,000	.....
AUSTRALIA:					
New South Wales	52,164	51,793	51,350	48,910	39,191
Queensland	69,646	76,282	88,249	78,580	85,591
Victoria	68,579	68,426	67,826	66,063	68,121
Western Australia	664,986	648,426	610,333	648,245	724,690
Tasmania	12,906	12,152	15,578	14,446	16,072
Other Australia	17,226	13,979	36,201	39,307	45,723
Total Australia (Commonwealth)	885,507	889,058	869,537	895,551	979,388
New Guinea	86,556	93,045	80,099	94,082	127,431
New Zealand	93,903	84,874	76,527	75,115	59,373
Fiji	98,000	104,036	103,412	94,000	.....
ASIA:					
China	88,200	60,000	108,000	100,000	.....
India	180,852	164,151	196,848	226,233	252,902
Japan	69,060	84,492	132,332	189,000	.....
Korea[1]	3,466	3,418	5,144	1,000	.....
Philippines Republic	209,225	287,844	333,991	393,602	464,142
Saudi Arabia	73,972	66,835	66,202	73,104	.....
Other Asia	*235,700	*123,200	*104,800	*128,700	.....
Total Asia	860,475	789,940	947,317	1,111,639	.....
AFRICA:					
Bechuanaland	1,507	256	261	.....	.....
Belgian Congo	299,767	333,847	339,408	352,302	368,749
British West Africa[2]	677,480	681,721	695,457	697,434	715,036
Ethiopia	41,595	45,102	43,200	33,000	.....
French Cameroons	10,719	8,931	7,169	5,420	2,604
French Equatorial Africa	63,715	57,259	54,996	52,848	51,536
Kenya	23,429	20,072	24,402	19,765	14,800
Liberia	13,797	14,656	11,025	9,822	.....
Madagascar	2,095	2,508	1,935	1,961	2,604
Rhodesia	514,440	528,180	511,163	486,907	496,731
Tanganyika	57,557	68,989	65,127	65,583	64,693
Transvaal, Cape Colony, and Natal	11,584,849	11,708,013	11,663,713	11,516,450	11,815,512
Uganda	921	871	586	223	201
Other Africa	21,900	23,800	19,800	.....	.....
Total Africa	13,313,771	13,494,205	13,438,242	.....	.....
RUSSIA[3]	7,000,000	7,000,000	8,000,000	9,500,000	.....
TOTAL WORLD	29,798,168	30,597,706	32,326,298	.....	.....

Maximum Canadian production ..... 5,345,179 ounces in 1941
Maximum Russian production ..... 9,500,000 ounces in 1951
Maximum United States production ..... 5,980,746 ounces in 1941
Maximum Transvaal, Cape Colony, and Natal production ..... 14,386,361 ounces in 1941
Maximum world production ..... 40,925,330 ounces in 1940

[1]South Korea only.
[2]Comprising Gold Coast, Sierra Leone, and Nigeria.
[3]As reported by Director of the Mint.

Gold Marketing

On September 8, 1951, the International Monetary Fund relaxed its regulations and now allow any gold producer to sell 100 percent of his production in the world's public markets for industrial or ornamental gold. On October 6 the Canadian Minister of Finance announced that gold producers would be granted access to premium gold markets, but that those producers selling their gold to premium markets would not be eligible for assistance under the Emergency Gold Mining Assistance Act. The mines receiving assistance under the act would be required to elect in advance whether to continue to receive assistance under the Emergency Gold Mining Assistance Act, or to have access to premium markets for the balance of the year.

Nickel-Copper and Platinum Metals

The nickel-copper industry in the Sudbury district reported shipping 14,380,684 tons of ore, which contained 281,040,842 pounds of nickel worth $151,626,438, and 250,230,034 pounds of copper worth $70,843,158. This all came from the two large operators, International Nickel Company of Canada, Limited, and Falconbridge Nickel Mines, Limited, and two mines under development, East Rim Nickel Mines, Limited, and Milnet Mines, Limited, which shipped development ore to Falconbridge. The total value of nickel from all sources, amounted to $151,666,687, and was made up of material from the nickel-copper industry and from silver-cobalt ores and concentrates shipped from the Cobalt district to the Deloro smelter. Besides the copper content from the Sudbury nickel-copper mines, New Ryan Lake Mines, Limited, in the Matachewan district, some silver-cobalt operators, and Wright-Hargreaves Mines, Limited, shipped concentrates containing copper to the smelter of Noranda Mines, Limited, at Noranda, Quebec. This brought the total production of copper to 250,715,175 pounds, valued at $70,981,618. Both International Nickel and Falconbridge now extract cobalt from their ores, the former in the form of cobalt-oxide, and the latter as metal; this year it amounted to 1,192,711 pounds, worth $2,589,819. Selenium and tellurium are by-products obtained; the value of selenium was $265,128, and that of tellurium $9,707.

General Statistics

The nickel-copper mining industry gave employment in its mines, mills, smelters, and refineries to 1,987 salaried officials, who received a total of $10,154,754, and 17,607 wage-earners, who received $64,507,609, or an average annual wage of $3,664. Fuel and electricity costs were $17,901,690, and process supplies $21,259,605. There were four active but non-producing mines, which paid out $83,802 to 18 salaried employees, $398,300 to 127 wage-earners, $42,247 for fuel and electricity, and $85,753 for process supplies.

Production of Precious Metals

The precious metals recovered in the refining of the nickel-copper ores are gold, silver, and the metals of the platinum group. The gold obtained was valued at $1,497,223, the silver at $1,028,539, and the platinum metals at $18,475,723. This last was a drop from $22,490,536, the value of platinum metals reported in 1951. Altogether, the precious metals made up a total value of $21,001,485. The average price of platinum and palladium dropped slightly during the year, ruthenium gained, and rhodium and iridium remained the same.

PRECIOUS METALS RECOVERED, 1948–52

	1948	1949	1950	1951	1952
	ounces	ounces	ounces	ounces	ounces
Platinum metals:					
Platinum	121,162	153,691	124,453	153,461	122,315
Palladium	116,541	135,594	109,560	126,708	119,568
Rhodium, ruthenium, and iridium	31,802	46,631	39,170	38,197	37,839
Total ounces	269,505	335,916	273,183	318,366	279,722
Value	$16,896,808	$19,885,049	$17,822,766	$22,490,536	$18,475,723
Gold ounces	39,752	35,748	36,264	40,394	43,689
Silver ounces	1,404,338	1,202,989	1,045,106	1,128,205	1,231,047

Dividends

The International Nickel Company of Canada, Limited, and Falconbridge Nickel Mines, Limited, the two producing companies, paid dividends amounting to $41,608,768 in 1952. This brings the grand total of dividends paid by these companies to the end of 1952 to $710,981,571, or 50.41 percent of all dividends paid by the metal-producing mines in Ontario since the beginning of operations.

DIVIDENDS PAID BY NICKEL COMPANIES TO END OF 1952

Company	Period	To end of 1951	1952
Canadian Copper Company	1894–1901	$ 1,975,000.00	.....
International Nickel Company[1] preferred	1906–28	12,299,273.00	.....
International Nickel Company[1] common	1909–28	65,811,694.00	.....
International Nickel Company of Canada, Limited[2] preferred	1929–51	44,258,989.05	$ 1,933,898.75
International Nickel Company of Canada, Limited[2] common	1929–51	502,502,155.36	37,903,239.40
Falconbridge Nickel Mines, Limited	1933–51	16,234,565.47	1,771,629.75
Total	.....	$643,081,676.88	$41,608,767.90
Mond Nickel Company[3] deferred	1906–14	£ 264,043	.....
Mond Nickel Company[3] preferred	1904–29	2,556,359	.....
Mond Nickel Company[3] ordinary	1905–29	2,581,984	.....
Total	.....	£ 5,402,386 or $ 26,291,126	.....
GRAND TOTAL	.....	$669,372,802.88	$41,608,767.90

[1]Successors to the Canadian Copper Company. The International Nickel Company paid dividends on the common stock from 1909 to 1919, inclusive, and again from 1925 to 1928, inclusive. Common stock outstanding was $41,834,600, and preferred stock $8,912,600, or a total of $50,747,200 at the beginning of 1928. On December 19, 1928, the authorized capital stock of $62,000,000 of the New Jersey company was reduced by changing the par value of the shares from $25 to $1 each, and at the same time the name of the company was changed to Nickel Holdings Corporation. On December 31, 1928, the authorized capital was further reduced to $993,425 fully issued or subscribed-for stock consisting of $843,700 preferred stock and $149,725 common stock, par value in each case.

[2]Dividends paid by the International Nickel Company of Canada, Limited, on the common stock in 1929 were 90 cents per share, and $1.00 per share in 1930. Common stock was increased to 15,000,000 shares of no par value on July 25, 1930; as a result, shares issued were increased from 13,758,208 to 14,584,025. Seven percent preferred stock (cumulative) now stands at $27,679,900. Dividends on common stock aggregated $2.00 a share in 1950.

[3]Upon completion of the exchange of stock under the amalgamation of the Mond and International companies, effective December 31, 1928, stock issued or issuable was as follows: $27,627,825 of 7 percent cumulative preferred, and 13,758,208 common shares without par value. Dividends paid on February 16, 1929, by the Mond company cover the 8-month period ending December 31, 1928. Dividends are paid in United States funds.

STATISTICAL SYNOPSIS OF THE NICKEL-COPPER INDUSTRY IN ONTARIO, 1950–52

Year	Number of producing companies	Number of plants in Ontario	Dividends paid	Salaried employees		Wage-earners		Selling value of products	
				Number	Salaries	Number	Wages	Kind	Value
1950	2	6 mines	$32,452,782	572	$ 2,701,022	7,020	$22,164,557	Nickel in matte	$ 35,882,219
		3 smelters		767	3,161,001	4,685	13,987,368	Metallic nickel	63,499,505
		2 refineries		266	1,100,673	1,917	5,611,738	Nickel oxide and salts	12,892,567
								Copper in matte	3,441,885
								Converter copper	50,962,934
								Gold (standard)	749,643
								Exchange	630,202
								Silver	844,654
								Platinum metals	17,822,766
								Selenium and tellurium	165,595
								Cobalt oxide	661,853
Total			$32,452,782	1,605	$ 6,962,696	13,622	$41,763,663		$187,553,823
1951	2	7 mines[1]	$41,542,262	719	$ 3,603,544	8,978	$30,885,294	Nickel in matte	$ 53,332,994
		3 smelters		879	3,704,135	5,351	17,497,706	Metallic nickel	87,024,046
		2 refineries		287	1,292,753	2,297	7,073,715	Nickel oxide and salts	10,832,942
								Copper in matte	4,100,743
								Converter copper	66,667,608
								Gold (standard)	835,018
								Exchange	653,501
								Silver	1,066,718
								Platinum metals	22,490,536
								Selenium and tellurium	278,599
								Cobalt oxide	1,360,190
Total			$41,542,262	1,885	$ 8,600,432	16,626	$55,456,715		$248,642,895
1952	4	12 mines[2]	$41,608,768	791	$ 4,316,829	9,748	$36,310,121	Nickel in matte	$ 54,357,284
		3 smelters		896	4,408,772	5,667	20,403,537	Metallic nickel	84,269,593
		2 refineries		306	1,498,964	2,289	8,089,975	Nickel oxide and salts	12,999,561
								Copper in matte	4,802,161
								Converter copper	66,040,997
								Gold	1,497,223
								Silver	1,028,539
								Platinum metals	18,475,723
								Sellenium and tellurium	274,835
								Cobalt oxide	2,589,819
Total			$41,608,768	1,993	$10,224,565	17,704	$64,803,633		$246,335,735

[1]Includes the Crean Hill mine of International Nickel Company of Canada, Limited, which was active but non-producing.
[2]Includes the Crean Hill mine of International Nickel Company of Canada, Limited, the Hardy mine of Falconbridge Mines, Limited, and Coldstream Copper Mines, Limited, which were active but non-producing.

Operations at the Mines

International Nickel Company of Canada, Limited.—This company is the world's largest producer of nickel, and at present is pushing towards completion its huge $150,000,000 program of underground mining expansion, which it hopes to have completed next year. This should give the company an annual capacity of 13,000,000 tons of ore, entirely from underground operations. The ore is obtained from the following mines: Frood-Stobie, Creighton, Levack, Garson, and Murray. Development work is continuing at the Crean Hill mine.

Falconbridge Nickel Mines, Limited.—Ore was mined from both the Falconbridge and McKim mines, and pilot raises for the extension of the No. 5 shaft of the Falconbridge mine were slashed from the previous shaft bottom of 3,204 to a depth of 3,786 feet below surface. At the Hardy mine, the No. 1 shaft was completed to a depth of 1,427 feet, and development work was being done on several different levels. The Falconbridge concentrator and smelter were in continuous operation all year.

East Rim Nickel Mines, Limited.—The No. 2 shaft was completed, at a depth of 728 feet below surface, and development work continued on the 250- and 400-foot levels. A crushing plant was installed, and development ore was shipped to Falconbridge in the latter part of the year.

Milnet Mines, Limited.—Shaft-sinking was begun on this property in July and completed to a depth of 478 feet by October. Development work was done on the 190- and 300-foot levels, and the ore from these was sent to Falconbridge for treatment.

NICKEL-COPPER MINING AND SMELTING, 1948–52

	1948	1949	1950	1951	1952
	tons	tons	tons	tons	tons
Ore shipped	11,688,146	10,923,823	10,777,859	12,885,455	14,380,684
Ore treated	11,674,955	10,919,950	10,786,506	12,870,547	14,348,126
Copper in blister produced in Ontario	113,820	104,000	108,802	120,339	115,699
Nickel produced in Ontario[1]	90,952	80,101	82,816	88,045	88,848
Matte exported[2]	60,870	72,392	60,229	71,973	78,324
Nickel content of matte exported	40,654	48,509	40,775	48,259	51,475
Copper content of matte exported	6,267	8,363	8,395	8,301	9,416

Silver-Cobalt

The Cobalt and Gowganda areas were very active during the year and shipped 6,527 tons of ore and concentrates, containing 4,845,081 ounces of silver, 229,152 pounds of cobalt, 76,230 pounds of nickel, and 15,872 pounds of copper. Shipments were made to the Deloro Smelting and Refining Company, Limited, at Deloro, Ontario, the smelter of Noranda Mines, Limited, at Noranda, Quebec, and to the American Metal Company at Carteret, New Jersey, U. S. A.

Cobalt production from all sources amounted to 1,421,923 pounds, valued at $3,226,903. This was made up of material from silver-cobalt mines, and cobalt obtained as a by-product from nickel-copper ores. The International Nickel Company of Canada, Limited, extracted cobalt from their ores in the form of cobalt oxide, and Falconbridge Nickel Company, Limited, in the form of metal. International Nickel produced 852,771 pounds, and Falconbridge 340,000 pounds.

[1] Previously published figures did not include nickel oxide sinter produced at Copper Cliff.

[2] Prior to 1918, when refining in Canada began at Port Colborne, Ont., all matte was exported. The British America Nickel Corporation commenced refining operations at Deschenes, Que., in 1920, and finally closed down in July, 1924. Every year since, and including 1934, relatively small quantities of revert material were brought back to Canada for treatment. These have been deducted.

SHIPMENTS FROM SILVER MINES, SMELTERS, AND REFINERIES, 1904–52

Year	Bismuth		Copper[1]		Lead[1]		Nickel[2]		Cobalt[3]		Arsenic		Silver		Total
	tons		tons		tons		tons		tons		tons		ounces		
1904–1925[4]	[5]25	$ 82,796	669	$231,383	141	$17,623	5,180	$ 927,695	[6]12,182	$16,398,380	55,173	$4,560,796	363,774,234	$226,296,692	$248,515,365
1926	3	6,440	35	5,394	11	1,463	83	30,051	332	1,136,014	2,025	135,549	8,981,557	5,541,009	6,855,920
1927	1	1,003	20	2,940	3	312	100	52,829	440	1,764,534	2,481	197,668	8,883,829	4,970,194	6,989,480
1928	7	5,067	38	15,764	27	2,169	111	57,039	477	1,671,900	2,049	178,149	6,688,454	3,882,570	5,812,658
1929	13	23,413	13	3,098	3	267	115	63,167	464	1,801,915	1,871	154,887	7,970,540	4,239,980	6,286,727
1930	6	6,366	23	5,070	22	1,748	53	27,455	347	1,143,631	1,375	109,928	9,109,885	3,460,247	4,754,445
1931	4	3,532	29	5,438	40	2,529	47	31,650	261	651,179	1,788	135,170	5,415,655	1,546,888	2,376,386
1932	8	7,289	18	2,152	43	1,756	33	17,772	245	587,957	1,212	98,914	5,106,888	1,592,893	2,308,733
1933	4	3,731	19	2,802	20	692	71	41,730	200	576,465	734	56,534	3,939,990	1,387,749	2,069,703
1934	4	3,444	12	.....	10	525	85	47,393	297	592,497	824	56,412	3,268,740	1,531,719	2,231,990
1935	3	6,796	18	2,804	11	706	118	65,784	341	512,705	1,279	75,326	3,625,143	2,326,447	2,990,568
1936	2	3,516	14	3,445	9	450	152	70,600	444	805,580	683	42,491	2,244,435	990,476	1,916,648
1937	3	5,654	23	6,057	15	1,525	82	55,348	253	848,145	695	41,032	1,823,452	806,343	1,764,104
1938	5	9,754	15	2,910	11	748	70	38,768	229	790,913	1,088	56,538	4,316,558	1,865,798	2,765,429
1939	.....	.....	22	4,517	4	16	113	59,362	366	1,213,454	871	52,257	1,496,861	599,405	1,929,011
1940	9	24,620	5	1,093	.....	.....	173	95,069	397	1,235,220	1,047	62,798	1,282,873	491,571	1,910,371
1941	4	10,379	.....	.....	.....	.....	141	84,964	132	255,904	1,444	14,792	573,111	220,369	686,408
1942	1	3,219	.....	.....	.....	.....	12	1,513	42	88,448	702	152,331	854,735	390,554	636,065
1943	.....	.....	7	1,759	.....	.....	24	8,828	88	191,407	204	32,924	143,151	66,257	301,175
1944	.....	.....	.....	64	.....	.....	5	1,726	18	34,106	179	26,922	688,255	295,949	358,767
1945	.....	.....	2	637	.....	.....	28	10,105	55	90,026	112	12,352	481,420	211,427	324,547
1946	.....	.....	6	1,321	.....	.....	16	5,641	38	64,471	163	16,684	290,667	252,836	340,953
1947	.....	.....	6	2,147	.....	.....	17	8,230	221	779,010	.....	.....	481,950	358,561	1,147,948
1948	3	10,724	49	18,925	3	1,099	139	87,936	606	2,189,391	384	55,663	1,009,003	756,092	3,119,830
1949	.....	.....	.....	.....	.....	.....	80	54,589	97	346,208	88	8,797	955,445	709,418	1,119,012
1950	.....	.....	7	3,471	.....	.....	19	17,911	71	302,150	124	16,220	2,945,256	2,380,356	2,720,108
1951	8	34,048	8	4,826	.....	.....	25	27,880	132	639,422	858	94,406	2,959,988	2,798,669	3,599,251
1952	.....	.....	28	15,872	.....	.....	38	40,249	115	637,084	794	71,477	4,845,081	4,046,611	4,811,293
Total	113	$251,791	1,086	$343,889	373	$33,718	7,130	$2,031,284	18,935	$37,348,116	80,247	$6,617,017	454,157,156	$274,017,080	$320,642,895

[1]Copper and lead are recovered from certain silver ores and concentrates shipped to United States refineries.
[2]Nickel metal and metallic contents of all nickel compounds.
[3]Cobalt metal and metallic contents of all cobalt compounds and cobalt contained in ores and speiss residues exported. In 1932, it includes 22,258 pounds worth $10,024 from northwestern Ontario.
[4]Prior to 1914 an estimate based on assays was made of the nickel, cobalt, and arsenic in the ores. Since that date recoveries have been reported.
[5]Recoveries of bismuth from base bullion were not reported prior to 1923.
[6]Includes 460 tons of speiss residues, worth $153,116, shipped in 1922.

Silver from all sources made up a grand total of 6,491,124 ounces, worth $5,416,647. This was obtained as follows: silver-cobalt ores, 4,845,081 ounces; gold mines, 408,731 ounces; nickel-copper ores of the Sudbury district, 1,231,047 ounces; and New Ryan Lake Mines, Limited, a copper-gold-silver producer, and Matarrow Lead Mines, Limited, a silver-lead-zinc producer, both in the Matachewan district, 6,265 ounces.

Deloro Smelting and Refining Company, Limited; the mill of Hellens Mining and Reduction Company, Limited; the mill of United Cobalt Mines, Limited; and the producing mines reported 131 salaried employees, who were paid $465,291, and 986 wage-earners, who were paid $2,871,108. Fuel and electricity costs were $492,347, and process supplies $1,020,899.

Cobalt Lode Silver Mines, Limited, operated their mine, the former Adanac mine, and the mill all year. Cross Lake Lease worked the old O'Brien mine for two months at the beginning of the year, until their lease expired, and shipped ore to Deloro. Harrison Hibbert Mines, Limited, worked the Harrison Hibbert and the Ruby claims all year, shipping the material to United Cobalt Mines, Limited, for milling; they in turn shipped the concentrates to Deloro and the United States. Hellens Mining and Reduction Company, Limited, treated tailings from Cobalt Lake in their mill, which was active all year, and then shipped the concentrates to Deloro. Mensilvo Mines, Limited, operated their mine and mill for about nine months. An extension was being built to the mill during the year, and it was expected to be ready for full operation in 1953. Penn-Cobalt Silver Mines, Limited, worked their properties, which consist of the Foster, Crown Reserve, and Kerr Lake mines, all year; production came from the Foster and Kerr Lake mines. Their shipments were sent to Deloro. Silanco Mining and Refining Company, Limited, worked the Agaunico-Ruethel and Colonial-Violet mines and also operated the Colonial mill continuously during the year and shipped the concentrates to Deloro and Noranda. Silver Miller Mines, Limited, owns both the Brady Lake mine and the La Rose mine; it operated them and the mill on the Brady Lake property all year, and the newly-constructed mill on the La Rose property from the time of its completion in September. United Cobalt Mines, Limited, operated its customs mill all year and shipped the concentrates to Noranda. Chas. Tasse, Jr., worked the dumps of the old Trinova Silver Cobalt mine and made a small shipment to Deloro.

Siscoe Metals of Ontario, Limited, Castle-Trethewey Mines, Limited, and New Morrison Mines, Limited, all in the Gowanda area, were active all year, although the Castle-Trethewey mill operated only from May to the end of November, and the New Morrison from October to the end of the year.

SILVER PRODUCTION, 1951 AND 1952

Source	1951		1952	
	Fine ounces	Value	Fine ounces	Value
Sales of bullion by the reduction companies, smelters, and mines; Contained in silver-cobalt concentrates and residues exported from Canada; Estimated as recovered from concentrates treated in other provinces	2,959,988	$2,798,669	4,845,081	$4,046,611
In crude gold bullion	430,034	406,088	408,731	336,265
Recovered by nickel-copper refineries	1,128,205	1,066,718	1,231,047	1,028,539
In copper-gold-silver ores	1,868	1,766	2,917	2,436
In silver-lead-zinc ores	.....	.....	3,348	2,796
Total	4,520,095	$4,273,241	6,491,124	$5,416,647

There were four companies, which were active but non-producing; they reported paying 43 employees $50,265 in salaries and wages. Fuel and electricity costs were $3,598, and process supplies $6,553.

Iron Ore, Pig Iron, and Steel

Production of iron ore dropped from 2,841,984 tons, with a value of $21,205,152 in 1951, to 2,717,490 tons, with a value of $19,632,551 this year. The drop was due to plant expansion and the large development programs at the properties of the two main producers, Algoma Ore Properties, Limited, in Algoma district, and Steep Rock Iron Mines, Limited, in the Rainy River district, and to strikes in some of the American steel mills, which curtailed shipments. Mag-Iron Mining and Milling, Limited, in Hastings county, eastern Ontario, also shipped a small amount of ore.

These three companies reported 164 salaried employees, who were paid $767,822, and 1,226 wage-earners, who were paid $4,637,620 in wages. Fuel and electricity cost $1,535,208, and process supplies $1,010,503.

Three non-producing companies, which are doing development work, paid 21 salaried employees $94,907 and 125 wage-earners $336,282. They also spent $51,330 for fuel and electricity and $182,627 for process supplies.

IRON AND STEEL STATISTICS, 1948–52[1]

Year	Domestic ore smelted[2]	Foreign ore smelted[2]	Limestone for flux (pig iron)	Pig iron produced	Steel made
	tons	tons	tons	tons	tons
1948	193,935	2,975,599	819,382	1,687,309	2,335,050
1949	228,871	2,827,421	753,762	1,681,600	2,365,201
1950	414,725	2,774,801	574,266	1,804,092	2,526,770
1951	570,412	3,168,571	669,367	2,066,993	2,619,072
1952	705,000	3,442,000	738,000	2,286,000	2,800,000

The following companies operated blast furnaces with a combined yearly capacity of 2,850,000 tons:

IRON BLAST FURNACES IN OPERATION, 1952

Company	Stacks operating	Furnaces		Location
		Number of stacks	Annual capacity	
			tons	
Algoma Steel Corporation, Ltd.	5	5	1,057,000	Sault Ste. Marie.
Canadian Furnace Co., Ltd.	2	2	223,000	Port Colborne.
Dominion Foundries and Steel, Ltd.	1	1	320,000	Hamilton.
Steel Company of Canada, Ltd.	3	4	1,250,000	Hamilton.

Operations at the Mines

Algoma Ore Properties, Limited.—The Helen mine provided all the ore treated during the year. This came from Blocks 1 and 2, but now that stope preparations have been completed on Block 3, it is expected that this will be a major source of ore. The sintered ore was shipped to the parent company, Algoma Steel Corporation, Limited, at Sault Ste. Marie, and to American steel mills

[1]Figures supplied by the Dominion Bureau of Statistics.
[2]In the production of pig iron.

Steep Rock Iron Mines, Limited.—All shipments from this company came from the Errington-mine open pit. Shaft-sinking was completed on Float Ore Island, and several levels established. At the Hogarth mine, stripping by dredges is still continuing. This company shipped ore to several Canadian steel mills as well as to United States customers.

Mag-Iron Mining and Milling, Limited.—A small quantity of sorted ore from an open cut was shipped by this company. This open cut is being extended along a zone containing magnetite.

PIG IRON, STEEL, AND FERRO-ALLOY PRODUCERS, 1952

Company	Location	Products
Algoma Steel Corporation, Ltd.	Sault Ste. Marie	Pig iron, steel
Atlas Steels, Ltd.	Welland	Steel
Burlington Steel Co., Ltd.	Hamilton	Steel
Canadian Carborundum Co., Ltd.	Niagara Falls	Ferro-silicon
Canadian Electric Castings, Ltd.	Orillia	Steel
Canadian Furnace Co., Ltd.	Port Colborne	Pig Iron
Chromium Mining and Smelting Corporation, Ltd.	Sault Ste. Marie	Ferro-alloys
Dominion Foundries and Steel, Ltd.	Hamilton	Pig iron, steel
Electro-Metallurgical Co. of Canada, Ltd.	Welland	Ferro-alloys
Exolon Co., Ltd.	Thorold	Ferro-silicon
Fahralloy Canada, Ltd.	Orillia	Steel
Ford Motor Co. of Canada, Ltd.	Windsor	Steel
Lionite Abrasives, Ltd.	Niagara Falls	Ferro-silicon
Norton Co.	Chippawa	Ferro-silicon
Steel Co. of Canada, Ltd.	Hamilton	Pig iron, steel
Welland Electric Steel Foundry	Welland	Steel
William Kennedy and Sons, Ltd.	Owen Sound	Steel

Lead and Zinc

Both lead and zinc production, which are valued at $291,979 and $130,630, respectively, came from the Matarrow Lead Mines, Limited, in the Matachewan district. The company employed 71 men, who were paid $217,166 in salaries and wages, and spent $13,731 for fuel and electricity, and $82,703 for process supplies.

Calcium and Magnesium

The total value of the production of calcium and magnesium this year was $4,812,368, compared with $3,618,219 in 1951, a gain of 30 percent. All the production comes from the plant of Dominion Magnesium, Limited, at Haley Station, Renfrew county. There were 67 salaried employees, who received $216,854 in salaries, and an average of 414 wage-earners, who received $1,039,603. Fuel and electricity costs amounted to $467,170, and process supplies to $785,789.

Tungsten

Tungsten concentrates were shipped to Hollinger Consolidated Gold Mines, Limited, by Coniaurum, McIntyre, and Preston East Dome mines, and with Hollinger's own concentrates, this company extracted 50,734 pounds WO_3, valued at $164,886. This material was shipped to a Canadian steel company.

NON-METALLIC MINERALS

Arsenic

The total value of arsenic produced during the year was $71,477 as compared with the previous year's value of $94,406. Since sulphur and sulphuric acid were in better supply for the manufacture of synthetic insecticides, the

demand for refined white arsenic was less. However, its chief use is as a decolourizing agent in the glass manufacturing industry. Deloro Smelting and Refining Company, Limited, produces white arsenic in their treatment of arsenical ores from the Cobalt district.

Asbestos

The Canadian Johns-Manville asbestos mine in Munro township produced the major amount of the 23,096 tons valued at $3,862,653, which was the output for 1952; Van-Packer Mines, Limited, in Deloro township was the only other producer. The output from the Johns-Manville mine, being of coarser texture than that mined in Quebec, is used in the manufacture of asbestos cement products. There were 238 wage-earners employed by the industry, who received $873,364, and 43 salaried employees who received $175,609. The cost of fuel and electricity amounted to $213,519, and process supplies to $250,133.

Feldspar

The production value of feldspar dropped from $125,727 in 1951 to $37,628 this year. Two producers have mines in eastern Ontario, and a third, a mine in the Parry Sound area; they shipped the greater part of their material to the United States. Feldspar is used by the ceramic trade as well as in the manufacture of scouring soaps and cleansers. Only a very high grade is used in the making of artificial teeth. The industry employed 21 wage-earners who were paid $9,380; $389 was spent on fuel and electricity, and $65 on process supplies.

Fluorspar

Only one company, Reliance Fluorspar Mining Syndicate, Limited, produced in 1952. The mine was in operation from the beginning of the year to the end of August, and the output was valued at $38,465, compared with the previous year's value of $223,398 from two operations. This company had 6 salaried employees and 22 wage-earners and paid them $10,524 and $33,864 respectively. Fuel and electricity costs were $5,670, and process supplies $18,221.

Fluorspar is used in the manufacture of aluminium fluoride in the aluminium industry, and is used in the steel industry as a fluxing agent. In the making of ceramics it is necessary that the grade be very fine.

Graphite

There was a slight increase this year in the value of production from the Black Donald mine at Calabogie, in spite of the mill being closed down for about one month in the summer. The total value of production was $255,732 compared with $231,167 for the previous year. Shipments were made of 194 tons of high-grade lubricating and pencil flake, 81 tons of dust, and 1,765 tons of amorphous foundry grades. The company employed an average of 54 wage-earners who were paid a total of $161,345; fuel and electricity costs came to $18,855, and process supplies to $17,100. The iron and steel industry accounts for a large part of the consumption of graphite, and other users are the manufacturers of heavy chemicals, electrical apparatus, paints, polishes, and lubricants.

Gypsum

The Canadian Gypsum Company, Limited, and Gypsum, Lime and Alabastine, Canada, Limited, reported combined production of 278,992 tons of gypsum, valued at $1,060,429, which was an increase of 57.73 percent over the 1951 production value of $672,276. Both these companies, the former having

its quarry at Hagersville and the latter at Caledonia, operate manufacturing plants where the raw material is used in the making of wallboards and plasters. The industry, aside from the manufacturing plants, employed 207 wage-earners, who were paid $673,234 in wages. The cost of fuel and electricity was $178,536, and process supplies $69,590.

GYPSUM SALES, 1948–52

Grade	1948	1949	1950	1951	1952
	tons	tons	tons	tons	tons
Crushed	21,607	25,067	16,613	.....	169,308
Fine-ground	1,150	2,967	694	555	109,684
Calcined, sold	.....	225	225	18,143	27,153
Calcined, used in products	159,546	174,928	181,782	243,883	251,839
Total sold or used	182,303	203,187	199,314	262,581	278,992
Total value	$770,004	$871,467	$875,217	$672,276	$1,060,429
Wage-earners[1] ..... number	188	155	197	180	207
Wages paid	$425,683	$455,018	$515,703	$529,958	$ 673,234

Mica

The North Bay Mica Company, Limited, and one small operator produced 202,160 pounds of white, or muscovite, mica worth $106,943. This is a drop of 74.57 percent in quantity and 65.56 percent in value from the previous year's output, which was 795,082 pounds valued at $310,530. There were 12 operators who shipped amber mica during the year, the production of which amounted to 329,200 pounds worth $4,618, which is a slight increase from last year's. An average of 75 men was employed in the industry, and they were paid $121,265.

SHIPMENTS OF AMBER MICA, 1950–52

Grade	1950		1951		1952	
	Quantity	Value	Quantity	Value	Quantity	Value
	pounds		pounds		pounds	
Ground and rough	.....	.....	.....	.....	.....	.....
Splittings, and knife-trimmed	89,110	$22,454	2,776	$1,719	14,460	$2,554
Scrap	883,920	5,845	227,232	2,185	314,740	2,064
Total	973,030	$28,299	230,008	$3,904	329,200	$4,618

Mineral Water

Two operators, both with wells in the Ottawa valley, reported shipping 2,370 gallons of mineral water, valued at $440, during the year.

Natural Gas

Natural gas production in Ontario in 1952 was 8,302,190 M cubic feet as compared with 8,442,842 M cubic feet in the previous year. Small gains or losses from year to year mean very little in the industry at the present time as there has been a great increase in the reserves of natural gas in the past three years, and production could be increased possibly 100 percent. When there was a decided scarcity of natural gas, the Union Natural Gas Company of Canada, Limited, made a contract to import natural gas from Texas into Ontario through a pipeline from Detroit. This gas must be taken every year; part of it is distri-

[1]Exclusive of wage-earners employed in the manufacturing division of the Caledonia plant.

buted, and part stored underground, depending on the demand. This feature may affect the production of natural gas from Ontario wells to a very considerable extent.

The industry employed 1,461 individuals and paid out $3,968,682 in wages and salaries during the year.

The following table is taken from a review of the natural gas industry in 1952 by R. B. Harkness:[1]

NATURAL GAS PRODUCTION BY FIELDS, 1952

County	Field	Quantity
		M cu. ft.
Essex	Kingsville and Leamington	17,183
Kent	Tilbury	1,623,281
	Dover	110,853
	Electric	11,416
	Declute	289,395
	Chatham and Camden gore	87,577
	Zone	115,100
Lambton	Dawn	744
	Moore (Kimball-Payne)	2,651,432
	Becher	44,707
Middlesex and Elgin	Mosald	298,246
Elgin	Bayham and Malahide	20,429
Haldimand, Lincoln, Wentworth	Haldimand	1,594,783
Brant	Brant	21,519
Norfolk	Norfolk	546,282
Oxford	Brownsville	21,661
	Norwich	34,554
Welland	Welland	686,528
Wells in surface drift	Harwich and Howard	6,500
Private wells		120,000
Total produced		8,302,190
Retail value		$9,946,024
		M cu. ft.
Gas distributed other than natural gas produced in Ontario:		
Still gas		193,655
Imported mixed gas		482,102
Natural gas imported from U.S.A. (Texas panhandle)		5,500,281
Oil gas		41,194
Propane gas		8,772
Total of other gases		6,226,004
Total of all gases distributed		14,528,194

Nepheline Syenite

The only company mining nepheline syenite, American Nepheline, Limited, owns deposits in Methuen township, Peterborough county. This company reported shipping crude and milled products to the value of $1,111,950 during the year, about 75 percent of this going to the United States. The company employed 18 salaried persons, paying them $94,054, and an average of 92 wage-earners, who received $242,745 in wages. Fuel and electricity costs amounted to $93,912, and process supplies to $22,236.

About two-thirds of the annual Canadian production is consumed by the glass industry, but it is also used in the manufacture of all types of pottery and wall and floor tile.

[1]R. B. Harkness, *Natural Gas in 1952*, Ont. Dept. Mines, Volume LXII, 1953, pt. 2, p. 2.

Peat

Two companies, one in Wentworth county and the other at Fort Frances, produced peat moss and humus to the total amount of 3,878,249 pounds, valued at $69,013, which was a slight decrease both in quantity and value from the previous year. This material is used in the horticultural business, and in stables and poultry runs as litter. An average of 20 men was employed, and they received $11,650 in wages.

One operator, whose bog is near Stratford, shipped 30 tons of peat for fuel, and this was worth $300.

Petroleum

The oil production in 1952 was 191,814 barrels, valued at $641,400, the average price being $3.35 a barrel. There were 5,358 barrels less than in 1951, the small decline being mainly due to the falling off of production in the Sombra oil field, which reached its peak last year.

OIL FIELDS AND THEIR PRODUCTION, 1952

Field	Number of wells				Number of wells drilled		Production
	Active	Idle	Abandoned	Reopened	Producing	Dry	
							barrels
ESSEX COUNTY:							
Tilbury West tp.	.....	2	.....	.....	.....	1	.....
KENT COUNTY:							
Bothwell-Thamesville	111	89	12	.....	1	1	12,035
Dover tp.	7	.....	.....	.....	.....	.....	2,704
Raleigh tp.	3	2	1	.....	.....	.....	112
Romney tp.	.....	2	.....	.....	.....	.....	.....
Chatham tp.	.....	2	.....	.....	.....	.....	.....
Harwich tp.	1	1	.....	.....	1	2	73
LAMBTON COUNTY:							
Petrolia and Enniskillen tp.	380	244	15	.....	.....	1	36,330
Oil Springs	623	105	8	.....	1	.....	26,957
Moore tp. Devonian	5	33	.....	.....	.....	.....	159
Moore tp. Silurian	6	.....	.....	.....	1	.....	1,585
Sarnia tp.	3	9	.....	.....	.....	1	147
Plympton tp.	.....	4	2	.....	.....	2	.....
Euphemia tp.	6	15	1	.....	3	10	2,997
Brooke tp.	3	3	4	.....	3	3	1,482
Warwick tp.	3	23	1	.....	.....	1	988
Sombra tp.	32	4	.....	.....	.....	.....	75,981
ELGIN COUNTY:							
Aldborough tp.	13	2	4	.....	11	5	12,043
Dunwich tp.	23	39	4	.....	.....	1	1,923
MIDDLESEX COUNTY:							
Adelaide tp.	.....	7	.....	.....	.....	.....	.....
Metcalfe tp.	2	9	5	.....	.....	.....	357
Mosa tp.	157	47	7	.....	6	3	15,925
BRANT COUNTY:							
Onondaga tp.	3	5	.....	.....	.....	.....	16
MANITOULIN DISTRICT:							
Assiginack tp.	.....	2	.....	.....	.....	.....	.....
Other	.....	.....	.....	.....	.....	[1]5	.....
Total	1,381	649	64	.....	27	36	191,814

A new field in Aldborough township is rapidly gaining in production. Information gained from a producing oil well drilled last year has indicated a new oil field, which is now being developed in a southerly direction; its limits have

[1]Two in Ekfrid tp., and one each in Caradoc, Eldon and Gosfield South tps.

not yet been reached. The major activity is in Lambton county where oil is being found in the search for gas.

A more detailed review of the petroleum industry for 1952 will be found in the report by R. B. Harkness[1] for that year.

OIL PRODUCTION BY FIELDS, 1945–52

Field	1945	1946	1947	1948	1949	1950	1951	1952
	barrels	barrels	barrels	barrels	barrels	barrels	barrels	barrels
ESSEX COUNTY:								
Tilbury West tp.	.....	.....	.....	609	.....	.....	.....	.....
KENT COUNTY:								
Dover and Raleigh tps.	5,935	4,643	4,545	3,830	3,762	3,714	3,607	2,704 112
Bothwell and Thamesville	22,791	18,610	16,025	15,238	17,940	17,067	13,135	12,035
Harwich tp.	.....	.....	.....	.....	.....	.....	.....	73
LAMBTON AND MIDDLESEX COUNTIES:								
Sombra tp.	.....	2,347	20,264	59,846	146,617	140,578	88,651	75,981
Moore tp.	247	259	132	544	301	931	1,683	1,744
Sarnia tp.	190	152	80	124	141	124	144	147
Petrolia and Enniskillen tp.	39,350	44,343	41,028	40,603	42,632	40,548	39,053	36,330
Oil Springs	25,657	27,995	25,683	26,165	25,692	25,310	26,576	26,957
Plympton	9	28	.....	8	.....	.....	.....	.....
Dawn and Euphemia tps.	362	238	163	7,312	999	2,281	1,488	2,997
Brooke tp.	.....	.....	.....	.....	.....	1,006	746	1,482
Adelaide, Metcalfe, and Warwick tps.	2,739	5,400	2,390	2,479	2,010	1,670	1,264	1,345
Mosa tp.	13,344	17,351	19,165	18,341	18,580	15,494	14,935	15,925
ELGIN COUNTY:								
Dunwich tp.	1,676	1,621	1,740	1,821	1,929	1,006	1,793	1,923
Aldborough tp.	.....	.....	.....	.....	.....	.....	4,050	12,043
BRANT COUNTY:								
Onondaga tp.	24	89	80	69	67	37	46	16
Total production	113,324	123,082	131,295	176,989	260,760	250,656	197,171	191,814
Total value	$268,478	$291,719	$349,895	$608,109	$905,143	$892,335	$677,905	$641,400
Average price	$2.37	$2.37	$2.67	$3.44	$3.47	$3.56	$3.43½	$3.35

Quartz, Quartzite, and Silica Brick

Quartz and silica sand production for 1952 amounted to 1,429,806 tons, valued at $1,495,245, which was slightly less in quantity and practically the same in value as for the previous year, when the figures were 1,545,136 tons, worth $1,496,404. Both the International Nickel Company of Canada, Limited, and Falconbridge Nickel Mines, Limited, use the output from their own properties near their respective mines as smelter flux. Dominion Mines and Quarries, Limited, which was taken over during the year by Electro-Metallurgical Company of Canada, Limited, and Canadian Silica Corporation, Limited, have quarries on Manitoulin Island and mine white Lorrain quartzite. Kingston Silica Mines, Limited, has a quarry of sandstone north of Kingston, and the sand obtained is used for sand-moulding by the steel industry. A small amount of quartz crystals was mined from an occurrence near Lyndhurst, the value of which was $11,287.

[1]R. B. Harkness, *Natural Gas in 1952*, Ont. Dept. Mines, Vol. LXII, 1953, pt. 3, pp. 23–32.

Altogether there were 153 wage-earners employed who were paid $343,101. The industry also paid out $94,839 for fuel and electricity, and $128,767 for process supplies.

Algoma Steel Corporation, Limited, works a quarry near Sault Ste. Marie and uses the production from this in the manufacture of silica brick for their own steel plant. The number of silica brick used was 1,161,000, valued at $246,108. The brick plant employed 43 wage-earners and paid them $145,426 in wages. The cost of fuel and electricity was $34,060, and process supplies $7,669.

QUARTZ, QUARTZITE, AND SILICA BRICK, 1948–52

Year	Rock sold or used		Silica brick sold or used		Total value
	Quantity	Value	Quantity	Value	
	tons		M		
1948	1,496,652	$1,019,997	1,266	$133,424	$1,153,421
1949	1,404,140	1,020,411	1,194	148,258	1,168,669
1950	1,386,833	1,027,791	1,215	174,372	1,010,663
1951	1,545,136	1,496,404	1,217	204,831	1,701,235
1952	1,371,806	1,235,245	1,161	246,108	1,481,353

Salt

Ontario's salt production comes from wells drilled into salt beds at Goderich, Sarnia, Warwick, and Sandwich in the southwestern part of the province. There were six companies, which contributed to the output of 757,025 tons, valued at $4,401,780; this was slightly below that of last year. An average of 241 wage-earners, who received $799,228 in wages, and 64 salaried officials, who received $237,796, was employed. The industry spent $778,511 on fuel and electricity, and $591,339 on process supplies.

Salt is one of the most important of the non-metallics and is used mainly by the chemical industries in the manufacture of soda ash, chlorine, and bleaches.

SALT SOLD OR USED, 1948–52

Schedule	1948	1949	1950	1951	1952
	tons	tons	tons	tons	tons
Fine	186,956	167,453	185,292	205,933	208,559
Coarse	19,419	11,437	9,869	7,784	6,995
Other grades	132,926	78,595	96,021	106,269	88,885
Total	339,301	257,485	291,182	319,986	304,439
Brine (salt equivalent)	280,297	349,721	405,400	452,599	452,586
Total sold or used	619,598	607,206	696,582	772,585	757,025
Value	$3,265,654	$3,477,583	$4,639,867	$4,789,990	$4,401,780
Wage-earners.....number	338	298	266	258	241
Wages	$702,267	$693,748	$652,040	$688,503	$799,228

Talc

Canada Talc Industries, Limited, with a mine in Hastings county, is the only producer of talc in the province. The output of 12,454 tons, valued at $149,711, was slightly less than in the previous year. The company employed 21 men, paying them $36,983 in wages, and also paid out $11,035 for fuel and electricity, and $4,599 for process supplies. This output is used by the ceramic, cosmetic, construction materials, rubber, and paint industries.

TALC STATISTICS, 1948–52

Year	Sales		Wage-earners, mine and mill	Wages paid
	Quantity	Value		
	tons		number	
1948	14,301	$164,462	18	$23,174
1949	13,600	160,757	20	27,836
1950	15,263	182,048	18	27,364
1951	13,651	160,540	19	41,182
1952	12,454	149,711	21	36,983

STRUCTURAL MATERIALS

Construction Contracts

The value of Canadian construction contracts awarded in 1952, as reported by *MacLean Building Reports, Limited*, was $1,812,177,600, as compared with $2,295,499,200 in 1951. Ontario contracts were $732,768,100, or 40.43 percent of the total.

VALUE OF CONSTRUCTION CONTRACTS, 1948–52

Classification	1948	1949	1950	1951	1952
Residential	$142,039,100	$192,159,200	$233,617,200	$215,932,500	$226,780,100
Business	111,637,900	102,627,400	157,347,000	206,461,500	204,306,400
Industrial	38,017,100	32,416,900	64,891,800	233,472,300	119,546,900
Engineering	58,918,200	93,895,400	141,305,900	361,560,600	182,134,700
Total	$350,612,300	$421,098,900	$597,161,900	$1,017,426,900	$732,768,100

Cement

Canada Cement Company, Limited, with two plants, one at Belleville and the other at Port Colborne, and St. Mary's Cement Company, Limited, whose plant is at St. Mary's, produced 5,577,025 barrels of cement having a selling value of $14,142,060. This was an increase of 13 percent over the 1951 production value. The industry paid $174,646 to 40 salaried employees and $1,943,137 to 570 wage-earners. Fuel and electricity cost $2,807,325, and process supplies $817,535.

PORTLAND CEMENT STATISTICS, 1948–52

Year	Operating plants	Sales		
		Quantity	Value	Average price per barrel
	number	barrels[1]		
1948	3	3,660,756	$ 7,076,317	$1.93
1949	3	4,592,106	9,142,804	1.99
1950	3	5,313,521	10,953,896	2.06
1951	3	5,438,101	12,494,677	2.30
1952	3	5,577,025	14,142,060	2.53

[1] 350-pound barrel.

Lime

The combined production of quicklime and hydrated lime was 622,279 tons, valued at $6,921,062, which was approximately the same as that for 1951. There were 11 companies and individuals reporting, and they paid out $122,969 to 30 salaried workers, $1,094,388 to 377 wage-earners, $1,824,154 for fuel and electricity, and $227,113 for process supplies.

LIME STATISTICS, 1948–52

Year	Lime marketed or used						Fuel cost	Wage-earners	Wages
	Hydrated			Quicklime					
	Quantity	Total value	Value per ton	Quantity	Total value	Value per ton			
	tons	$	$	tons	$	$	$	number	$
1948..	71,496	963,747	13.48	436,634	3,797,774	8.70	1,248,187	259	513,393
1949..	83,071	1,227,299	14.77	446,915	4,342,251	9.72	1,509,873	364	802,913
1950..	91,497	1,347,677	14.72	479,993	4,682,551	9.76	1,598,504	296	718,832
1951..	92,387	1,424,614	15.42	527,382	5,497,302	10.42	1,745,415	356	984,166
1952..	86,816	1,580,916	18.21	535,463	5,340,146	9.97	1,824,154	377	1,094,388

Distribution of the quicklime and hydrated lime sold in 1952, as reported by the producing companies, was as follows:

Industrial consumption	Quicklime		Hydrated lime	
	Quantity	Value	Quantity	Value
	tons		tons	
Building trades, finishing and masonry	23,328	$ 401,614	68,389	$1,282,505
Agriculture	.....	.....	1,914	30,335
Chemical and metallurgical industries:				
Smelters	31,504	329,635	1,530	25,224
Iron and steel	27,218	282,215	287	4,735
Gold-milling	11,350	124,916	1,555	25,657
Pulp and paper	26,667	274,054	858	14,215
Glass	7,480	93,646	.....	.....
Sugar	6,979	54,886	.....	.....
Tanneries	1,307	14,200	2,730	45,065
Fertilizers and insecticides	455	4,730	.....	.....
Dealers and others	33,290	316,200	3,143	51,520
Other chemicals[1]	365,885	3,444,050	6,410	101,660
Total	535,463	$5,340,146	86,816	$1,580,916

Sand and Gravel

The sand and gravel industry made another record in 1952; production was 43,423,737 tons, valued at $23,240,203, an increase of 16.75 percent in value over last year, when the output was 39,218,058 tons, worth $19,905,293. There were 233 reporting individuals and companies, including 17 dredging operators. Altogether, $3,805,850 was paid out to 1,421 wage-earners, $570,754 to 163 salaried employees, $1,394,738 for fuel and electricity, and $307,545 for process supplies.

[1]Uses for lime under this heading include the manufacture of alkali, acetate of lime, and calcium carbide, the last-mentioned being used largely for making cyanamid.

A comparison of sand and gravel production for the years 1951 and 1952 is given in the following table:

OUTPUT OF SAND AND GRAVEL, 1951 AND 1952

Source	1951		1952	
	Quantity	Value	Quantity	Value
	tons		tons	
Private pit operators	15,828,272	$10,285,204	19,365,651	$12,757,673
Dredged from Great Lakes and rivers	1,080,819	1,031,185	1,135,828	1,138,373
Department of Highways	13,038,800	4,656,250	13,450,000	5,221,000
Miscellaneous counties and townships	7,186,333	3,593,167	7,588,962	3,794,481
Estimate for other producers[1]	2,083,834	339,487	1,883,296	328,676
Total	39,218,058	$19,905,293	43,423,737	$23,240,203

Sand-Lime Brick

Two companies reported the manufacture of sand-lime brick during the year. The output value was $520,619 compared with $714,528 in 1951. Salaries and wages of 124 employees amounted to $374,036, and fuel and electricity costs were $41,364.

Stone

There was a very minor decline in the quantity and value of the stone production in 1952 when compared with that of the previous year. The output of limestone, sandstone, granite, trap, and marble was 8,217,411 tons with a value of $10,303,173, whereas in 1951 it amounted to 8,080,087 tons worth $10,396,650. Salaried employees, who numbered 82, were paid $253,531, and 1,051 wage-earners received $2,822,732. Fuel and electricity costs were $659,394, and process supplies $1,083,159.

The following table gives a comparison of production for the last three years:

OUTPUT OF STONE, 1950–52

Variety	1950		1951		1952	
	Quantity	Value	Quantity	Value	Quantity	Value
	tons		tons		tons	
Limestone	5,254,219	$6,192,498	7,531,536	$8,513,829	7,818,958	$9,153,307
Marble	34,227	174,738	38,113	196,986	30,638	211,105
Trap, Granite	405,636	1,298,836	487,496	1,485,446	350,724	798,680
Sandstone	21,977	177,052	22,942	200,389	17,091	140,081
Total	5,716,059	$7,843,124	8,080,087	$10,396,650	8,217,411	$10,303,173

Clay Products

The still heavy demand for brick by the building industry has pushed the production value of clay products to another record; the total value of the 1951 output of $10,485,341 was increased by 14.22 percent to a total of $11,975,200 for 1952. The 67 reporting companies had 97 salaried employees, who were paid $399,160, and 1,604 wage-earners, who were paid $4,288,901. Fuel and electricity costs were $2,035,248, and process supplies $207,617.

[1]Railway ballast.

HEAVY CLAY PRODUCTS MARKETED, 1952

Kind	Quantity	Value
Brick:		
Soft-mud process {face ... number	12,085,122	$ 529,894
Soft-mud process {common ... number	4,707,588	192,683
Stiff-mud (wire-cut) process {face ... number	110,133,515	5,215,303
Stiff-mud (wire-cut) process {common ... number	8,201,306	244,353
Dry-press {face ... number	82,100,417	1,356,907
Dry-press {common ... number	1,249,887	47,238
Fancy or ornamental brick (including special shapes, embossed, and enamelled brick) ... number	9,007	726
Sewer	...	5,687
Paving brick ... number	226,000	17,631
Tile:		
Structural (hollow blocks, including fireproofing and load-bearing tile) ... tons	56,018	1,050,159
Roofing tile	...	...
Floor tile (quarries) ... sq. ft.	205,042	98,285
Drain ... number	27,408,940	1,506,992
Sewer pipe (including copings, flue linings)	...	1,321,499
Pottery (flower pots) from domestic clay	...	280,224
Haydite and other products	...	89,188
Blue clay ... tons	1,165	18,431
Total value	...	$11,975,200

VALUE OF CLAY PRODUCTS SOLD OR USED, 1948–52

Product	1948	1949	1950	1951	1952
Brick:					
Common and sewer	$ 817,976	$ 336,931	$ 433,547	$ 449,470	$ 489,961
Pressed, fancy, building tile, etc.	4,127,494	5,179,858	6,443,705	7,426,522	8,268,905
Pottery	84,294	92,390	110,057	114,720	280,224
Drain tile	831,785	963,635	1,058,567	1,243,891	1,506,992
Sewer pipe	646,000	786,878	1,197,901	1,124,201	1,321,499
Haydite and other products; clay	56,205	75,747	79,486	125,537	107,619
Total	$6,563,754	$7,435,439	$9,323,263	$10,484,341	$11,975,200

MISCELLANEOUS STATISTICS

Mining Company Incorporations

A summary of mining companies incorporated and licensed in Ontario from 1948 to 1952, inclusive, follows:

MINING COMPANIES INCORPORATED AND LICENSED, 1948–52

Year	Incorporated				Extra-provincial and mortmain licences	
	Number	Nominal capital	"No par" companies		Number	Capital for use in Ontario
			Number	Shares		
1948	85	$240,705,000	14	17,900,100	...	...
1949	97	279,380,000	23	19,280,500	5	$ 450,000
1950	112	310,012,000	34	38,048,650	3	1,065,000
1951	94	254,958,655	37	56,183,800	5	420,000
1952	126	353,115,000	31	43,969,500	13	2,997,000

MINING COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN ONTARIO IN 1952

Name of Company	Head office	Date of incorporation	Capital
Albercalif Petroleums, Limited	Toronto	July 15	$ 3,000,000
Alberfield Oil & Gas, Limited	Toronto	Apr. 22	3,000,000
Albersask Oil & Minerals, Limited	Toronto	July 11	3,000,000
Allerson Copper Mining Corporation, Limited	Toronto	Aug. 1	4,000,000
Asuncion Mines, Limited	Toronto	Oct. 29	3,000,000
Atcan Petroleums, Limited	Windsor	Oct. 8	3,000,000
Auric Mining Explorations, Limited	Toronto	Apr. 25	3,000,000
Aylen Mining Syndicate, Limited	Toronto	Oct. 1	35,000
Barclay Oil Company, Limited	Toronto	Mar. 4	2,500,000
Bar-Fin Mining Corporation, Limited	Toronto	Aug. 1	3,500,000
Battle Plains Petroleum, Limited	Toronto	Jan. 28	3,500,000
Bazeldo Mines, Limited	Toronto	Apr. 1	4,000,000
Bessey Mining Syndicate, Limited	Welland	June 23	35,000
B.I.M. Minerals, Limited	Toronto	Mar. 12	100,000
Blue Rock Cerium Mines, Limited	Toronto	Jan. 11	3,000,000
Bornite Copper Mines, Limited	Toronto	July 31	3,000,000
Brilund Mines, Limited	Toronto	May 27	4,000,000
Britco Oils, Limited	Toronto	May 29	2,000,000
Burmac Explorations, Limited	Brighton	Apr. 8	40,000
Bushveld, Limited	Toronto	Aug. 6	100,000
Camarillo Oils, Limited	Toronto	Mar. 25	5,000,000
Camberton Iron Explorations, Limited	Toronto	Sept. 4	5,000,000
Camoose Mines, Limited	Toronto	Oct. 28	3,000,000
Carndesson Mines, Limited	Toronto	Nov. 24	3,000,000
Coballoy Mines & Refiners, Limited	Toronto	Aug. 8	5,000,000
Cobo Minerals, Limited	Toronto	July 11	100,000
Cran-Kor Metals Mines, Limited	Toronto	Sept. 4	3,000,000
Crazy Creek Mines, Limited	Toronto	Sept. 29	3,000,000
Cropsey-Gordon Mines, Limited	Toronto	May 15	3,000,000
Denree Consolidated Mines, Limited	Toronto	July 14	3,000,000
Derosier Nickel & Copper Mines, Limited	Toronto	June 2	4,000,000
Dodge Copper Mines, Limited	Toronto	Mar. 17	3,000,000
Ellesmere Oil and Development, Limited	Toronto	June 20	4,000,000
Elmwood Mines, Limited	Toronto	Aug. 29	3,000,000
Epic Mines, Limited	Toronto	Apr. 28	5,000,000
Eramont Petroleums, Limited	Toronto	July 23	5,000,000
Ethel Copper Mines, Limited	Haileybury	Nov. 26	3,000,000
Excelsior Mines, Limited	Toronto	Apr. 1	3,000,000
Falgar Mining Corporation, Limited	Sudbury	Aug. 21	3,500,000
Fallmac Nickel Mines, Limited	Toronto	May 5	4,000,000
Glenmac Oil & Gas Company, Limited	Toronto	Feb. 22	3,000,000
Hay River Oils, Limited	Toronto	June 2	1,000,000
Hazeur Chibougamau Mines, Limited	Toronto	Mar. 21	3,000,000
Hemany Mines, Limited	Hamilton	July 9	500,000
Hymac Metals, Limited	Sault Ste. Marie	Jan. 11	100,000
Inlet Mining Corporation, Limited	Toronto	May 28	4,000,000
Inter-Rock Oil Co. of Canada, Limited	Toronto	June 13	5,000,000
Iso Uranium Mines, Limited	Toronto	Oct. 23	3,000,000
Israel Continental Oil Company, Limited	Toronto	Oct. 17	5,000,000
Jahala Lake Uranium Mines, Limited	Toronto	Sept. 10	4,000,000
Jerd Petroleums, Limited	Toronto	Dec. 18	600,000
Kenar Oils & Mines, Limited	Toronto	Apr. 2	3,000,000
Keymet Mines, Limited	Toronto	Jan. 22	3,000,000
Kristina Copper Mines, Limited	Toronto	May 12	3,500,000
Kyanite Corporation of Canada, Limited	North Bay	Sept. 16	150,000
Levack Nickel Mines, Limited	Toronto	Sept. 11	4,000,000
Lodge Uranium Mines, Limited	Toronto	Apr. 1	3,500,000
Lone Bachelor Mines, Limited	Toronto	Apr. 9	3,000,000
Lookout Mountain Mines, Limited	Toronto	May 14	3,500,000
Lorado Uranium Mines, Limited	Toronto	Apr. 10	3,000,000
McCombe Mining & Exploration, Limited	Toronto	Apr. 9	3,000,000
Milliken Lake Uranium Mines, Limited	Toronto	Oct. 17	3,000,000
Miron Mining Syndicate, Limited	Mimico	Oct. 1	35,000
Montgary Petroleum Corporation, Limited	Toronto	Jan. 15	3,000,000

MINING COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN ONTARIO IN 1952—*Continued*

Name of Company	Head office	Date of incorporation	Capital
Montoco Petroleums, Limited	Toronto	May 7	$ 5,000,000
Morreyn Mines, Limited	Chatham	Aug. 7	1,000,000
Najmar Petroleum Corporation, Limited	Toronto	Dec. 2	100,000
Nemegos Mining Company, Limited	Toronto	May 6	2,000,000
New Fortune Mines, Limited	Toronto	Mar. 17	4,000,000
New York Yukon Mines, Limited	Toronto	Apr. 21	4,000,000
Niemetz Base Metal Mines, Limited	Toronto	July 28	4,000,000
Nipiron Mines, Limited	Toronto	Jan. 18	5,000,000
Nipissing-O'Brien Mines, Limited	Toronto	Jan. 2	2,500,000
Nonnie Gold Mines, Limited	Toronto	May 22	3,000,000
Norbert Silver Mines, Limited	Windsor	Feb. 18	3,000,000
Northabie Mines, Limited	Toronto	Jan. 3	3,000,000
North Pacific Exploration, Limited	Toronto	May 22	2,250,000
N & G Metals Corporation, Limited	Toronto	Mar. 20	40,000
Offshore Mines, Limited	Toronto	May 12	4,000,000
Ornum Copper Mines, Limited	Toronto	Sept. 23	3,500,000
Orolea Mines, Limited	Toronto	Apr. 17	3,000,000
Ontario Cobalt Mines, Limited	Toronto	May 2	4,000,000
Orville Mines, Limited	Toronto	Jan. 24	100,000
Overland Oils & Minerals, Limited	Toronto	May 23	3,000,000
Paley Mining Company, Limited	North Bay	Oct. 23	100,000
Parkway Silver Mines, Limited	Windsor	Feb. 13	3,000,000
Peach Uranium & Metal Mining, Limited	Toronto	July 15	35,000
Peruvian Oils & Minerals, Limited	Toronto	May 8	3,000,000
Pileggi Missanabie Mining Syndicate, Limited	Toronto	May 5	35,000
Prado Oil and Gas Company, Limited	Toronto	Mar. 5	4,000,000
Renlip Metals Mining Corporation, Limited	Toronto	June 3	250,000
Rheims Mines, Limited	Toronto	Sept. 29	40,000
Rib Lake Copper Mines, Limited	Toronto	June 6	3,000,000
Rickey Petroleums & Mines, Limited	Toronto	May 20	1,500,000
Roford Mines, Limited	Windsor	Nov. 17	3,000,000
Ryerson Mining and Development, Limited	Toronto	Feb. 11	3,000,000
St. Mary's Uranium Mines, Limited	Toronto	Sept. 26	3,000,000
Saska Mining Syndicate, Limited	Toronto	Apr. 28	35,000
Saturn Oil & Gas, Limited	Toronto	Apr. 23	4,000,000
Scarlet Oils, Limited	Toronto	May 16	5,000,000
Silver Heart Mines, Limited	Windsor	Jan. 28	3,000,000
Silver Jackpot Mines, Limited	Kirkland Lake	May 19	4,000,000
Silver Wedge Mines, Limited	Toronto	Feb. 13	3,500,000
Southbar Mines, Limited	Toronto	July 18	4,000,000
Sparton Asbestos Mines, Limited	Toronto	Oct. 10	4,000,000
Statesman Coal, Oil and Gas (Alberta), Limited	Toronto	Apr. 1	150,000
Strike Uranium Mines, Limited	Toronto	Sept. 4	3,000,000
Sudbay Exploration & Mining, Limited	Toronto	Apr. 18	5,000,000
Sudbury Midzone Mines, Limited	Toronto	Feb. 19	4,000,000
Sudbury Northrim Exploration Company, Limited	Toronto	Feb. 19	5,000,000
Sudbury-Onoman Pyrites, Limited	Toronto	Apr. 9	50,000
Sulzinc Mines, Limited	Toronto	Feb. 18	3,000,000
Temagami Mining Company, Limited	Toronto	May 27	600,000
The Granton Mining Syndicate, Limited	Timmins	July 15	35,000
Thorncrest Oil and Gas Company, Limited	Thornhill	Apr. 25	3,500,000
Trans Border Exploration Company, Limited	Toronto	Aug. 25	3,500,000
Transland Uranium Mines, Limited	Toronto	Dec. 3	4,000,000
Trio Petroleum Corporation, Limited	Toronto	June 2	3,500,000
Triumph Oil Corporation, Limited	Toronto	Feb. 13	4,000,000
Tud Cobalt Mines, Limited	Haileybury	Dec. 2	4,000,000
Victor Petroleums, Limited	Toronto	June 26	3,500,000
Wabico Mines, Limited	Toronto	June 25	3,000,000
West Strike Gas and Oil, Limited	Toronto	Sept. 9	3,000,000
William Holden Iron Mines, Limited	North Bay	Oct. 20	1,000,000
Winwest Oil and Gas Lands, Limited	Toronto	Nov. 4	5,000,000
Zenmac Metal Mines, Limited	Toronto	Feb. 14	3,000,000
Total (126 companies)			$353,115,000

MINING COMPANIES INCORPORATED IN ONTARIO IN 1952 HAVING SHARES WITHOUT NOMINAL OR PAR VALUE

Name of company	Head office	Date of incorporation	Number of shares
Anglo-Luria Corporation, Limited	Toronto	Jan. 21	30,000
Arab Oils, Limited	Toronto	Sept. 3	4,000,000
Big Agaunico Mines, Limited	Haileybury	Sept. 29	3,000,000
B.I.M. Minerals, Limited	Toronto	Mar. 12	100,000
Canada Pyrite Mines, Limited	Toronto	Jan. 10	1,000,000
Canair Molybdenum Corporation, Limited	Toronto	Feb. 21	1,000
Chromite Mining Corporation, Limited	Hamilton	Aug. 14	100,000
Cobo Minerals, Limited	Toronto	July 11	150,000
Columinda Metals Corporation, Limited	Toronto	Jan. 14	5,000,000
Crosby Oil Corporation, Limited	Toronto	July 21	6,000,000
Edlon Mines, Limited	Toronto	July 4	2,500,000
Emkay Development, Limited	Toronto	May 22	200,000
Geo-Scientific Prospectors, Limited	Toronto	Apr. 3	200,000
Hatschaden Mines, Limited	Toronto	July 21	35,000
International Salt of Canada, Limited	Toronto	Mar. 4	40,000
Jarviston Mines, Limited	Toronto	Apr. 1	3,000,000
Jerd Petroleums, Limited	Toronto	Dec. 18	100,000
Kyanite Corporation of Canada, Limited	North Bay	Sept. 16	100,000
Magnetewan Iron Mines, Limited	Toronto	Jan. 25	40,000
Massee Mines, Limited	Toronto	July 14	100,000
Meston Lake Mines, Limited	Toronto	Jan. 3	3,500,000
Northbridge Mines, Limited	Toronto	July 18	3,000,000
Oberon Petroleums, Limited	Toronto	Aug. 7	5,000,000
Panhandle Oil Canada, Limited	Toronto	Dec. 19	500
Remor Industrial Alloys, Limited	Toronto	Oct. 3	100,000
Richmount Developments, Limited	Welland	Mar. 19	25,000
Riverlake Oils, Limited	Fort William	May 28	500,000
Shekinah Oil Company, Limited	Toronto	Sept. 11	48,000
Sydenham Gas And Petroleum Company, Limited	Toronto	Feb. 19	100,000
Tisdale-Ankerite Mines, Limited	Toronto	Aug. 18	1,000,000
Trans-Era Oils, Limited	Toronto	Mar. 6	5,000,000
Total (31 companies)			43,969,500

INCORPORATED COMPANIES WHOSE NAMES WERE CHANGED DURING 1952

Old name	New name
Abacus Gold Mines, Limited	Signet Petroleums, Limited
Acorn Minerals, Limited	Spearhead Explorations, Limited
American Yellowknife Gold Mines, Limited	American Yellowknife Mines, Limited
Apex Metal & Ore Company, Limited	Transworld Metal Company, Limited
Bobs Lake Gold Mines, Limited	New Bobs Lake Gold Mines, Limited
The Cobalt Chemical & Refinery Company, Limited	Cobalt Chemicals, Limited
Consolidated Lebel Oro Mines, Limited	Copper-Man Mines, Limited
Discovery Yellowknife Mines, Limited	Consolidated Discovery Yellowknife Mines, Limited
Duvay Gold Mines, Limited	Duvex Oils & Mines, Limited
Eldona Gold Mines, Limited	D'Eldona Gold Mines, Limited
Fairbanks Yellowknife Gold Mines, Limited	Fairbanks Uranium Mines, Limited

INCORPORATED COMPANIES WHOSE NAMES WERE CHANGED DURING 1952—*Continued*

Old Name	New Name
Great North West Uranium Explorers, Limited	U. R. Mines, Limited
Grompo Red Lake Mines, Limited	Deermont Oil & Gas Company, Limited
Halcrow Swayze Mining Company, Limited	Landover Oils and Mines, Limited
Highridge Mining Company, Limited	New Highridge Mining Company, Limited
Jonsmith Gold Mines, Limited	Jonsmith Mines, Limited
Kenar Oils & Mines, Limited	Kenwell Oils & Mines, Limited
Kirk Asbestos Mines, Limited	Donegal Petroleums, Limited
Larder "U" Island Mines, Limited	New Larder "U" Island Mines, Limited
Lewmul Gold Mines, Limited	Denlake Gold Mines, Limited
Macfie Red Lake Mines, Limited	Macfie Explorations, Limited
Minnesota-Huron Iron Company, Limited	Trent River Iron, Limited
Mohawk Gas & Oil Syndicate, Limited	Mohawk Gas and Oil, Limited
Norpick Gold Mines, Limited	Norpax Oils & Mines, Limited
Peak Oils, Limited	Consolidated Peak Oils, Limited
Prize Petroleum, Limited	Antone Petroleums, Limited
Quayana Mines, Limited	Consolidated Quayana Mines, Limited
Radio-Active Minerals, Limited	Westall Petroleums, Limited
Red Pic Petroleums, Limited	Stanwell Oil & Gas, Limited
Rouandah Gold And Metals, Limited	Rouandah Oils And Mines, Limited
Sabre Petroleums, Limited	Cougar Petroleums, Limited
Saturn Oil & Gas, Limited	Golden Saturn Oil & Gas, Limited
Silruca Gold Mines, Limited	Zinc Lake Mines, Limited

EXTRA-PROVINCIAL COMPANIES AND MORTMAIN LICENCES ISSUED BY ORDER-IN-COUNCIL IN 1952[1]

Name of company	Place of incorporation	Date of licence	Capital for use in Ontario
A. T. Massey Coal Company, Incorporated	Virginia	July 10	$ 25,000
Aconic Mining Corporation	Quebec	Oct. 9	300,000
Derraugh Lackner, Incorporated	Delaware	Nov. 6	40,000
Frontenac Exploration & Development Company, Limited	Canada	July 17	100,000
Fulton Feldspar Inc.	Delaware	June 5	100,000
Inter-Provincial Geophysics, Limited	Saskatchewan	July 25	2,000
LeBrasseur Lackner, Incorporated	Delaware	Nov. 6	40,000
MacDonnell Lackner, Incorporated	Delaware	Nov. 6	40,000
Molybdenum Corporation of America	Delaware	May 7	10,000
Quebec Nickel Corporation, Limited	Quebec	June 12	100,000
Redwater Utilities Holdings Oil & Gas, Limited	Alberta	Mar. 14	200,000
Russ-Mac Holding and Development, Limited	Saskatchewan	July 24	2,000,000
Torbrit Silver Mines, Limited	British Columbia	Mar. 20	40,000
Total (13 companies)			$2,997,000

[1]When a company is of foreign incorporation, or is incorporated in a province of Canada other than Quebec with which a reciprocity agreement exists, it is necessary for it to take out an extra-provincial licence to do business in Ontario, and to declare the amount of capital for use in Ontario.

Mining Revenue and Expenditure

The revenue of the Department of Mines for the fiscal year ending March 31, 1953, was $5,175,440.85 as compared with $5,949,435.74 for the previous year. Expenditures were $1,850,362.11. The following table gives details of the revenue:

REVENUE, DEPARTMENT OF MINES, APRIL 1, 1952, TO MARCH 31, 1953

ORDINARY:		
Licences and Permits:		
Sand and gravel	$ 1,060.00	
Unwrought metal sales	108.00	
Refinery	105.00	
Miners	69,416.26	
Gas	2,744.74	
Quarry	368.30	
		$73,802.30
Mining Claims:		
Recording fees	$159,222.50	
Abstracts and miscellaneous	10,744.73	
		$169,967.23
Rentals:		
Gas leases	$19,549.41	
Mining leases	18,022.36	
Licences of occupation	18,666.66	
		$56,238.43
Royalties:		
Sand and gravel	$ 450.00	
Gas and oil	90,506.91	
		$90,956.91
Taxes:		
Acreage	$ 123,765.93	
Profits	[1]4,377,162.82	
Gas	32,229.64	
		$4,533,158.39
Laboratories:		
Chemical and assay	$ 1,762.52	
Cable testing	29,156.70	
Sampling and assaying	112,665.80	
		$143,585.02
Services:		
Blueprinting	$5,886.71	
Record books	1,599.00	
Sale of gold and silver ore		
Miscellaneous revenue	7,977.55	
		$15,463.26
Reimbursements:		
Sulphur fumes	$894.45	
		$894.45
CAPITAL:		
Mining lands sales		$91,374.86
Total revenue		$5,175,440.85

DETAILS OF PROFIT TAX

GOLD:	
Aunor Gold Mines, Limited	$ 24,763.61
Bonwhit Mines, Limited	15,195.60
Broulan Reef Mines, Limited	6,193.04
Campbell Red Lake Mines, Limited	40,359.16

[1]The total assessment under section 4 of the Mining Tax Act as shown on page 63 is $91,116.76 less than the amount shown on the revenue statement above to have been collected by the Department. The difference is accounted for by the credit balances, refunds and other adjustments taken into account during the fiscal year 1952–53 although related to other fiscal years.

DETAILS OF PROFIT TAX—*Continued*

GOLD:—*Continued*		
Cochenour-Willans Gold Mines, Limited	10,666.80	
Delnite Mines, Limited	13,475.75	
Dome Mines, Limited	48,002.25	
Hallnor Mines, Limited	45,367.33	
Hollinger Consolidated Gold Mines, Limited (including Ross mine)	117,933.78	
Hugh-Pam Porcupine Mines, Limited	3,169.77	
Kerr-Addison Gold Mines, Limited	411,955.20	
Kirkland Lake Gold Mining, Co., Limited	4,510.72	
Leitch Gold Mines, Limited	12,257.37	
Macassa Mines, Limited	5,253.15	
MacLeod-Cockshutt Gold Mines, Limited	25,856.38	
Madsen Red Lake Gold Mines, Limited	13,448.34	
McIntyre Porcupine Mines, Limited	46,384.17	
New Dickenson Mines, Limited	19,890.90	
Pickle Crow Gold Mines, Limited	7,831.19	
Preston East Dome Mines, Limited	18,982.85	
Renabie Mines, Limited	21,066.22	
Sylvanite Gold Mines, Limited	22,822.51	
Upper Canada Mines, Limited	10,378.95	
Wright-Hargreaves Mines, Limited	27,634.01	
		$973,399.05
SILVER:		
Castle-Tretheway Mines, Limited	$4,328.89	
Cross Lake Lease	719.71	
Siscoe Metals of Ontario, Limited	8,987.18	
		$14,035.78
NICKEL:		
Falconbridge Nickel Mines, Limited	$ 124,969.68	
International Nickel Company of Canada, Limited	3,068,310.79	
		$3,193,280.47
IRON:		
Algoma Ore Properties, Limited	$23,336.97	
		$23,336.97
MISCELLANEOUS:		
Canadian Johns-Manville (Ontario), Limited	$39,420.56	
Canadian Gypsum Company	11,981.30	
Dominion Magnesium, Limited	17,431.44	
Dominion Mines & Quarries, Limited	8,717.77	
Electro-Metallurgical Company	115.89	
Gypsum, Lime and Alabastine, Canada, Limited	4,326.83	
		$81,993.79
Total		$4,286,046.06

PROSPECTING ACTIVITY, PROFIT TAX, AND TOTAL REVENUE, 1948–52

Year	Calendar year				Fiscal year	
	New miners' licences issued	Miners' licences renewed	Total licences and renewals	Mining claims recorded	Profit tax	Total mining revenue
1948	1,817	4,199	6,016	9,029	$2,695,098.56	$3,270,701.47
1949	3,247	4,043	7,290	14,420	2,718,019.76	3,296,306.76
1950	2,295	3,993	6,288	14,233	3,878,800.39	4,480,178.90
1951	2,386	3,858	6,244	13,403	5,305,045.60	5,949,435.74
1952	2,323	4,747	7,070	13,789	4,286,046.06	5,175,440.85

The following statement gives detail of the mining tax assessed under authority of the Mining Tax Act by A. R. Crozier, Mine Assessor, for the calendar year 1952:

CORRECTION: The above paragraph has been wrongly placed. It should precede "Details of Profit Tax" on page 62.

STATEMENT OF MONIES FROM OFFICES OF THE MINING LANDS BRANCH, APRIL 1, 1952, TO MARCH 31, 1953

Mining division	Purchase price	Licences of occupation	Mining leases	Blueprints	Recording fees	Miners' licences	Miscellaneous fees	Total
Head office	$ 3,543.51	$2,237.78	$ 3.00 (credit)	$ 101.10	$ 13,171.25	$47,053.89	$ 458.64	$ 66,563.17
Fort Frances	3,252.38	38.29	140.92	166.00	5,334.00	959.00	370.16	10,260.75
Kenora	432.65	.....	.....	242.25	8,152.00	1,319.00	647.64	10,793.54
Larder Lake	15,003.27	12.45	99.21	299.25	13,521.00	2,636.00	1,119.88	32,691.06
Montreal River	696.02	101.00	985.86	203.25	6,543.00	1,035.00	604.44	10,168.57
Patricia	2,103.67	1.00	.....	33.00	4,617.00	931.00	421.04	8,106.71
Porcupine	921.75	5.47	.....	203.00	6,743.00	1,490.00	395.05	9,756.27
Port Arthur	3,111.16	252.63	661.79	336.75	28,306.00	2,800.89	1,541.04	37,010.26
Red Lake	11,492.03	410.72	.....	152.75	12,100.00	930.85	612.00	25,698.35
Sault Ste. Marie	282.18	41.29	.....	397.64	11,327.10	1,945.00	540.58	14,533.79
Sudbury	46,541.91	2,738.09	1,968.88	905.40	38,364.15	6,141.00	2,813.25	99,472.68
Timiskaming	3,994.33	42.00	397.78	281.50	11,044.00	2,174.63	1,223.01	19,157.25
Total	$91,374.86	[1]$5,880.72	[1]$4,251.44	[2]$3,321.89	$159,222.50	$69,416.26	$10,744.73	$344,212.40

[1]The amounts shown for licences of occupation and mining leases are respectively $12,785.94 and $13,770.92 less than shown in the revenue statement on page 62. The difference in both cases are annual rentals collected by the Accounts Branch.

[2]The amount shown for blueprints is $2,564.82 less than shown in the revenue statement on page 62. The difference is the revenue collected from blueprints sold by the publications office.

Provincial Assay Office

As an aid in the development of the mineral resources of Ontario, the Government established a Provincial Assay Office in Belleville in 1898. This was for the purpose of making assays of the various ores found in the Province, and to assist the prospector in the development of claims. This office is now established in the East Block of the Parliament Buildings, Toronto.

Free assays may be obtained as provided by the Mining Act of Ontario, R.S.O. 1937, Chapter 47, section 67, as amended in 1943, as follows:

> Every licensee who stakes out and records a mining claim shall be given by the recorder two free assay coupons on recording it, and two additional free assay coupons on recording each forty days' work thereafter, and on forwarding or delivering, charges prepaid, samples from the mining claim to the Provincial Assayer, Toronto, together with the required number of coupons, he shall be entitled to have such samples assayed without charge.

The Provincial Assayer and Chemist, D. A. Moddle, reports as follows:

ASSAY RETURNS FOR 1952

Determinations	For coupons	For cash	For the department	Accounts outstanding	Total
Aluminium	.....	1	1	.....	2
Antimony	4	2	2	.....	8
Arsenic	2	.....	.....	.....	2
Barium	.....	.....	.....	.....	.....
Beryllium	1	.....	.....	.....	1
Bismuth	2	2	.....	.....	4
Cadmium	2	1	.....	.....	3
Calcium	.....	4	5	1	10
Chromium	60	1	1	.....	62
Cobalt	166	19	3	17	205
Columbium	.....	.....	.....	.....	.....
Copper	382	60	35	27	504
Fluorine	3	.....	.....	.....	3
Gold[1]	734	157	73	15	979
Iron	135	25	14	4	178
Lead	84	16	6	14	120
Lithium	2	.....	.....	.....	2
Magnesium	12	.....	4	1	17
Manganese	16	1	11	1	29
Mercury	2	.....	.....	.....	2
Molybdenum	2	4	.....	.....	6
Nickel	262	11	8	9	290
Palladium[2]	2	1	.....	.....	3
Platinum[2]	49	6	3	.....	58
Potassium	8	.....	5	.....	13
Phosphorus	11	1	14	2	28
Silicon	6	2	8	2	18
Silver[1]	391	71	22	66	550
Sodium	.....	.....	.....	.....	.....
Strontium	.....	.....	.....	.....	.....
Sulphur	28	7	14	.....	49
Tantalum	.....	.....	.....	.....	.....
Tellurium	1	.....	.....	.....	1
Tin	12	3	2	1	18
Titanium	77	6	.....	.....	83
Tungsten	9	3	1	21	34
Vanadium	28	1	.....	1	30
Uranium	12	85	4	.....	101
Zinc	142	24	14	8	188
Others	3	4	6	1	14
Totals	2,650	518	256	191	3,615

[1]Fire assays
[2]Fire assay-spectrographic determinations

Some assays require one coupon in payment, and some require two or more, as indicated on the coupons now being distributed.

Minerals and rocks not requiring chemical analysis are identified free of charge, and tests for radioactivity are also free. All other work requires a fee, as outlined in the schedule of charges of this department.

OTHER ANALYTICAL WORK

Examination and identification of minerals and rocks	493
Miscellaneous spectrographic analyses	335
Routine (complete) spectrographic analyses	321
Radioactivity determinations	316
Detailed examination and identification of special mineral specimens	17
Complete rock analyses	16
Coal analyses	2

FEES RECEIVED

Year	Coupons	Cash
1950	1,968	$1,454.96
1951	3,370	1,616.03
1952	3,909	1,992.27

Projects and Research

1) On a number of occasions samples thought to represent oil seepages were examined and tested. There were 11 such samples.

2) A set of samples were screen sized and assayed for a private concern in connection with a metallurgical problem.

3) A total of 248 quantitative spectrographic analyses were made for a mining company in connection with a research problem.

4) A small project involved the spectrographic analysis of tree twigs, in connection with biochemical prospecting by a private company.

5) The laboratory was consulted on a police action and carried out assays and other services.

6) Fillers from fluorescent tubes were analyzed for the Ontario Department of Health.

7) Feldspar samples were analyzed for the Department of Geophysics, University of Toronto.

8) In connection with the work begun several years ago at the University of Toronto to correlate the location of orebodies with trace-element distribution in granite stocks, a further 23 samples were analyzed in 1952.

9) The work begun at the University of Toronto in 1950 to determine the relation between the accessory mineral composition of various rock types to the ore mineralization in the Sudbury area was completed in 1952 and published under the heading "Trace Elements and their Association with Mineralization," Department of Geological Sciences, University of Toronto, by H. B. Stonehouse, October, 1952.

10) A project is now in progress at the University of Toronto to study the trace elements in the Steep Rock iron formation.

Summary

The number of regular assays is approximately the same as reported in 1951. Base metal assays fell off somewhat, and gold assays remained low in number. It is noteworthy that the interest in uranium determinations was low during the early part of the year, as it was throughout 1951. However, in the final three months the situation changed, and the total number reported exceeded that of the previous year.

Mining Accidents in 1952

By
The Staff of the Mines Inspection Branch

STATISTICAL REVIEW

Introduction

During the year 1952, at the mines, metallurgical works, quarries, and clay, sand, and gravel pits regulated by the Mining Act there were 2,738 accidents to employees reported to the Department of Mines up to January 21, 1953. Forty-one fatalities from 36 separate accidents and 2,697 non-fatal accidents were recorded.

The returns represent an increase of 310, or 13 percent,[1] in the total number of non-fatal accidents reported and an increase of 7 in the number of fatal accidents over that of the previous year. There were 32 accidents in which 1 man was killed, 3 accidents in which 2 men were killed, and 1 accident in which 3 men were killed.

The report shows a fatality rate of 1.1 persons killed per 1,000 employed, which is an increase of 0.17 per 1,000 over the preceding year but is 0.44 per 1,000 lower than the average for the last 25 years. There were 72 non-fatal accidents per 1,000 persons employed, an increase of 7, or 10.8 percent, over the rate of 1951, but 7, or 8.8 percent, lower than the average for the last 25 years. The percentage of non-fatal accidents followed by infection decreased from 4.5 in 1951 to 3.4 in 1952.

The total employment figures show an increase of 532, or 1.4 percent, from 36,729 in 1951 to 37,261 in 1952; employment underground and on surface at mines showed a decrease from 21,316 to 21,081.

EMPLOYMENT UNDERGROUND AND ON SURFACE AT MINES, 1942–52[1]

Year	Surface		Underground		Total
	Number	Percent	Number	Percent	
1942	8,205	34	15,679	66	23,884
1943	7,148	37	12,396	63	19,544
1944	6,914	38	11,184	62	18,098
1945	6,687	39	10,535	61	17,222
1946	7,442	39	11,503	61	18,945
1947	8,111	39	12,653	61	20,764
1948	7,851	37	13,663	63	21,514
1949	7,918	36	13,968	64	21,886
1950	8,372	36	14,591	64	22,963
1951	8,626	37	15,000	63	23,626
1952	8,283	35	15,201	65	23,484
Average	7,778	37	13,307	63	21,085

[1]These figures do not include contract diamond-drilling.

Summary of Fatal and Non-Fatal Accidents

The following table is a summary for the past 25 years of the number of persons injured per 1,000 employed at mining operations:

ACCIDENTS TO EMPLOYEES IN MINES, METALLURGICAL WORKS, QUARRIES, AND CLAY, SAND, AND GRAVEL PITS, 1928–52

Year	Persons injured			Persons employed at all operations[1]			Persons injured per 1,000 employed	
	Fatally	Non-fatally	Total	Producing operations	Non-producing operations	Total	Fatally	Non-fatally
1928	85	2,516	2,601	15,787	2,000	17,787	4.76	142
1929	55	2,389	2,444	17,145	1,849	18,994	2.89	126
1930	56	2,167	2,223	18,217	317	18,534	3.02	117
1931	37	1,813	1,850	17,820	447	18,267	2.03	99
1932	25	1,452	1,477	14,378	431	14,809	1.69	98
1933	25	1,514	1,539	15,080	804	15,884	1.57	95
1934	34	1,913	1,947	19,302	1,254	20,566	1.65	93
1935	36	2,048	2,084	21,444	1,528	22,972	1.57	89
1936	65	2,359	2,424	25,725	2,547	28,272	2.30	83
1937	52	2,721	2,773	28,938	3,220	32,158	1.62	85
1938	62	2,147	2,209	29,434	1,421	30,855	2.01	70
1939	47	2,246	2,293	32,444	897	33,341	1.41	67
1940	42	2,128	2,170	35,137	438	35,575	1.18	60
1941	64	2,240	2,304	35,317	618	35,935	1.78	62
1942	50	2,167	2,217	33,336	431	33,767	1.48	64
1943	36	2,101	2,137	29,083	394	29,477	1.22	71
1944	32	2,238	2,270	28,032	444	28,476	1.12	79
1945	41	2,026	2,067	25,639	1,413	27,052	1.52	75
1946	39	2,483	2,522	25,458	2,691	28,149	1.38	88
1947	35	2,608	2,643	29,965	1,136	31,101	1.13	84
1948	31	2,429	2,460	31,571	1,136	32,707	0.95	74
1949	33	2,341	2,374	32,586	327	32,913	1.00	71
1950	25	2,070	2,095	35,073	481	35,554	0.70	58
1951	34	2,387	2,421	36,178	551	36,729	0.93	65
1952[2]	41	2,697	2,738	36,759	502	37,261	1.10	72
Average	43	2,208	2,251	26,794	1,091	27,885	1.54	79

Fatal Accidents

A COMPARISON OF FATAL ACCIDENTS BY YEARS, 1948–52

Distribution	1948	1949	1950[3]	1951	1952
Mines, underground	21	26	16	21	29
Mines, surface	1	2	1	3	3
Metallurgical works	3	2	4	4	1
Quarries	2	0	2	2	1
Clay, sand, and gravel pits	1	0	1	1	1
Contract diamond-drilling	1	0	0	0	1
Total	29	30	24	31	36

[1]Three hundred 8-hour shifts = 1 man's yearly employment.

[2]Number reported up to January 21, 1953.

[3]The 1950 figures are corrected to include an accident that occurred during 1950 resulting in the death of one man in 1951.

FATALITIES ACCORDING TO INDUSTRIES

Gold mines	20
Copper, nickel, and zinc mines	13
Iron mines	3
Silver-cobalt mines	1
Mica mines	1
Nickel-copper smelters	1
Quarries	1
Clay, sand, and gravel pits	1
Total	41

CAUSES OF FATALITIES AT MINES, 1948–52

Cause	1948	1949	1950[1]	1951	1952
	percent	percent	percent	percent	percent
Fall of ground	38	45	48	44	32
Explosives	0	7	0	7	13
On surface	4	7	4	11	13
Rock burst	0	0	0	0	11
Run of ore or rock	8	7	0	11	8
Shaft accidents	21	0	20	4	5
Falls down stope or raise	4	17	28	15	5
Haulage	8	3	0	4	5
Unclassified	17	14	0	4	8

FATALITIES BY MONTHS

Month	Number of accidents	Number of men killed
January	3	3
February	2	2
March	3	3
April	2	2
May	8	10
June	4	5
July	4	5
August	3	3
September	2	2
October	1	1
November	1	1
December	3	4
Total	36	41

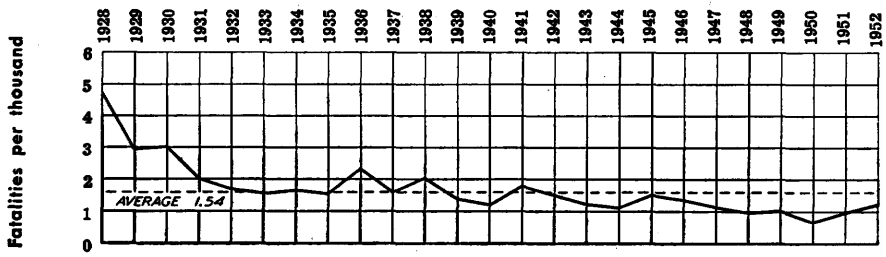
FATALITY RATE PER 1,000 FOR MINES, METALLURGICAL WORKS, QUARRIES, AND CLAY, SAND, AND GRAVEL PITS

	Men employed[2]	Number killed	Rate per thousand
Mines[3]	24,335	38	1.56
Metallurgical works	9,824	1	0.10
Quarries	1,377	1	0.73
Clay, sand, and gravel pits	1,725	1	0.58
Total	37,261	41	1.10

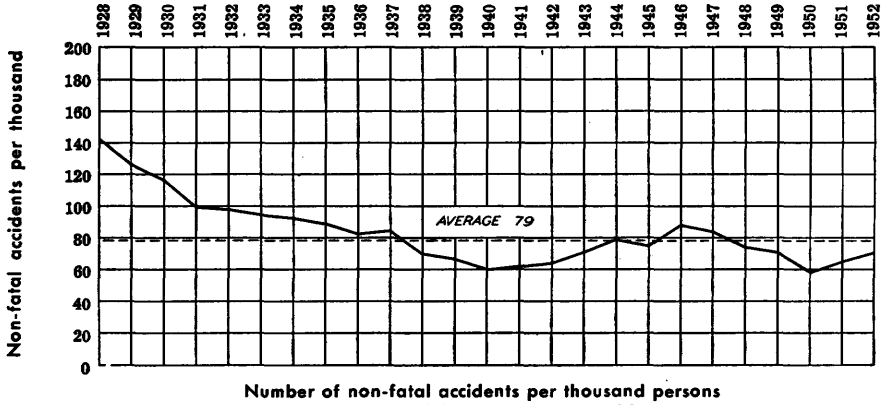
[1]The 1950 percentages are corrected to include an accident that occurred during 1950 resulting in the death of one man in 1951.

[2]Average number for year.

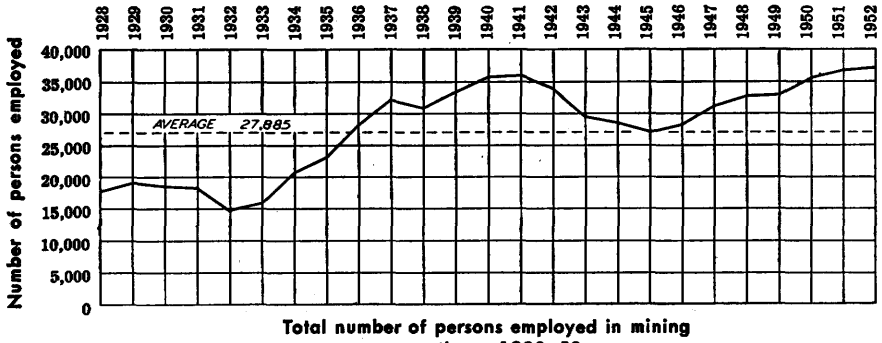
[3]Includes contract diamond-drilling at mines.



Number of fatalities per thousand persons employed in mining operations, 1928–52.



Number of non-fatal accidents per thousand persons employed in mining operations, 1928–52.



Total number of persons employed in mining operations, 1928–52.

FATALITIES BY AGE GROUPS

17–20	21–25	26–30	31–35	36–40	41–45	46–50	Over 50	Total
4	2	7	7	4	6	1	10	41

Non-Fatal Accidents

Mines

There were 23,484 persons employed at mines in Ontario in 1952. During the year, 1,941 were injured, giving a non-fatal accident rate of 83 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS AT MINES

Cause	Surface	Underground	Total
Fall of persons	70	192	262
Strain while lifting	23	128	151
Falling objects	36	109	145
Crushed between two objects	25	111	136
Strain while moving	28	103	131
Flying objects, drilling, sledging, etc.	24	101	125
Fall of rock or ore, drilling, scaling, etc.	1	112	113
Rock or ore at chute	2	111	113
Fall of loose rock or ore	1	103	104
Drilling machines	1	76	77
Handling or tramming mine cars	.....	76	76
Roll of broken rock or ore	3	62	65
Hand tools	32	33	65
Mechanical transportation	2	54	56
Running into or striking objects	8	39	47
Nails or splinters	10	37	47
Mechanical loaders	1	34	35
Machinery, general	20	7	27
Handling rock or ore	.....	26	26
Tugger hoists, scrapers, etc.	.....	22	22
Handling materials other than rock or ore	5	17	22
Cage, skip, or bucket in shaft	.....	20	20
Falls down shaft, wince, or stope	.....	18	18
Burns	11	3	14
Dermatitis	5	8	13
Rock busts	.....	12	12
Unclassified	1	8	9
Explosives	.....	6	6
Electricity	1	1	2
Caught by run of rock or fill	1	.....	1
Natural gas explosion	.....	1	1
Total	311	1,630	1,941

Metallurgical Works

There were 9,824 persons employed at metallurgical works in Ontario in 1952. During the year, 371 were injured, giving a non-fatal accident rate of 38 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS AT METALLURGICAL WORKS

Strain while lifting or moving	63	Hoisting equipment-hooks, slings, blocks, etc.	11
Fall of persons	45	Dermatitis, chemical burns, etc.	9
Falling objects	42	Machinery	5
Burns	39	Electricity	4
Burns by slag or metal	29	Noxious gases	3
Flying objects, sledging, etc.	28	Transportation	3
Crushed between objects	26	Unclassified	2
Hand tools	18	Nails or splinters	1
Handling materials	16	Explosives	1
Loading, unloading, and handling cars	14		
Running into or striking objects	12	Total	371

Quarries

There were 1,377 persons employed at quarries in Ontario in 1952. During the year, 79 were injured, giving a non-fatal accident rate of 57 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS AT QUARRIES

Strain while lifting or moving	16	Burns	3
Fall of persons	10	Transportation	3
Machinery	9	Crushed between two objects	2
Falling objects	8	Fall of material from face	2
Fall of material during handling	7	Running into or striking objects	2
Flying objects, sledging, etc.	7	Dermatitis	1
Handling materials	4	Nails or splinters	1
Hand tools	4		
		Total	79

Clay, Sand, and Gravel Pits

There were 1,725 persons employed at clay, sand, and gravel pits in Ontario during 1952. During the year, 118 were injured, giving a non-fatal accident rate of 68 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS AT CLAY, SAND, AND GRAVEL PITS

Machinery	26	Handling materials	5
Fall of persons	19	Burns	3
Strain while lifting or moving	17	Fall of material during handling	3
Flying objects, sledging, etc.	14	Nails or splinters	3
Falling objects	7	Transportation	3
Crushed between two objects	6		
Hand tools	6	Total	118
Fall of material from bank	6		

Contract Diamond-Drilling

There were 851 persons employed in contract diamond-drilling in Ontario in 1952. During the year, 188 were injured, giving a non-fatal accident rate of 221 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS IN DIAMOND-DRILLING

Handling drill rods	31	Burns	8
Strain while lifting or moving	30	Handling materials	8
Hand tools	24	Flying objects, sledging, etc.	7
Fall of persons	21	Running into or striking objects	6
Wire, nails, or splinters	15	Transportation	3
Caught in moving parts	13	Fall of loose rock or ore	1
Crushed between two objects	12		
Falling objects	9	Total	188

Infection

Records show that infection followed in 91 cases out of a total of 2,697 accidents.

ANALYSIS OF ACCIDENTS FOLLOWED BY INFECTION

Location	Number of accidents	Accidents followed by infection	Percent infection
Mines, underground	1,630	41	2.5
Metallurgical works	371	19	5.1
Diamond-drilling	188	13	7.0
Mines, surface	311	11	3.5
Quarries	79	4	5.0
Clay, sand, and gravel pits	118	3	2.5
Total	2,697	91	3.4

Electrical Accidents

ACCIDENTS DUE TO THE USE OF ELECTRICITY AT MINES, METALLURGICAL WORKS, QUARRIES, AND CLAY, SAND, AND GRAVEL PITS, 1943–52

	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	Total
Fatal	.....	1	1	.....	.....	1	1	.....	1	1	6
Non-fatal	5	2	1	7	2	2	4	2	8	2	35
Total	5	3	2	7	2	3	5	2	9	3	41

Explosives

CAUSES OF ACCIDENTS FROM EXPLOSIVES

Cause	Number of accidents	Persons injured		
		Non-fatally	Fatally	Total
Returned too soon to scene of blast	3	3	1	4
Killed in accidental explosion	3	1	3	4
Did not take sufficient cover	3	3	.....	3
Drilled into missed hole	2	1	1	2
Delayed too long at scene of blast	1	1	.....	1
Removed powder from bootleg hole	1	1	.....	1
Fall resulting from blast concussion	1	1	.....	1
Total	14	11	5	16

FIRES

Dome Mines, Limited

No. 235

A fire occurred about 2.45 A.M. on January 4 in the timber-framing shed, which is located on surface near the No. 3 shaft of the Dome mine. The fire was caused by a woollen mitt falling into the fan blades, causing an overload on the fan motor. The starting winding burned out, setting some books on fire.

Smoke was noticed by the No. 3-shaft deckman, while he was pushing a mine truck into the framing shed. He found that a wooden platform under a Sheldon steam heater was smouldering; he used a 1½-quart fire-extinguisher on the fire and then turned in the alarm. The fire was then completely doused with a 1½-inch fire-hose.

A woollen mitt and some requisition books were found on the wooden platform. The books were charred. It appears that the mitt may have fallen into the fan blades and caused an overload on the fan motor. The motor-starting winding burned out, igniting the requisition books.

International Nickel Company of Canada, Limited

No. 236

A fire occurred at 11.15 P.M. on January 6 at the Creighton Mine No. 3 shaft about 5 feet below the collar. The fire was due to a short-circuit in the 2,200-volt, 25-cycle power cable. The damage consisted of the burning of the 2,200-volt cable at the point mentioned and scorching of some planks in the manway compartment of the shaft. The fire was extinguished at 11.45 P.M.

At 11.15 P.M. on January 6, a switchboard operator, R. Brooks, in the No. 3-shaft compressor room, noticed that an oil circuit-breaker had "blown out," throwing oil on the floor and starting a small oil fire. This fire was immediately extinguished, and a call was sent to Assistant Chief Electrician A. A. McAllister. Brooks was then notified by the topman of No. 3 shaft that the power was off, and that there was a smell of smoke in the area of the No. 3-shaft collar. The fire was located at 11.20 P.M. in the manway compartment of No. 3 shaft about 5 feet below the collar. The power was shut off at 11.23 P.M. on the instructions of McAllister. The fire whistle was then sounded, and the stench gas was introduced into the compressed-air lines.

Soda-acid and pump-tank extinguishers were first used on the fire about 11.25 P.M. Fire-hose was then used on the area from 11.30 until 11.45 P.M. when the fire was completely extinguished.

The 25-cycle power cable had been installed in No. 3 shaft in 1916 and as a consequence of this incident it was proposed to remove it.

Starratt Olsen Gold Mine

No. 237

A fire occurred under the floor of the Starratt Olsen hoist-room about 10.55 P.M. on January 18. The cause of the fire was the over-heating of the hoist-electrical grids, which are located in the basement of the hoist-room.

At 10.55 P.M., a hoistman, A. Hagar, when coming on shift, noticed smoke pouring through the sides of the basement door of the hoist-room. The fire alarm was immediately sounded, and the stench-warning gas was introduced into the underground air lines. The underground crew was instructed by telephone to come to surface by way of the secondary exit. The main power switch was then opened, and the fire was extinguished by 11.15 P.M.

An examination of the fire site disclosed that the hoist electrical grids had become overheated, and this had set fire to the floor planking immediately above the grids. The damage was slight: two electrical leads had to be replaced, the flooring of the hoist-room was charred, and there was some water damage.

No one was affected by the fire, and the mine was in full operation at 8.00 A.M. January 19. Some insulating material was installed immediately above the grids.

International Nickel Company of Canada, Limited

No. 238

A small electrical fire occurred underground in the Levack mine on February 20 about 6.10 A.M.

The fire started in battery No. 14 of Motor No. 110 while it was on charge in the 1,600-foot-level charging-station. The wooden partition between two rows of cells had started to burn. The fire was discovered at 6.10 A.M. and was extinguished immediately with a carbon-dioxide extinguisher. It would seem that the fire was caused by a ground, occurring between the battery and metal plate, owing to a build-up of fire ore and moisture at this point.

Lake Shore Mines, Limited

No. 239

On April 26, about 7.15 P.M., G. W. Oliver, the mill shift boss, noticed one of the compressors running hot. The compressor was shut down immediately, and a call was sent to the Fire Department.

There was considerable evidence of heat around the exhaust pipes of the compressor, and when the plugs on one of the exhaust pipes was opened, a small fire was noticed burning in the concrete exhaust trench that runs underneath the floor for about 20 feet to the steel exhaust chimney. The firemen extinguished the flames in a few minutes with foamite.

On Monday the 28th, the compressor was examined and one of the springs in the exhaust ports was found to be broken. This was repaired, and the compressor put again in operation. No damage was done by the fire.

Wright-Hargreaves Mines, Limited

No. 240

A small electrical fire occurred in an underground locomotive on May 5 about 10.30 A.M.

The No. 19 locomotive was being used to move cars into position to draw chutes under 4302-51 stope at the Wright-Hargreaves mine. This is approximately 500 feet from the No. 5 winze station on the 4,350-foot level. The motorman noticed black smoke issuing from underneath the locomotive. By the time an extinguisher was obtained, flames were rising on both sides of the locomotive. The fire was quickly put out with the extinguisher.

The damaged locomotive was removed to surface at 11.10 P.M., and it is believed that the fire was due to the controller being used in the first position for too long a period; this caused the over-heating of the resistance grids and set fire to the insulation on four connecting wires leading to the motor proper.

The stench warning was not used.

Coldstream Copper Mines, Limited

No. 241

Fire destroyed the mine service building at Coldstream Copper mine at 2.00 A.M. on May 19. This building contained a workshop, change-room, and offices. The building was totally destroyed, and only part of the records recovered from the office.

The fire originated in a temporary stove used to heat the change-room. The shaft crew came to surface and one of the shaftmen discovered the fire on entering the room shortly after 2.00 A.M. The deckman and two trammers had not noticed the fire previously since there were no windows on the shaft side of the building.

Fire-extinguishers were used, but the fire had gained too much headway, and the men were unable to save the building. The available water supply was directed to the hoist-room to keep it from burning.

Emergency fire-fighting equipment was available in all buildings. A water line to be connected to a pump at No. 2 shaft had been installed but was not yet in operation. A jacket heater was to have been installed to replace the temporary stove.

Hollinger Consolidated Gold Mines, Limited

No. 242

At approximately 11.00 A.M. on June 11, smoke was seen issuing from the skip-hoist control-room on the 2,450-foot level by W. Stephens, an electrician, at the Hollinger mine.

Stephens came to surface and notified B. Rutherford, electrical foreman, by telephone from No. 19 shaft hoist-room. Stephens then opened the circuit-

breaker in the surface substation at No. 19 shaft, cutting off the power to the hoist on the 2,450-foot level.

Rutherford notified No. 11 shaft first-aid room at approximately 11.15 A.M., and a six-man rescue team equipped with McCaa oxygen apparatus, which had just returned from a training mission, were immediately dispatched to the 2,450-foot level by way of No. 19 shaft, accompanied by Stephens and Rutherford. Upon their arrival on the 2,450-foot level, they proceeded towards the skip-hoist control-room; the smoke was very noticeable and strong.

It was found that a short-circuit had occurred between turns of the winding in a 5KVA, 500–2,200-volt control transformer. One fuse on the primary side of the control transformer had blown. This transformer is of a dry type having class A insulation. It did not show any signs of being overheated. The outside coat of paint showed no signs of blistering.

The skip-hoist control-room is about 50 feet from the hoist platform. It is a class A room with ventilation openings controlled by thermal links.

The smoke was caused by the smouldering of insulation on the windings. Stench gas was not introduced into the mine area.

The skip-hoist was not in operation, and no men were affected.

The rescue team returned to surface at 12.35 P.M.

Teck-Hughes Gold Mines, Limited

No. 243

A fire occurred at 9.30 P.M. on July 4 when the hoist motor at the Teck-Hughes mine failed owing to some of the stator-coil connections short-circuiting. There was visible damage to eight coils, and the end loops and connections were burned. The short-circuit tripped out the underground-feeder breaker and also the south-shaft-feeder breaker in the Hydro-Electric Power Commission substation on the property.

The motor insulation, adjacent to the failure, burned and was extinguished by the hoistman, using a 15-pound, carbon-dioxide extinguisher. There was considerable smoke in the hoist-room. There was no report of smoke having been noticed in the mine other than in the hoist-room.

During repairs it was found advisable to replace twenty-three stator coils and re-wedge all the remaining coils. Repairs were completed, and the hoist was in operation again by noon on the 6th of July.

Upper Canada Mines, Limited

No. 244

At approximately 10.50 A.M., July 21, a fire occurred in the roof of the boiler-house at No. 2 shaft of Upper Canada mines.

At 10.50 A.M. on July 21, H. Bowers, the surface foreman, noticed the paint peeling from the smoke stack and assumed it was burning out. Inside the boiler-house, the roof was starting to burn around the stack.

Water was sprayed on the roof through two lengths of 1½-inch forestry hose from the fire-house and also from the inside by a water hose kept connected to the water-pipe inside the building.

Stench gas was released into the mine at 10.53 A.M. At 10.55 A.M. the fire was extinguished. The underground men who had reported to the level-stations were returned to work.

McIntyre Porcupine Mines, Limited

No. 245

At approximately 9.45 P.M. on August 16, the windings of the 75-horsepower, 2,200-volt, 1,500-r.p.m. motor, driving the 3,750-foot-level fan, broke down. Subsequent examination showed that the temperature-protective device, taped to the windings, had worn through the insulation, causing a short-circuit in two of the motor coils. This is a class B, insulated motor, and there was no indication of fire.

Simultaneously on the 1,875-foot level of No. 11 shaft, the motor windings of the 60-horsepower, 500-r.p.m., 2,200-volt motor, driving a 5- by 10-inch Aldrich pump, burned out, causing considerable smoke. The cage-tender, wearing a self rescuer, extinguished the fire without any difficulty, and a general alarm was not necessary. This motor is of the class A, insulated type and will have to be completely rewound.

It is believed that the breakdown of the pump-motor winding was a direct result of the previous grounding of the fan-motor winding. This is only a surmise as the two simultaneous failures may have been pure coincidence.

Leitch Gold Mines, Limited

No. 246

At 6.00 P.M on August 18, a fire occurred in the 125-horsepower motor on the mine pump in the 9th-level pump station at the Leitch mine. The motor burned out apparently because of the accumulation of salt from the mine air in the rotor gap. The motor became overheated, and a fire started but was quickly extinguished. No damage was done to any other equipment or enclosure.

International Nickel Company of Canada, Limited

No. 247

A small electrical fire occurred in a battery-charging station on the 13th level of the Levack mine at 3.00 P.M. on August 2.

E. Alkinson discovered smoke issuing from a battery when he went to the 13th level charging-station to take it off charge. He disconnected the battery from the charging power-source. When the battery hood was lifted, flames shot up. Alkinson put out the flames with a carbon-tetrachloride extinguisher.

The fire appeared to have originated in the rubber-covered, single-conductor cable that connected the negative pole of the polarized receptacle, mounted on the battery box, and the negative terminal of the battery. Approximately 2 feet of this cable showed signs of fire. Arc burns were evident at one point on the battery box. It is thought that the cable grounded at this point, and a short-circuit was set up in conjunction with another ground, or grounds, in the cells or connected circuits, thereby causing the fire.

Canadian Gypsum Company, Limited

No. 248

At 7.30 A.M. October 22, a small fire occurred in the quarry garage of the Canadian Gypsum Company, Limited.

The fire was caused when an oil-drip pan, left under the spare locomotive, was ignited by a piece of hot metal from cutting torches that were being used by a mechanic working about 10 feet from a Whitcomb gasoline locomotive. As the mechanic was alone and working with his back towards the locomotive, he did not notice the fire until it had blazed up under the locomotive, which of

course had grease covering its chains and bearings. The mechanic seized the oil-drip pan and threw it out through the door. A second mechanic, the foreman, and a truck driver tied a rope to the motor and pulled it out of the garage by hand to 75 feet away from the garage. The single 20B Ansul, powder extinguisher in the quarry garage was not sufficient to put out the fire; but it was quickly extinguished by the combined efforts of company employees, using fire-extinguishers, and the Guelph Fire Department, which had been called in and arrived within a few minutes of the outbreak.

No employees were burned or injured and no apparent damage was done to the locomotive.

Hollinger Consolidated Gold Mines, Limited

No. 249

A small smouldering fire occurred underground at the Hollinger mine on the 100-foot level at approximately 10.20 A.M., October 31. The fire was in an employee's smock in the 20 E and W 9.4 stope.

Shift Boss T. Anderson noticed a very strong odour of smoke, other than that caused by blasting, as he entered 9.4 crosscut on the 100-foot level. He followed this strong odour of smoke and arrived at 20 E and W 9.4 C and F stope, where a service crew consisting of F. Pecanic, serviceman, and O. Lapalme, helper, were engaged in placing air and water lines in the manways of the stope. Anderson discovered a workman's smock smouldering in an empty chute and extinguished the fire.

F. Pecanic, serviceman, had thrown his smock on the drift floor when he commenced work that morning and, during the course of the morning, had thrown away a burning cigarette butt, which landed on his smock. A little later he asked his partner O. Lapalme if he smelt something burning and, on receiving a negative reply, looked around the drift bottom and found his smock, which was smouldering. Pecanic stamped out the smouldering smock and, thinking it was completely extinguished, put it in an empty chute of 20 E and W 9.4 stope. Apparently the smouldering fire in the smock had not been completely extinguished, and the downcast draft from the stope raise caused the smock to smoulder once again unknown to the service crew.

About a quarter of the smock had been consumed by fire.

All personnel working in the vicinity were told by T. Anderson that there was no mine fire, and that everything was under control. The shift boss also notified the Accident Prevention Unit immediately by telephone to the effect that the smouldering fire had been extinguished and that the smoke was dissipating rapidly. Stench gas was not introduced into the mine.

Madsen Red Lake Gold Mines, Limited

No. 250

At approximately 11.00 P.M. on November 12, Simon Huzio, employed by Forsberg and Company, contractor at Madsen Red Lake Gold Mines, Limited, kindled a small fire in the 12-level station.

During the lunch period Huzio used powder box chips to start a fire in the metal cover of a metal clay container outside the lunch room on the 12th level. The lunch room is a rock excavation, approximately 7 by 9 feet, sealed off with concrete and having a steel door.

The act was witnessed by Huzio's helper, Federiw, and a sampler, H. Tesch. No damage was done by the fire, which apparently burned out in the metal

cover. The evidence was discovered by F. Olafson, of Forsberg and Company when making his round on November 13 and was reported by him the same day. Huzio was immediately dismissed.

Hollinger Consolidated Gold Mines, Limited

No. 251

An electrical fire, which occurred at 2.50 P.M. on November 17, was caused by a short-circuit in an electric slusher-hoist cable in 55 E 15 NH slice-and-fill stope on the 3,500-foot level.

The electric cable used on this hoist is fire resistant. It is a two-conductor, No. 2 rubber-insulated, neoprene-jacketed, trailing cable having a rated capacity of 600 volts. It is normally operated at 275 volts. The hoist was not in operation at the time of the short-circuit.

The stope crew were occupied in the drilling of a raise round, and while the runner was walking past the hoist, he noticed a flame shoot directly out from the cable, 6 feet behind the hoist. The stope helper immediately went to the level above and pulled the switch. He saw that the fuse had been blown. The runner, thinking that a fire might start in the cable, used a Fyrfyter extinguisher, standard equipment with electric hoists, on the cable where the short-circuit had occurred.

An inspection of the cable revealed a cut in the neoprene jacket and insulation, caused in all probability by a piece of rock; the wires inside the insulation were bruised by this rock. The only damage done was to the insulation where the short-circuit took place.

A company rule requires that the disconnecting switch, which disconnects the trailing cable from the source of power, be pulled when the hoist is not in use. Steps are being taken to see that this rule is more-rigidly enforced. Slusher operators have also been instructed to report all cuts in trailing cables to the electrical department immediately.

PROSECUTIONS

Regina *vs.* Marion Borysiewicz
Regina *vs.* Hans Dietrich Buckmeier

A charge was laid jointly against Marion Borysiewicz and Hans Dietrich Buckmeier, stope runners at the Paymaster mine, as follows:

That Marion Borysiewicz and Hans Dietrich Buckmeier did fail to guard an approach leading to the scene of a blast in No. 2 chute of 2503C1 stope on the 2575 level of Paymaster Consolidated Mines Limited about 9.45 A.M., August 28, 1952, contrary to Section 162, subsection 75 (a) of the Mining Act of Ontario.

Both workmen pleaded guilty before Magistrate S. Gardner in South Porcupine, on September 9. A fine of $10.00 and costs was imposed on each man. The fines and costs, amounting to $14.00 each, were paid.

Regina *vs.* Romeo Bouchard

A charge was laid against Romeo Bouchard, a driller, employed by the Preston East Dome Mines, Limited, as follows:

That Romeo Bouchard, on October 15th, 1952, in 866 subdrift at Preston East Dome Mines, in the township of Tisdale, did unlawfully drill within six inches of the remnants of holes which had been blasted, contrary to Section 162, subsection 73 (b) of the Ontario Mining Act.

The case was heard before Magistrate S. Gardner in South Porcupine on November 4.

Although the charge was proven to the satisfaction of the Crown, Magistrate Gardner dismissed the case saying that he would give Bouchard the benefit of the doubt. The Magistrate considered that there had been too much delay in securing the engineer's information that had been presented. The engineer secured measurements of the face on October 21, at which time photographs were also taken. The latter did not show the face plainly and the Crown did not present them.

Regina *vs.* Armand Brosseau

A charge was laid against Armand Brosseau, a switchman at the Levack mine of the International Nickel Company of Canada, Limited, as follows:

That Armand Brosseau at the Town of Levack on the 17th day of July, 1952, did unlawfully enter upon the property of the International Nickel Company of Canada, Limited; to wit, the Levack Mine, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII, of the Mining Act of Ontario.

Brosseau pleaded guilty before Magistrate W. J. Golden at Sudbury on July 17. A fine of $10.00 and costs, or 10 days in jail, were imposed. The fine and costs, amounting to $20.50, were paid.

Regina *vs.* Hector Carriere

A charge was laid against Hector Carriere, a hoistman at the Murray mine of the International Nickel Company of Canada, Limited, as follows:

That Hector Carriere at the Township of McKim on the 3rd day of June, 1952, did unlawfully enter upon the property of the International Nickel Company of Canada, Limited; to wit, the Murray Mine, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

Carriere pleaded guilty before Magistrate W. F. Woodliffe at Sudbury on June 11. A fine of $10.00 and costs of $6.00 were imposed and paid.

Regina *vs.* Delmar Dorey

A charge was laid against Delmar Dorey, a process labourer at the Copper Cliff smelter of the International Nickel Company of Canada, Limited, as follows:

That Delmar Dorey at the Town of Copper Cliff on the 23rd day of December, 1952, did unlawfully enter upon the property of the International Nickel Company of Canada, Limited; to wit, the Copper Cliff Smelter, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

Dorey pleaded guilty before Magistrate W. F. Woodliffe at Sudbury on December 24. A fine of $20.00 and costs, or 10 days in jail, were imposed. The fine and costs, amounting to $26.00, were paid.

Regina *vs.* Edward Erlich

A charge was laid against Edward Erlich, employee of Steep Rock Iron Mines, Limited, as follows:

That on January 10, 1952, at 3.30 P.M., he was under the influence of intoxicating liquor while working at Steep Rock Iron Mines, contrary to Section 162, subsection 411, of the Mining Act of Ontario.

Court was held in the Ontario Provincial Police Station at Atikokan before Magistrate F. Cornell on January 23. Erlich was found guilty and fined $10.00 and costs.

Regina *vs.* Hubert McKibbon

A charge was laid against Hubert McKibbon, a pillar leader at the Frood mine of the International Nickel Company of Canada, Limited, as follows:

That Hubert McKibbon at the town of Frood Mine on the 28th day of February, 1952, did unlawfully enter upon the property of the International Nickel Company of Canada, Limited; to wit, the Frood Mine, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

McKibbon pleaded guilty before Magistrate W. J. Golden at Sudbury on March 14. A fine of $10.00 and costs, amounting to $16.00, were imposed.

Regina *vs.* Juozos Stankevicius

A charge was laid against Juozos Stankevicius, a spare skimmer at the Coniston smelter of the International Nickel Company of Canada, Limited, as follows:

That Juozos Stankevicius at the Town of Coniston on the 26th day of December, 1952, did unlawfully have in his possession a quantity of liquor on the mining property of the International Nickel Company; to wit, the Coniston Smelter, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

Stankevicius pleaded guilty before Magistrate W. J. Golden at Sudbury on December 26. A fine of $25.00 and costs, or 20 days in jail, were imposed. The fine and costs, amounting to $31.00, were paid.

Regina *vs.* John Thompson

A charge was laid against John Thompson, a slusherman employed at the Creighton mine of the International Nickel Company of Canada, Limited, as follows:

That John Thompson at the Village of Creighton Mine on the 28th day of October, 1952, did unlawfully enter upon the property of the International Nickel Company, Limited; to wit, the Creighton Mine, No. 5 shaft, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

Thompson pleaded guilty before Magistrate W. F. Woodliffe at Sudbury on October 29. A fine of $10.00 and costs, or 10 days in jail, were imposed. The fine and costs, amounting to $16.00, were paid.

Regina *vs.* A. Weston

A charge was laid against A. Weston, driller at the New Dickenson Mines, Limited, as follows:

That A. Weston of the Improvement District of Balmertown in the District of Kenora, on or about the 18th day of March, 1952, at the Mine of New Dickenson Mine Company, Limited, in the District of Kenora, did unlawfully drill within 6 inches of an old remnant of a hole previously drilled and blasted in the 6-5555 south crosscut of the New Dickenson Mine Company, Limited, Mine at the Improvement District of Balmertown in the District of Kenora, contrary to Section 162, subsection 73, Paragraph (b), of the Mining Act, R.S.O., Chapter 236, 1950.

The case was heard on March 27, before Magistrate J. A. Cox in the Red Lake Provincial Building. Weston pleaded guilty. A fine of $25.00 and costs of $7.50 were imposed.

MINE RESCUE STATIONS

During the year the training of teams in mine rescue and recovery operations was carried out in basic, standard, advanced, and supervisory classes.

Teams of trained personnel available for emergencies, maintained by the mines, are as follows:

Station	Superintendent	Active	Reserve men	Supervisory staff	Apparatus men[1]
Porcupine	A. H. Graham	34	.....	20	18
Kirkland Lake	G. E. Wilson	19	.....	45	33
Cobalt	R. Eveson	10	.....	.....	.....
Sudbury	G. G. McPhail, H. G. Moorhouse	30	.....	78	5
Geraldton	John Lang	3	.....	8	18
Steep Rock	John Lang	.....	.....	9	.....
Helen	John Lang	2	.....	6	15
Renabie	John Lang	2	.....	3	10
Red Lake	C. S. Culbert	9	.....	16	4
Pickle Lake	C. S. Culbert	2	.....	.....	.....
Total	.....	111	.....	185	103

The number of men who passed the necessary examinations and who were granted their Basic Certificates or Approval Seals are as follows:

Station	Basic certificate	Standard seal	Advanced seal	Supervisory seal
Porcupine	65	51	8	.....
Kirkland Lake	40	25	.....	.....
Cobalt	[2]52	.....	.....	.....
Sudbury	32	41	.....	34
Geraldton	48	.....	.....	.....
Red Lake	31	.....	.....	.....
Total	268	117	8	34

A station was equipped and opened in the Cobalt area. The station superintendent is R. Eveson, Box 21, Cobalt. This station covers the mines in the Cobalt, Gowganda, and South Lorrain areas.

A station in charge of J. Lang, Geraldton, was equipped at the Steep Rock Iron Mines, Limited, at Atikokan.

ONTARIO GOVERNMENT CABLE-TESTING LABORATORIES

The following table is a summary of the work accomplished during the year. The end column shows the comparative work in the previous year, 1951.

SUMMARY OF ROPE TESTS, 1952

Classification	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total 1952	Total 1951
Tests for Ontario Mines	71	44	56	39	48	52	53	49	45	43	42	28	570	560
Special informative tests	19	32	38	.....	33	28	25	.....	56	20	13	.....	264	383
Tests for wire-rope manufacturers	29	30	21	25	26	29	25	21	29	25	21	35	316	303
Tests for mines outside Ontario	28	29	26	44	37	37	29	28	36	34	34	70	432	386
Tests for industries other than mining	.....	3	10	.....	2	2	8	3	.....	.....	4	1	33	8
Other tests	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	147	138	151	108	146	148	140	101	166	122	114	134	1,615	1,640

[1]Hoistmen, cagetenders, electricians, mechanics, and other specialists.
[2]Modified.

Classes for Prospectors, 1952–53

By W. D. Harding

During the winter season of 1952–53, between December 1 and March 6, classes for prospectors were conducted by The Ontario Department of Mines in the following nine towns and cities: Peterborough, North Bay, Beardmore, Atikokan, Port Arthur, Schreiber, Geraldton, Chapleau, and Toronto.

The instruction at the classes was similar to that at the classes held during the previous season. The subjects discussed included, mineralogy, geology, practical prospecting, uranium, the geiger counter, geophysical prospecting, assaying, staking regulations, and the regulations of The Ontario Securities Commission as they affect the prospector.

Mr. E. Pye newly appointed Resident Geologist at Port Arthur assisted the writer at the classes held at Beardmore, Port Arthur, Geraldton, Atikokan, and Toronto.

The details of the attendance at the classes held during the 1952–53 season are given in the accompanying table:

PROSPECTORS' CLASSES 1952–53

Place	Period	Registration (afternoon only)	Average daily attendance at afternoon classes	Average daily attendance at evening classes	Total student-hours (afternoon and evenings)	Number who had experience in prospecting or mining	Number who had attended a previous class
	1952						
Peterborough	Dec. 1–6	22	18.0	45.8	409	7	3
North Bay	Dec. 8–13	39	35.0	47.4	657	19	2
	1953						
Beardmore	Jan. 5–10	13	8.0	17.0	165	7	.....
Atikokan	Jan. 12–17	16	10.1	[1]20.0	162	8	3
Port Arthur	Jan. 19–24	56	47.0	76.4	944	24	14
Schreiber	Jan. 26–31	35	26.6	36.2	427	18	11
Geraldton	Feb. 2–7	17	14.6	29.8	305	5	6
Chapleau	Feb. 9–14	36	25.0	22.6	413	12	10
Toronto	Mar. 2–6	83	65.0	100.6	1,153	34	16
Total	.....	317	.....	.....	4,635	134	65

Peterborough

The class at Peterborough was the first held in that city since 1937. Arrangements were completed with the co-operation of the Peterborough Chamber of Commerce, and the meetings were held in the Public Library. This accommodation was centrally situated and very satisfactory. The average daily attendance of 18 at the afternoon class was rather low in view of the population. The low figure was probably a reflection of the full employment, which prevailed in Peterborough. The evening class was much better attended. The Peterborough Chamber of Commerce suggested that another class be conducted in that city as soon as convenient.

[1]Only two evening classes were held.

North Bay

A class conducted at North Bay during the period December 8–13, 1952, was attended by a substantial number of prospectors and many interested laymen. This class was held at the request of Jack Grainger of the North Bay *Nugget* acting on behalf of a group of local prospectors. Prospecting interest in the vicinity was high as the result of recent discoveries of radio-active mineral on islands in Lake Nipissing. Kyanite, a mineral of economic importance, had also been discovered near Mattawa, situated east of North Bay.

The MacDonald Beverage Company of North Bay generously placed the conference room at their offices on Oak Street at the writer's disposal for use as a class room. This space, although rather small, was centrally situated and was filled to capacity at several of the meetings.

Beardmore

Through the co-operation of G. C. Springer of the Beardmore Board of Trade, arrangements were made to conduct the class in the Legion Hall. In spite of the fact that Beardmore is the commercial centre of a mining area, the attendance was disappointingly small. It appears that, except under special circumstances, the holding of classes in very small communities does not justify the trouble and expense.

Atikokan

Arrangements for the class at Atikokan were completed through the co-operation of B. J. Eyton of the local Chamber of Commerce. The afternoon class was conducted in the Legion Hall at Atikokan. This hall was not availabled in the evenings. Owing to the difficulty in securing accommodation at Atikokan, provision was made to hold the evening class in the Recreational Hall at Steep Rock Iron Mines, Limited, seven miles from Atikokan. This arrangement proved unsatisfactory. Most of those who were in attendance at the afternoon class resided in Atikokan, and the only means of transportation between Atikokan and Steep Rock was by taxi. On account of the expense involved, it was impossible for most of the members to attend in the evening. Two evening lectures, however, were conducted at Steep Rock. A snow storm then made travelling difficult, and the remainder of the evening meetings were cancelled.

Port Arthur

The class at Port Arthur was conducted, as in the previous season, in excellent quarters in the Public Library. This accommodation was made available largely through the courtesy of Robert Porter, director of the Public Library at Port Arthur.

This class drew an excellent attendance; a large number came from the adjoining city of Fort William.

For many years past the Ontario Department of Mines Prospectors' classes held at Port Arthur and Fort William have shown a high attendance. These results reflect a wide interest in prospecting and mining by the residents of these communities. Judging by the satisfactory attendance at the class held during the season just ended, this interest appears to be sustained at high level.

Schreiber

In response to a request from two prospectors, Don Campbell and Clement Downey, a class was conducted in the town hall at Schreiber during the last week

in January. The last previous class held in that village was conducted by E. M. Burwash in 1936. Owing to the small population of that community, it was felt that the holding of a class at Schreiber was a doubtful venture. However, a very successful class was held. W. A. Spicer, town clerk, was very helpful in making the preliminary arrangements. The class was attended faithfully by many local prospectors and by a number of very interested laymen. Many useful discussions were promoted, and several prospectors suggested that another class be conducted in the area in the near future.

Geraldton

The class at Geraldton was conducted during the first week in February in convenient and spacious quarters in the Legion hall. The local branch of the Canadian Institute of Mining and Metallurgy generously undertook to complete arrangements for this accommodation. A satisfactory number of local prospectors and miners were in attendance. About half the members had attended a class on a previous occasion.

Chapleau

The class at Chapleau was held at the request of local prospectors, who have recently been active in that area. The last previous class in that town was conducted by E. M. Burwash in 1933.

The meetings were held in the town hall. In view of the small population of Chapleau, the attendance was large. Members of the class joined freely in the discussions, and there were numerous questions.

Toronto

During the period March 2–6, a prospectors' class was held in Toronto and was jointly conducted by the Ontario Department of Mines and the Prospectors and Developers Association. The class meetings were held in the Mining Building at the University of Toronto on College Street.

On the opening day, March 2, the members of the class were welcomed by Hon. Philip T. Kelly, Minister of Mines for Ontario, and by Cyril T. Young, veteran prospector, on behalf of the Prospectors and Developers Association.

The total registration at this class was 83. Over 100 were present at several of the meetings.

The instruction was given largely by the writer and was supplemented by several speakers who gave lectures on special subjects: D. A. Moddle, Provincial Assayer, explained the operations of the Provincial Assay office and explained various methods of assaying ores and minerals; R. V. Scott, Mining Recorder of the Ontario Department of Mines, explained the Mining Act as it concerned the prospector; E. Gillanders, geologist, formerly of the Eldorado mine at Great Bear Lake, presented many important facts relative to prospecting for Uranium; P. O'Brien of the Department of Geophysics, University of Toronto, outlined some of the common methods of geophysical prospecting; R. W. Knox-Leet of the Ontario Securities Commission, explained the securities regulations from the prospector's standpoint.

The Toronto class included many well known prospectors, brokers, miners, bushmen, and laymen from various occupations. The course was also taken by several women.

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Mine	Ore raised	Material discarded (sorted)	Ore milled	Bullion produced				Total value of bullion Canadian funds
				Gold content		Silver content		
				Quantity	Value, Canadian funds	Quantity	Value	
	tons	tons	tons	ounces		ounces		
PORCUPINE BELT								
Aunor	178,827	.....	178,827	74,347.000	$ 2,693,984	5,426	$ 4,504	$ 2,698,488
Bonwhit	67,009	.....	67,009	25,119.007	902,615	.....	.....	902,615
Broulan Reef	138,066	400	137,666	35,040.144	1,257,750	4,157	3,492	1,261,242
Buffalo Ankerite	118,832	.....	117,795	18,933.432	647,799	1,668	1,381	649,180
Coniaurum	129,325	.....	129,325	29,669.340	1,014,534	5,088	4,228	1,018,762
Delnite	158,786	.....	158,794	52,650.465	1,798,834	4,027	3,325	1,802,159
Dome	687,400	.....	687,400	168,794.692	5,776,759	32,411	26,926	5,803,685
Hallnor	134,236	.....	134,236	51,186.242	1,866,027	3,697	3,080	1,869,107
Hollinger	1,070,722	.....	1,068,778	302,421.000	10,358,345	58,805	46,862	10,405,207
Hugh-Pam	26,053	.....	26,053	7,862.000	280,610	.....	.....	280,610
McIntyre Porcupine	760,230	.....	760,230	211,075.368	7,222,134	40,795	33,787	7,255,921
Pamour	611,270	.....	611,270	56,430.170	1,931,558	5,458	4,539	1,936,097
Paymaster Consolidated	173,773	.....	174,454	39,509.208	1,352,474	10,524	8,734	1,361,208
Preston East Dome	239,549	.....	239,500	68,341,396	2,336,804	7,599	6,291	2,343,095
Ross (Hollinger)	110,421	.....	110,331	21,860.000	746,830	33,913	27,361	774,191
Miscellaneous[1]	.....	.....	.....	106.082	3,657	6	5	3,662
Total	4,604,499	400	4,601,668	1,163,345.546	$40,190,714	213,574	$174,515	$40,365,229
KIRKLAND LAKE AREA								
Kirkland Lake Gold	120,543	.....	120,543	44,827.846	$ 1,536,876	3,995	$ 3,326	$ 1,540,202
Lake Shore	263,595	.....	263,595	89,886.545	3,072,892	25,495	21,267	3,094,159
Macassa	139,660	.....	139,660	44,640.041	1,527,588	7,529	6,269	1,533,857
Sylvanite	171,745	.....	171,868	54,249.834	1,855,245	13,523	11,156	1,866,401
Teck-Hughes	218,879	.....	218,930	40,359.180	1,437,475	9,963	8,241	1,445,716
Toburn	45,052	3,752	41,300	15,143.307	578,825	3,065	2,416	581,241
Upper Canada	177,468	.....	177,468	49,020.842	1,676,819	21,280	17,597	1,694,416
Wright-Hargreaves	189,770	.....	189,770	79,253.228	2,707,487	14,026	11,604	2,719,091
Miscellaneous	.....	.....	.....	1.000	34	.....	.....	34
Total	1,326,712	3,752	1,323,134	417,381.823	$14,393,241	98,876	$ 81,876	$14,475,117
LARDER LAKE AREA								
Chesterville	179,209	.....	179,209	17,938.052	$ 615,939	969	$ 808	$ 616,747
Kerr-Addison	1,649,794	.....	1,649,836	348,113.576	12,550,166	18,038	14,905	12,565,071
Total	1,829,003	.....	1,829,045	366,051.628	$13,166,105	19,007	$ 15,713	$13,181,818
MATACHEWAN AREA								
Matachewan Consolidated	164,257	.....	164,407	14,668.902	$ 504,370	7,340	$ 6,181	$ 510,551
Young-Davidson	286,677	.....	287,265	25,475.000	869,066	5,091	4,177	873,243
Total	450,934	.....	451,672	40,143.902	$ 1,373,436	12,431	$ 10,358	$ 1,383,794
SUDBURY DISTRICT								
Curtin Prospecting Syndicate	.....	.....	.....	18.875	$ 638	3	$ 2	$ 640
Renabie	169,899	.....	169,674	40,818.602	1,396,526	12,225	10,146	1,406,672
Total	169,899	.....	169,674	40,837.477	$ 1,397,164	12,228	$ 10,148	$ 1,407,312
ALGOMA DISTRICT								
G. Calverley	50	.....	50	129.242	$ 4,382	21	$ 18	$ 4,400
Magino (E. M. Hartling)	.....	.....	.....	50.092	1,710	5	4	1,714
Total	50	.....	50	179.334	$ 6,092	26	$ 22	$ 6,114
THUNDER BAY DISTRICT								
Leitch	46,050	8,806	36,276	29,459.661	$ 1,005,791	902	$ 744	1,006,535
Little Long Lac	99,607	78	99,607	23,526.015	804,291	2,487	2,056	806,317
MacLeod-Cockshutt	410,837	.....	411,777	65,049.208	2,360,384	6,171	5,120	2,365,504
Magnet (clean-up)	.....	.....	.....	81.919	2,866	9	7	2,873
Theresa	13,293	112	13,181	1,935.229	64,828	79	66	65,643
Total	569,787	8,996	560,841	120,052.032	$ 4,238,160	9,648	$ 7,993	$ 4,246,902
KENORA AND RAINY RIVER DISTRICTS[1]								
Russell Cone	.....	.....	.....	39.893	$ 1,368	4	$ 3	$ 1,371
Total	.....	.....	.....	39.893	$ 1,368	4	$ 3	$ 1,371
PATRICIA PORTION								
Campbell Red Lake	178,930	.....	178,930	78,043.391	$ 2,858,740	5,389	$ 4,462	2,863,202
Cochenour Willans	67,361	.....	67,361	34,309.487	1,243,526	1,127	930	1,244,456
Hasaga	58,135	1,856	56,314	5,847.178	202,452	2,272	1,945	204,397
McKenzie Red Lake	94,731	11,443	83,288	21,459.743	734,511	5,436	4,499	739,010
Madsen Red Lake	304,251	.....	304,251	67,344.377	2,303,978	14,689	12,177	2,316,155
New Dickenson	101,993	.....	102,442	45,240.005	1,548,985	2,618	2,176	1,551,161
New Jason	5,431	.....	6,820	2,125.903	73,983	239	209	74,192
Pickle Crow	113,741	5,399	108,275	41,029.800	1,402,291	5,782	4,783	1,407,074
Starratt Olsen	156,709	.....	155,690	26,239.387	897,047	5,342	4,421	901,468
Howey Consolidated (clean-up)	.....	.....	.....	125.161	4,219	43	35	4,254
Total	1,081,282	18,698	1,063,371	321,764.432	$11,269,732	42,937	$ 35,637	$11,305,369
Total for gold mines	10,032,166	31,846	9,999,455	2,469,796.067	$86,036,012	408,731	$336,265	$86,373,026
Nickel-copper refining	.....	.....	.....	43,689.000	1,497,223	.....	.....	.....
Copper-gold-silver ores	.....	.....	.....	104.820	3,592	.....	.....	.....
Copper-lead-zinc ores	.....	.....	.....	110.682	3,793	.....	.....	.....
Total gold output, 1952	.....	.....	.....	2,513,700.569	$87,540,620	.....	.....	.....
CALENDAR YEAR 1951								
Porcupine Belt	4,404,809	3,757	4,397,645	1,062,952.120	$39,170,329	214,352	$203,280	$39,373,609
Kirkland Lake Area	1,366,566	3,330	1,363,053	454,984.949	16,920,968	112,754	106,104	17,027,072
Larder Lake Area	1,927,062	.....	1,926,655	352,135.452	13,196,088	18,771	17,705	13,213,793
Matachewan Area	566,349	.....	566,346	41,983.985	1,543,162	18,055	16,979	1,560,141
Sudbury District	89,036	.....	88,736	23,716.851	867,618	7,549	7,038	874,656
Thunder Bay District	646,506	12,444	634,568	137,289.497	5,050,462	9,294	8,725	5,059,187
Kenora and Rainy River District	.....	.....	.....	36.107	1,336	5	5	1,341
Patricia Portion	1,247,432	35,946	1,228,567	349,402.574	12,864,034	49,254	46,252	12,910,286
Total for gold mines, 1951	10,247,760	55,477	10,205,570	2,422,501.535	$89,613,997	430,034	$406,088	$90,020,085
Nickel-copper refining	.....	.....	.....	40,394.000	$ 1,488,519	.....	.....	.....
Copper-gold-silver ores	.....	.....	.....	80.361	2,961	.....	.....	.....
Total gold output, 1951	.....	.....	.....	2,462,975.896	$91,105,477	.....	.....	.....

[1] High-grading and recovery from scrapped machinery.

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-SECOND ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXII, PART 2, 1953

Mining Operations in 1952

Compiled by

D. J. FIELD

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO

Printed and Published by Baptist Johnston, Printer to the Queen's Most Excellent Majesty

1954

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MINING OPERATIONS IN 1952

Compiled by D. J. Field

Only those mines or mining properties that have reported actual mining or development operations in the year 1952 are included in this report.

ASBESTOS

Canadian Johns-Manville Ontario, Limited

Canadian Johns-Manville Ontario, Limited, was incorporated in March, 1950, with an authorized capitalization of 1,000 shares of $100 par value, all of which have been issued. The company is a wholly-owned subsidiary of the Canadian Johns-Manville Company, Limited. The officers are: L. M. Cassidy, chairman of the board; A. R. Fisher, president; Vandiver Brown, secretary; Roger Hackney, treasurer; A. Brown, E. C. Brockett, G. K. Foster, K. V. Lindell, F. A. Bromley, R. S. Gardner, A. G. Sinclair, and C. F. Rassweiler, vice-presidents and directors. The secretary's office is at 22 East Fortieth Street, New York 16, N.Y. The head office and mine office address is Matheson.

The company's main property, known as the Munro mine, is in Munro and Beatty townships, Porcupine area, district of Cochrane.

Operations were continued throughout 1952. A vertical two-compartment shaft, 314 feet deep, was sunk during 1951 on the C orebody on claim L.25634, Beatty township, and 1,176 feet of drifting and 2,972 feet of crosscutting were done at the 300-foot level. No further underground development work was done in 1952. Some 246,675 tons of overburden were stripped from the A orebody in Munro township in 1952. There were 595,100 tons of ore mined from the open pit on the A orebody, of which 566,348 tons were milled.

The dry-rock storage building, begun in the previous year, was completed in 1952, and a bunk-house, ten single-family dwellings, and a lunch room at the pit, were built. The concrete ore bin was enlarged.

Six diamond-drill holes, totalling 5,671 feet, were drilled on a property in Reeves township, about 40 miles southwest of Timmins. The construction of a mining access road to this property was begun.

R. D. Baker was mine manager, employing 294 men.

Van Packer Mines of Canada, Limited

Van Packer Mines of Canada, Limited, was incorporated in October, 1951. The capitalization is 4,000,000 class A preference shares of no par value; 3,944 Class B preference shares of $1 par value, issued to Teegana Mines, Limited; and 55,800 common shares of no par value. The officers and directors are: L. P. Brown, president; R. F. Van Alstyne, vice-president and chairman of the board; T. R. F. Langdon, secretary; R. L. Van Alstyne, treasurer; R. M. Ennis, managing director; A. T. Jensen and C. A. Pynn, directors. The head office and mine office address is Box 1000, South Porcupine.

The company held an option on claims in Deloro township, Porcupine area, district of Cochrane, owned by Teegana Mines, Limited. Operations were carried on from April 1 to August 29, in 1952. Some 2,932 tons of ore were mined from the open pit, and 2,822 tons were milled. After operations ceased, the property reverted to Teegana Mines, Limited.

An average of 17 men was employed.

COPPER

Coldstream Copper Mines, Limited

Coldstream Copper Mines, Limited, was incorporated in November, 1951, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,465,006 shares have been issued. The officers and directors are: L. J. Moreaux, president; B. P. Davis, secretary-treasurer; K. A. Davis, S. T. Douglass, John Allen, J. E. McKeon, and F. A. Best, directors. The head office is at 192 Bay Street, Toronto. The mine address is Kashabowie.

The company holds 4 patented and 40 unpatented claims in the area east of Moss and Ames townships, district of Thunder Bay. The property is about 90 miles west of Fort William and 8½ miles, by road, south of Kashabowie station on the Canadian National railway. It includes the former Tip Top mine.

Former operators sank an inclined two-compartment shaft, known as the No. 1, to a depth of 200 feet from surface and did considerable lateral work. There are also two shallow vertical shafts on the property, sunk during previous operations.

The present operators carried on work from May 8 to October 10, 1952. A new vertical three-compartment shaft, No. 4, was sunk to a depth of 351 feet, with levels at 180 and 325 feet. The following table shows the lateral work done:

Level	Drifting	Crosscutting
	feet	feet
180-foot	195	412
325-foot	160	435

Diamond-drilling in 1952 consisted of 2 holes, totalling 707 feet, from surface and 24 holes, totalling 4,264 feet, from underground.

A hoist-room, power plant, dry-house, machine shop, and assay office were built.

New equipment included a 36- by 24-inch, double-drum Ingersoll-Rand PE-1 hoist, two single-stage Broomwade air compressors individually driven by 140-horsepower Wakeshaw WAKD-6, full-diesel engines, a 190-horsepower Atlas Polar diesel engine, and a 156-kilovolt-ampere Westinghouse AC generator.

Some 5,050 tons of waste rock were hoisted.

P. S. Broadhurst was manager, employing 32 men on surface and 15 underground.

New Ryan Lake Mines, Limited

Ryan Lake Mines, Limited, was incorporated in March, 1947. The name was changed to New Ryan Lake Mines, Limited, in October, 1951. The authorized capitalization is 3,500,000 shares of $1 par value, of which 2,511,103 shares have been issued. The officers and directors are: G. S. Welsh, president; H. A. Campbell, vice-president; H. L. Simons, secretary-treasurer; R. D. Cumming and

Ethel Welsh, directors. The address of the head office and the mine is Matachewan.

The company's property consists of 10 claims, held under lease, in Powell township, Matachewan area, district of Timiskaming.

Early in 1952 the two-compartment vertical shaft was deepened from 105 to 209 feet, and a second level was established at 192 feet from surface. The development work in 1952 consisted of: drifting, 1,161 feet; crosscutting, 212 feet; raising, 195 feet. The total development at December 31, 1952, was as follows: drifting, 2,036 feet; crosscutting, 237 feet; raising, 521 feet. Diamond-drilling in 1952 consisted of 15 holes, totalling 2,215 feet, from underground.

A hoist-room and compressor-house, an addition to the mill, a warehouse, a boiler-room, and a dry-house were built during the year. The air hoist was converted to an electric drive.

The mill capacity was increased during the early part of the year, and the mill was shut down for two months while the alterations were being made. During the period of operation the mill treated 21,543 tons of ore. The copper concentrate was taken by truck to Elk Lake, then sent by rail to Noranda, Quebec.

G. S. Welsh is manager. An average of 39 men was employed.

COPPER-LEAD-ZINC

Ontario Pyrites Company, Limited

The Ontario Pyrites Company, Limited, was incorporated in July, 1942, with an authorized capitalization of 6,000,000 shares of no par value, 5,029,477 of which have been issued. The officers and directors are: Thayer Lindsley, president; J. M. Cunningham-Dunlop, vice-president; F. C. Sullivan, secretary-treasurer; A. G. Fulton and W. S. Morlock, directors. The head office is at 25 King Street West, Toronto. The mine address is R.R. 2, Chelmsford.

The company's two main holdings are the old Errington property in Creighton township and the Vermillion Lake property in Fairbank township, both in the district of Sudbury.

Errington Mine

There are several shafts on the Errington mine, all sunk during former operations. Nos. 1 and 2 shafts are both vertical and have three compartments. No. 1 is 619 feet deep, and No. 2 is 1,571 feet deep.

Plant buildings were put up at both shafts in 1952, and camp and office buildings were erected. A diesel-driven mining plant was installed at No. 1 shaft in April, and the dewatering of the mine was begun. The water had been lowered to the 500-foot level by July. Diamond-drilling operations were then begun on the exposed levels and continued for the rest of the year. The amount of drilling done from underground was 150 holes, having a total length of 25,902 feet. Thirty diamond-drill holes, totalling 7,541 feet, were drilled from surface.

The installation of an electrical mining plant at No. 2 shaft was under way at the end of the year.

Vermillion Lake Mine

A diesel-driven mining plant was installed at the Vermillion Lake property in 1952, and shaft sinking was begun on the south shore of the lake in September. By the end of the year the vertical three-compartment shaft had reached a depth of 450 feet, and levels had been cut at 300 and 450 feet.

The work in 1952 was done by contractors, who employed an average of 7 men at the Vermillion Lake mine and an average of 20 at the Errington. The company employed an average of five men. J. C. Kirkland is manager for the company.

FELDSPAR

Cameron or Ox Lake Mine

The Cameron or Ox Lake Mine is on the north half of lot 22, concession VII, Murchison township, district of Nipissing.

Production of feldspar in 1952 amounted to 1,314 tons.

W. B. Cameron was in charge, employing five men.

Canadian Flint and Spar Company, Limited

The Canadian Flint and Spar Company, Limited, was incorporated in March, 1930, under Dominion of Canada charter, with an authorized capitalization of 12,000 shares of no par value, all of which have been issued. The officers and directors are: N. J. Dunbeck, president; C. M. Edwards, secretary; R. P. Resch, vice-president and treasurer; J. P. Margeson, E. D. McDougal, Jr., and Edward Tubbs, directors. N. B. Davis is general manager. The head office is at 512 Victoria Building, Ottawa.

The company produced feldspar from two properties during 1952.

MACDONALD PIT

West half of lot 12, concession IX, Bathurst township, county of Lanark

Operations were carried on from January 1 to February 23. Feldspar, amounting to 381 tons, was mined from the north end of the pit.

T. McCann was foreman, and 13 men were employed.

RICHARDSON PIT

Lot 1, concession II, Bedford township, county of Frontenac[1]

Operations were carried on from January 1 to May 31. Feldspar was mined from the walls and centre island of the pit. Production amounted to 513 tons.

Earl Abrams was foreman, employing 12 men.

FLUORSPAR

Reliance Fluorspar Mining Syndicate, Limited

The Reliance Fluorspar Mining Syndicate, Limited, was incorporated in December, 1940, with an authorized capitalization of 35,000 shares of $1 par value, of which 20,005 have been issued. The officers and directors are: W. J. Symon, president; A. M. Symon, secretary-treasurer; Mrs. E. M. Arthur, director. The head office and mine office are at Madoc.

[1]In Volume LXI, part 2, this property was incorrectly described as being located in lot 1, concession I.

During the first nine months of 1952 the company carried on operations at the Perry Lake mine, on lot 11, concession XIII, Huntingdon township, Hastings county.

A sinking plant was installed and a vertical two-compartment shaft was sunk to a depth of 170 feet. Levels were established at 75, 120, and 165 feet below the collar. The following table shows the amount of lateral work done:

Level	Drifting	Crosscutting
	feet	feet
75-foot	85	70
120-foot	270	80
165-foot	177	100

About 1,793 tons of ore were hoisted, of which the mill treated 893 tons.

W. J. Symon was manager. An average of 12 men was employed.

GOLD

Aunor Gold Mines, Limited

Aunor Gold Mines, Limited, was incorporated in May, 1939, with an authorized capital of 2,000,000 shares of $1 par value, all of which have been issued. The officers and directors are: J. Y. Murdoch, president; C. H. Windeler, secretary; R. G. Rudolf, treasurer; J. R. Bradfield, W. S. Mitchell, N. C. Urquhart, and K. C. Gray, directors. The head office address is Bank of Nova Scotia Building, Toronto. The mine address is Box 2001, Timmins.

The company owns nine claims and holds a 99-year lease on two others, in Deloro township, Porcupine area, district of Cochrane.

Mining and milling operations continued throughout 1952. The vertical three-compartment No. 1 shaft is 3,082 feet deep. No sinking was done in 1952. The following development work was done during the year: drifting, 1,576 feet; crosscutting, 691 feet; raising, 2,119 feet. The total amount of development work to the end of 1952 is as follows: drifting, 50,812 feet; crosscutting, 11,874 feet; raising, 28,664 feet. Diamond-drilling in 1952 consisted of 477 holes, totalling 37,779 feet, all from underground.

Some 178,827 tons of ore were mined and milled.

The following is taken from the manager's report for the year ending December 31, 1952:

Production

Mining was carried on between the 875-foot and the 2,125-foot levels. Tonnage mined was slightly higher than that of the previous year, 489 tons per calendar day as compared with 482 for 1951; and the average grade was 0.426 ounces of gold per ton as compared with 0.381 for 1951.

Development

Drifting west on the 2,900-foot level was continued, progress being slow owing to the heavy ground encountered. The total advance was 565 feet; at the year's end this drift had reached a point 850 feet from the projected ore zone and 1,950 feet from the Aunor-Delnite boundary.

The drift driven by Delnite Mines, Limited, from the west into the Aunor property, on the 2,500-foot level, was stopped at a point 547 feet east of the Aunor-Delnite boundary. Diamond-drilling from this drift and from the 2,125-foot level has indicated continuity of ore between the 2,125-foot and the 2,900-foot levels.

Following is a summary of development including that done from the Delnite workings:

	Feet
Drifts and drift slashing	2,414
Raises and raise slashing	710
Diamond-drilling	37,779

Ore Reserves

At the end of the year, the ore reserves above the 2,125-foot level are as follows:

	Tons	Percent	Ounces of gold per ton
Broken	11,000	1.5	0.268
Proved	710,000	96.6	0.374
Probable	14,000	1.9	0.292
Total	735,000	100.0	0.371

New ore developed during the year was 194,000 tons. Ore sent to the mill was 178,827 tons. From information available, there is no ore remaining to be mined above the 1,125-foot level at the present price of gold. Approximately 25,000 tons of ore, in the form of sill floors, remain to be mined between the 1,125- and 1,375-foot levels.

MILLING STATISTICS

	1952	To date
Tons milled ..... tons	178,827	2,024,991
Tons milled per calendar day ..... tons	488.6	449.0
Average gold content per ton ..... ounces	0.426	0.349
Average tailings loss per ton ..... ounces	0.0103	0.0088
Total recovery ..... percent	97.58	97.47
Total production ..... ounces	74,347.5	723,252.2
Value of total production	$2,680,476	$26,874,837
Recovery per ton	$14.99	$12.65

SOURCES OF ORE MILLED, 1952

	Tons	Percent
Development	6,127	3.4
Drawn above 1,000-foot level	2,200	1.2
Drawn from 1,125-foot level	400	0.2
Drawn from 1,250-foot level	7,800	4.4
Drawn from 1,375-foot level	17,500	9.8
Drawn from 1,500-foot level	44,500	24.9
Drawn from 1,625-foot level	20,500	11.5
Drawn from 1,750-foot level	15,400	8.6
Drawn from 1,875-foot level	26,100	14.6
Drawn from 2,000-foot level	10,000	5.6
Drawn from 2,125-foot level	28,300	15.8
Total	178,827	100.0

Plant

A plant for treating timber against rot was constructed and put into operation during the year.

An average of 391 men was employed, of whom 286 were underground and 105 on surface. R. E. Findlay is manager.

Banner Porcupine Mines, Limited

Banner Porcupine Mines, Limited, was incorporated in June, 1945, with an authorized capitalization of 3,000,000 shares of no par value, of which 1,936,843 have been issued. The officers and directors are: George Bannerman, president; B. W. Lang, vice-president; R. A. Cranston, secretary-treasurer; J. T. Gauthier and A. R. Harkness, directors. The head office is at 372 Bay Street, Toronto. The mine address is Pamour.

The company owns 14 claims in Whitney and Tisdale townships, Porcupine area, district of Cochrane.

The property is operated under the management of Broulan Reef Mines, Limited, and further reference to the work appears under that company's name.

During 1952 the long drive on the 650-foot level from the Reef property was extended a further 825 feet into Banner ground. No development work was done in the old Canusa shaft area.

Diamond-drilling consisted of seven holes, totalling 5,072 feet, from underground.

There was no production in 1952. Employment figures are included in the report for Broulan Reef Mines, Limited. W. F. Brown is mine manager.

Bonwhit Mines, Limited

Bonwhit Mines, Limited, was incorporated in September, 1951, with an authorized capitalization of 100,000 shares of no par value, of which 90,005 have been issued. The officers and directors are: B. W. Lang, president; W. F. James vice-president; T. C. Newman, secretary-treasurer; F. G. Lawson and F. J. Bowley, directors. The head office is at 372 Bay Street, Toronto. The mine address is Pamour.

The company, a wholly-owned subsidiary of Broulan Reef Mines, Limited, owns that part of the Bonetal mine which was developed from the Reef shaft. The property is in Whitney township, Porcupine area, district of Cochrane, and forms part of the group operated by Broulan Reef Mines, Limited. Further information regarding the operation and production figures appear under Broulan Reef Mines, Limited.

The following table shows the amount of underground development work done during 1952 and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1952	Total	1952	Total	1952	Total
	feet	feet	feet	feet	feet	feet
650-foot	694	728	.....	.....	171	171
800-foot	138	928	.....	77	146	169
970-foot	.....	1,447	.....	83	278	669

Diamond-drilling consisted of 81 holes, totalling 10,235 feet, from underground.

W. F. Brown was mine manager. The employment figures given for Broulan Reef Mines, Limited, include the men employed in the Bonwhit section.

Broulan Reef Mines, Limited

Broulan Reef Mines, Limited, was incorporated in June, 1951, with an authorized capitalization of 6,000,000 shares of $1 par value, of which 5,961,142 have been issued. The officers and directors are: B. W. Lang, president; W. F. James and F. G. Lawson, vice-presidents; D. R. Michener, secretary-treasurer; J. B. Streit, F. H. Snyder, and C. C. Richardson, directors. The head office is at 372 Bay Street, Toronto. The mine address is Pamour.

The company owns the Broulan Reef mine and part of the old Bonetal mine in Whitney, Murphy, and Tisdale townships, Porcupine area, district of Cochrane.

It also operates the property of its wholly-owned subsidiary company, Bonwhit Mines, Limited,[1] and the properties of Banner Porcupine Mines, Limited,[2] and Hugh-Pam Porcupine Mines, Limited,[3] all in the same group.

During the first half of 1952 the vertical three-compartment No. 1 Reef shaft was sunk a further 400 feet to a total depth of 1,550 feet, and new levels were cut at 1,270 and 1,420 feet below the collar. Sinking was suspended in July, but will be resumed early in 1953.

The following table shows the underground development done during 1952, and the total, from the Reef shaft:

Level	Drifts		Crosscuts		Raises	
	1952	Total	1952	Total	1952	Total
	feet	feet	feet	feet	feet	feet
200-foot	.....	1,139	.....	579	.....	416
350-foot	.....	2,104	119	467	60	1,162
500-foot	478	2,083	.....	525	199	1,152
650-foot	.....	2,499	.....	689	312	966
800-foot	41	2,234	.....	684	.....	988
970-foot	.....	2,447	.....	734	.....	727
1,120-foot	1,678	1,678	496	496	300	300

A 100- by 70-inch, double-drum Nordberg hoist was installed at the Reef shaft in December.

Diamond-drilling in the Reef shaft area in 1952 consisted of 176 holes, totalling 19,414 feet, all from underground.

The vertical three-compartment No. 1 Broulan shaft is 675 feet deep. A vertical two-compartment winze runs from a depth of 630 feet to a total depth of 1,002 feet below the surface. No further sinking was done on it in 1952.

The following table shows the amount of development work from the Broulan shaft and winze during 1952, and the total:

Level	Drifts		Crosscuts		Raises	
	1952	Total	1952	Total	1952	Total
	feet	feet	feet	feet	feet	feet
173-foot	.....	3,164	.....	1,000	.....	3,576
273-foot	.....	3,177	.....	794	.....	1,582
398-foot	.....	1,551	.....	918	.....	1,685
523-foot	.....	7,770	.....	482	131	1,429
650-foot	.....	318	.....	330	.....	337
630-foot (winze)	.....	467	.....	136	96	335
755-foot (winze)	.....	.....	.....	252	38	225
880-foot (winze)	98	98	.....	.....	.....	.....

The following is taken from the mine manager's report for the year ending December 31, 1952:

REEF MINE

Production and Treatment

During the year, 94,741 tons of ore were mined and milled. Production was 27,513.5 ounces of fine gold valued at $987,701. Average recovery was 0.29 ounces of gold or $10.43 per ton milled.

[1]See page 7.
[2]See page 6.
[3]See page 31.

Mining

In addition to the exploration and development work done during the year, the following work was done for other companies:

1) 602 feet of drifting, 65 feet of crosscutting, 140 feet of raising, 3,020 tons of slashing, 3,615 feet of diamond-drilling, and the mining and hoisting of 26,054 tons of ore for Hugh-Pam Porcupine Mines, Limited;
2) 831 feet of drifting and 4,482 feet of diamond-drilling for Banner Porcupine Mines, Limited;
3) considerable work for the wholly-owned subsidiary Bonwhit Mines, Limited.

Ore Reserves

Proven ore reserves are calculated to be 339,558 tons having an average uncut grade of 0.47 ounces of gold per ton or a cut grade of 0.26 ounces per ton.

Additions to Plant and Equipment

During the year work was practically completed on the following items, which were well in hand at the start of the year:

1) installation of a sprinkler system, including necessary tanks, pumps, and pump-houses;
2) an addition to the dry-building including a full basement, which is used for a warehouse, and complete renovation of the old dry-building;
3) an addition to the hoist house and installation of an air compressor moved from the Broulan mine.

Work on the following items was started and completed during the year:

1) a concrete block addition to the hoist-house and the installation therein of a 100-inch-diameter, double drum Nordberg hoist capable of hoisting from an ultimate depth of 4,000 feet;
2) the headframe was raised 16 feet, and two new sheave wheels were installed.

BONWHIT MINE

Production and Treatment

During the year, 67,009 tons of ore were mined and milled. Production totalled $902,615, representing 25,119 ounces of fine gold. Average recovery was 0.375 ounces of gold or $13.47 per ton milled.

Ore Reserves

Proven ore reserves are calculated to be 146,771 tons having an average uncut grade of 0.62 ounces of gold per ton or a cut grade of 0.35 ounces.

BROULAN MINE

Production and Treatment

During the year, 42,925 tons of ore were mined and milled. Production totalled $273,541, representing 7,526.6 ounces of fine gold. Average recovery was 0.175 ounces of gold or $6.37 per ton milled.

Mining

There is still a small tonnage of marginal-grade ore remaining in the winze area. The cost of mining it and the price received for gold will determine how much longer we can continue to mine and mill this material.

MILLING FOR ALL MINES

During the year, the mill treated 230,729 tons of ore from which were recovered 68,021.64 ounces of gold and 4,157.38 ounces of silver. Recovery averaged 98.136 percent. This tonnage was derived from the four mines as follows: Reef, 94,741 tons; Broulan, 42,925 tons; Bonwhit, 67,009 tons; and Hugh-Pam, 26,054 tons.

The following table shows a comparison of some of the milling data for the past five years:

Year	Total milled	Tailings
	tons	ounces per ton
1948	161,752	0.008
1949	194,776	0.006
1950	189,426	0.005
1951	221,441	0.005
1952	230,729	0.0056

GENERAL

Operating costs for the full 230,729 tons of ore mined and milled from all sources during the year, including head-office administration and general expense, amounted to $6.48 per ton.

Average earnings of all hourly-rated employees during the year 1952 was $71.81 per week.

W. F. Brown is mine manager, employing an average of 246 men of whom 147 were underground, and 99 in the mill and on general surface work. These figures include the men employed at all the properties operated by the company.

Buffalo Ankerite Gold Mines, Limited

Buffalo Ankerite Gold Mines, Limited, was incorporated in October, 1932, with an authorized capitalization of 1,000,000 shares of $1 par value, of which 997,500 have been issued. The officers and directors are: Dr. F. R. Burton, president and general manager; H. J. Carmichael, first vice-president; A. J. Baldeck, second vice-president; H. B. Clearihue, secretary-treasurer; J. D. Barrington, C. C. Calvin, Everett Bristol, Dr. W. F. James, and F. V. C. Hewitt, directors. The address of both the head office and the mine is Box 340, South Porcupine. The secretary's office is at 320 Bay Street, Toronto.

The company's main property, containing about 1,286 acres, is in Deloro township, Porcupine area, district of Cochrane. The mine and mill continued to operate throughout 1952, but at the end of the year preparations were being made to suspend all operations because of the exhaustion of ore reserves.

Work on the adjoining Tisdale or Dobie claims, held under option in 1951, was continued in 1952. In August a subsidiary company, Tisdale-Ankerite Gold Mines, Limited, was formed. Further information regarding the new company and the development work and production appears on page 80.

Operations on the Buffalo Ankerite property are conducted through the vertical five-compartment, No. 5 shaft, which is 3,996 feet deep. There was no sinking in 1952. The following development work was done during the year: drifting, 1,365 feet; crosscutting, 634 feet; raising, 694 feet. Total development to the end of 1952 is as follows: drifting, 108,714 feet; crosscutting, 68,285 feet; raising, 42,512 feet. Diamond-drilling in 1952 consisted of 39 holes, totalling 11,592 feet, all from underground.

The following is taken from the mine manager's report for the year ending December 31, 1952:

Exploration and Development

Crosscutting and drifting were done on the No. 30 vein structure on the 3,600- and 3,750-foot levels. Although several short lengths that graded 0.20 ounces per ton across widths ranging from 3 to 7 feet were developed, none of them persisted more than a few feet vertically, and after a small amount of stoping, work was discontinued.

Diamond-drilling thoroughly tested the favourable zones in the general area about the No. 5 shaft, from the 3,450-foot level to 370 feet below the 3,900-foot level. Results were discouraging and warranted no further exploration in that block of ground.

Ore Reserves

	Tons	Ounces per ton	Grade (at $35 per ounce)	Value
In place	1,417	0.14	$4.90	$ 6,943.30
Broken	5,622	0.19	6.65	37,386.30
Total	7,039	0.18	$6.30	$44,329.60

Mining

More than 60 percent of the stoped ore came from the wide, low-grade orebodies between the 725- and 1,050-foot levels; 30 percent from stopes astride the Paymaster boundary, from the 1,400- to 2,000-foot level; the rest from below the 3,250-foot level. As a greater proportion of ore was drawn from wide, low-grade stopes, the mining cost was reduced from $4.50 per ton for 1951 to $3.99 per ton for 1952.

Milling

In 1952 the mill treated 103,140 tons of ore, an average of 281.8 tons per day. Bullion recovery was 16,697.052 ounces, or 0.16 ounces per ton. Total production, including silver, was valued at $572,786 or $5.55 per ton. In 1951, 117,777 tons were milled with a recovery of $7.83 per ton. Mint returns for gold during 1952 averaged $34.32 per ounce as compared with $36.88 for 1951.

Costs

The costs per ton milled compared with 1950 and 1951 were as follows:

	1952	1951	1950
Exploration and development	$0.74	$1.86	$ 2.441
Mining	3.99	4.50	4.970
Milling	1.34	1.39	1.424
General mine expense	0.39	0.56	0.683
Administration	0.18	0.18	0 233
Depreciation, write-off	0.16	0.21	0.320
Deferred development, write-off	0.48	0.20	0.194
Royalties	0.14	0.15	0.031
Provincial taxes	.....	.....	0.047
Total	$7.42	$9.05	$10.343

Plant and Equipment

During the year, additions to fixed assets totalled $1,125.17, and $29,436.70 of surplus equipment was sold.

General

The labour supply was ample except in September and October when a considerable number of men left the company's employ owing to rumours of the mine's closing. Because of the uncertain future of the mine, the collective bargaining agreement of August 1, 1951, with Local 4436, United Steel Workers of America (CCL-CIO), was extended by mutual agreement.

Heating costs for the latter part of the year were considerably reduced by the use of wood shavings, which were in good supply.

An average of 187 men was employed during 1952, of whom 113 were underground and 74 on surface. These figures include the men employed in the Tisdale-Ankerite mine. C. E. Bowker was mine manager.

Campbell Red Lake Mines, Limited

Campbell Red Lake Mines, Limited, was incorporated in August, 1944, with an authorized capitalization of 4,000,000 shares of $1 par value, all of which have been issued. The company is a subsidiary of Dome Mines, Limited, which owns 2,265,105 shares of the stock. The officers and directors are: C. W. Michel, president; C. C. Calvin, vice-president and secretary-treasurer; J. G. McCrea, general manager; A. W. White, and Dr. W. F. James, directors. The head office is at 50 King Street West, Toronto. The mine address is Balmertown.

The company owns 27 claims, approximately 1,175 acres, in Balmer township, Red Lake area, Patricia portion of Kenora district.

Mining and milling operations continued throughout 1952. A total of 178,677 tons of ore was mined. The mill treated 178,930 tons, of which 253 tons came from the surface dump.

The following development work was done during the year: drifting, 7,120 feet; crosscutting, 1,070 feet; raising, 1,497 feet. The total amount of development

work at the end of 1952 was as follows: drifting, 31,873 feet; crosscutting, 10,282 feet; raising, 6,902 feet. Diamond-drilling in 1952 consisted of 18 holes, totalling 14,876 feet, from surface, and 119 holes, totalling 20,778 feet, from underground. There was no sinking in 1952. The vertical four-compartment shaft, on claim K.R.L.20071, is 1,170 feet deep.

The following is taken from the general manager's report for the year ending December 31, 1952:

During the year, 198,714 tons were hoisted of which 178,677 were ore, and 20,037 waste. In addition, 253 tons were sent to the mill from the surface stock pile.

The 178,930 tons of ore milled yielded bullion containing 78,043.391 ounces of gold, the average yield being 0.43617 ounces or 8.723 pennyweights per ton. All grades or ore will be expressed in pennyweights (dwt.) throughout this report. One pennyweight equals one-twentieth of an ounce troy weight. At $35 per ounce of gold, one pennyweight is worth $1.75 in Canadian funds. During the year the gold production was sold on the free market, the average price received was $36.63 per ounce as compared with $36.77 in 1951, and $37.99 in 1950.

The following statement gives the revenue and expenditure for the year:

OPERATING STATEMENT
(For the year ending December 31, 1952)

EARNINGS:	
Revenue from bullion production	$2,857,698.16
EXPENDITURES:	
Development	$339,859.67
Mining, including hoisting	546,436.12
Reduction	402,583.47
Refining and marketing	32,434.67
General and administrative expenses	154,179.53
Taxes other than income	2,001.26
Total	$1,447,494.72
OPERATING PROFIT FOR THE YEAR	$1,380,203.44

Mining

Broken ore, totalling 125,400 tons, remains in the stopes and on the surface ore dump, an increase of 7,800 tons from the previous year.

In all, 146,484 tons of a grade of 10.10 pennyweights were drawn from the stopes and sent to the mill.

All major stoping operations are above the 4th level or the 550-foot horizon.

Ore Reserves

The ore reserves are estimated at 763,900 tons, an increase of 132,200 tons over last year. The ore reserves include 125,400 tons of broken ore in the stopes and on the surface stock pile.

A summary of the distribution of ore in place, broken ore, and total ore mined to the end of 1952 is as follows:

SUMMARY OF ORE RESERVES AND EXTRACTION BY LEVELS

	Ore in place	Average grade	Broken ore in stopes	Total ore extracted from stopes to end of 1952
	tons	dwt.	tons	tons
Ore dump, surface	.....	.....	16,300	.....
Surface to 1st level	54,600	11.94	12,100	93,218
1st to 2nd level	59,100	11.93	19,000	127,993
2nd to 3rd level	54,600	10.89	42,200	92,669
3rd to 4th level	43,600	8.94	32,900	105,500
4th to 5th level	115,400	9.65	100	843
5th to 6th level	137,200	10.16	100	1,424
6th to 7th level	174,000	11.60	2,700	3,505
Total	638,500	10.75	125,400	425,152

Development

A total of 11,322 feet of development work was done during the year. This work was distributed between the 1st and 7th levels inclusive.

Diamond-drilling, totalling 35,654 feet, was done in search of new ore and as a guide to mining.

Ore Production

The mine produced 178,677 tons of ore, averaging 10.02 pennyweights, during the year. The stopes produced 146,484 tons, averaging 10.10 pennyweights, and the development work produced 32,193 tons, averaging 9.68 pennyweights. In addition, 253 tons, averaging 7.08 pennyweights, from the surface stock pile were sent to the mill.

Mill

The following are the results of milling operations:

Tons treated	tons	178,930
Average grade of ore treated	dwt. per ton	10.016
Recovery	dwt. per ton	8.723
Recovery	percent	87.09

The drop in recovery percentage from that of 1951 was due to a more refractory type of ore. The milling rate for the year is shown in the following data:

Period	Total Milled	Average per day milled
	tons	tons
1st quarter	45,320	498.02
2nd quarter	45,581	500.89
3rd quarter	43,593	473.83
4th quarter	44,436	483.00
Average	44,733	488.94

Costs

The expenditure on mining was $546,436.12, or $3.054 per ton milled.

The expenditure on development was $339,859.67, or $1.899 per ton milled.

Operating costs before depreciation, interest on income bond, and write-off of preproduction expenditures, were $8.257 per ton milled.

Capital Expenditures

Capital expenditures for the year were approximately $280,000. The principal items were the addition to the main substation and installation of three new transformers, ten new flotation cells for the mill, and replacement of the roaster stack, which was badly corroded, by a new one that has a firebrick lining to ensure longer life. A new tractor was bought to replace the one purchased in 1946.

To provide additional accommodation, ten new staff-houses were built on the townsite of Balmertown, and eight of the houses formerly on the company property were moved to the townsite and put on concrete basements.

General

A new zone, lying northwest of the mine workings and striking northwest, was opened on the 7th level for a distance of 800 feet and shows a grade well above mine average. This zone has also been opened on the 6th level for a distance of 600 feet of comparable grade.

Balmertown is now a registered townsite with 161 fully developed domestic lots and 12 fully developed business lots.

J. Chisholm is mine manager. An average of 239 men was employed, of whom 106 were underground, and 133 on surface work.

Central Porcupine Mines, Limited

Central Porcupine Mines, Limited, was incorporated in December, 1933, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 3,695,118 have been issued. The officers and directors are: C. H. E. Stewart, president; W. Samuel, vice-president; H. D. Poole, secretary-treasurer; J. M. Cunningham-

Dunlop, W. H. Woods, and T. M. Mungovan, directors. The head office is at 25 King Street West, Toronto. The mine address is Schumacher.

The property consists of 14 claims adjoining the south boundary of the Coniaurum mine, in Tisdale township, Porcupine area, district of Cochrane.

Mining operations were continued throughout 1952. The present operation is a joint effort by Central Porcupine Mines, Limited, and Coniaurum Mines, Limited. The actual work is being done under the direct supervision of the latter company, and further reference to it appears on page 19.

Preparations were continued for the sinking of a vertical three-compartment winze, below the 5,500-foot-level crosscut from the Coniaurum property, to a depth of 7,000 feet below surface. About 290 feet of crosscutting was done in 1952. The winze was sunk 20 feet below the level, and 125 feet of raising was done above the level to accommodate the headframe. One diamond-drill hole, 457 feet long, was drilled from underground.

W. O. Lafontaine is acting manager for Coniaurum. The employment figures are included in those given for Coniaurum Mines, Limited, on page 21.

Chesterville Mines, Limited

The Chesterville Larder Lake Gold Mining Company, Limited, was incorporated in March, 1907, with an authorized capitalization of 2,000,000 shares of $1 par value. In June, 1946, the name was changed to Chesterville Mines, Limited. All the shares have been issued. The officers and directors are: L. J. Kearns, president; H. J. Kearns, vice-president; E. V. Oag, secretary-treasurer; H. W. Knight, W. E. Young, W. F. James, and J. B. Streit, directors. The head office is at 330 Bay Street, Toronto. The mine address is Kearns.

The property is immediately east of the Kerr-Addison mine, in McGarry township, Larder Lake area, district of Timiskaming.

Mining operations were carried on from January 1 to September 4, 1952. No development work was done. The operation was confined to the extraction of all ore that could be profitably mined before the mine was closed. The mill was operated until December 4.

The vertical three-compartment No. 1 shaft is 2,799 feet deep.

The following table shows the total amount of development work when operations ceased:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
1st	2,015	1,587	1,513
2nd	3,797	1,457	2,241
3rd	1,703	1,370	1,923
4th	1,551	1,148	1,733
5th	1,290	969	925
6th	1,115	1,025	912
7th	879	1,147	1,016
8th	1,207	1,047	1,136
9th	1,945	1,251	1,308
10th	928	1,456	1,569
11th	876	1,386	1,431
12th	1,037	5,506	1,909
13th	1,124	2,047	1,303
14th [1]	.....	.....	.....
15th	1,136	2,147	2,844
16th [1]	.....	.....	.....
17th	792	1,996	2,470
18th	487	1,298	845
19th	110	3,367	385
20th	.....	1,182	830

[1]These levels were not developed.

The following is taken from the manager's report for the year ending December 31, 1952:

In 1952 a total of 179,209 tons was milled with an average recovery of 0.098 ounces or $3.13 per ton. In addition there were 1,654.713 ounces of gold recovered from mill clean-up operations.

No development work, either lateral or vertical, or any exploratory or development drilling was done in 1952. The only work was in connection with the extraction of pillars and blast-hole diamond-drilling.

Operating costs at the mine, less head-office charges, in 1952 were $3.36 per ton milled as compared with $2.55 in 1951. The increase was due to salvage work done concurrently with the mining operations and also to the reduction in tons milled in the shorter mining period in 1952. These operating costs for 1952 do not include the costs of the final underground salvage or the mill clean-up.

Mine Production

The following table shows production figures, including clean-up for the year, and the cumulative totals since the beginning of operations:

	1952	To date
Milled....tons	179,209	3,251,064
Average milled per day....tons	654	669
Total gold recovered....ounces	17,938	358,711
Total silver recovered....ounces	968	19,305
Total value of production	$616,066	$13,308,279
Recovery per ton	$3.44	$4.09
Tailings loss per ton	$0.30	$0.34
Mill clean-up, total gold recovered (value included in that of value of production above)....ounces	....	1,654.7

Stoping

The following table shows the sources from which ore was drawn during the year:

Zone	Tons	Percent of total tons	Grade
			ounces per ton
A	27,622	15.4	0.106
B	10,539	5.9	0.099
C	27,374	15.3	0.090
D	79,157	44.1	0.122
F	2,798	1.6	0.059
G	1,970	1.1	0.074
J	29,749	16.6	0.105
Total	179,209	100.0	0.109

All ore was derived from the extraction of pillars or previously broken rock.

Summary of Operations per Ton Milled

	1951 (313,948 tons)	1952 (179,209 tons)	To end of 1952 operations (3,251,064 tons)
Costs:			
Development	$0.10	none	$0.35
Mining	1.19	$1.84	1.50
Milling	0.92	1.11	0.87
Administration and general	0.35	0.40	0.47
Total mine operating expense	$2.55	$3.36	$3.19
Bullion recovered, operating	$2.49	$3.13	$4.08
Mine operating profit or loss	— 0.06	— 0.23	0.89
Deferred development charges	0.05	none	0.34
Capital expenditures	— 0.07	— 0.27	0.21
Total mine cost to produce $1.00 gold, excluding clean-up	1.05	1.07	0.87

Exploration

During the year, a total of 149 properties was brought to our attention, of which 52 were examined.

The Dickson property in Rickaby township of western Ontario was explored by diamond-drilling. No orebody was found that could be mined profitably.

The mill building and equipment and all underground equipment were sold to East Rim Nickel Mines, Limited. The mine office, change-house, recreation hall, eleven residences, and some stores were not included in the sale and will be disposed of separately. The property is being retained by the company.

An average of 135 men was employed, of whom 62 were in the mine, and 73 on the surface. M. D. Calder was manager.

Cochenour Willans Gold Mines, Limited

Cochenour Willans Gold Mines, Limited, was incorporated in April, 1936, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,961,555 have been issued. The officers and directors are: W. M. Cochenour, president; G. M. Huycke, secretary-treasurer; E. C. Cochenour, J. M. Macintosh, and Oliver Hall, directors. The head office is at 501 Dominion Bank Building, Toronto. The mine address is Cochenour.

The company's property is located in Dome township, Red Lake area, Patricia portion of Kenora district.

Mining and milling operations continued throughout 1952. The vertical three-compartment No. 1 shaft was sunk a further 519 feet to a total depth of 1,207 feet, and new levels were established at depths of 775, 875, 975, 1,075, and 1,175 feet. No sinking was done on the vertical three-compartment No. 2 shaft, which is 446 feet deep. During the year the following development work was done: drifting, 4,023 feet; crosscutting, 1,918 feet; raising 2,814 feet. Diamond-drilling consisted of 25 holes, totalling 15,617 feet, from surface, and 339 holes, totalling 38,126 feet, from underground.

A new concrete-block hoist-house and a new oil-house were built. A 72- by 48-inch, PE-1 Canadian Ingersoll-Rand hoist was installed at the end of the year at the No. 1 shaft and put into operation in January, 1953. A Massco McCool pulverizer, with 9-inch discs, was added to the assay-office equipment.

Some 67,361 tons of ore were hoisted and milled, a daily average of 184 tons.

The following is taken from the manager's report for the year ending December 31, 1952:

Production

In this past year, 34,309.487 ounces of fine gold and 1,126.750 ounces of fine silver were produced from the mining and milling of 67,361 tons of ore. The average price received per ounce of gold was $36.2444, and per ounce of silver $0.82514.

Period	Production	Tons	Recovery per ton	Total cost per ton	Tails	Heads
1952	$1,244,456.40	67,361	$18.47	$16.29	$2.09	$20.56
1951	1,320,839.10	70,531	18.72	14.63	2.56	21.28
1950	1,445,050.07	71,171	20.30	12.80	2.39	22.69
1949	1,071,610.11	83,891	12.77	10.93	1.31	14.08

All-time production, from inception of milling in 1939 to December 31, 1952, amounts to $13,472,904.26, from the treatment of 805,055 tons. The average grade milled is 0.4957 ounces or $17.35 per ton (gold at $35 per ounce.)

Operating Costs

	Cost per ounce		Cost per ton	
	1952	1951	1952	1951
Development	$ 4.039	$ 3.503	$ 2.057	$ 1.754
Diamond-drilling, underground	1.436	1.244	0.732	0.623
Diamond-drilling, surface	0.211	.....	0.107	.....
Mining	8.885	9.146	4.525	4.580
Crushing and conveying	0.400	0.355	0.204	0.178
Milling	4.128	3.905	2.102	1.955
General expense	1.733	2.044	0.883	1.023
Deferred development	0.198	0.248	0.101	0.124
Depreciation	3.329	2.814	1.695	1.409
Head office	1.048	1.132	0.534	0.567
Taxes	0.946	4.350	0.482	2.179
Total	$26.353	$28.741	$13.422	$14.392

Development Exploration

The following table of statistics outlines the development work completed during the year, and also shows, for comparative purposes, the footages for the past four years. Development advance was increased by 1,191 feet; underground drilling by 3,820 feet; and surface diamond-drilling by 3,317 feet compared with the previous year.

Level	Drifts	Crosscuts	Raises	Total
	feet	feet	feet	feet
150-foot	.....	.....	253	253
275-foot	367	141	597	1,105
375-foot	1,034	186	516	1,736
475-foot	1,257	95	769	2,121
575-foot	1,365	384	573	2,322
675-foot	.....	22	106	128
775-foot	.....	1,090	.....	1,090
Total	4,023	1,918	2,814	8,755

	1952	1951	1950	1949
	feet	feet	feet	feet
Shaft-sinking	519	.....	.....	.....
Drifting	4,023	3,362	2,489	4,230
Crosscutting	1,918	2,257	2,232	907
Raising	2,814	1,945	1,855	1,637
Total	8,755	7,564	6,576	6,774
Diamond-drilling:				
Underground	38,126	34,306	35,984	52,273
Surface	3,317	.....	.....	.....
Marcus property	13,300	.....	.....	.....
Test holes	8,605	5,384	12,284	22,817

The outstanding developments of the year have been:

1) On the 575-foot level the downward extensions of the 2-406 and 2-410 ore have proved good.

2) The large area of flat-dipping ore on the 439 structure that extends for 300 feet east-west and 100 feet north-south.

3) An eastward extension of the 439 ore on the 375-foot level known as the 341 stope is high grade and apparently extends up dip to the lake bottom. Grouting is being done so that stoping can be extended to within safe mining limits of the lake bottom.

Two other interesting developments were:

1) The 443 area was successfully grouted, and then an exploratory crosscut disclosed several short segments of high-grade ore bounded by strong east-west and north-northwest faults. Further drilling to the northwest has now found what offers to be a less broken section of the ore structure, but grouting is still necessary.

2) The 308W crosscut to investigate the high-grade diamond-drill intersections obtained in 1951 found an area of strongly sheared and altered lavas highly mineralized with pyrite. Visible gold was found in pyritic rock with lenses of quartz and sulphides, but the average values obtained did not warrant stoping. Further exploration is now being done in the hopes of finding a better defined and higher-grade section nearer the "Point Rock."

The sinking of the shaft for another 500 feet was a major step in the development program and has been followed by the extension of the 1,000-foot crosscut on the 775-foot level to the "33" and "35" orebodies. This area was just being reached at the year's end.

Another favourable area is below the 506-510 section which is 1,500 feet from the main shaft, and a crosscut is now being started to test this ore on the 675-foot level.

Mining

A table covering the source of ore by levels and grade is set out below covering the year under review. For comparison purposes details of the three previous years are included. The fiscal year ends December 31.

Level	1952		1951		1950		1949	
	Tons	Grade	Tons	Grade	Tons	Grade	Tons	Grade
150-foot	898	$ 7.65	543	$11.86	7,226	$11.29	7,477	$11.66
275-foot	3,644	12.21	5,768	15.86	22,489	23.02	39,939	15.52
375-foot	7,772	18.12	19,361	21.70	26,173	30.00	14,802	12.08
475-foot	26,694	22.29	8,244	25.25	5,697	14.68	18,308	13.22
575-foot	18,353	22.25	24,605	23.34	7,470	15.04	3,347	15.72
675-foot	10,000	18.88	12,010	16.65	2,116	16.37	18	4.44
Total	67,361	$20.56	70,531	$21.28	71,171	$22.69	83,891	$14.08

A gradual change to the use of light-weight rock drills mounted on pneumatic pusher legs, using tungsten-carbide insert steel, is under way. There are many apparent benefits to be derived through their use, and a complete change-over is now considered advisable. These benefits include: a saving of time in set-up, faster drilling, reduced maintenance cost, lower drilling cost per foot. They also offer greater ease in the training of new employees.

The ore was mined from 35 working places during the year, of which 17, in 5 groups, produced 78 percent of the gold from 60 percent of the tonnage as follows:

Group	Tons	Grade	Ounces
439	14,153	0.58	8,234
537	10,942	0.68	7,470
2-408, 10, 12	6,303	0.93	5,906
639	7,237	0.67	4,852
341 N. and S.	2,784	0.85	2,399
	41,419	0.70	28,861

Milling and Metallurgy

The details of the mill operation are shown in the following summary. For purposes of comparison, the three previous years are also shown:

	1952	1951	1950	1949
Total milled.....tons	67,361	70,531	71,171	83,891
Operating time.....percent	97.9	97.8	95.9	90.6
Milled daily.....tons	184	193.2	194.9	229.8
Average millhead, gold.....ounces	0.5671	0.5692	0.5987	0.3827
Average flotation tail, gold.....ounces	0.0312	0.0468	0.0491	0.0277
Average calcine tail, gold.....ounces	0.0264	0.0217	0.0143	0.0097
Recovery.....percent	89.87	88.00	89.41	90.45

Close analytical supervision has been followed in the milling and roasting procedures throughout the year. It is indeed pleasing to note the improvement recorded in the percentage of extraction.

Safety

The company and its employees have been honoured this year by winning of the John T. Ryan Regional Trophy Mine Safety Award for the Province of Ontario. We quote from the report of the Institute Committee:

"To Cochenour Willans Gold Mines, Limited, goes the distinction of being the first mine in northwestern Ontario to win the Trophy for Ontario as a whole. Having had only one compensable accident of more than six days' duration for an average of 155 men employed through the year, this Red Lake operation was also runner-up to Canadian Malartic for Dominion honours. This deserving win is due in no small part to the stimulating effects of the Safety Group meetings sponsored in recent years by the Mine Superintendents in the Red Lake area."

Summary

Outside exploration was confined to a drilling campaign on the optioned Marcus property, an expenditure of $41,428.15. The work gave us some encouragement as well as good geological information. This property is well located, and I recommend a further expenditure of $20,000 to complete the cross-sectional drilling of the property.

Expenditures on the property under option, the heavy write-offs of the complete shaft deepening, and all the work on the 775-foot level, contributed to a smaller net profit shown during the year, but the mine maintained a strong cash position.

An average of 148 men was employed, of whom 75 were underground, and 73 on the surface. C. A. Sheehan is mine manager.

Conecho Mines, Limited

Conecho Mines, Limited, was incorporated in 1950, with an authorized capitalization of 3,500,000 shares of $1 par value, of which 2,666,671 shares have been issued. Of the issued shares, 600,000 are pooled. The officers and directors are: G. A. Fallis, president; W. C. Fisher, vice-president; L. F. Yusko, secretary-treasurer; S. A. Hayden, E. T. Donaldson, and J. P. Arnott, directors. The head office is at 44 King Street West, Toronto.

The company owns 20 claims in Echo township and 1 in McAree township, district of Kenora.

The property adjoins that of Newlund Mines, Limited, and the underground exploration work was done from the 200-foot level of the Newlund mine between September 1 and December 15, 1952. About 257 feet of drifting and 468 feet of crosscutting were done, and 28 diamond-drill holes, totalling 2,659 feet, were drilled.

P. E. Young was chief engineer. The labour was supplied by Newlund Mines, Limited, and the employment figures are included in that company's report on page 60.

Coniaurum Mines, Limited

Coniaurum Mines, Limited, was incorporated in July, 1929, with an authorized capitalization of 3,000,000 shares of no par value, of which 2,766,743 have been issued. The officers and directors are: J. M. Cunningham-Dunlop, president; A. L. Bishop, vice-president; A. G. Fulton, secretary; W. B. Malone, treasurer; Thayer Lindsley, W. S. Morlock, T. H. Rea, J. Redington,[1] and F. D. Reid, directors. The head office is at 25 King Street West, Toronto. The mine address is Schumacher.

The main property consists of 22 claims, adjoining the McIntyre Porcupine mine, in Tisdale township, Porcupine area, district of Cochrane. It includes the former Goldale, Newray, Armstrong-Booth, and Strong Bow properties.

Mining and milling continued throughout 1952. There was no sinking done on the company's own property.[2] The following development work was done:

[1]Deceased January 1, 1953.

[2]A table showing shafts sunk and footage appears in Ont. Dept. Mines, Vol. LVIII, 1949, pt. 2, p. 20.

drifting, 3,888 feet, crosscutting, 2,701 feet; raising, 4,146 feet. A further 290 feet of crosscutting was done in Central Porcupine ground to reach the site of the winze being sunk below the 5,500-foot horizon under joint agreement between the two companies.

The following is taken from the report of the acting manager, for the year ending December 31, 1952:

Exploration and Development

Underground development was carried out in various sections of the mine from the 1,000-foot level to the deepest, or 5,500-foot, level. Particular attention was again given to the No. 68-vein zone lying in "99" greenstone flow, and this work developed short shoots of ore on the 1,000- and 1,750-foot levels. Crosscuts in the same zone on the 1,750- and 2,300-foot levels have not yet reached their objectives and are being continued. A crosscut south, to explore the zone on the 3,500-foot level, failed to find ore and was stopped.

In the No. 2-winze section, additional ore was outlined in the No. 34-vein zone on the 3,750- and 4,000-foot levels and on the 3,900-foot sublevel. A considerable length of drifting in ore, in satisfactory geological conditions, was carried out on the 3,750-foot level in the No. 57-vein zone, but subsequent work on this proved disappointing.

The total development footage for the year, including drifting, crosscutting, and raising, amounted to 11,700 feet, a decrease of 902 feet from the previous year. Total ore recovered from development operations was 12,676 tons or 9.8 percent of all ore milled.

The following is a summary of the principal ore sections developed in drifting and raising during the year.

Level	Heading	Vein No.	Length	Width	Grade
			feet	feet	ounces per ton
1,000-foot	Drift	10E	74	2.8	0.28
	Drift	68A	61	3.3	0.27
1,750-foot	Drift	71	84	3.5	0.29
3,750-foot	Drift	57	232	3.4	0.24
	Raise	34C	182	3.5	0.27
3,900-foot	Drift	34A	245	4.0	0.31
4,000-foot	Drift	34S.H.	209	3.7	0.30
	Raise	34S.H.	147	3.1	0.29
4,750-foot	Raise	57	181	3.0	0.22
5,000-foot	Drift	66	140	2.8	0.33
	Raise	66	140	2.6	0.39
5,250-foot	Raise	67	255	2.6	0.28
5,500-foot	Raise	47	85	3.1	0.27

Diamond-Drilling

A total of 31,949 feet of underground diamond-drilling in 133 holes was completed during the year.

A considerable portion of this drilling was carried out to continue exploration of the "99" greenstone on the levels down to the 2,300-foot level. Most of this work was concentrated in the Nos. 68- and 10-vein zones, but several holes were also drilled across the flow in previously untested sections.

In the No. 2-winze area, diamond-drilling aided the extension of the present ore zones. This work is now largely directed to exploring between-the-level possibilities and must be carried out from stopes and sublevels.

Stoping

During the past year, ore broken in stopes amounted to 101,355 tons, having an average grade of 0.260 ounces per ton.

Distribution of production from the mine is given in the following table:

Levels	Trammed	Tonnage	Value	
	tons	percent	ounces	percent
From above 1,000-foot	21,866	18.7	4,938.3	16.6
1,000–3,000-foot	20,456	17.5	5,523.3	18.5
3,000–4,500-foot	39,300	33.7	9,355.2	31.4
4,500–5,500-foot	35,027	30.1	9,992.1	33.5
Total	116,649	100.0	29,808.9	100.0

Ore Reserves

Broken ore reserves as at December 31, 1952, are calculated to be 69,315 tons with an average grade of 0.225 ounces per ton. This is a reduction from last year of 6,028 tons with the grade slightly lower by 0.005 ounces per ton.

Unbroken reserves as at December 31, 1952, were estimated at 179,375 tons having an average grade of 0.236 ounces per ton as compared with 201,280 tons with an average grade of 0.238 ounces per ton at the end of 1951.

Continued high costs, with a lower price for gold in terms of Canadian dollars, are responsible in part for the reduction in ore reserves. These conditions demand that vein material must now have a higher gold content to be classed as ore, and material that would be ore under more favourable conditions is now waste.

Operations

On the 5,500-foot level the joint work being carried out by the Coniaurum and Central Porcupine companies on the latter property was continued. Preparations for actual sinking operations consisted of excavations for shaft station, hoist-room, link-house, and loading-pocket, as well as the driving of the shaft raise to connect with the cable raise at a point 110 feet above the shaft collar. The shaft was sunk to a depth of 20 feet, and timbers installed. In addition, a larger air line and a power cable were carried from the Coniaurum shaft to the site of the new work. Preparatory work is continuing, its speed being dependent on other mine operations.

This year the company closed down its mining and milling operations for the annual vacation period of two weeks from July 27 to August 10. During this shut-down, some major repairs were carried out, particularly on the electrical installations.

The collective bargaining agreement with Local No. 4439 expired November 28. Negotiations for a renewal have not been successfully completed, and in the latter part of December, the union applied for the assistance of the Ontario Department of Labour's conciliation service.

The average price received for gold produced in 1952, excluding government assistance, was $33.96 per fine ounce compared with $36.74 during the previous year.

Milling

During the past year, 129,325 tons of ore were treated in the mill, resulting in a production of 29,669.34 ounces of fine gold and 5,087.52 ounces of fine silver. This represented a recovery of 96.8 percent of the gold content of the ore.

An average of 239 men was employed, of whom 159 were in the mine, and 80 on the surface. This includes the men working in the Central Porcupine mine. W. O. Lafontaine was acting manager.

Curtin Prospecting Syndicate

The Curtin Prospecting Syndicate was organized in September, 1950, with an authorized capitalization of 3,500 units of $10 par value, of which 1,395 have been issued, and 1,166 vendor units, have been pooled. The syndicate members are: S. J. White, A. W. Trotter, and C. H. Smith who is secretary-treasurer. The head office and mine office address is Box 626, Espanola.

The syndicate owns 5 claims and holds 10 claims under option in Curtin township, district of Sudbury.

There is a vertical one-compartment shaft, sunk by former operators, on claim S.24308. Work by the present operators has been confined to surface-trenching. In the summer and early fall of 1952, 300 feet of trenching 9 feet deep was done. About 30 tons of ore from the old surface dumps was tested in the 10-ton Gibson milling unit installed during the previous year.

Delnite Mines, Limited

Delnite Mines, Limited, was incorporated in October, 1934, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,978,767 have been issued. The officers and directors are: W. V. Moot, president and managing director; K. C. Gray, vice-president; W. S. Walton, secretary; C. L. Ingham, treasurer; L. R. Gulick, Harry Yates, James Savage, and A. H. Sharpe, directors. The head office and mine address is Box 590, Timmins.

The company's property is located in Deloro township, Porcupine area, district of Cochrane, three miles southeast of Timmins.

Mining and milling operations continued throughout 1952. The No. 3 internal shaft, collared at the 2,875-foot level, was sunk a further 570 feet, and levels were established at depths of 4,100, 4,125, 4,250, and 4,375 feet below the surface. The vertical two-compartment No. 1 shaft remained at a depth of 391 feet, and the vertical three-compartment No. 2 shaft at a depth of 3,030 feet.

The following development work was done during the year: drifting, 3,042 feet; crosscutting, 1,278 feet; raising, 1,998 feet. Total development as at December 31, 1952, is as follows: drifting, 62,223 feet; crosscutting, 31,987 feet, raising, 26, 977 feet. Diamond-drilling in 1952 consisted of 257 holes, totalling 27,362 feet, from underground.

The following is taken from the manager's report for the year ending December 31, 1952:

Production

Ore treated	tons	158,794
Gross value		$1,877,138
Bullion recovered:		
Gold, 52,650.465 ounces at $34.165579	$1,798.834	
Silver, 4,027.13 ounces at $0.825697	3,325	
Total value		$1,802,159
Value per ton		$11.821
Recovery per ton		$11.349
Recovery	percent	96.006

ORE AND WASTE HOISTED

Shaft	Ore	Waste	Total
	tons	tons	tons
No. 2	158,786	20,204	178,990
No. 3	1,133	3,020	4,153

Some 36,511 tons of backfill were placed in stopes.

Broken Ore Reserves

Broken ore reserves are estimated at 84,579 tons, an increase of 12,366 tons in the year.

Costs

	Total costs	Cost per ton milled		Cost per fine ounce gold produced 1952
		1952	1951	
OPERATING COSTS (before cost-aid):				
Development and exploration[1]	$ 300,804	$ 1.894	$ 2.834	$ 5.713
Mining	788,608	4.966	4.615	14.978
Milling	214,387	1.350	1.303	4.072
General mine charges after deducting sundry revenue	109,196	0.688	0.742	2.074
Administrative expense (partly mine)	52,675	0.332	0.372	1.000
Bullion marketing expense, including mint-handling and refining charges	13,512	0.085	0.077	0.257
Total	$1,479,182	$ 9.315	$ 9.943	$28.094
OTHER COSTS:				
Provision for depreciation	$ 77,051	$ 0.485	$ 0.674	$ 1.463
Provision for taxes	84,000	0.529	0.058	1.596
Total	$ 161,051	$ 1.014	$ 0.732	$ 3.059
Total cost	$1,640,233	$10.329	$10.675	$31.153

[1]Includes shaft-sinking costs of $153,679 as against $193,472 for 1951.

Summary

The average daily milling rate was slightly higher at 433.9 tons of ore per day.

The production of gold was increased by 12,237 ounces over that of 1951. Production in 1951 was reduced because of strike action, which closed the mine for a month. The production of gold from each ton milled increased from 0.29 ounces in 1951 to 0.332 ounces in 1952. In Canadian dollars, this increased production by $0.62 per ton. Part of the increase in ounces was due to the elimination of several lower-grade stopes, and part was due to the finding of two small higher-grade veins.

Although no direct comparison can be made with costs in 1952 and 1951 because of the month shut-down in 1951, the costs in 1952 show an upward trend owing to higher wage rates, higher freight rates, more new openings underground, which require to be supported, more total workings to be kept open, more ore coming from the lower levels, and the time loss and extra cost of double hoisting from workings below the 2,875-foot level. In 1952 shaft-sinking costs decreased from $0.42 per ton milled to $0.97 as compared to 1951, and total costs at $10.33 were lower by $0.35.

Largely because the ore milled had more gold in each ton, the cost of producing each ounce of gold decreased, and this reduced the estimated cost-aid in 1952. Of the estimated cost-aid of $91,200 for 1952, the amount of taxes payable thereon to federal and provincial governments is slightly over $50,000. For 1953 it is expected that the cost base for calculating cost-aid will be reduced from $22.00 to $18.00. This will tend to increase cost-aid payments.

The sinking of No. 3 internal shaft was completed in August to a depth of 1,637 feet with stations cut for the 4,000-, 4,125-, 4,250-, and 4,375-foot levels. A loading pocket was cut below the 4,000- and 4,375-foot levels. Following the support of the stations with rock bolts and gunite, the main crosscuts were driven north to the ore zone on the 3,000- and 3,125-foot levels and were commenced on the 3,250-, 3,375-, 3,500-, 3,625-foot levels. This shaft provides 12 levels for development work, as compared to 23 levels from the No. 2 shaft.

Drifting on 11 levels gave 837 feet of ore, a reduction of 50 percent from 1951. Drifting was curtailed as most of the known ore is developed down to, and including, the 2,875-foot level, which is the bottom level serviced by the No. 2 shaft. The south vein system gave 430 feet of ore and the new vein system gave 407 feet of ore of which 65 feet was on the 3,000-foot level. The drift headings on the 3,000- and 3,125-foot levels have not reached the main ore area.

No gravel backfill was purchased during the year. The percentage of ore mined in cut-and-fill stopes increased slightly to 42.9 percent. This percentage will increase fairly rapidly as most of the larger shrinkage stopes in the upper levels of the mine will be completed next year.

An average of 246 men was employed, of whom 167 were underground, and 79 on the surface. John Beattie is manager.

Detta Minerals, Limited

Detta Minerals, Limited, has an authorized capitalization of 4,000,000 shares of $1 par value, of which 3,700,000 have been issued. The original name of the company, which was incorporated in May, 1945, was Detta Red Lake Mines, Limited. The change was made in July, 1950, at which time the capitalization was increased from 3,500,000 shares of $1 par value to 4,000,000 shares. The officers and directors are: A. W. White, president; C. B. Deller, vice-president; R. B. Law, secretary; L. W. McIlmurray, assistant secretary; D. F. Burt and James Stewart, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Balmertown.

The company owns 17 claims in Balmer township, Red Lake Area, Patricia portion of Kenora district.

Operations in 1952 were carried on from May 15 to October 31. The vertical three-compartment shaft on claim K.R.L.19502, is 280 feet deep, with levels at 129 and 265 feet. No sinking was done in 1952. Some 643 feet of drifting and 32 feet of raising were done on the second level. The total amount of development on the second level is: drifting, 978 feet; crosscutting, 601 feet; raising, 32 feet. The work being done from the fourth level of the adjoining New Dickenson mine was continued in 1952, and a further 45 feet of drifting was done. The total development on this level is: drifting, 240 feet; crosscutting, 115 feet; raising, 36 feet. Diamond-drilling in 1952 consisted of 19 holes, totalling 3,479 feet, from underground.

F. A. Fell was mine manager, employing one man.

Dome Mines, Limited

Dome Mines, Limited, was incorporated in July, 1923, under Dominion charter, to succeed the Dome Mines Company, Limited. The authorized capitalization is 2,000,000 shares of no par value, all of which have been issued. The officers and directors are: C. W. Michel, president and treasurer; J. H. Stovel, vice-president and managing director; R. E. Dye, vice-president and general manager; J. G. McCrea, vice-president; C. C. Calvin, secretary; M. F. Stern, F. W. Pershing, B. C. Foy, J. L. Carson, H. C. Brunie, and A. B. Matthews, directors. The president's office is at 42 Wall Street, New York 5, N.Y. The secretary's office is at 36 Toronto Street, Toronto. The mine office is at South Porcupine.

The company owns 60 claims and the beds of Porcupine and Simpson lakes, in Tisdale, Whitney, and Shaw townships, Porcupine area, district of Cochrane.

Mining and milling operations continued throughout 1952. There was no shaft-sinking during the year. The following development work was done: drifting, 10,895 feet; crosscutting, 7,754 feet; raising, 11,070 feet. Total development work to December 31, 1952, is as follows: drifting, 296,660 feet; crosscutting, 141,940 feet; raising, 175,004 feet. Diamond-drilling in 1952 consisted of 517 holes, totalling 88,171 feet, from underground.

The following is taken from the general manager's report for the year ending December 31, 1952:

During the year, 687,400 tons of ore were treated in the mill, and 80,200 tons of waste rock were excavated, most of which was used as fill underground.

The 687,400 tons of ore milled yielded 168,795 ounces of gold, the yield being 0.2456 ounces, or 4.9120 pennyweights per ton.

All values of ore will be expressed in pennyweights (dwt.) throughout this report. One pennyweight equals $^1/_{20}$ of an ounce troy weight. At $35 per ounce of gold, one pennyweight is equal to $1.75 in Canadian funds.

Costs

The expenditure on development was $1,108,630.84 or $1.61 per ton as compared with $1.65 per ton milled in 1951.

The expenditure on mining was $2,871,621.88 or $4.18 per ton as compared with $3.78 per ton milled in 1951.

The total operating charges for the year were $7.63 per ton as compared with $7.19 per ton milled in 1951.

Development

The total development work of 39,492 feet compares with 40,839 feet done in the previous year. The total development work done below the 16th level was 20,822 feet as compared with 22,767 feet done the previous year. The 88,171.0 feet of core diamond-drilling compares with 92,626.5 feet done in 1951.

Mining

The 687,400 tons of ore milled during the year were produced as follows:

	Tons	Average grade, dwt. per ton
From stopes	597,100	5.24
From development	90,300	4.02
Total	687,400	5.08

The following tabulation is presented to indicate the parts of the mine from which the ore came:

Source of ore	Tons	Dwt. per ton
5th level to surface	3,481	3.71
Ankerite veins	159,644	4.92
Area serviced by No. 6 shaft	161,500	4.81
Remainder of mine	362,775	5.29
Total mine	687,400	5.08

Ore Reserves

Ore reserves at the close of the year were estimated at 2,472,000 tons, a net increase of 24,000 tons for the year. The following tabulation is presented to indicate the change:

	1951	1952
	tons	tons
Unbroken ore	2,016,000	2,066,000
Broken ore	432,000	406,000
Total	2,448,000	2,472,000

Ankerite ore makes up 26 percent of the ore reserves.

Mill

Following are the milling results:

Ore treated	tons	687,400
Average grade treated	pennyweights per ton	5.08
Recovery	percent	96.64

Capital Expenditure

The details of changes in capital assets are as follows:

PLANT BUILDINGS AND EQUIPMENT	
Additions:	
Mine buildings and equipment	$ 62,566.75
Reduction buildings and equipment	813.41
Surface buildings and equipment	130,788.70
Water supply	18,996.17
Increase	$213,165.03
Less retirements	27,808.42
Net increase	$185,356.61

An average of 1,019 men was employed during the year, of whom 646 were underground, and 373 on surface.

Hallnor Mines, Limited

Hallnor Mines, Limited, was incorporated in April, 1936, with an authorized capitalization of 2,000,000 shares of $1 par value, all of which have been issued. The officers and directors are: J. Y. Murdoch, president; Oliver Hall, vice-president; C. H. Windeler, secretary; R. G. Rudolf, treasurer; F. M. Connell, L. H. Timmins, and H. L. Roscoe, directors. The head office and mine office are at Pamour.

The property is located in Whitney township, Porcupine area, district of Cochrane, adjoining the west boundary of the Pamour Porcupine mine.

Mining and milling operations continued throughout 1952. The mine is operated through the vertical three-compartment No. 1 shaft, which is 3,156 feet deep. There was no sinking done in 1952. Development work for the year consisted of: drifting, 1,556 feet; crosscutting, 613 feet; development raising, 142 feet; stope raising, 736 feet. The total amount of development work at December 31, 1952, was: drifting, 41,292 feet; crosscutting, 11,398 feet; development-raising, 11,188 feet; stope-raising, 2,917 feet. Diamond-drilling in 1952 consisted of 173 holes, totalling 23,959 feet, all from underground.

The following is taken from the manager's report for the year ending December 31, 1952:

Drifting

Total drifting amounted to 2,169 feet, consisting of 708 feet done on the 1st, 5th, 6th, and 7th levels to further develop the main ore zone and 1,461 feet done in exploring the 19th and 20th levels. Of the latter, 1,371 feet was done on the 19th level to the west to reach the area of the projected extension downwards of ore found on the 18th level; 250 feet remain to be done.

Of the total, 91 feet was in ore averaging 0.41 ounces per ton.

Raising

Raising amounted to 1,392 feet, comprising 142 feet of combined manway-fill and ventilation raises, 817 feet of stope-fill raises, and 433 feet of box-hole raises.

Diamond-Drilling

Diamond-drilling amounted to 23,959 feet, comprising 4,986 feet of test holes drilled in stope walls, 8,310 feet of exploratory drilling on the 5th, 6th, 7th, and 8th levels, and 10,663 feet of exploratory drilling on the lower levels.

The exploratory drilling on the upper levels indicated seven subsidiary ore zones, but sufficient information is not available on which to base reliable tonnage and grade estimates.

The lower-level drilling intersected scattered values. Detailed investigation will be necessary to determine if the intersections represent commercial ore chutes.

Stoping

Ore broken amounted to 117,703 tons, and ore drawn off to 129,011, or 11,308 tons in excess of the tonnage broken. The broken ore reserve was reduced to 27,590 tons.

Of the ore drawn, 118,896 tons came from cut-and-fill stopes, 9,902 tons from shrinkage stopes, and 4,188 tons from development headings.

The production from the various levels was as follows:

	1952	Total to Dec. 31, 1952
	tons	tons
1st level	6,007	58,195
2nd level	5,868	217,632
3rd level	8,719	282,643
4th level	19,109	277,916
5th level	15,132	343,145
6th level	9,883	229,984
7th level	56,594	213,000
8th level	7,486	14,022
18th level	.....	1,807
Miscellaneous and development	4,401	150,112
Total	133,199	1,788,516

Backfill placed in stopes amounted to 114,125 tons.

Ore Reserves

At December 31, 1952, the ore reserves were 438,462 tons of an average grade of 0.33 ounces of gold per ton.

Mill

The mill was in continuous operation throughout the year with short shutdowns for repairs, inspections, and power failures. The 8- by 8-foot ball mill was in operation 8,616.3 hours or 98 percent of possible running time.

Tonnage milled averaged 371 tons per day as compared with 379 tons per day in 1951.

The mill treated 134,236 tons of ore from which was recovered 51,186.242 ounces of fine gold and 3,696.80 ounces of fine silver, having a combined value of $1,869,106.60. The average recovery was $13.91 per ton compared with $13.13 per ton in 1951.

To December 31, 1952, the mill has treated 1,785,191 tons of ore from which has been recovered 763,874.081 ounces of fine gold and 58,241.49 ounces of fine silver, having a combined value of $28,488,124.90.

A. L. Sharp was manager until October 1, when he retired and was succeeded by W. J. Marshall who had formerly been mine superintendent. An average of 168 men was employed, of whom 97 were underground, and 71 on the surface.

Hasaga Gold Mines, Limited

Hasaga Gold Mines, Limited, was incorporated in October, 1938, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 3,000,000 have been issued. The officers and directors are: J. E. Hammell, president and managing director; C. S. Hamilton, vice-president; A. G. Hattie, director of mining; G. M. Huycke, secretary-treasurer; J. Bland, assistant secretary-

treasurer. The executive office is at 25 King Street West, Toronto. The head office and mine address is Red Lake.

The company's property consists of 34 claims in Heyson and Dome townships, in the Red Lake area, Patricia portion of Kenora district.

Mining operations continued from the beginning of 1952 until May 31. The mill operated until June 3. The mine has been developed through three vertical three-compartment shafts. No shaft-sinking was done in 1952. The depths of the shafts are shown in the following table:

Shaft	Depth
	feet
No. 1	1,075
No. 2	233
No. 3[1]	2,450

Development work during 1952 consisted of: drifting, 98 feet; crosscutting, 435 feet; raising, 129 feet. The following table shows the total development when the mine closed:

Level	Drifting	Crosscutting	Raising
	feet	feet	feet
125-foot	711	405	345
250-foot	1,175	639	567
375-foot	991	419	778
500-foot	2,993	1,072	720
560-foot	.....	.....	50
650-foot	1,542	387	748
850-foot	1,576	905	1,268
940-foot	292	30	215
1,050-foot	902	268	778
1,250-foot	898	367	745
1,450-foot	933	721	760
1,600-foot	3,109	1,068	642
1,650-foot	207	.....	42
1,660-foot (loading pocket)	.....	.....	72
1,800-foot	2,737	2,440	1,174
1,950-foot	358	63	.....
2,000-foot	1,130	1,520	1,206
2,100-foot	467	12	267
2,200-foot	1,170	1,180	902
2,250-foot (loading pocket)	.....	.....	46
2,350-foot	665	899	380

Diamond-drilling in 1952 consisted of 39 holes, totalling 13,102 feet, from underground.

The following is taken from the mine manager's report for the year ending December 31, 1952:

Development (1,800- to 2,135-foot levels)

	Advance	Slash
	feet	cubic feet
Drifting	98	1,128
Crosscutting	435	1,020
Raising	129	.....

Exploration Diamond-Drilling

Core	Feet
A	11,667
B	1,435
Total	13,102

[1]No. 3 shaft has four compartments from the 1,450-foot level to the 1,660-foot loading pocket.

During January, 1952, the exploratory 1805 W. drift was completed to a point 2,806 feet west of the No. 3 shaft. At a distance of 2,500 feet from the shaft, the 1881 N. crosscut was driven north 228 feet to serve as a diamond-drill station. Similar diamond-drill stations had been established in 1867 N. crosscut and 1873 S. crosscut during the previous year. These crosscuts were approximately 400 feet apart.

Twenty diamond-drill holes were fanned from these crosscuts to explore the ground below the 1805 W. drift.

Holes from the 1867 N. crosscut encountered a poorly defined zone of fracturing near the north contact of the quartz-porphyry body. Hole U18142 returned good values but these were not substantiated by other holes in the vicinity.

Drilling below the 1873 S. crosscut indicated a zone of fracturing and mineralization in the vicinity of the south contact of the quartz porphyry. Holes U18151, U18155, U18159, U18160, and U18162, from the 1873 S. crosscut, and hole U18148 from the 1181 N. crosscut, cut the zone at the greatest depth penetrated and returned an average grade of $6.65 over 19.5 feet, representing a length of approximately 375 feet. Holes closer to the 1805 W. drift returned lower values and indicated that the top of the zone was approximately 400 feet below the 1,800-foot level.

Experience gained from the orebody previously mined indicated that the zone of good values would not have sufficient depth to justify the costly development required to prepare it for mining.

Exploration was concluded upon completion of hole U18162 in June, 1952.

Milling and Production Data

	1952	1939–52
Waste stored....tons	1,856	255,849
Ore crushed....tons	56,789	1,475,271
Ore milled....tons	58,645	1,731,120
Average daily tonnage ground....tons	372	333
Average daily tonnage milled....tons	384	387
Heads (calculated), milled....per ton	3.42	4.34
Heads (calculated), ground per ton	3.53	.....
Tailings, milled....per ton	0.140	0.157
Tailings, ground....per ton	0.144	.....
Recovery per ton....percent	96.1	96.4
Value precipitated....	$204,397.43	$7,704,939.83
Gold recovered....ounces	5,847.2	.....

Costs

	Total
Development, including diamond-drilling....	$ 48,533.78
Mining....	138,358.20
Milling....	65,156.55
Ore transporation....	9,263.65
Shipping and marketing....	2,225.14
General mine expenses....	28,263.44
Total operating cost....	$291,800.76
Depreciation and development write-offs....	54,807.19
Total cost....	$346,607.95

An average of 49 men was employed during the operating period, of whom 26 were in the mine, and 23 on surface. Following the cessation of operations, a small underground crew was retained, and the salvaging of all rails and pipe was begun. All electrical and mechanical equipment was brought to surface and put into condition for sale. This work and the mill clean-up and conditioning of equipment were completed before the end of September. W. E. Barton was mine manager.

Hollinger Consolidated Gold Mines, Limited

Hollinger Consolidated Gold Mines, Limited, was incorporated in January, 1916, with an authorized capitalization of 5,000,000 shares of $5 par value, of which 4,920,000 have been issued. The officers of the company are: Jules R. Timmins, president; Leo H. Timmins, vice-president; J. I. Rankin, treasurer; P. C. Finlay, secretary. The directors are: A. A. McMartin, Hon. A. Raymond, J. Y. Murdoch, D. M. Dunlap, N. A. Timmins, and J. A. McDougald. E. L.

Longmore is the general manager of the Hollinger mine. The mine and head office are at Timmins. The general office is at 44 King Street West, Toronto.

The main property operated by the company is located in Tisdale township, Porcupine area, district of Cochrane, and includes part of the ground underlying the town of Timmins. The company has numerous other holdings and interests. It owns and operates the Ross mine in Hislop township, district of Cochrane, and controls and operates the Young-Davidson mine,[1] in Powell township, Matachewan area, district of Timiskaming.

Mining and milling operations continued throughout 1952. There was no shaft-sinking during the year. The following development work was done: drifting, 9,184 feet; crosscutting, 3,536 feet; raising, 49 feet. Diamond-drilling consisted of 36 holes, totalling 9,693 feet, from surface, and 1,493 holes, totalling 173,338 feet, from underground.

The following is taken from the general manager's report for the year ending December 31, 1952:

Bullion Statement

INVENTORY, JANUARY 1, 1952:		
Gold in process ($20.67)	$ 201,560	
Premium on gold in process	140,869	
Silver on hand	22,514	
		$ 364,943
GROSS VALUES PRODUCED, 1952:		
Ore milled	$ 11,539,338	
Tailings loss	359,940	
		11,179,398
		$11,544,341
INVENTORY, DECEMBER 31, 1952:		
Gold in process ($20.67)	$ 217,453	
Premium on gold in process	139,859	
Silver on hand	41,625	
		$ 398,937
BULLION SHIPPED DURING 1952		11,145,404
		$11,544,341

Yearly Average Costs

Accounts	Sundries	Labour	Stores	Total	Per ton ore milled
General miscellaneous charges and administration	$ 56,552.67	$ 635,562.50	$ 153,443.50	$ 845,558.67	$0.7170
Surface services	.....	127,718.56	48,487.90	176,206.46	0.1494
Insurance, fire	41,107.03	.....	.....	41,107.03	0.0349
Insurance, group, sickness and accident, medical and unemployment	.....	263,173.16	.....	263,173.16	0.2232
Marketing bullion	76,926.10	.....	.....	76,926.10	0.0652
Workmen's compensation	.....	176,240.79	.....	176,240.79	0.1495
Silicosis assessment	.....	105,861.28	.....	105,861.28	0.0898
Milling charges	.....	650,634.28	688,354.88	1,338,989.16	1.1356
Mining charges	.....	4,880,153.10	2,038,130.23	6,918,283.33	5.8674
Total cost	$174,585.80	$6,839,343.67	$2,928,416.51	$9,942,345.98	$8.4320
Annual vacation[2]	.....	.....	.....	$ 164,708.94	$0.1397

[1]See account on page 86.

[2]The annual vacation costs are distributed among the first two and last two items above.

Employees

The average number of men employed during the year has been 1,854 distributed as follows:

Miners:		Mechanics:		General:	
Exploration	28	Operation	118	Mill and refinery	158
Development	76	Maintenance	161	Technical	135
Production	899			Clerical	64
				Miscellaneous	97
				Ross mine	118
Total	1,003	Total	279	Total	572

Milling

The milling results were as follows:

Total of ore milled	tons	1,179,109
Average value per ton		$9.79
Gross value	$11,539,338.46	
Deduct loss in tailings	359,940.44	
Net value recovered		$11,179,398.02
Average milled per day	tons	3,882
Percent of possible time run		86.8
Tons per 100 percent running time		4,472
Solutions precipitated per ton ore	tons	1.2
Value per ton tailing		$0.31
Cyanide consumed per ton of ore	pounds	0.655
Zinc consumed per ton of ore	pounds	0.045
Zinc consumed per ton of solution	pounds	0.038
Lime consumed per ton of ore	pounds	2.168
Lead acetate consumed per ton of ore	pounds	0.010
Average value of pregnant solution		$8.11
Average value received per ounce of gold sold		$34.28

Ore Reserves (Hollinger and Ross Mines)

The ore reserves on December 31, 1952, consisted of 5,400,704 tons, averaging 0.305 ounces of gold, or $6.31 per ton, giving a total value of $34,060,276.

The ore reserves on December 31, 1951, consisted of 5,832,127 tons, averaging 0.310 ounces of gold, or $6.41 per ton, giving a total value of $37,367,121.

In the calculations dealing with ore reserves, the price of gold at $20.67 per ounce has been taken as the basis of value, and the same minimum ore grade, namely $4, as used in former years, continued. Taking the price of gold at $35 per ounce as the basis of value, the ore reserves had a total value of $57,672,874 at the end of the year, a decrease of $5,599,937 from the 1951 figure of $63,272,811.

General Exploration

Some additional diamond-drilling was done on the remaining properties adjoining Kam-Kotia Porcupine Mines, Limited, to further test geophysical anomalies. No mineralization was found, and all options have been dropped.

Three properties in Cape Breton, Nova Scotia, were examined, but the results did not justify further work. Numerous properties in Ontario and Quebec were examined, but no options were taken. Eighteen claims were staked in the Sudbury Basin area of Ontario. A geological and geophysical survey of the group did not disclose any important mineralization. These claims are still held by the company.

Underground exploration of Midcamp Mines, Limited, is being continued.

Hollinger Mine

The moving of the shops and stores to the new site has been completed. Improved shop layout and equipment makes it possible to restrict operations entirely to the day shift, and should make for higher efficiency.

Mining of scheelite ore was completed in December. A larger tonnage of scheelite concentrate than anticipated was produced. The discovery of scheelite ore is wholly incidental to the search for gold ore. The tonnage and grade of scheelite ore discovered in 40 years of combing the main productive areas, together with its extremely erratic occurrence, does not justify extensive search for scheelite ore apart from the search for gold in the mine.

Ore from above the 800-foot level accounted for 35.3 percent of the tonnage milled, compared with 38.3 percent in 1951.

The estimated ore reserves at the Hollinger mine on December 31, 1952, were 4,606,778 tons, with a gold content of 0.320 ounces per ton. This is a decrease from the December 31, 1951 figures of 418,912 tons and a decrease in value of $5,547,963, taking the price of gold at $35 per ounce.

Young-Davidson Mine

Some 287,265 tons of ore were milled, an average of 825 tons per 348 days' operation, with a recovery of $3.04 per ton with gold at $35 per ounce.

Broken ore in stopes on December 31, 1952, is estimated at 378,018 tons.

Ross Mine

The Ross mine consists of approximately 456 acres owned by the company in Hislop township, district of Cochrane.

Operations continued throughout 1952. The vertical three-compartment No. 1 shaft remained at a total depth of 1,598 feet, and the vertical two-compartment No. 2 winze at a total depth of 1,235 feet.

Development work during the year consisted of: drifting, 869 feet; crosscutting, 1,924 feet; raising, 995 feet. Four diamond-drill holes, totalling 3,723 feet, were drilled from surface, and 102 holes, totalling 11,265 feet, were drilled from underground. Some 110,415 tons of ore were hoisted, and the mill treated 10,417 tons, a daily average of 301 tons.

The following is taken from the general manager's report for the year ending December 31, 1952:

> The ore reserves as of December 31, 1952, were 793,926 tons, with a gold content of 0.219 ounces per ton. These figures compare with 806,437 tons with an average gold content of 0.218 ounces per ton at the end of 1951. This is a decrease of 12,511 tons and a decrease in total value of $51,974, making a total value of $6,093,650 with gold at $35 per ounce.

J. J. Caty is resident manager. The mine address is Holtyre.

Hugh-Pam Porcupine Mines, Limited

Hugh-Pam Porcupine Mines, Limited, was incorporated in 1935, with an authorized capitalization of 4,000,000 shares of $1 par value, of which, 3,867,000 shares have been issued. The officers and directors are: R. A. Cranston, president; J. B. Streit, vice-president; George Scott, secretary-treasurer; J. A. Hackett and W. H. Maedel, directors. The head office is at 50 King Street West, Toronto. The mine address is Pamour.

The company owns 15 claims in Whitney township, Porcupine area, district of Cochrane. The mine is operated under the management of Broulan Reef Mines, Limited, and further details regarding the work appear under that company's name on page 7.

There are two vertical two-compartment shafts on the property, the Mulholland and the Hughes, each about 200 feet deep. A two-compartment winze, 110 feet deep, runs at an angle of 70 degrees from the 200-foot level of the Hughes shaft. Considerable lateral work was done from these two shafts in former years, but no further development work was done in 1952. The present work being done on the property is through extensions of the Reef workings of Broulan Reef Mines, Limited. The following table shows the work done in the area in 1952 and the total amount done to date.

Level	Drifts		Crosscuts		Raises	
	1952	Total	1952	Total	1952	Total
	feet	feet	feet	feet	feet	feet
200-foot	.....	193	.....	.....	.....	167
350-foot	.....	155	35	35	.....	.....
500-foot	.....	691	.....	46	140	140
650-foot	.....	2,174	.....	44	.....	157
800-foot	86	874	.....	57	.....	153
970-foot	181	479	30	396	.....	.....
1,120-foot	335	335	.....	.....	.....	.....

Diamond-drilling in 1952 consisted of 29 holes, totalling 3,224 feet, from underground.

The following is taken from the mine manager's report for the year ending December 31, 1952:

Production and Treatment

During the year, 26,054 tons of ore were mined and milled. Production totalled $282,096, representing 7,862.4 ounces of fine gold. Average recovery was 0.302 ounces of gold or $10.83 per ton milled.

Mining

During the year, stopes on the 200-, 350-, and 500-foot levels were prepared and put into operation.

On the 800-foot level, No. 81-60 drift was extended 86 feet. There is now in this drift a total length of 277 feet of ore. Towards the end of the year, stope preparation in this zone produced 636 cars of ore assaying 0.50 ounces of gold per ton, or 0.22 ounces of gold per ton cutting high assays to one ounce.

Operating costs, exclusive of charges by Broulan Reef Mines, Limited, for use of shaft, plant, etc., were $5.98 per ton or $6.47 per ton including these charges.

W. F. Brown is mine manager. Employment figures for the year are given in the report on Broulan Reef Mines, Limited.

Kerr-Addison Gold Mines, Limited

Kerr-Addison Gold Mines, Limited, was incorporated in April, 1936, with an authorized capitalization of 5,000,000 shares of $1 par value, 4,730,301 of which have been issued. The officers and directors are: J. Y. Murdoch, president; Andre Dorfman, vice-president and managing director; G. A. Cavin, secretary; J. Ingram, treasurer; F. M. Connell, Oliver Hall, H. H. Leather, J. H. Rattray, and W. D. Smith, directors. The head office is at 44 King Street West, Toronto. The mine address is Virginiatown.

The main property is in McGarry township, Larder Lake area, district of Timiskaming.

Mining and milling operations continued throughout 1952. No footage was added to the vertical five-compartment No. 3 shaft, which is the only operating shaft at the mine. Most of the development work was done below the 2,050-foot level. Ore production was generally derived from stopes between the 1,450- and 2,050-foot levels.

Experimental work with classified tailings fill has been successful. An addition to the mill for storage of the tailing sands is under construction, and new and larger equipment for the plant is being installed.

A timber-treating plant was constructed during the year.

The mill handled 1,649,836 tons of ore, an average of 4,507 tons per day.

The following development work was completed during the year: drifting, 9,155 feet; crosscutting, 6,986 feet; raising, 12,135 feet. Total development work to December 31, 1952, is as follows: drifting, 143,617 feet; crosscutting, 45,213 feet; raising, 77,289 feet. Diamond-drilling consisted of 556 underground holes totalling 86,900 feet.

The following is taken from the manager's report for the year ending December 31, 1952:

Production and Costs

Production was at an all-time high both in terms of tonnage milled and ounces of gold produced. Increased costs and a reduced price for gold resulted in lower operating profit than for the previous year. Extraction of gold in milling was 96.10 percent.

SUMMARY OF PRODUCTION[1]

Total milled (average per day, 4,507.7)....tons	1,649,836
Total gold recovered....ounces	348,113.58
Total silver recovered....ounces	18,037.55
Average gold recovery per ton (0.2110 ounces).....	$7.3850
Average tailings loss per ton (0.0086 ounces).....	$0.3010
Average mill head value per ton (bullion plus tails) (0.2196 ounces).....	$7.6860
Total realized value of bullion (Canadian funds).....	$12,566,610.67
Total realized value of bullion per ton (Canadian funds)	$7.617

SUMMARY OF COSTS

	Total	Per ton
Development	$ 945,537.40	$0.573
Stope development	612,144.79	0.371
Mining	1,062,167.53	0.644
Haulage	812,877.01	0.492
Hoisting	326,271.80	0.198
Crushing and conveying	194,330.45	0.118
Milling	1,111,532.58	0.674
General expenses	530,215.65	0.321
Bullion marketing	130,692.72	0.079
Total operating cost at mine	$5,725,769.93	$3.470

The net operating profit at the mine before provision for depreciation, taxes, and head office expenses, was $6,840,840.74 or $4.147 a ton.

Mining and Mine Development

New levels have been established at 2,800, 2,950, 3,100, 3,250, 3,400, 3,550, 3,700, and 3,850 feet. Crosscutting to the ore zone is well advanced on all but the deepest, and drifting has been started on the 2,800-, 3,100-, and 3,700-foot levels.

A skip-loading station was constructed at a depth of 3,934 feet, and ore and waste crushers are being installed at the 3,777-foot sublevel. The ore- and waste-pass systems connecting these installations to each of the new levels are about 50 percent complete.

Actual mining operations were mainly concentrated in the block of ground between the 1,000- and 1,900-foot levels. Within it, 78.35 percent of all ore was broken, and from it was drawn 83.4 percent of the year's mill feed. No stoping has yet been done below the 2,200-foot level.

Deferred filling of old stopes was resumed in August, and 105,117 cubic yards were placed. A fireproof raise to serve as a secondary escape route from underground workings was completed from surface to the 1,600-foot level and is 75 percent complete between the 1,600- and 2,500-foot levels. This will also serve as the route for all rubber-lined pipelines for carrying hydraulic-type backfill into the mine. This class of backfilling will be started in large volume early in 1953.

During the next six years, it is planned to convert almost entirely from the present shrinkage-and-sublevel mining methods to cut-and-fill. Extensive development and stope-development work is scheduled for 1953 in preparation for cut-and-fill stopes, and it is anticipated that more than 10 percent of the year's ore will come from them.

Ore Development

During the year, efforts towards blocking out new ore were mainly concentrated on the 2,650-foot level with the result that the block between that and the 2,500-foot level is estimated to contain 1,096,743 tons having an average grade of 0.3223 ounces per ton, after allowing for dilution. This does not include No. 6 west orebody, which is not yet developed at the 2,650-foot level.

Diamond-drilling for structure from some of the new lower levels produced some impressive ore intersections, but at the year's end insufficient information was available upon which to assess their importance.

Ore Reserves

The lower price for gold, plus plans to mine most ore below the 2,200-foot level and much pillar ore above that horizon by cut-and-fill methods, have required the elimination of some lower-grade tonnages from ore classification. The over-all result is a reduced tonnage of improved grade.

At the year's end reserves of proven ore were as follows: between surface and the 1,600-foot level there are 4,912,909 tons having a grade of 0.2139 ounces per ton; between the 1,600- and 2,650-foot levels there are 10,599,666 tons having a grade of 0.3027 ounces per ton; or a total of 15,512,575 tons having a grade of 0.2746 ounces per ton, after allowing for dilution. Included in this reserve are 1,003,704 tons of broken ore having a grade of 0.1695 ounces per ton, which will be drawn from heavily during the current year.

[1]Gold at $35 per ounce.

Above the 1,600-foot level there still remain ore tonnages equal to three year's milling requirements, and during 1953 it is estimated that 45 percent of mill feed will be drawn from it.

General

Early in the year both cage- and skip-hoisting facilities were extended through to the 3,850-foot level.

A mine-ventilation fan, initially delivering about 165,000 cubic feet per minute but capable of delivering up to 400,000 cubic feet per minute, when required later in the life of the mine, was installed on surface.

In January a decision was made to design and erect a plant to produce hydraulic backfill from mill tailings. At the year's end the plant was 75 percent complete. When in operation it is expected to produce 1,800 tons of backfill daily from 4,500 tons of mill tailings. This plant includes a pump-house and a 16-inch pipeline to supply 4,000 gallons per minute of lake water.

An average of 845 men was employed, of whom 520 worked underground W. S. Row is manager, and J. L. Ramsell is assistant manager.

Kirkland Lake Gold Mining Company, Limited

Kirkland Lake Gold Mining Company, Limited, was incorporated in November, 1915, with an authorized capitalization of 5,500,000 shares of $1 par value, of which 5,326,699 have been issued. The officers and directors are: J. B. Tyrrell, president; V. H. Emery, vice-president; H. F. Cassidy, secretary-treasurer; J. A. Dalton, W. S. Walton, and N. S. Beaton, directors. The head office and mine office are at Chaput-Hughes. The executive office is at 44 King Street West, Toronto.

The property is located in Teck township, Kirkland Lake area, district of Timiskaming.

Mining and milling operations were continuous throughout 1952. The No. 4 winze was deepened 31 feet below the 5,850-foot level to provide a sump and landing point for the 5,850-foot level.[1]

The following development was completed during the year from Nos. 1, 2, and 4 winze levels between the 4,600- and 5,725-foot levels: drifting, 3,029 feet; crosscutting, 676 feet; raising, 937 feet. Total development work to December 31, 1952, is as follows: drifting, 100,556 feet; crosscutting, 37,236 feet; raising, 19,067 feet.

Diamond-drilling consisted of 42 holes, totalling 6,430 feet, from underground.

Some 120,543 tons of ore were milled, an average of 329 tons per day.

The following is taken from the report of the managing director for the year ending December 31, 1952:

Operating Costs

	Total	Cost per ton milled
Development and exploration	$ 225,064.53	$1.87
Stoping	315,733.81	2.62
Timbering	235,484.60	1.95
Transporting ore, hoisting, etc.	286,307.31	2.38
Milling	202,675.79	1.68
Marketing bullion	13,357.27	0.11
General and undistributed charges (maintenance mine buildings, administration and management, insurance, workmen's compensation, and miscellaneous)	204,792.91	1.70
Total	$1,483,416.22	$12.31

[1]For further details on shaft development see Ont. Dept. Mines, Vol. LIX, 1950, pt. 2, p. 33.

Gold produced	ounces	44,827.846
Cost per ounce		$33.09

Taxes charged against operations (not included above) totalled $9,947.30, or at the rate of 8 cents per ton milled and 22 cents per ounce of gold produced. For purposes of comparison with previous years, the Government cost-aid has not been taken into account in the foregoing calculations.

New Ore Developed During the Year

Level	Length	Average width	Average cut grade at $35 per ounce
	feet	feet	
46th	115	3	$15.00
53rd	326	3	16.20
54th	275	3	27.75
56th	863	3	22.00
57th	35	3	21.70
58th	355	3	15.00
Total	1,969	3	$21.00

Ore from development accounted for 20 percent of the ore milled during the year, and 65 percent of drifting was in ore.

Production and Milling

Ore milled	tons	120,543
Average milled per day	tons	330
Gross value	$1,610,064.89	
Loss in tailings	69,862.74	
Net value recovered		$1,540,202.15
Average value per ton	$13.36	
Value in tailings per ton	0.58	
Recovery per ton		$12.78
Extraction	percent	95.6

General

During the year there was a further increase in the cost of labour and supplies and a further decrease of $2.51 per ounce for gold produced.

The proven ore reserves in the mine at the end of 1952 amount to 328,183 tons, having a gross value of $5,153,624.00, calculated at $35 per ounce.

The mine payroll at the Kirkland Lake mine for 1952 was $998,854.13, an increase of $53,961.84 over 1951.

An average of 298 men was employed. G. C. Dunn is general superintendent.

Lake Shore Mines, Limited

Lake Shore Mines, Limited, was incorporated in February, 1914, with an authorized capitalization of 2,000,000 shares of $1 par value, all of which have been issued. The officers and directors are: A. L. Blomfield, chairman of the board; J. C. Adamson, president; Albert Wende; vice-president and treasurer; G. F. Doggett, secretary; W. W. Foskett and C. M. Hilton, directors. The head office and mine office are at Kirkland Lake.

The main property is located in Teck township, Kirkland Lake area, district of Timiskaming.

Mining and milling operations were continuous throughout 1952. During the year no shaft-sinking was done. The depths of the shafts serving the mine are set out in the following table:

Shaft	Number of compartments	Total depth from surface
		feet
No. 1 shaft, surface–2,200 feet	3	2,250
No. 1 shaft, 2,000–2,450 feet	3	2,507
No. 2 shaft, inclined	1	632
No. 3 shaft, abandoned	5	4,000
No. 4 shaft, below 4,325-foot level	3	7,788
No. 5 shaft	5	4,000
No. 6 shaft, below 3,575-foot level	5	2,549

Development work during 1952 consisted of: drifting, 2,484 feet; crosscutting, 5,812 feet; raising, 815 feet. Total development work to December 31, 1952, was as follows: drifting, 263,355 feet; crosscutting, 94,036 feet; raising, 142,224 feet. Diamond-drilling consisted of 177 underground holes totalling 14,154 feet.

The company operated its own sand pit in Gauthier township for mine backfill.

During 1952 some 263,595 tons of ore were milled, an average of 720 tons per day. The drop in tons produced from 1951 was mainly due to severe damage to the mine resulting from rock bursting during the latter part of 1951 and early part of 1952.

The following is taken from the report of the mine superintendent for the year ended December 31, 1952:

In the period, 89,887 ounces of gold and 28,617 ounces of silver were recovered from 263,595 dry tons of ore milled. The gross value of the production was $3,485,107.75.

Costs

Costs per ton milled for the last five fiscal periods are given below:

	6 months ending Dec. 31, 1948	1949	1950	1951	1952
Development	$ 1.257	$ 1.114	$ 1.234	$ 1.144	$ 1.432
Mining	6.107	6.297	6.658	7.358	8.600
Milling and refining	1.717	1.653	1.586	1.744	2.498
Marketing bullion	0.118	0.116	0.104	0.159	0.093
General and administrative	0.303	0.299	0.299	0.334	0.428
Total operating cost	$ 9.502	$ 9.479	$ 9.881	$10.739	$13.051
Depreciation	0.128	0.432	0.425	0.355	0.364
Total	$ 9.630	$ 9.911	$10.306	$11.094	$13.415
Provision for Dominion and Provincial taxes	1.493	1.509	1.125	1.079	.....
Total	$11.123	$11.420	$11.431	$12.173	$13.415
Re-treatment of other tailings	0.185	0.216	0.195	0.198	(1)

Development

In the year, 2,484 feet of development drifting done on ten levels in the mine exposed a total of 1,336 feet of ore having an average cut grade of 0.534 ounces per ton across a width in the drifts of 65.9 inches.

In the old Nos. 1 and 2 vein zones, 522 feet of drifting exposed 373 feet of 0.606-ounce ore over a width of 73.4 inches. The remainder of the drifting, amounting to 1,962 feet, was done in the new vein zone that has been designated the No. 4 zone, and which was described in some detail in the annual report for 1951.

Drifting in the No. 4 vein zone was started in August, 1951, at the 7,825-foot horizon. Exploration of the zone was continued during 1952 at that level, and considerable crosscutting and drifting was done to open the zone at the 7,700-, 7,575, and 7,325-foot levels. The work done during

[1]Re-treatment of other tailings, $0.328, is included in milling and refining.

the year exposed a total of 963 feet of ore having an average cut grade of 0.521 ounces per ton over an average width in the drifts of 63.6 inches.

All of the year's work in this vein zone, with the exception of one heading on the 7,325-foot level, was carried out to the east of the Lake Shore fault. At the 7,325-foot horizon a total length of 218 feet of ore was opened by drifting on a vein, the presence of which was first indicated by two diamond-drill holes drilled southward from the drift on the north vein, at a place 800 feet west of the main crosscut. The occurrence, which was reached by a crosscut from the north-vein drift, was opened by drifting to the west of the crosscut for a distance of 326 feet. The drive exposed an ore shoot 160 feet long. Driving to the east of the crosscut for a distance of 107 feet exposed 58 feet of ore. The appearance of the ore in this vein and its position with respect to the No. 2 vein zone, both strongly suggest the probability that it belongs to the same geological structure as the new ore developed to the east of the fault on the 7,575-foot, 7,700-foot, and 7,825-foot levels. The occurrence, therefore, has been included in the No. 4 vein zone.

At the 7,575-foot level, one heading was driven in the No. 4 vein zone for a distance of 386 feet of which a length of 54 feet was ore. At the year's end this heading was driving in ore.

The total drifting advance in the zone at the 7,700-foot level was 754 feet made in two headings. Four lengths of ore, totalling 526 feet, were exposed, the longest one having a length of 195 feet.

At the 7,825-foot level, two headings were driven for a total of 333 feet, exposing three shoots of ore having a combined length of 165 feet.

In addition to the development work already carried out, a considerable amount of work remains to be done before stoping operations can be started on the ore bodies in the new No. 4 vein zone. To date, a waste-pass system has been completed from the 6,575-foot level to the 7,700-foot horizon, and a connection through to the 7,825-foot level will be provided when a raise, now driving, is completed in about six weeks' time. A fan has been installed at the 6,700-foot level to pass fresh air down the system to ventilate the lower levels. Work still to be done is:

1) The driving of development raises on the ore between levels.
2) The driving of an ore-pass system.
3) The installation of a loading-pocket at No. 4 shaft.

It is probable that the loading-pocket will be installed at the 8,075-foot level, and it will therefore be necessary to deepen No. 4 shaft for a distance of 250 feet. Further exploration of the levels now under development down to the 7,825-foot horizon is being continued.

At the year's end, the total footage of ore exposed in the mine and available for stoping was 14,789 feet, grading 0.504 ounce per ton over a width in the drifts, before slashing, of 56.9 inches. This is an increase in length over last year of 103 feet and 0.002 ounces per ton in grade. During the year under review, development drifting exposed a length of 1,336 feet of new ore as follows:

Level	Ore Length	Width before slashing	Grade
	feet	inches	ounces per ton
1,400-foot	67	104.7	1.015
4,450-foot	91	64.4	0.471
4,825-foot	97	64.6	0.485
5,325-foot	18	68.0	0.515
5,450-foot	73	65.7	0.308
5,825-foot	27	60.0	0.272
7,325-foot	218	63.2	0.414
7,575-foot	54	60.0	0.698
7,700-foot	526	64.0	0.496
7,825-foot	165	63.8	0.691
Total	1,336	65.9	0.534

Mining

During the year, an average of 722 tons per day was milled as compared with 985 tons per day for the year ending December 31, 1951.

The total ore milled, which is down 95,894 tons from last year, was made up of 30.4 percent from the No. 1 or south vein zone, 65.5 percent from the No. 2 or north vein zone, and 4.1 percent from the new No. 4 vein zone.

During the year, recovery of broken ore from an old shrinkage stope on the 1,400-foot level amounted to 22,060 tons, down 3,472 tons from last year. This is low-cost ore, the replacement of which from currently mined stopes is at a much higher cost per ton. The discontinuance of these recovery operations in October, 1952, caused a loss of 70 tons per day of this class of ore. Since May, 1952, no ore has been broken in the mine in shrinkage stopes, which is a lower-cost method of stoping than the cut-and-fill method by means of which most of the production is derived. Production from currently mined shrinkage stopes in 1952 was down 13,935 tons, or 38 tons per day from the average for 1951.

In the latter part of 1951 and early in 1952, trouble was experienced owing to rock burstings from the walls and backs of the main crosscuts on the 5,450-, 5,575-, 5,700-, and 5,825-foot levels. The trouble was caused by enlargement of the ore pass due to wear and sloughing of the walls resulting in a condition of undue stress being set up around the enlarged opening. Initial remedial measures were taken by providing substantial additional support, in the form of reinforced concrete plugs, in the ore-pass area. This repair work failed to overcome the difficulty, and it was found necessary to abandon the pass, fill it tightly with waste material, and drive a new sytem of passes from the 5,325-foot level down to the 5,825-foot horizon. This work cost a total of $60,158.65 of which the new ore pass accounted for $26,234.61. For the three preceding years the average cost of maintenance and repairs to ore passes was $19,957.54.

Damage caused to some underground workings by rock bursts necessitated the driving of new crosscuts in order to provide a second means of exit from the stoping areas on a number of levels. This work is not yet completed, but the cost for 1952 amounted to $89,000.

In 1952 the cost of drift and crosscut maintenance and repair work was considerably higher than in preceding years. The cost of this work for 1952 increased by $81,000 over the figure for 1951 and was $158,000 higher than the average for the preceding five years.

The increased expenditures noted above are inordinately accentuated in the cost-per-ton figure because of the smaller tonnage treated. The reduction in tonnage was due partly to the loss in shrinkage-ore recovery but was caused largely by the inactivity, for part of the year, of certain stoping sections as a result of the heavy bursting in December, 1951. This bursting was also responsible for the increased charges for drift and crosscut maintenance.

Production

Operating period	Tons milled	Gross value of bullion[1]	Dividends paid	Price received from mint per ounce for gold
Mar., 1918 to June 30, 1932	3,171,005	$ 49,025,540.74	$ 19,020,000	.....
July, 1932 to June 30, 1933	797,673	13,277,685.72	6,000,000	$24.08
July, 1933 to June 30, 1934	836,991	16,382,274.27	6,000,000	33.68
July, 1934 to June 30, 1935	833,094	16,026,108.57	8,000,000	34.68
July, 1935 to June 30, 1936	873,101	16,361,529.69	8,000,000	35.19
July, 1936 to June 30, 1937	879,559	15,692,652.85	12,000,000	34.96
July, 1937 to June 30, 1938	928,036	15,030,273.43	10,000,000	35.08
July, 1938 to June 30, 1939	898,894	14,608,714.60	8,000,000	35.18
July, 1939 to June 30, 1940	755,661	12,281,332.25	5,500,000	37.80
July, 1940 to June 30, 1941	612,906	9,404,780.99	3,700,000	38.50
July, 1941 to June 30, 1942	388,738	6,191,672.38	2,200,000	38.50
July, 1942 to June 30, 1943	338,810	5,540,130.54	1,600,000	38.50
July, 1943 to June 30, 1944	267,698	4,498,529.77	1,600,000	38.50
July, 1944 to June 30, 1945	261,583	4,276,226.30	1,600,000	38.50
July, 1945 to June 30, 1946	331,048	4,983,114.19	1,600,000	38.50
July, 1946 to June 30, 1947	294,665	4,681,358.00	1,440,000	35.01
July, 1947 to June 30, 1948	321,237	4,697,785.51	1,440,000	35.00
July, 1948 to Dec. 31, 1948	177,483	2,819,195.71	720,000	35.00
Jan., 1949 to Dec. 31, 1949	379,079	6,056,923.35	1,480,000	36.54
Jan., 1950 to Dec. 31, 1950	370,267	5,491,393.52	1,560,000	37.99
Jan., 1951 to Dec. 31, 1951	359,489	5,324,793.69	700,000	37.51
Jan., 1952 to Dec. 31, 1952	263,595	3,485,107.75	400,000	34.27
Total	14,340,612	$236,137,123.82	$102,560,000	.....

Shaft Work and Lower Development

During the year the following work was done on lower development:

A new ore-pass system was completed from the 5,325-foot down to the 5,825-foot level.

A waste-pass system was driven from the 6,825-foot to the 7,700-foot level. Work on a connection through to the 7,825-foot level was in progress at the end of the year.

A ventilation raise was driven from the 6,700-foot to the 6,575-foot level to make a connection with the fresh-air supply at that level. A fan has been installed at the bottom of this raise at the 6,700-foot level, which will force fresh air down the waste-pass system to the bottom levels in the mine.

Numerous small fan installations, used to force air through galvanized piping and rubber tubing to the working faces on the lower levels, were made during the year.

New development hoppers for dumping development rock into the skips at No. 4 shaft were installed at the 7,075-foot and 7,575-foot levels.

The main crosscuts on the 7,575-foot and 7,700-foot levels were completed to the vein zone during the year. Advances were 546 feet and 450 feet respectively.

[1]Includes exchange premium and amount recoverable under the Emergency Gold Mining Assistance Act (estimated for 1952).

Crosscuts, each 100 feet long, were driven to the new waste-pass system on the 6,700-, 6,825-, 7,075-, 7,575-, 7,700-, and 7,825-foot levels.

Supplies and Equipment Purchased

	1918 to Dec. 31, 1951	1952	Total to date
Explosives	$ 3,181,557	$ 70,615	$ 3,252,172
Lumber and timber	5,085,735	154,316	5,240,051
Rock drills and parts	1,097,557	16,848	1,114,405
Pipe fittings, plumbing supplies	1,151,433	20,157	1,171,590
Electrical supplies	1,800,426	30,524	1,830,950
Mill supplies	6,071,041	116,880	6,187,921
Machinery and parts	6,565,344	204,307	6,769,651
Building materials	1,241,551	25,622	1,267,173
Fuel	963,103	43,761	1,006,864
Steel products	3,480,584	52,607	3,533,191
Oil and lubricants	345,718	6,294	352,012
Trucks, cars, bulldozer, and power shovels	173,082	3,023	176,105
Miscellaneous	3,940,433	102,790	4,043,223
Backfill	1,273,766	30,986	1,304,752
Power	7,459,837	226,264	7,686,101
Total	$43,831,167	$1,104,994	$44,936,161
Freight and express included in value of above materials	$3,134,600	$69,062	$3,203,662

An average of 615 men was employed. W. T. Robson is mine superintendent.

Leitch Gold Mines, Limited

Leitch Gold Mines, Limited, was incorporated in July, 1935, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,912,505 have been issued. The officers and directors are: K. J. Springer, president; J. H. C. McClelland, vice-president; W. W. McBrien, secretary-treasurer; F. E. Hall, assistant secretary; S. H. Robinson, J. D. Barrington, and J. R. Cryderman, directors. The head office is at 67 Yonge Street, Toronto. The mine address is Beardmore.

The main property is located in Eva and Summers townships, district of Thunder Bay, about 5 miles from Beardmore by motor road.

Mining and milling operations continued throughout 1952. The mine is served by a vertical three-compartment shaft, 3,006 feet deep, known as No. 1. There was no shaft-sinking in 1952. The following development work was done during the year: drifting, 1,096 feet, crosscutting, 1,340 feet; raising, 928 feet. Diamond-drilling consisted of 51 holes, totalling 11,116 feet, from underground.

Preparations were started for the sinking of a winze below the 19th level, approximately 1,200 feet west of the shaft. An entry crosscut was driven to the winze station and to the hoist-room, and the raise for the headframe was started.

Six small houses were bought from the Undersill Gold Mining Company, Limited, and moved to Leitch property. A new well and water system was installed to take care of the additional users.

The following is taken from the mine manager's report for the year ending December 31, 1952:

Exploration and Development

The drive west on the 8th level was advanced 891.5 feet, from a point 5,390 feet distant from the shaft, to 6,281 feet, and 78.0 feet equivalent of slashing was done for diamond-drill stations and turnouts. A branch was driven from near the face of this crosscut and advanced 147.5 feet northwest. No. 16 vein, lying about 30 feet south of No. 802W crosscut, was opened up for a length of

490 feet east of the wide diabase dike and 264 feet west of it. The developed sections of the vein extend 4,100–4,900 feet from the shaft. The vein is narrow, being about eight inches wide, and in some places is split into two stringers separated by four or five feet of waste. Values are somewhat erratic, but the following ore lengths (cut grade) have been developed from east to west:

	Length	Width	Assay
	feet	inches	ounces per ton
Ore lengths	170	7.7	0.884
	90	10.5	0.850
	20	5.0	2.000
	120	9.3	0.975
Total	400	8.1	1.071

The possible ore shoots indicated by the surface drilling west of No. 16 vein were not proven. The crosscut traversed the zone, and diamond-drill holes put out on either side explored it thoroughly. Many narrow intersections were obtained in drilling, but values were too low and inconsistent to warrant further exploration or development. A thin, vertical vein, striking S. 80° W., called No. 18, was cut by No. 802W crosscut near the face, but values were low in the section opened, and it pinched to a thin stringer in the face. The northwest branch crosscut, mentioned above, intersected a vertical vein striking roughly east-west. This vein, called No. 19, was opened for a length of 48 feet but proved to be of low grade and discontinuous. It was explored further west by diamond-drill holes, but the intersections obtained were of low value. Diamond-drilling is continuing in the area south and east of No. 16 vein where a number of narrow intersections have been obtained but which are not yet correlated.

A limited amount of drifting was done on the main veins below the sill. No. 1703 drift was advanced 209.0 feet, with 94.0 feet equivalent of slashing to complete the development of No. 3 vein on the 17th level. Together with previous work this opened up an ore shoot 295 feet long.

Ore Reserves

Ore reserves are estimated at 103,882 tons, averaging 0.615 ounces per ton, or $20.91 per ton at $34 per ounce. This makes a total of 63,932.00 ounces.

Hoisting

Some 46,050 tons of ore were hoisted: 1,231 tons or 2.7 percent from drifting, 964 tons or 2.1 percent from raising, and 43,855 tons or 95.2 percent from stoping.

Milling

Some 36,275.6 tons of ore were milled after sorting 8,806 tons of waste. Average milling and sorting rates were 100.8 and 24.4 tons per day based on 360 operating days during the year. Production for the year was 29,459.661 ounces of fine gold and 902.22 ounces of fine silver, valued at $1,006,465.21. Average recovery was 0.812 ounces gold per ton milled.

Installation of equipment in the new mill addition was completed during the year. The new mill circuit has made a considerable improvement in capacity and recovery. Costs are higher owing to finer grinding. A further improvement in recovery and reduction of costs is expected.

Costs

Operating costs per ton milled for the year were as follows:

	Per ton milled
Exploration and development:	
Underground diamond-drilling	$ 0.42
Crosscutting and drifting, 8th level	1.76
Drifting	0.25
Raising	0.48
Crosscutting, winze preparation	0.10
Raising, winze preparation	0.03
Station cutting, winze preparation	0.05
Total	$ 3.09
Mining	12.46
Milling	4.41
Total operating cost at the mine	$19.96

Over-all operating costs were $0.30 per ton milled lower than in 1951. Development costs

were lower, $3.09 per ton milled as against $5.41 last year. Mining costs were higher, $12.46 per ton milled as against $11.00 per ton milled last year. Milling costs were $4.41 per ton milled compared were $3.75 per ton milled in 1951.

The trend of unit costs is again increasing as shown by the following tabulation:

	1949	1950	1951	1952
Crosscutting and drifting.....per foot advance	$22.98	$21.84	$22.43	$24.16
Crosscutting and drifting, 8th level.....per foot advance	.....	26.16	25.56	29.27
Raising.....per foot advance	16.08	18.17	17.00	17.62
Mining.....per ton broken	8.78	8.44	9.22	10.70
Milling.....per ton milled	3.62	3.55	3.75	4.41

Costs of development on the 8th level were higher owing to the increased distance from the shaft. The extreme face is 6,400 feet from the shaft, and the remoteness caused an increase in hauling costs and reduced the working time at the face. The increase in mining costs is due mainly to the added timbering required in stopes at lower levels and to the program of backtimbering required to ready new stopes for mining on the levels below the sill. Milling costs were higher owing to the increased grinding costs and the high replacement costs occasioned by the mill change-over.

The cost of timber and steel products continued to rise during the year, while the cost of chemicals and mechanical rubber goods were reduced. The supply and delivery of most supplies was good although delivery of machinery and parts was slow. Increased freight rates are having a marked effect on prices of all supplies.

General

Operations continued at a steadier rate throughout the year than the previous year although the effect of the summer and early fall labour slack was evident in reduced rate of production during this period. More men are available, but increased difficulties are encountered in training them to do productive work.

An average of 130 men was employed, 64 of whom were in the mine, and 66 on the surface. G. A. McKay is mine manager.

Little Long Lac Gold Mines, Limited

Little Long Lac Gold Mines, Limited, was incorporated in January, 1933, with an authorized capitalization of 2,000,000 shares of no par value, of which 1,841,000 have been issued. The officers and directors are: J. G. Boeckh, president; J. C. Allen, vice-president; M. C. Maddigan, secretary-treasurer; S. J. Bird, R. C. Stanley, J. R. Strathy, and A. W. White, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Geraldton.

The property is in the townships of Errington and Ashmore, Little Long Lac area, district of Thunder Bay.

Mining and milling continued throughout 1952. The mine is operated through a vertical three-compartment shaft, 2,322 feet deep, and a vertical three-compartment winze, which runs from the 16th level to a depth of 3,952 feet from surface, about 1,680 feet southwest of the shaft. Lineal development in 1952 consisted of: drifting, 63 feet; crosscutting, 20 feet; raising, 148 feet. The total amount of lineal development at the end of 1952 was: drifting, 45,905 feet; crosscutting, 10,627 feet; raising, 17,827 feet. Ten diamond-drill holes, totalling 7,795 feet, were drilled from underground.

The following is taken from the manager's report for the year ending December 31, 1952:

Production

Ore hoisted	tons	99,607
Ore milled	tons	99,529
Bullion recovered, gold	ounces	23,526.01
Bullion recovered, silver	ounces	2,487.20
Total gold in residue	ounces	2,374.70
Calculated mill head assay		$8.96
Calculated mill residue assay		$0.86
Recovery	percent	90.02

Milling

The average daily tonnage treated was 288.0, and the recovery was 90.02 percent. Mill tonnage for the first nine months averaged 309.5 tons daily, but due to completion of mining in the winze area and to a rock burst that occurred in the main shaft in November, tonnage for the last quarter averaged only 200 tons daily. Recovery was down 5 percent from the previous year. This was owing partly to the discontinuance of the flotation and roasting operations and partly to the mining of the more refractory shaft-pillar ore. However, the loss of 5 percent in recovery amounts to approximately 35 cents per ton, while the cost of flotation and roasting is approximately 55 cents per ton milled. It was found, however, that when more pillar ore was milled, lower recovery resulted, so flotation was resorted to again, beginning October 1. The concentrates were reground and passed through the circuit again, resulting in a recovery for the last quarter of 94.45 percent without roasting.

Mining

During 1952, 103,736 tons were broken in stopes of which 2,187 tons were waste. Of the 97,734 tons drawn from stopes, 20.9 percent was drawn from the main vein, 51.6 percent from the south vein, 10.4 percent from the "04" and "09" zones, and 17.1 percent from the shaft pillars.

All mining in the winze area was completed by December 5, and salvage operations in the winze were in progress at the end of the year.

The source of ore for the year by levels was as follows:

Level	Removed	Percentage
	tons	
No. 3	705	0.7
No. 4	13,104	13.1
No. 5	268	0.3
No. 6	2,132	2.1
No. 7	2,793	2.8
No. 8	3,988	4.0
No. 9	877	0.9
No. 10	3,170	3.2
No. 16	15,729	15.8
No. 17	5,498	5.5
No. 21	3,399	3.4
No. 22	19,935	20.1
No. 23	15,588	15.6
No. 24	8,343	8.3
No. 25	4,218	4.2
Total	[1]99,747	100.0

It will be noted from the above that 57.1 percent of the ore drawn in 1952 came from the winze levels, which are now mined out; 17.1 percent of the ore came from the shaft pillars. In December, 78 percent of the ore milled was from the shaft pillars.

Development

Development was kept to a minimum during 1952. A raise was driven from the No. 1609 drift to the 15th-level horizon to explore values revealed by diamond-drilling in 1951. A short subdrift was driven east and west from this raise at the 15th-level horizon, but values in both the raise and the subdrift were below ore grade.

Underground Exploration

Some 3,039 feet of drilling was done to check the westerly extension of the main vein on the 15th level. This consisted of three holes. The first hole intersected an altered fractured zone with irregular pyritized quartz stringers, which assayed 0.10 ounces over 7.2 feet. Holes were drilled 200 feet to the east and west of this but failed to show values. Some 753 feet of drilling, comprising two holes, were drilled below the No. 1609 drift to test the "09" zone below the 16th level. No ore was intersected.

Outside Exploration

Exploration efforts were concentrated on two groups known as the Northwest and Tom-Lac groups.

The Northwest group consisted of a block of 140 claims located approximately four miles to the northwest of the Little Long Lac mine. These claims were staked by the company to test a geological theory. Geophysical work was carried out from the air followed by an electrical geo-

[1]Includes development ore.

physical survey on the more likely portions. Some 4,769 feet of diamond-drilling was carried out to test anomalies and although several shears and sulphide zones were located, no ore was revealed.

The Tom-Lac group was formed jointly by MacLeod-Cockshutt Gold Mines, Limited, Tombill Gold Mines, Limited, and this company. Each company put 5 claims into the group forming a 15-claim group located south of Little Long Lac mine and north of MacLeod-Cockshutt mine. Some 6,420 feet of diamond-drilling was carried out from surface, and 3,531 feet from the underground workings of this mine. First results from the surface drilling were very encouraging. However, in close drilling, the zone proved very disappointing.

Ore Reserves

The ore reserves as of December 31, 1952, are:

	Tons	Grade	
		Ounces per ton	Value (gold at $35 per ounce)
Shaft pillars	31,540	0.420	$14.70
Main vein, 16th level	9,850	0.399	13.96
"09" vein	3,000	0.300	10.50
Broken ore	9,494	0.399	13.96
Total	53,884	0.405	$14.17

Operating Costs

The operating costs for 1952 are as follows:

	Total cost	Per ton milled
Exploration	$ 7,170.13	$0.0720
Development	14,208.82	0.1428
Mining	535,817.79	5.3835
Milling	180,191.61	1.8104
Mine office and supervision	50,214.02	0.5045
General operating expense	59,860.39	0.6015
Total expense at property	$847,462.76	$8.5147
Toronto office expense	28,537.68	0.2867
Total expenditures	$876,000.44	$8.8014

Operating costs were somewhat lower in 1952 than in 1951. Total costs in 1951 were $999,-881.17 or $9.83 per ton, as compared with $876,000.44 or $8.80 per ton milled in 1952. Costs up to the third quarter of 1952 averaged $8.06 per ton milled. The fourth quarter costs were somewhat higher owing to the lower tonnage treated and heavy salvage costs.

Exploration and development costs were down from $54,515.60 in 1951 to $21,378.95 in 1952. However, this lower development cost was more than offset by extra costs of pillar preparation and winze salvage. These costs amounted to $25,824.44 and $11,502.26 respectively.

Milling costs were down from $201,449.19 or $1.98 per ton milled in 1951 to $180,191.61 or $1.81 per ton milled in 1952. Milling costs up to and including the third quarter were $1.62 per ton milled. Higher costs in the final quarter were due to lower tonnage treated and the resumption of the flotation operation.

Mining costs were down from $579,990.73 or $5.70 per ton milled in 1951 to $535,817.79 or $5.38 per ton milled in 1952. Included in these were the costs of pillar preparation and salvage plus heavy rock-burst costs in November.

Mine office and supervision and general operating expenses were both down from the previous year.

The emergency cost-aid amounted to $96,349.59 or 97 cents per ton milled in 1952 as compared with $132,746.92 or $1.30 per ton milled in 1951.

The price paid for gold by the Mint during 1952 averaged $34.19 per ounce or $2.68 per ounce lower than in 1951. This amounts to approximately $60,370 or 61 cents per ton milled.

General

There were ten rock bursts during 1952. Six bursts occurred in the winze area, one in a 16th-level stope, and three in the shaft pillar stopes. Two men received minor injuries due to bursts. The most serious burst occurred adjacent to and in the main shaft at a depth of 850 feet where stoping of the shaft pillars was in progress. Production was held up for five days for repairs to the shaft.

An average of 160 men was employed, 104 of whom were in the mine, and 56 on the surface. W. A. Carter is manager.

Macassa Mines, Limited

Macassa Mines, Limited, was incorporated in April, 1926, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,678,068 have been issued. The officers and directors are: R. A. Bryce, president; L. Soliague, vice-president; H. W. Salthouse, secretary-treasurer; C. R. Leonard, J. D. Perrin, A. G. Slaght, and H. M. Porteous, directors. The head office is at 85 Richmond Street West, Toronto. The mine address is Kirkland Lake.

The company's property consists of 11 claims in Teck township, Kirkland Lake area, district of Timiskaming.

Mining and milling operations continued throughout 1952. There was no shaft-sinking during the year.[1] The following development work was done: drifting, 2,337 feet; crosscutting, 2,722 feet; raising, 1,175 feet. The total amount of development work at December 31, 1952, was: drifting, 93,284 feet; crosscutting, 32,260 feet; raising, 17,178 feet. Diamond-drilling consisted of 72 holes, totalling 9,900 feet, from underground.

The following is taken from the mine manager's report for the year ending December 31, 1952:

Ore Reserves

Year	Gross recovery	Tons milled	Recovery per ton
1950	$1,662,908.34	128,710	$12.92
1951	1,655,383.35	135,440	12.22
1952	1,534,630.74	139,660	10.99

During the year, the price of gold, expressed in Canadian dollars, has fluctuated between a high of $35.129 and a low of $33.598 per ounce. The average price we received for our gold from the Canadian Mint for the year was $34.22 per ounce. Under the provisions of The Emergency Gold Mining Assistance Act, it is estimated that the company is entitled to receive the sum of $143,294.58, which is $1.026 per ton milled, or $3.21 per ounce of gold recovered. Of this amount $85,294.58 has been received on account.

Combining the Mint price received with the estimated cost-aid gives a total of $37.43 per ounce as compared with $39.295 for 1951.

From the commencement of milling in October, 1933, 2,054,801 tons of ore have been treated from which 851,260.7 ounces of gold and 147,162.9 ounces of silver have been recovered, having a gross value of $31,310,478.78, the equivalent of $15.23 per ton, exclusive of cost-aid.

Development and Exploration

During the year, 555 feet of new ore was exposed in drifting, which has an average value of 0.4 ounce per ton over an average width of 4.8 feet. Of this length, 81 feet was on the 3,600-foot level, and 230 feet on the 4,500-foot level and above the collar of the No. 2 winze on the 4,625-foot level. On the new levels below the 4,625-foot, 134 feet was opened by drifting on the 4,750-foot level, having an average grade of 0.5 ounce over 3.5 feet, and on the 5,025-foot level, 110 feet of an average grade of 0.58 ounce over a width of 5.5 feet. A new vein is partially developed on the 3,100-foot level west, having an indicated reserve of 15,000 tons of above mine average grade, which cannot as yet be included in the positive reserve.

On the eight new levels below the 4,625-foot, each station was enlarged, following sinking last year, and a crosscut extended away from each to allow installation of signal equipment. A pumping layout was placed on the 5,625-foot level. Active exploration was carried out on the first three levels, the 4,750-, 4,900-, and 5,025-foot, first by diamond-drilling, followed by crosscutting and drifting. A total of 2,861 feet of diamond-drilling, 1,489 feet of crosscutting, and 829 feet of drifting was done, with encouraging results as noted above. As crosscutting to the ore zone is completed on these three levels, drifting east and west will now be continued.

Active exploration of both the older part of the mine above the 4,625-foot level and the new levels below the 4,625-foot will be continued as quickly and as extensively as conditions will permit.

[1]For a detailed description of the shafts see Ont. Dept. Mines, Vol. LIX. 1950, pt. 2, p. 43.

Ore Reserves

Positive ore reserves at December 31 were as follows:

	Tons	Ounces per ton	Value (gold at $35 per ounce)
Unbroken	313,100	0.37	$12.95
Broken	56,100	0.33	11.62
Total	369,200	0.365	$12.78

Milling

An adequate and stable supply of men during the last five months of the year helped make it possible to mine and mill a higher tonnage than for 1951. The average tons milled per day for 1952 was 381.6 as compared with 371 tons for 1951 and 352.6 for 1950. The extraction for the year was 95.0 percent, and no serious mechanical difficulties hampered the operation.

Operating Costs

The cost of some operating supplies rose again during the year, as it has now for six years. The operating and other costs per ton milled and per ounce of gold recovered compared with those of 1951 were as follows:

	1952		1951	
	44,640.04 ounces recovered from 139,660 tons milled		44,597.71 ounces recovered from 135,440 tons milled	
	Per ton	Per ounce	Per ton	Per ounce
Development and exploration	$ 1.316	$ 4.116	$ 0.714	$ 2.169
Mining	6.965	21.789	6.670	20.258
Milling	1.498	4.687	1.459	4.431
Undistributed mine operating charges	0.433	1.355	0.472	1.431
Administration and head office	0.430	1.344	0.474	1.438
Operating costs	10.642	33.291	9.789	29.727
Depreciation	0.233	0.731	0.240	0.730
Provision for municipal, provincial, and federal taxes	0.090	0.280	0.619	1.878
Total cost	$10.965	$34.302	$10.648	$32.335

A comparison of the main items of expenditure during 1952 with those of 1951 is as follows:

	1952	1951
Wages and salaries	$911,741.37	$878,573.52
Supplies and services	468,409.72	443,146.75
Power, hydro-electric	75,230.95	76,384.35
Provision for taxes	12,636.39	83,760.48

Wages for 1952 were the highest of any year since the mine started operation. The labour turnover for the last half of the year was the lowest for some time.

Capital Expenditures

A net increase of $9,871.56 in capital expenditure resulted during the year. A change in the crushing plant to lower operating costs, and new underground working equipment, made up the amount.

An average of 276 men was employed, of whom 194 were underground, and 82 on the surface. A. A. McCloskey is mine manager.

McIntyre Porcupine Mines, Limited

McIntyre Porcupine Mines, Limited, was incorporated in March, 1911, with an authorized capitalization of 800,000 shares of $5 par value, of which 798,000 have been issued. The officers and directors are: Balmer Neilly, president; B. E. Smith, vice-president; E. D. Fox, secretary; W. B. Dix, treasurer; J. C. Fraser, D. H. McDougall, and R. S. McLaughlin, directors. The head office and mine address is Schumacher. The executive office is at 25 King Street West, Toronto.

The company has numerous holdings in Ontario, the chief of which is the McIntyre mine in Tisdale township, Porcupine area, district of Cochrane.

Mining and milling operations continued throughout 1952.

The following is taken from the report of the general manager for the fiscal year ending March 31, 1953:

Production

Ore Treated.....tons		768,930
Value per ton (0.2929 ounces per ton).....		$9.9744
Gross value.....		$7,669,658.68
Gold and silver produced:		
Gold (214,399.877 ounces at $34.055)..	$7,301,493.55	
Silver (41,966.510 ounces at $0.8186)..	34,352.09	
Total value.....		$7,335,845.64
Recovered per ton (0.2801 ounces per ton).....		$9.54

Mining

	Tons
Ore broken in stopes.....	700,302
Ore from development.....	66,408
Total.....	766,710
Ore delivered to passes.....	777,251

Development

Development work amounted to 21,951 feet. This includes 15,880 feet of drifting of which 2,408 feet was on line and 4,927 feet in ore averaging 0.385 ounces per ton over a width of 6.7 feet.

No. 3 Vein.—Stopes produced 60,066 tons of an average of 0.273 ounces per ton: 251 feet of drifting on the 1,375-foot and 2,000-foot levels developed 56 feet of ore averaging 0.261 ounces per ton over a width of 7.9 feet.

No. 5 Vein.—Stopes produced 43,574 tons of an average of 0.254 ounces per ton: 1,985 feet of drifting on the 200-, 400-, 500-, 700-, 800-, 900-, 1,000-, 1,625-, and 1,750-foot levels developed 438 feet of ore averaging 0.348 ounces per ton over a width of 9.0 feet.

No. 6 Vein.—Stopes produced 2,509 tons of an average of 0.236 ounces per ton; 45 feet of drifting was done on the 2,875-foot level.

No. 7 Vein.—Stopes produced 37,374 tons of an average of 0.244 ounces per ton; 450 feet of drifting on the 1,125-, 1,250-, 1,375-, and 2,500-foot levels developed 42 feet of ore averaging 0.208 ounces per ton over a width of 7.5 feet.

No. 8 Vein.—Stopes produced 6,936 tons of an average of 0.206 ounces per ton; 62 feet of drifting on the 1,375-foot level developed 62 feet of ore averaging 0.242 ounces per ton over a width of 7.5 feet.

No. 9 Vein.—Stopes produced 61,442 tons of an average of 0.282 ounces per ton; 832 feet of drifting on the 1,000-, 1,500-, 1,875-, 2,000-, 2,500-, 2,750-, 3,000-, and 3,250-foot levels developed 154 feet of ore averaging 0.298 ounces per ton over a width of 6.3 feet.

No. 10 Vein.—Stopes produced 126,530 tons of an average of 0.310 ounces per ton; 2,704 feet of drifting on the 1,250-, 1,375-, 1,875-, 2,375-, 2,750-, 3,375-, 3,500-, 4,325-, 4,475-, 4,625-, 5,375-, and 5,675-foot levels developed 1,379 feet of ore averaging 0.324 ounces per ton over a width of 5.9 feet.

No. 12 Vein.—Stopes produced 82,523 tons of an average of 0.289 ounces per ton; 380 feet of development on the 200-, 500-, 700-, and 800-foot levels developed 68 feet of ore averaging 0.339 ounces per ton over a width of 5.0 feet.

No. 13 Vein.—Stopes produced 52,947 tons of an average of 0.241 ounces per ton; 76 feet of drifting on the 2,250- and 4,625-foot levels developed 28 feet of ore averaging 0.232 ounces per ton over a width of 4.0 feet.

No. 14 Vein.—Stopes produced 11,883 tons of an average of 0.205 ounces per ton; 113 feet of drifting on the 1,625- and 3,000-foot levels developed 65 feet of ore averaging 0.242 ounces per ton over a width of 6.9 feet.

No. 15 Vein.—Stopes produced 70,359 tons of an average of 0.235 ounces per ton; 544 feet of drifting on the 800-, 1,000-, and 1,625-foot levels developed 91 feet of ore averaging 0.404 ounces per ton over a width of 8.0 feet.

No. 16 Vein.—Stopes produced 1,168 tons of an average of 0.286 ounces per ton; 549 feet of drifting on the 4,775-, 4,925-, 6,425-, and 6,575-foot levels developed 78 feet of ore averaging 0.820 ounces per ton over a width of 7.4 feet.

No. 18 Vein.—Stopes produced 5,942 tons of an average of 0.364 ounces per ton; 6 feet of drifting was done on the 300-foot level.

Nos. 21, 22, and 24 Veins.—Stopes produced 85,794 tons of an average of 0.291 ounces per ton; 7,812 feet of drifting on the 3,375-, 3,875-, 4,025-, 4,175-, 4,325-, 4,475-, 4,625-, 5,375-, 5,675-, 5,975-, 6,425-, and 6,825-foot levels developed 2,466 feet of ore averaging 0.431 ounces per ton over a width of 6.7 feet.

No. 25 Vein.—Stopes produced 63,796 tons of an average of 0.478 ounces per ton; 88 feet of drifting was done on the 3,375-, and 4,325-foot levels.

Ore Reserves

	Tons	Ounces of fine gold	Value (gold at $35 per ounce)
Estimated in place	2,595,272	861,110.6	$30,138,871
Broken ore	56,165	14,576.0	510,160
Total	2,651,437	875,686.6	$30,649,031
Average per ton		0.330	$11.55

Development and Exploration, 1952-53

Period	Drifts	Cross-cuts	Raises	Winzes	Shafts	Stations	Sumps	Excavations	Total footage	Excavations	Diamond-drilling
	feet	feet	feet	feet	feet	cu. feet	cu. feet	cu. feet	feet	cu. feet	feet
1	1,161	805						6,259	1,966	6,259	12,239
2	1,160	874							2,034		14,336
3	1,216	738				2,100			1,954	2,100	14,080
4	1,364	392						7,284	1,756	7,284	16,020
5	708	175						1,800	883	1,800	8,021
6	1,300	348						2,376	1,648	2,376	14,135
7	1,239	561	123					7,980	1,923	7,980	15,327
8	1,275	229	108					10,620	1,612	10,620	15,784
9	1,529	243	82					540	1,854	540	14,932
10	1,603	266	95					1,680	1,964	1,680	16,291
11	1,606	352	129					600	2,087	600	15,526
12	1,719	288	263					5,580	2,270	5,580	15,427
Total	15,880	5,271	800			2,100		44,719	21,951	46,819	172,118
Previous to date	479,721	222,012	38,130	613	16,162	1,096,403	55,039	460,718	756,638	1,612,160	1,541,955
Total to date	495,601	227,283	38,930	613	16,162	1,098,503	55,039	505,437	778,589	1,658,979	1,714,073

Operating Costs

	Total	Per ton ore milled
Mining:		
Exploration	$ 28,839.46	$0.0375
Development	842,667.17	1.0959
Breaking and stoping	4,835,205.78	6.2882
Total	$5,706,712.41	$7.4216
Milling	831,850.75	1.0818
Administration and general expense	95,110.71	0.1237
Total	$6,633,673.87	$8.6271

SUMMARY OF MILLING COSTS

	Labour and employees' insurance	Supplies	Shop repairs and maintenance	Power	Indirect charges	Total	Per ton
Crushing and conveying	$ 40,307.28	$ 35,010.52	$17,575.89	$15,194.15	$18,248.55	$126,336.39	$0.1643
Tube-milling	23,559.48	111,363.39	11,759.10	25,294.65	.....	171,976.62	0.2237
Flotation	59,332.33	70,483.07	34,176.03	17,005.80	35,259.50	216,256.73	0.2812
Cyanidation	71,913.39	140,216.49	7,857.00	15,056.25	34,473.12	269,516.25	0.3505
Refining	12,616.96	9,104.47	989.20	146.70	.....	22,857.33	0.0297
Assaying	13,889.00	6,220.13	3,473.80	1,324.50	.....	24,907.43	0.0324
Mill alterations	.....	.....	.....	.....	.....	.....	.....
Total	$221,618.44	$372,398.07	$75,831.02	$74,022.05	$87,981.17	$831,850.75	$1.0818
Unit cost per ton	$0.2882	$0.4843	$0.0986	$0.0963	$0.1144	$1.0818	.....

ADDITIONS TO PLANT BUILDINGS AND EQUIPMENT

Surface buildings and equipment	$19,480.37
Underground equipment	51,173.39
Total	$70,653.76

General

Operations throughout the year continued without incident worthy of record. The upward trend in the cost of supplies was mostly owing to increased freight rates. The working force decreased during the summer months, otherwise there was a plentiful supply of men. The turnover, while still high, was slightly lower than that of the previous year.

Approximately 27 percent of the drifting in ore during the year was above and 73 percent below the 4,875-foot level. Estimated tonnage in the ore reserve is roughly 49 percent above and 51 percent below the same horizon.

The most important development has been on the 5,975-foot level where results have been up to expectations. From the limited amount of work done on the 5,675-foot and 6,425-foot levels, conditions to date also appear favourable.

Work on the 6,825-foot level so far has been disappointing; although some ore has been developed, results have been below expectations. This level, as far as the No. 22 vein area is concerned, has not been fully explored, but extensive diamond-drilling does not indicate any orebodies of major importance to date.

An average of 1,259 men was employed, of whom 828 were in the mine, and 431 on surface. M. L. Urquhart is manager.

McKenzie Red Lake Gold Mines, Limited

McKenzie Red Lake Gold Mines, Limited, was incorporated in February, 1933, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,940,000 have been issued. The officers and directors are: H. G. Young, president and managing director; A. C. Snively, vice-president and secretary-treasurer; S. Langley, G. P. Campbell, and J. A. McDougald, directors. The head office and mine office is at McKenzie Island.

The property is located at the north end of McKenzie Island, Dome township, Patricia portion of Kenora district.

Mining and milling operations continued throughout 1952. The following table gives details of the shafts on the property:

Shaft	Number of compartments	Depth
		feet
No. 1, vertical	3	456
No. 2, inclined 36 degrees	3	1,704
No. 4, vertical	3	420

Work on the new No. 5 shaft was continued in 1952. A further 353 feet was driven in the pilot raise, between the 1,650- and 1,250-foot levels. More detailed

information is given below in the mine manager's report. The following development work was done during the year: drifting, 3,005 feet; crosscutting, 418 feet; raising, 2,763 feet. Diamond-drilling consisted of 215 holes, totalling 29,586 feet, from underground.

The following is taken from the mine manager's report for the year ending December 31, 1952:

Production and Cost

	1952	1951
Milled.....tons	83,288	80,828
Average recovery per ton milled.....ounces	0.26	0.29
Value of gold bullion recovered	$739,010.16	$873,082.78
Operating cost	$796,254.48	$755,806.09

The above figures are based on mint returns, which gave an average price per ounce of $34.23 for 1952 as compared with $36.75 in 1951 and $37.90 in 1950.

Development

Development, exclusive of work done in connection with the new shaft, amounted to 6,186 feet. Of this, 3,443 feet was confined to the 1,050-foot level in the exploration of the Nos. 10–127 and 10–47 stope areas. The 550-foot-level development was confined to the No. 558 stope area. The 650-foot-level development consisted, for the most part, of the exploration of the No. 6164 stope area.

Shaft Program

The shaft program was well advanced during the year. Drifting in connection with this program amounted to 121 feet, crosscutting 109 feet, and raising 353 feet. In addition to this, the shaft was slashed to full size from the 450-foot level to surface, and considerable rock work was done in preparation for the site of the headframe, crusher, and conveyer installations. This program involved the hoisting to surface and disposing of 9,986 tons of waste. No. 4 shaft was dewatered and put into operation, and work commenced from the 1,450- and 1,650-foot levels. At the time of writing, the pilot raise is almost completed from the 1,650- to 1,250- foot level. This will complete the pilot raising from the 1,650-foot level to surface. Work will be concentrated on the section between the 1,650- and 1,250-foot levels during the winter months while labour is plentiful. This section of the shaft is most difficult as approximately 5,000 tons of waste rock must be hoisted through three shafts, with intermediate tramming, and disposed of on surface. Erection of the headframe and installation of hoist and crushing plant, is planned for this year.

Mining and Milling Operations

	1952	1951	Total to date
	tons	tons	tons
Ore broken in stopes and stope development, slashes included	82,286	81,845	1,345,690
Ore broken in development	12,445	9,073	171,850
Ore milled	83,288	80,828	1,284,555
Ore discarded by sorting	11,443	10,090	232,985
Total ore hoisted (milled and sorted, dry)	94,731	90,918	1,517,540
	ounces	ounces	ounces
Average value per ton milled	0.2660	0.3006	0.3218
Average recovery per ton milled	0.2592	0.2936	0.3132
	feet	feet	feet
Diamond-drilling	29,586	21,880	385,585
Percentage of extraction	97.45	97.69	97.34
Total value of bullion produced and marketed	$739,010.16	$873,082.78	$14,759,484.85
Total operating cost	$796,254.48	$755,806.09	$10,117,200.12

Ore Position

Despite promising diamond-drill results, the No. 10-127 area, on which much of the year's development and exploration was concentrated, proved to be disappointing. The values were erratic, which resulted in a good deal of low-grade ore. The failure of this area to respond satisfactorily had much to do with the exceptionally poor grade throughout the year. On diverting this development to other parts of the mine, better results were obtained and prospects are good for an immediate improvement in grade. It is expected that tonnage can be maintained throughout the year.

Analysis of Operating Costs

	Total	Per ton milled and sorted (94,731 tons)	Per ton (83,288 tons)
Mine operations:			
Development and exploration:			
Diamond-drilling	$ 29,697.14	$0.313	$0.357
Current development	127,143.05	1.342	1.527
Total	$156,840.19	$1.655	$1.884
Stoping	$369,818.95	$3.904	$4.440
Mill operations:			
Crushing and conveying	$ 21,088.27	$0.223	$0.253
Sorting	11,778.45	0.124	0.141
Milling	105,570.70	1.114	1.268
Total	$138,437.42	$1.461	$1.662
General expenses	$116,061.17	$1.226	$1.393
Head office expense	15,096.75	0.159	0.181
Totals	$796,254.48	$8.405	$9.560

General

The labour situation showed a decided improvement over the previous year. While labour has been comparatively plentiful, the process of training good underground labour is slow.

The mine is now converted 100 percent to tungsten-carbide tipped bits and rods. The conversion to light machines of both the jackleg and stoper type is 85 percent complete.

The program of improvement and overhaul of mechanical installations is being continued. The results of this program have been highly satisfactory in eliminating time lost because of mechanical break-downs.

An average of 146 men was employed, of whom 92 were in the mine, and 54 on surface. A. G. Vance is mine manager.

MacLeod-Cockshutt Gold Mines, Limited

MacLeod-Cockshutt Gold Mines, Limited, was incorporated in September, 1933, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,862,490 have been issued. The officers and directors are: F. G. MacLeod, president; Arthur Cockshutt, vice-president; J. M. Macintosh, secretary-treasurer; A. L. Cochrane, J. W. Baker, and William Smith, directors. The head office is at 357 Bay Street, Toronto. The mine address is Geraldton.

The company owns and operates a property consisting of 23 claims in Ashmore and Errington townships, district of Thunder Bay.

Mining and milling operations continued throughout 1952. The depths of the shafts serving the mine are given in the following table:

Shaft	Number of compartments	Total depth from surface
		feet
No. 1, vertical	3	2,053
No. 2, vertical	4	1,921
No. 3 winze, inclined 45 degrees	4	430

There was no shaft-sinking in 1952. The following development work was done; drifting, 3,540 feet; crosscutting, 792 feet; raising, 1,055 feet. Diamond-drilling consisted of four surface holes totalling 859 feet and 368 underground exploration holes totalling 51,765 feet. There were 410,837 tons of ore hoisted, and the mill treated 411,777 tons.

The company decided to revise the mill system, and a contract for the work was given to an engineering firm.

The following is taken from the general manager's report for the fiscal year ending September 30, 1952:

General

During the past year all the ore milled was from the F-zone development, stope preparation, and actual stoping. Development continued on the 8th, 9th, 10th, 11th, and 13th levels.

Mining

The tonnage milled for the year was increased from 350,705 to 396,119 tons or about 126 tons per day. The broken ore reserves for this period were increased by 143,286 tons with another 98,937 tons drilled off ready for blasting.

The production per man-shift on the payroll increased 39 percent, while the underground production per man-shift showed an increase of 52 percent.

ORE DELIVERED TO THE ORE-PASS SYSTEM
(October, 1951, to September, 1952)

Source	Total ore	Percentage of total	Grade	Total production	Percentage of production
	tons		ounces per ton	ounces	
8th-level development	14	0.01	0.028	0.39	.....
9th-level development	6,416	1.61	0.094	605.77	0.87
9th-level stopes	22,154	5.57	0.139	3,082.77	4.43
10th-level development	1,176	0.29	0.134	157.93	0.22
10th-level stopes	331,362	83.25	0.180	59,683.80	85.75
11th-level development	7,111	1.79	0.085	603.95	0.87
11th-level stopes	29,454	7.40	0.185	5,453.00	7.83
13th-level development	326	0.08	0.056	18.26	0.03
Total	398,013	100.00	0.175	69,605.87	100.00

Ore Reserves

Ore reserves at the end of the fiscal year were 1,518,239 tons with a grade of 0.167 ounces per ton of which 318,239 tons were in sulphide zones.

Operating Costs
(October, 1951, to September, 1952)

	Amount	Per ton milled
Joint enterprise development	$ 2,841.93	$0.0072
Property expansion development	19,601.50	0.0495
Diamond-drilling	52,173.24	0.1317
Current development	140,167.85	0.3539
Mining	822,730.91	2.0770
Milling	461,865.47	1.1659
Mine office and supervision	107,356.90	0.2710
General operating expense	133,956.23	0.3382
Marketing bullion	26,021.31	0.0656
Total expense at property	$1,766,715.34	$4.4600

Milling

The production from 396,116 tons of ore milled amounted to $2,477,018.42 or $6.2532 per ton. The mill operated 344.1 days at an average of 1,151 tons per day. Mill heads during the year averaged $7.2803 per ton.

To obtain the maximum recovery, fine grinding to approximately 85 percent minus 200-mesh, must be obtained. This will be accomplished by the addition of a rod mill.

ORE MINED FROM THE COMMENCEMENT OF OPERATIONS
(To September 30, 1951)

	Tons	Average value	Total ounces
South zone	261,503	0.234	61,247.13
North zone	2,142,711	0.223	478,392.85
West zone	528,207	0.229	121,014.80
South limb of iron	106,427	0.229	24,416.04
Surface dump	3,956	0.163	643.22
F-zone	791,347	0.191	150,807.76
Total	3,834,151	0.218	836,521.80

An average of 213 men was employed, 110 of whom were underground, and 103 on the surface. J. M. Kilpatrick is general manager.

Madsen Red Lake Gold Mines, Limited

Madsen Red Lake Gold Mines, Limited, was incorporated in March, 1935, with an authorized capitalization of 5,000,000 shares of $1 par value. On June 6, 1940, the capitalization was reduced to 3,500,000 shares by the cancellation of 1,500,000 unissued shares. The number of shares issued by the end of 1952 was 3,499,529. The officers and directors are: Joseph McDonough, president; F. R. Marshall, vice-president; M. Masterson, secretary-treasurer; Marius Madsen, Hugh Mackay, H. G. Young, A. H. Seguin, and S. J. Bird, directors. The head office is at 67 Yonge Street, Toronto. The mine address is Madsen.

The company's property is located in Baird and Heyson townships, Red Lake area, Patricia portion of Kenora district. It is about seven and a half miles southwest of the Howey mine and may be reached by road from Red Lake.

Mining and milling operations continued throughout 1952. There are two shafts on the property. The No. 1, vertical two-compartment shaft, 573 feet deep, is not being used at present. Operations are conducted through the vertical three-comparment No. 2 shaft, which is 2,949 feet deep. There was no sinking in 1952. The following development work was done during the year: drifting, 14,526 feet; crosscutting, 1,032 feet; raising, 2,325 feet. The total development work at December 31, 1952, was as follows: drifting, 65,864 feet; crosscutting, 13,350 feet; raising, 25,726 feet. Diamond-drilling consisted of 30 holes, totalling 18,287 feet, from surface, and 478 holes, totalling 79,108 feet, from underground.

The following is taken from the general manager's report for the year ending December 31, 1952:

Summary

During the year, 404,850 tons of ore were developed in sufficient detail to be taken into the reserve, which was of considerably higher grade, with the result that the average grade of the whole reserve was increased by 0.044 ounces per ton.

Records were established for ounces of gold produced and for tonnage of ore milled, but dollar value of production, less cost-aid, was not a record owing to the price received per ounce of gold, being the lowest since commencement of milling.

Net profits for the year were within $35,000 of last year's figure, even after paying for the heaviest development program in the life of the mine.

Production

During the year, 304,251 tons of ore were milled to yield 67,336.769 ounces of fine gold and 14,597.750 ounces of fine silver. The total value of this bullion was $2,315,979.87. This was a recovery of $7.612 per ton milled.

The average price received for gold sold to the Royal Canadian Mint during the year was

$34.2136 per fine ounce. This was a reduction of $2.56 per fine ounce from the average price received during 1951.

Total production, since milling started in August, 1938, to December 31, 1952, was $21,644,630.14 from the treatment of 2,532,009 tons of ore. Average recovery per ton of ore milled was $8.54.

Analysis of Operating Costs

Operating costs, less credits under the Emergency Gold Mining Assistance Act, continued to rise as the development program was accelerated, and as the method of mining was partially changed over from inexpensive shrinkage and open-stope methods to costly cut-and-fill stoping. This latter change in mining methods, however, will reduce the amount of dilution of the ore. Considerable money was also spent in completing both the waste-rock backfill system and the classified tailings backfill system.

The estimated payment to be received under the Emergency Gold Mining Assistance Act for the year, is calculated at $284,000, an increase of $109,000 over the amount received last year. This increase in assistance payment made it possible to hold the net operating cost per ounce of gold produced to a figure only $0.06 per ounce over last year's cost.

OPERATING COSTS

	Total	Per ton milled	Per ounce produced
Development and exploration	$ 596,517.43	$1.960	$ 8.859
Stope preparation	111,302.16	0.368	1.653
Stoping	290,711.42	0.955	4.318
Mucking, tramming, and hoisting	386,812.80	1.271	5.744
Crushing and conveying	68,250.11	0.224	1.014
Milling	281,055.83	0.924	4.174
Mine general expense	188,832.69	0.622	2.804
Head office expense	37,306.18	0.120	0.554
Marketing charges	21,366.47	0.070	0.317
Total cost	$1,982,155.09	$6.514	$29.437
Estimate of emergency assistance	284,000.00	0.933	4.218
Net cost	$1,698,155.09	$5.581	$25.219

Mine Development

The driving of the waste-pass raise system in the lower portion of the mine was continued and completed up to the 12th level.

Extraction drifts on the 9th, 11th, 12th, 13th, 14th, and 15th levels were driven for a total advance of 2,441 feet. A footwall drift was driven around the 2-14 orebody.

A total of 1,137 feet of stope service raising was completed.

Permanent escapement and ventilation raises were completed between the 12th and 11th levels and also between the 6th and 2nd levels. This work required 689 feet of raising and 628 feet of raise slashing.

Four additional boxhole units were constructed in the year.

Mining

The first unit, consisting of three 12-inch diameter Dorr Clones with necessary pumps to produce backfill material by the classification of mill tailings, was installed in the mill building and was ready for service by the end of June. In the last six months of the year, 24,930 tons of sand from this unit were successfully placed in the mine by hydraulic means through a series of diamond-drill holes, interconnected by pipes leading from surface down to the 10th level.

These classified mill tailings have replaced the use of waste rock as fill material in all current cut-and-fill stopes below the 4th level. The present excess production of sand is being used to supplement waste rock in the backfilling of empty shrinkage stopes.

The installation of a second unit of three Dorr Clones was started. When it is in service, this system of producing backfill material will yield 350 tons of sand per 24 hours. This will be sufficient to assure the mine of all the fill material required for cut-and-fill mining for some time to come, at a reasonable cost.

The mining of the No. 3-15 orebody was commenced using an inclined cut-and-fill method of stoping.

The No. 4-14 orebody was mined up to the dike above the 2nd level. With the completion of this stope, the broken ore in it, as well as in the Nos. 5-14, 6-14, and 7-16 stopes, was made available for mill feed.

The No. 6-12 orebody was started as a cut-and-fill stope and was mined half-way up to the 5th level.

The No. 7-2 cut-and-fill stope was completed. The Nos. 7-8, 7-10, and 9-16 stopes were drawn down until the grade of ore became uneconomic due to excessive dilution.

The Nos. 8-8A and 9-10 stopes were drawn empty. Backfilling of the Nos. 9-10 and 9-16 stopes with both waste rock and classified mill tailings was commenced.

The Nos. 9-8, 9-10A, and 10-10 orebodies are being prepared for mining. The Nos. 9-6, 10-6, 10-8, and 11-8 stopes are being drawn down.

The preparation of the Nos. 10-1, 10-24, and 11-24 orebodies was completed, and mining started in all three by cut-and-fill methods.

All the ore in the west portion of the No. 11-10 orebody was broken. The backfilling of the east portion of this stope was completed. The 11-10A stope was drawn empty and was backfilled with waste rock.

A total of 11,660 feet of diamond-drilling for blast hole purposes was completed.

Ore Developed

The details of the ore are outlined below:

Block	Tonnage	Average Grade
		ounces per ton
Between 11th and surface	153,110	0.218
Between 12th and 11th level	151,940	0.345
Between 13th and 12th level	89,300	0.358
Between 14th and 13th level	10,500	0.484
Total	404,850	0.304

Several other orebodies were indicated in the drifting and horizontal diamond-drill holes on the lower levels. Considerable drilling between levels will be required to fully assess their tonnage possibilities. Data on the more important of these orebodies are as follows:

Orebody	Length	Width	Grade	Tons per vertical foot	Ounces per vertical foot
	feet	feet	ounces		
No. 6-11	102	7.2	0.48	65	31
No. 9-5	75	8.9	0.52	59	30
No. 9-9	125	26.0	0.26	290	77
No. 12-20	150	12.4	0.22	165	36
No. 12-22A	100	11.8	0.21	105	22
No. 13-2A	25	24.9	0.48	55	27
No. 13-22	125	20.2	0.19	225	44
No. 14-4	225	14.8	0.50	296	150
No. 14-22	133	7.7	0.25	92	23
No. 15-4	200	15.5	0.48	276	132

Ore Reserves

The calculated ore reserve is as follows:

Block	December 31, 1951			December 31, 1952		
	Tonnage	Ounces	Grade	Tonnage	Ounces	Grade
7th level to surface	47,160	9,183	0.195	15,530	3,205	0.206
11th to 7th level	411,760	96,596	0.234	382,960	87,899	0.230
14th to 11th level	.....	.....	.....	251,740	89,404	0.355
Broken reserve	227,270	44,318	0.195	136,560	25,537	0.187
Total reserve	686,190	150,097	0.218	786,790	206,045	0.262

All high assays were reduced to 1.00 ounce and a dilution factor of 10 percent was allowed on the calculation of the tonnage of the reserve.

Milling

The details of the mill operation are shown in the following summary. For comparative purposes the details of the two previous years' operation and for the total operating life of the mine are also shown:

	Dec. 31, 1950	Dec. 31, 1951	Dec. 31, 1952	Aug. 11, 1938 to date
Dry tons treated	282,050	302,227	304,251	2,532.009
Percentage operating time	91.56	98.20	98.54	94.08
Treated per day.....tons	772.7	828.0	831.3	481.6
Average gold assay of heads.....ounces	0.2431	0.2158	0.2358	0.2453
Average gold assay of tails.....ounces	0.0111	0.0117	0.0145	0.0144
Percentage recovery	95.44	94.58	93.87	94.14

During the year, intermittent difficulty was experienced in extracting the extremely fine gold which is disseminated throughout the ore. This had a slight downward effect on the average percentage recovery for the year.

Exploration

Property exploration.—A surface diamond-drilling program was started and continued throughout the year. This program was to explore the tuff zone to the east of the No. 2-30 raise and also to test the anomalies disclosed in the geophysical survey conducted last year on the ground to the west of the 2-15 orebody.

Outside exploration.—A group of 36 claims was staked in the Gorman River area of northwestern Ontario during the month of January, 1952. These claims were inspected after the spring break-up, but no showings worthy of continued work were disclosed.

An average of 314 men was employed, of whom 183 were underground, and 131 on the surface. E. G. Crayston is general manager.

Magnet Consolidated Mines, Limited

Magnet Consolidated Mines, Limited, was incorporated in April, 1936, with an authorized capitalization of 3,000,000 shares of $1 par value. In March, 1951, the number of shares was increased to 4,000,000, of which 3,575,000 have been issued. The officers and directors are: J. Dumaresq Smith, president; R. C. C. Henson, vice-president; M. Brocklebank, secretary-treasurer; H. A. Friedman and A. W. Johnston, directors. The head office is at 185 Bay Street, Toronto. The mine address, when operations are in progress, is Geraldton.

The company's property consists of 41 claims in Errington and Lindsley townships, Little Long Lac area, district of Thunder Bay.

The mill did not operate in 1952. Underground work was continued until May 31, but consisted of salvage operations only. No development work was done. Three diamond-drill holes, having a total length of 1,725 feet, were drilled from underground. All the underground equipment was brought to surface and sold. The surface mining plant and the mill are being retained by the company.

The depths of the shaft and winzes in the mine are shown in the following table:

Shaft or winze	Number of compartments	Depth below collar
		feet
No. 1 shaft, vertical	3	1,772
No. 1509 winze, 47½ degree incline (below the 9th level)	2	229
No. 1 winze, vertical (below the 11th level)	3	931

The following table shows the total development when the mine closed:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
1st	970	208	195
2nd	3,241	2,869	505
3rd	1,177	149	267
4th	1,554	110	199
5th	2,014	253	584
6th	2,429	435	463
7th	2,438	768	661
8th	2,878	336	618
9th	3,066	465	719
10th	1,586	142	642
11th	4,495	376	1,321
12th	1,426	82	320
13th	1,007	108	635
14th	889	189	142
15th	.....	.....	.....
16th	.....	.....	.....
17th	713	339	.....

The total number of tons hoisted and milled during the years of operation was 359,912, and the total value of the production, including cost-aid, was $5,965,165.22, the total recovery per ton being $16.57.

An average of 9 men was employed in 1952, of whom 4 were underground, and 5 on the surface. W. E. Field was mine manager.

Matachewan Consolidated Mines, Limited

Matachewan Consolidated Mines, Limited, was incorporated in July, 1933, with an authorized capitalization of 4,000,000 shares of no par value, of which 3,439,000 have been issued. The officers and directors are: Thayer Lindsley, president; H. H. Sutherland, vice-president; J. M. Cunningham-Dunlop, managing director; A. G. Fulton, secretary; W. B. Malone, treasurer; G. McKeown, director. The head office is at 25 King Street West, Toronto. The mine address is Matachewan.

The property is located in Cairo and Powell townships, Matachewan area, district of Timiskaming.

During 1952 the mine was worked on a salvage basis. The bulk of the ore came from two large stopes, Nos. 1313 and 1314. Stope No. 248, which had been inactive for several years, was reopened to permit the mining of ore that had been left in place.

The levels up to the 2,400-foot were allowed to flood. The water level is maintained a few feet below the 2,040-foot level.

The tonnage treated in 1952 was 164,407 tons, a decrease of 94,685 tons from the previous year. Part of the mill was converted to allow the handling of lead-zinc ore from Matarrow Lead Mines, Limited, and the first concentrates were obtained at the end of June.

There was no new development work in 1952. The total development at December 31, 1952, was: drifting, 34,909 feet; crosscutting, 8,986 feet; raising, 16,759 feet.

The following is taken from the mine manager's report for the year ending December 31, 1952:

General

The mine was operated on a salvage basis throughout the year with no development, stope preparation, or underground exploration work performed.

The mill operated at an average rate of 457.96 tons of ore per day, treating a total tonnage of 164,407 tons. Treatment of Matachewan Consolidated ore decreased more than 50 percent after July 1, when the milling of Matarrow Lead Mines ore commenced.

Diamond-Drilling

A total of 4,027.5 feet of blast-hole diamond-drilling for recovery purposes was completed in the Nos. 1,313- and 1,314-stope area.

Ore Reserves

As of December 31, 1952, the recoverable ore reserves, including broken ore, are estimated as follows:

	Tons
Ore reserve, December 31, 1951	127,385
Dilution increase, all levels	78,079
Total	205,464
Less hoisted in 1952	164,257
Estimated recoverable reserves as of December 31, 1952	41,207
	Ounces
Average estimated grade per ton	0.096

Mining

A summary of mining operations for the year 1952 is given below:

Ore Broken	Tons
Ore broken during 1952	54,613
Less ore hoisted from stopes 1952	164,257
Carried forward from 1951 (adjusted)	148,851
Broken ore reserve, December 31, 1952	39,207
	Ounces
Estimated grade per ton	0.096

A total of 164,257 tons of ore was hoisted from stopes. The sources of the ore, by zones and levels, are shown:

Sources of Ore Hoisted

	Tons	Percent
By zones:		
West boundary porphyry zone	161,400	98.26
Central and east zone	2,857	1.74
Total	164,257	100.00
By levels:		
2nd	2,857	1.74
11th	124,299	75.67
13th ... 2400	37,101	22.59
Total	164,257	100.00

Milling

The mill performance for the year was as follows:

Tons milled	164,407
Average daily tons milled	457.96
Average value of heads ..... ounces per ton	0.0981
Average value of tails ..... ounces per ton	0.0089
Average value of recovery ..... ounces per ton	0.0892

The milling operation was interrupted for a period of eight days in June to convert the mill into separate cyanidation and flotation circuits in order to treat both Matachewan and Matarrow ore simultaneously. Recovery for the year of Matachewan ore was 90.95 percent.

Production

The metal recovery for 1952 was as follows:

	Ounces
Gold	14,779.584
Silver	7,178.96

G. H. McDougall is mine manager. An average of 159 men was employed, of whom 68 were underground, and 91 on surface.

Midcamp Mines, Limited

Midcamp Mines, Limited, was incorporated in November, 1946, with an authorized capitalization of 4,500,000 shares of $1 par value, of which 2,731,355 have been issued. The officers and directors are: J. Y. Murdoch, president; J. R. Bradfield, secretary; R. G. Rudolf, treasurer; W. H. Bouck, E. H. Walker, J. Ingram, and J. R. Timmins, directors. R. V. Porritt is manager. The head office and manager's address is Bank of Nova Scotia Building, Toronto. The mine address is Timmins.

The company owns 355 acres in Deloro and Tisdale townships, Porcupine area, district of Cochrane.

Underground development is carried on from the levels of the adjoining Paymaster Consolidated and Preston East Dome mines.

Operations continued throughout 1952. The following table shows the development work done during 1952 and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1952	Total	1952	Total	1952	Total
	feet	feet	feet	feet	feet	feet
From Preston East Dome mine:						
9th	.....	112	.....	2,819	.....	6
12th	605	2,310	.....	5,017	15	15
23rd	.....	.....	303	303	.....	.....
From Paymaster mine:						
10th	.....	547	.....	.....	.....	.....
20th	.....	419	.....	321	.....	.....
25th	.....	1,125	.....	.....	.....	.....

Diamond-drilling consisted of 23 holes, totalling 6,719 feet, from underground.

The labour was all supplied by Preston East Dome Mines, Limited, and is included in the employment figures for that company. R. E. Findlay is resident manager.

New Dickenson Mines, Limited

Dickenson Red Lake Mines, Limited, was incorporated in November, 1944, with an authorized capitalization of 3,500,000 shares of $1 par value. In June, 1947, the capitalization was increased to 4,000,000 shares. In June, 1949, the company was reorganized, and the name changed to New Dickenson Mines, Limited, the capitalization being reduced to 3,750,000 shares. The number of shares issued at the end of 1952 was 2,400,000. The officers and directors are:

A. W. White, president and treasurer; C. R. Diebold, vice-president; R. B. Law, secretary; L. W. McIlmurray, assistant secretary; R. A. Jodrey, T. M. Fyshe, and E. B. Magee, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Balmertown.

The company owns 16 claims in Balmer township, Red Lake area, Patricia portion of Kenora district.

Mining and milling operations continued throughout 1952. The vertical No. 1 shaft was sunk an additional 10 feet, to a total depth of 1,315 feet. The shaft has three compartments from the surface to the eighth level, and four compartments from that point to the bottom. The following development work was done during the year: drifting, 2,706 feet; crosscutting, 3,818 feet; raising, 1,359 feet. The total development at the end of the year was: drifting, 16,221 feet; crosscutting, 13,305 feet; drifting, 6,086 feet. Diamond-drilling consisted of 190 holes, having a total length of 15,622 feet, from underground.

There were 101,993 tons of ore mined and hoisted. The mill treated 102,443 tons, a daily average of 279.9 tons.

Construction in 1952 included the following frame buildings: heating plant, powder magazine, assay office extension, office extension, recreation building, and a two-storey dwelling in Balmertown.

An average of 203 men was employed, 99 of whom were underground and 104 on the surface. F. A. Fell is mine manager.

New Jason Mines, Limited

New Jason Mines, Limited, succeeded Jason Mines, Limited, on July 8, 1948, by an exchange of stock whereby the shareholders of Jason Mines, Limited, received one share in the new company for three in the old. In May, 1949, the authorized capitalization was increased from 3,000,000 to 3,500,000 shares of $1 par value. The number of shares issued at December 31, 1952, was 3,449,668. The officers and directors are: C. O. Stee, president and managing director; J. J. Coghlan, vice-president; J. L. Noble, secretary-treasurer; J. Dumaresq Smith, D. A. Macintosh, A. W. Johnston, and C. A. Lister, directors. The head office is at 7 King Street West, Toronto. The mine address, when operations are in progress, is Casummit Lake.

The property consists of 44 claims located at Casummit Lake, about 100 miles north of Sioux Lookout on the Canadian National railway, in the Patricia portion of Kenora district.

Operations were continued from January 1, 1952, to April 12. No lineal development work was done. One diamond-drill hole, 70 feet long, was drilled from underground. Some 6,502 tons or ore were hoisted, and the mill treated 6,820 tons, operating at a daily average rate of 67.5 tons.

The depths of the shafts on the property are shown:

Shaft	Inclination	Number of compartments	Depth from surface
No. 1	50° to 4th level, 37° to 9th level	3	1,370
No. 2	Vertical	2	320
Winze, collared at 3rd level of No. 2 shaft	40°	2	827

The following table shows the total development when the mine closed in April, 1952:

Level	Drifts	Crosscuts	Raises
No. 1 shaft:	feet	feet	feet
100-foot	184	16	114
200-foot	951	205	162
300-foot	1,282	145	174
400-foot	1,113	365	77
411-foot (sublevel)	573	.....	133
500-foot	2,086	864	365
511-foot (sublevel)	170	.....	102
600-foot	1,705	678	547
700-foot	3,178	960	941
800-foot	701	848	1,048
900-foot	600	1,044	609
No. 2 shaft:			
75-foot	198	95	.....
200-foot	823	45	268
221-foot (sublevel)	434	.....	.....
300-foot	2,455	2,060	246
321-foot (sublevel)	428	46	15
Winze:			
400-foot	933	70	81
500-foot	703	198	.....
600-foot	599	147	.....
700-foot	236	147	.....
800-foot	181	211	.....

An average of 14 men was employed, of whom 3 were underground, and 11 on the surface. E. S. Walsh was mine manager.

Newlund Mines, Limited

Newlund Mines, Limited, was incorporated in September, 1949, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 3,681,008 have been issued. The officers and directors are: J. Ingram, president; D. A. Macintosh, vice-president; G. C. Andrew, secretary-treasurer; R. D. Stewart, assistant secretary-treasurer; M. C. Mosher and J. A. Grant, directors. The head office is at 44 King Street West, Toronto.

The company owns 45 claims, acquired from Lunward Gold Mines, Limited, 25 miles southwest of Sioux Lookout, in Echo township, district of Kenora.

Underground operations were continued in 1952 until October 27, when it was decided to close the mine. All operations ceased on December 15.

The vertical three-compartment shaft was sunk a further 325 feet to a total depth of 825 feet during the year, and a new level was established at 800 feet. The following table shows the later work done in 1952, and the total when operations ceased:

Level	Drifting		Crosscutting	
	1952	Total	1952	Total
	feet	feet	feet	feet
200-foot	558	4,391	167	1,566
350-foot	.....	2,330	.....	712
500-foot	831	2,699	221	813
650-foot (station only)	.....	.....	.....	.....
800-foot	2,023	2,023	412	412

Diamond-drilling in 1952 consisted of 73 holes, totalling 7,565 feet, all from underground.

The following is taken from the report of the consulting engineer, on December 20, 1952:

In the last annual report it was stated that, considering the dimensions and grade of the showings on the first two levels, it was desirable to explore the mine at greater depth. It was recommended and subsequently approved to deepen the shaft to 825 feet and open a new level at 800 feet. During the past year this work was done, and it is regrettable to report that exploration on the 800-foot level failed to find ore.

The drift westward from the main crosscut on the 800-foot level was advanced to within 220 feet of the western limit of the ore encountered on the upper levels, but only scattered gold values were found. The structural conditions associated with a porphyry dike encountered at this point did not appear favorable for ore deposition. It is to be noted that the quartz-stringer pattern with accompanying alteration and pyrite mineralization was not as intense as on the levels above.

The drift eastward on the 800-foot level was advanced to the east limit of the main fracture zone as explored on the 200-foot level. Although the zone was quite favorable in appearance, and gold values were obtained from a drift length of 200 feet that showed promise, crosscutting and diamond-drilling did not indicate an ore shoot.

The possibility that ore might be found towards the hanging-wall of the dike, rather than adjacent to the footwall, was tested by diamond-drill holes at regular intervals along the 800-foot level. Several intersections with good gold values were made but no ore shoots were indicated.

Additional drifting and crosscutting was done on the 500-foot level, but no additions were made to the short lengths of ore previously reported on this level.

The east drift on the 200-foot level was advanced to explore a section of rock encountered in a flat diamond-drill hole. The results of this work indicated an ore shoot having a possible length of 140 feet and a width in excess of 50 feet. The averages of muck samples from two crosscuts, 85 feet apart in this zone, were as follows:

Crosscut	Length	Grade
	feet	ounces of gold per ton
No. 127 (1,770 feet east of main crosscut)	62	0.31
No. 128 (85 feet east of No. 127 crosscut)	64	0.12

A flat diamond-drill hole was drilled eastward from the drift on the 500-foot level, to explore the possible downward extension of this indicated ore shoot, with inconclusive results. This is a favourable area for additional exploration.

It has been suggested by the consulting geologist that the deterioration of the ore shoots in depth may be a local feature caused by a group of pre-ore dikes. It is his opinion, with which the writer concurs, that it would be premature to infer from the disappointing results on the 800-foot level that the bottom of the ore possibilities has been reached.

A resumption of work at some future time could be directed towards exploring the ore possibilities below the pre-ore dikes encountered on the 800-foot level. The possible downward extension of the ore located at the extreme east end of the 200-foot level should also be investigated.

D. B. Angus was manager. An average of 35 men was employed, of whom 28 were underground, and 7 on surface. This includes the men supplied to do the work in the adjoining Conecho and Windward mines.

New Mosher Longlac Mines, Limited

New Mosher Longlac Mines, Limited, was incorporated in June, 1950, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 3,808,377 have been issued. The officers and directors are: Thayer Lindsley, president; J. M. Cunningham-Dunlop, executive vice-president; B. Johnston, vice-president; A. K. Roberts, secretary-treasurer; C. R. Archibald, assistant secretary; G. T. N. Woodrooffe, assistant treasurer; M. C. Mosher, F. H. Todd, and T. H. Rea, directors. The head office is at 25 King Street West, Toronto. The mine address is Box 160, Geraldton.

The company owns and is developing a property consisting of 37 claims, to the west of the MacLeod-Cockshutt mine, in Errington township, district of Thunder Bay. It also owns six claims in Jordan township, district of Kenora.

Operations at the property in Errington township were continued in 1952. The construction of the surface plant was completed, the machinery and equipment installed, and the sinking of a vertical two-compartment shaft on claim T.B.10046 was begun on July 15. By the end of the year the shaft had reached a depth of 1,200 feet. Levels were cut at 500 and 1,000 feet, and sublevels at 250 and 750 feet. Diamond-drilling consisted of one hole, 1,100 feet long, from surface, and one hole, 200 feet long, from underground.

The surface buildings include a shaft-house, headframe, hoist- and compressor-house, boiler-house, transformer station, switch-house, machine shop, dry-house, powder-house, tractor garage, water-tank, pump-house, and oil-house.

The machinery includes a PE-1, 60- by 36-inch, 200-horsepower Canadian Ingersoll-Rand hoist, a V.H.E.-2, 1,500-cubic-foot Canadian Ingersoll-Rand compressor, three transformers, and an 80-horsepower Pascol boiler.

The shaft-sinking is being done by a contracting company; 10 men were employed. A. E. Cave is manager.

Pamour Porcupine Mines, Limited

Pamour Porcupine Mines, Limited, was incorporated in March, 1934, with an authorized capitalization of 5,000,000 shares of no par value, all of which have been issued. The officers and directors are: J. Y. Murdoch, president; G. H. Rainville, vice-president; C. H. Windeler, secretary; R. G. Rudolf, treasurer; J. R. Timmins, Messmore Kendall, Oliver Hall, and L. H. Timmins, directors. The head office is in the Bank of Nova Scotia Building, Toronto. The mine address is Pamour.

The main property is located in Whitney township, Porcupine area, district of Cochrane, and includes the former La Palme Porcupine, Three Nations, and Porcupine Grande properties. The company also holds three claims at the south end of Three Nations Lake in the same area.

Mining and milling operations continued throughout 1952. Operations are conducted through the vertical four-compartment No. 3 shaft, 3,144 feet deep, and the vertical two-compartment No. 4 internal shaft, which runs from the 600-foot to the 1,400-foot level. There was no sinking done in 1952.

The following development work was done in 1952: drifting, 9,572 feet; crosscutting, 2,003 feet; raising, 3,055 feet. The total amount of development at the end of 1952 was: drifting, 117,816 feet; crosscutting, 21,291 feet; raising, 65,544 feet.

The following is taken from the manager's report for the year ending December 31, 1952:

Development

Approximately 90 percent of the drifting and crosscutting done during the year was on the levels below the 1,400-foot level. Some drifting was done to explore the lavas north of the main ore zone in both the east and west sections of the mine. Most of the other drifting and crosscutting was in greywacke in the west section of the mine. Lateral development in ore totalled 832 feet, with an average assay of 0.115 ounces per ton over drift width.

Preparatory stoping was done in four conglomerate stopes in the east end and in our greywacke stopes in the west end of the mine.

Diamond-Drilling

Location of holes drilled and footages are given below:

Level	Holes in east end	Holes in west end	Total holes	Total footage
400-foot	7	69	76	9,119
600-foot	1	51	52	7,691
800-foot	9	68	77	10,480
1,000-foot	6	37	43	4,540
1,200-foot	24	21	45	6,571
1,400-foot	13	36	49	7,241
1,600-foot	1	.....	1	723
2,200-foot	26	.....	26	3,928
2,400-foot	.....	1	1	81
Total, 1952	87	283	370	50,375
Total, 1951	116	195	311	54,045
Total to date	.....	.....	4,801	766,176

Drilling in the east end was done mainly in the conglomerate to outline stoping areas. Some exploratory drilling was done in the south greywacke and in the north lavas.

Drilling in the west end was largely confined to locating faulted extensions of known veins in the No. 4 shaft area.

Stoping

Stoping was carried on in 9 conglomerate stopes in the east end, 3 lava stopes north of the main ore zone, and 15 greywacke stopes in the west end of the mine; 70 percent of the tonnage broken, and 61 percent of the tonnage milled, came from the east end. Details of stoping and ore production are listed below:

STOPING SUMMARY

Level	Broken		Pulled		
	Tons	Percent	Tons	Percent	Ounces per ton
West end:					
400-foot	.....	.....	53,006	8.83	0.100
600-foot	64,813	11.81	69,362	11.55	0.134
800-foot	60,923	11.11	60,192	10.02	0.127
1,000-foot	5,810	1.06	21,223	3.53	0.120
1,200-foot	4,257	0.78	5,277	0.88	0.133
1,400-foot	27,928	5.09	24,473	4.08	0.119
Total	163,731	29.85	233,533	38.89	0.122
East end:					
400-foot	6,058	1.10	16,265	2.71	0.110
600-foot	9,770	1.78	114,374	19.05	0.081
800-foot	79,485	14.49	55,758	9.29	0.079
1,000-foot	133,551	24.35	65,913	10.98	0.092
1,200-foot	147,079	26.83	110,803	18.45	0.091
1,400-foot	8,778	1.60	3,800	0.63	0.081
Total	384,721	70.15	366,913	61.11	0.087
Total mine	548,452	100.00	600,446	100.00	0.101

Mill

Average daily tonnage was 1,670 tons, making a total of 611,270 tons milled during the year. The average grade of ore milled was 0.1003 ounces per ton, and the over-all recovery was 92.06 percent. Production by quarters is tabulated below:

Quarter	Milled	Mill head assay	Recovery	Recovery		Gross value of bullion shipped
				Gold	Silver	
	tons	ounces per ton	percent	fine ounces	fine ounces	
1st	146,628	0.1028	92.07	13,883	1,281	$ 486,274
2nd	154,454	0.0994	91.91	14,115	1,160	485,141
3rd	150,688	0.1010	92.28	14,040	1,106	474,108
4th	159,500	0.0981	91.99	14,188	1,201	482,985
Smelter shipments				204	710	7,520
Total, 1952	611,270	0.1003	92.06	56,430	5,458	$1,936,028
Total, 1951	581,746	0.1043	91.72	55,654	5,269	$2,053,820

An average of 381 men was employed, of whom 222 were underground, and 159 on surface. T. R. Wearing is manager.

Paymaster Consolidated Mines, Limited

Paymaster Consolidated Mines, Limited, was incorporated in February, 1930, with an authorized capitalization of 9,000,000 shares of $1 par value of which 8,629,090 have been issued. The officers and directors are: E. H. Walker, president and managing director; A. S. Fuller, vice-president; E. L. O'Reilly, secretary-treasurer; W. W. Lindsay, assistant secretary-treasurer; C. E. Cook, H. M. Pryale, and H. D. Rothwell, directors. The head office and mine office are at South Porcupine. The executive office is at 19 Melinda Street, Toronto.

The main property, in Deloro and Tisdale townships, Porcupine area, district of Cochrane, contains approximately 748 acres and consists of amalgamated holdings of former operating companies.

Mining and milling operations continued throughout 1952. The vertical three-compartment No. 5 shaft is being deepened from the 2,500- to the 4,000-foot level, where a considerable amount of development has already been done from the No. 5 winze. In 1952 a further 918 feet of sinking was accomplished, bringing the shaft to a depth of 3,633 feet.

The following development work was done during the year: drifting, 7,639 feet; crosscutting, 1,760 feet; raising, 6,487 feet. The total amount of development at the end of 1952 was: drifting, 154,040 feet; crosscutting, 67,126 feet; raising, 36,375 feet. Diamond-drilling in 1952 consisted of 530 holes, totalling 41,706 feet, from underground.[1]

During the calendar year a total of 173,773 tons of ore was hoisted, and the mill treated 174,454 tons, a daily average rate of 477 tons.

The following is taken from the general manager's report for the fiscal year ending June 30, 1953:

Mining

Development and mining consisted mainly of the following:
Development work on the Nos. 3, 14, 19, and 27 veins from the 1,740- to the 2,575-foot level

[1]The diamond-drilling includes holes drilled by Buffalo Ankerite Gold Mines, Limited, within Paymaster ground.

Development work on the Nos. 8, 18, 23, 24, and 31 veins, from the 2,575- to the 4,075-foot level.

Deepening of the No. 5 shaft has reached 108 feet below the 4,075-foot level. Stations were cut at level intervals of 150 feet from the 3,000-foot to the 4,075-foot levels. The cutting of the underground crusher station below the 4,075-foot level is under way. When the crusher station is completed, there remains approximately 154 feet more of sinking, the cutting of a loading pocket with raises from the loading pocket to the crusher station, a pocket to handle hoisting spillage, and a sump. Owing to the blocky ground conditions in the area, the sinking has not progressed as rapidly as anticipated. All stations and pockets have been rock bolted and will have to be gunited when the shaft is completed. The deepening of No. 5 shaft and the removal of the rock pentice should be completed about the end of 1953, at which time it will be necessary to shut down mining operations for approximately one week, and milling operations for part of this period.

An ore- and waste-pass system from the 4,075-foot to the 3,750-foot level at No. 5 shaft has been completed to the 3,900-foot level.

Extensive down-hole diamond-drilling from the 4,075-foot level has proven that the new No. 36 and No. 37 orebodies continue below the 4,075-foot level. Rock work is in progress on the 4,075-foot level in preparation for sinking an internal shaft or winze below the 4,075-foot level to develop this ore. This winze location is approximately 100 feet north and 40 feet east of No. 5 shaft. This will permit a direct gravity transfer of ore from this new winze to the No. 5 shaft crushing and hoisting system.

Ore- and waste-pass systems are being driven and are nearly completed from the 4,075-foot level in the No. 5-2075-1 winze area to connect with the ore- and waste-pass systems of the levels above the 3,575-foot level.

Of the ore milled, 7.5 percent was from lateral development, 28 percent from stoping between the 1,050-foot and 2,075-foot levels, and 64.5 percent from stoping between the 2,075-foot and 3,200-foot levels.

STOPING, DEVELOPMENT, AND DIAMOND-DRILLING

	Feet
Drifting	4,833.7
Crosscutting	2,967.1
Raising, development only	7,899.1
Sinking	997.2
Diamond-drilling:	
Surface	none
Underground	37,085
	Tons
Ore stoped	150,802
Ore from development	27,005
Waste hoisted	46,091

Ore Reserves

	Tons	Ounces per ton
Probable ore	154,598	0.262
Positive ore	280,187	0.227
Broken ore	54,737	0.250
Total	489,522	0.241

Ore reserves show a decrease of 32,222 tons. The over-all grade increased from 0.239 ounces at June 30, 1952, to 0.241 ounces per ton at June 30, 1953.

The work done by Buffalo Ankerite in our mining claim H.R. 908 is summarized as follows:

	Feet
Diamond-drilling	none
Drifting	15
Crosscutting	none
Raising	46

Buffalo Ankerite discontinued all mining operations in Paymaster ground in December, 1952.

Milling

During the fiscal year 172,421.7 tons of ore were milled. The average daily milling rate was 472 tons as against 463 for the previous fiscal year.

Costs

The mining cost per ton of ore broken was $5.45.

Following is an analysis of operating costs:

	Total Cost	Cost per ton milled
Diamond-drilling	$ 21,027.58	$ 0.12
Shaft-sinking and stations	245,393.17	1.43
Drifting	96,165.17	0.56
Crosscutting	68,918.58	0.40
Raising	136,040.26	0.79
Mining	821,520.79	4.76
Ore transporation	13,548.86	0.08
Crushing	29,961.89	0.17
Milling	227,518.61	1.32
General expense	139,389.52	0.81
Total	$1,799,484.43	$10.44

As in the past, no bullion was sold in the open market.

The average prices received from the Royal Canadian Mint per ounce of gold sold during each of the last three fiscal years were as follows:

Fiscal year ending:	Price per ounce
June 30, 1951	$37.54
June 30, 1952	35.87
June 30, 1953	34.34

The total cost of shaft-sinking and station-cutting for the fiscal year was $245,393.17. This amount was charged direct to operations and contributed to the operating loss of $200,810.60.

An average of 342 men was employed, of whom 255 were underground, and 87 on the surface. C. E. Cook is general manager.

Pickle Crow Gold Mines, Limited

Pickle Crow Gold Mines, Limited, was incorporated in January, 1934, with an authorized capitalization of 3,500,000 shares of $1 par value, of which 3,136,850 have been issued. The officers and directors are: J. E. Hammell, president and managing director; C. S. Hamilton, vice-president; A. G. Hattie, director of mining; G. M. Huycke, secretary-treasurer; John Bland, assistant secretary-treasurer. The head office and mine office are at Pickle Crow. The executive office is at 25 King Street West, Toronto.

The property consists of 96 claims located in Connell and McCullagh townships, Pickle Lake area, Patricia portion of Kenora district.

Mining and milling continued throughout 1952. No further shaft-sinking was done during the year.[1] The following development work was done: drifting, 1,098 feet; crosscutting, 1,875 feet; raising, 867 feet. The total development at the end of 1952 was: drifting, 37,257 feet; crosscutting, 31,980 feet; raising, 19,197 feet.

The following is taken from the manager's report for the year ending December 31, 1952:

Development

No. 1 Shaft, 375-foot Level.—A raise was started from the back of the No. 370 E. stope to provide a means of backfilling this stope. However, sampling of the stope and raise indicated a grade too low to warrant further operations here.

900-foot Level.—A short raise was driven from the back of the No. 960 E. stope to the 750-foot level. This raise was driven to help in the recovery of the sill pillar in this stope.

Iron Formation Zone, 2,600-foot Level.—During the year, crosscutting to the indicated ore zone in the iron formation was completed, and the No. 2603 W. drift was advanced 245 feet in this zone.

[1]For a detailed description of the shafts see Ont. Dept. Mines, Vol. LIX, 1950, pt. 2, p. 64.

1,100-foot Level.—Four raises totalling 176 feet were driven from the 1,100-foot-level stopes to the 975-foot level for backfilling purposes.

1,225-foot Level.—The No. 2-128 raise was driven from the back of the No. 2-121 W. stope to the 1,100-foot level with an advance of 79 feet. Channel samples on the vein in this raise averaged $25.20 over 6 inches.

1,475-foot Level.—The No. 3-143 crosscut was driven in the porphyry from the No. 3-141 N. crosscut towards No. 6 vein.

The vein which is located some 850 feet due west of No. 3 shaft and 600 feet south of No. 2 vein at this horizon was originally located on the 1,600-foot level and explored from there.

The crosscut on the 1,475-foot level was approximately 150 feet from the vein at the year's end.

1,600-foot Level.—The No. 3-164 W. crosscut was driven from the No. 3-161 N. crosscut to the west towards No. 6 vein which was intersected by diamond-drill hole No. 3-1632 and assayed $18.91 over 31½ feet core length. The crosscut was advanced 760 feet to where the vein was encountered on the south contact of the porphyry body. From this point the No. 3-162 W. drift was advanced 799 feet on the vein, which is very irregular in strike and dip at this horizon. Of the 799 feet of drifting accomplished, 674 feet of vein length averaged $21.00 across 22 inches cut grade or $38.15 uncut.

A raise was driven from the back of this drift to the 1,475-foot horizon with an advance of 166 feet and averaged $29.05 across 23 inches.

Diamond-Drilling

Surface exploration drilling, totalling 1,625 feet in two holes, was done as a continuation of the previous year's work on the west claims; this work was stopped in February with nothing of immediate importance being disclosed.

One hole, 109 feet in length, was drilled in August into No. 110 W. stope in order to backfill with sand. Another surface hole was drilled in the townsite for water drainage, a length of 192 feet.

Total surface drilling on the four holes was 1,926 feet.

Underground drilling totalling 11,595 feet was done with distribution as follows:

	Feet
Guide for mining operations	863
Opening up and exploration of No. 6 vein	5,433
General exploration, No. 3 shaft area	1,885
General exploration, No. 1 shaft area	1,250
Opening up and exploration of iron formation	2,162
Total	11,593

Stoping

During the year, 106,704 tons were drawn from the stopes.

No. 1 shaft stoping operations supplied 28,557 tons, 27,595 tons of which were extracted from No. 1 vein, and 962 tons from the stopes in the iron formation.

No. 3 shaft stoping operations supplied 78,147 tons, 73,667 tons of which were extracted from No. 2 vein, and 4,480 tons from No. 6 vein.

Ore Reserves

Ore reserves amounted to 547,697 tons of an average grade of 0.366 ounces per ton.

Milling

A summary of mill operations follows:

Milled	tons	113,674
Gold recovered per ton milled	ounces	0.361
Gold recovered	ounces	41,034.8

Costs

	Cost	Per ton	Per ounce
Development	$ 130,234.56	$ 1.146	$ 3.174
Mining	707,553.39	6.224	17.243
Milling	196,108.63	1.725	4.780
Shipping and marketing	13,386.25	0.117	0.326
General mine expenditures	152,434.06	1.341	3.713
Total before depreciation	$1,199,716.89	$10.554	$29.236
Depreciation	56,781.51	0.499	1.384
Total	$1,256,498.40	$11.053	$30.620

An average of 241 men was employed, of whom 145 were underground, and 96 on surface. A. G. Hattie is manager.

Preston East Dome Mines, Limited

Preston East Dome Mines, Limited, was incorporated in January, 1911, and reorganized by supplementary letters patent in February, 1936. The authorized capitalization is 3,000,000 shares of $1 par value, all of which have been issued. The officers and directors are: W. H. Bouck, president; G. B. Langford, vice-president; L. I. Hall, secretary-treasurer; J. B. Allen, J. W. Ecclestone, S. A. Hayden, and F. R. Joubin, directors. The executive office is at 10 Adelaide Street East, Toronto. The head office and mine office are at South Porcupine.

The company owns seven claims immediately south and east of the Dome mine, in Tisdale township, Porcupine area, district of Timiskaming.

Mining and milling continued throughout 1952. There was no shaft-sinking during the year.[1] Development work consisted of: drifting, 4,646 feet; crosscutting, 8,926 feet; raising, 4,174 feet. The total amount of development at the end of 1952 was: drifting, 78,099 feet; crosscutting, 93,715 feet; raising, 37,150 feet. Diamond-drilling in 1952 consisted of 365 holes, totalling 49,285 feet, from underground.

The following is taken from the manager's report for the year ending December 31, 1952:

Production

Milling results for the 12-month period ending December 31, 1952, are shown in the table below:

Ore hoisted	tons	239,549
Total dry tons milled		239,500
Average dry tons milled per day		656
Average mill heads	ounces gold per ton	0.2919
Average net recovery	ounces per ton milled	0.2854
Average gold in tailings	ounces per ton	0.0065
Average recovery	percent	97.75
Gold produced	fine ounces	68,341.396
Silver produced	fine ounces	7,599.44

Bullion production for the year was 13 percent greater than in 1951, owing in part to a moderate increase in tonnage milled, and in part to a further improvement in the grade of ore treated.

Despite the increase in the grade of ore milled, the average tailings content, 0.0065 ounce per ton, was slightly lower than in 1951.

Costs

The total mine operating costs were $8.505 per ton milled, exclusive of administration, write-offs, depreciation, and taxes. Detailed costs are shown below:

	Per ton milled
Development and diamond-drilling	$2.192
Mining	5.248
Milling	1.065
Total	$8.505

The operating cost per ounce produced was $29.81 as compared with $31.95 for the previous year, or a decrease of $2.14 per ounce. This decrease was mainly owing to an increase in the grade of ore treated.

The expenditures on development showed a decrease of $0.056 per ton as compared with the previous year.

The expenditures on mining and milling showed an increase of $0.212 per ton and $0.076 per ton respectively as compared with the previous year.

The total mine operating costs for the year showed an increase of $0.232 per ton milled as compared with those of 1951, owing to further increases in labour and supply costs.

[1]For details on depths and levels of shafts, see Ont. Dept. Mines, Vol. LIX, 1950, pt. 2, p. 67.

Development

The total development for the year was 18,668 feet, of which 17,360 feet was done within the boundaries of the Preston East Dome property and the remaining 1,308 feet in Midcamp property.

The total lateral advance for the year was 14,479 feet of which 3,081 feet, or 21.3 percent was in ore, grading 0.60 ounces per ton uncut and 0.26 ounces per ton cut. This compares with a total of 3,005 feet, grading 0.94 ounces per ton uncut and 0.24 ounces per ton cut, disclosed in 1951.

Lateral development accomplished during the year was distributed throughout the main producing zones as follows:

Zone	Lateral development	Total
	feet	percent
West porphyry	6,543.0	49.8
Preston porphyry	464.5	3.5
North greenstones	4,247.0	32.4
Porphyry greenstones	1,875.5	14.3
Total	13,130.0	100.0

West Porphyry

In the west porphyry area, 1,630 feet of ore, grading 0.91 ounces per ton uncut and 0.35 ounces per ton cut was developed during the year.

The old levels from the New York Porcupine shaft were connected with the Preston workings by a raise from the 5th level. This will facilitate exploration of the southwest corner of the property above the 5th level, where good indications of ore have been obtained in diamond-drilling.

Encouraging values have been obtained in drilling a porphyry body lying adjacent to the west porphyry on the upper levels. This porphyry is now under development on the 7th level.

The highlight of development on the lower levels was the discovery of a new vein of good grade which, at the year's end, had been developed by drifting and raising over an average length of 300 feet and vertical range of 500 feet. To date, this vein has been proven to extend from the 20th to the 24th levels in good ore.

Preston Porphyry

In the Preston porphyry area, a total of 409 feet of ore, grading 0.24 ounces per ton uncut and 0.20 ounces per ton cut, was developed in 1952. This ore was disclosed in stringer zones on the 7th and 18th levels and in narrow veins on the 15th level.

A drive, which is being extended on the 19th level, was approaching the south end of this porphyry at the year end.

North Greenstones

Development in this zone was carried out on all levels between the 16th and 21st. This work produced 494 feet of ore grading 0.37 ounces per ton uncut and 0.18 ounces per ton cut. In the coming year development in this zone will be extended to include the 23rd level.

In the upper part of this area, formerly known as the carbonated greenstones and now included as part of the north greenstone area, exploration was limited this year.

Porphyry Greenstones

Detailed work in this zone was done on the 11th and 19th levels, and drives are underway on the 20th and 23rd levels.

In all, 548 feet of ore was disclosed; it averaged 0.44 ounces per ton uncut and 0.20 ounces per ton cut. The 19th level development, although incomplete at the year's end, was successful in outlining orebodies with an aggregate length of 335 feet and an average width of 14 feet.

The tonnage potential in this area, which to date has been comparatively small, is expanding appreciably owing to these new disclosures.

Diamond-Drilling

Diamond-drilling, totalling 49,285 feet, was done in search of new ore and as a guide to mining operations. The table below will serve to show the distribution of diamond-drilling done by zones:

	Percent
West porphyry	41.9
Preston porphyry	14.1
North greenstones	34.1
Porphyry greenstones	9.2
Miscellaneous	0.7
Total	100.0

Mining

During the year the mine produced 240,014 tons of ore. Of this total, the stopes produced 210,951 tons and the balance of 29,063 tons came from development.

Broken ore remaining in stopes at the year's end totalled 36,220 tons as compared with 33,945 tons in the previous year, or an increase of 2,275 tons.

The table below gives a record of ore trammed by mining method for the year 1952:

Mining method	Tram 1952	Percent of total
	tons	
Open stopes	7,582	3.2
Square-set pillar recovery	129	0.1
Shrinkage	25,361	10.6
Cut-and-fill	94,074	39.2
Intermittent cut-and-fill	1,789	0.7
Stull	74,732	31.1
Miscellaneous	7,284	3.0
Development	29,063	12.1
Total	240,014	100.0

The following table gives a record of production by zones for the year 1952:

Zone	Ore trammed	Percent or total	Grade	
			Uncut	Cut
Preston porphyry	61,912	25.8	0.32	0.21
West porphyry	105,344	43.9	0.35	0.22
Porphyry greenstones	4,722	2.0	1.94	0.21
North greenstones	38,973	16.2	0.44	0.19
Development	29,063	12.1	1.04	0.18
Total	240,014	100.0	0.47	0.21

Ore Reserves

Ore reserves as of December 31, 1952, are estimated at 501,770 tons with a grade of 0.266 ounces per ton after allowance for dilution. Compared with the previous year, this represents a net gain of 30,430 tons and an increase in gold content of 0.035 ounces per ton.

This increase in gold content is a reflection of the comparatively good grade of ore developed during the last two years and also the elimination of some low-grade tonnages from the reserve, which can no longer be classified as ore under present economic conditions.

Of the total reserve, 14.2 percent is contained in the Preston porphyry; 56.9 percent in the west porphyry; 6.6 percent in porphyry greenstones; and 22.3 percent in the north greenstones.

Construction

A new area was developed on the northeast claim for the disposal of mill tailings. This area, when fully developed, will hold upwards of 2,000,000 tons of tailings.

Capital Expenditures

Capital expenditures for the year totalled $38,068.33. They include the new tailings disposal area, as well as additions to the plant and underground mechanical equipment.

Outside Exploration

A total of 51 properties were submitted to the company during the year, and of these, 35 were examined, and 4 taken under option. In addition, 6 properties were staked.

In all, 7,383 feet of diamond-drilling was done on the optioned properties, and this work with geological and geophysical surveying and a more intensive prospecting effort brought the total cost of outside exploration to $45,214.66.

Cincinnati Property

No work was undertaken on this property during the year, but the present program under way in the west porphyry area, on the upper levels, is giving encouraging results and will facilitate entry to this property as work progresses.

Midcamp Property

Development in this property was carried on during the year on the 12th and 23rd-level horizons where a total lateral advance of 1,293 feet together with 15 feet of raising, were completed. In addition, 21 holes, totalling 5,766 feet, were drilled.

General

Efficiency was maintained at a high level during the year, shown by the fact that the over-all tons per man-shift increased from an average of 2.02 tons in 1951 to 2.07 tons in 1952.

A program of mine research was continued throughout the year, which included investigations into many phases of mining operations with good results. In addition, tests on mine equipment were continued with a view to reducing costs.

The average price received for gold during 1952 was $34.19 per ounce as compared with $36.82 in 1951, or a decrease of $2.63 per ounce.

To summarize, bullion production for the year reached the highest since 1942 and exceeded the previous year's production by 7,874 ounces. The development work done during the year produced more ore than in 1951 and resulted in a further improvement in the ore position. Also, the gold content of the ore reserves showed a moderate improvement owing to the better grade of ore disclosed in development during the last two years.

An average of 386 men was employed, of whom 271 were underground, and 115 on the surface. W. A. Hutchison is manager.

Renabie Mines, Limited

Renabie Mines, Limited, was incorporated in January, 1941, with an authorized capitalization of 1,500,000 shares of $1 par value, of which 1,050,005 have been issued. The company is a subsidiary of Macassa Mines, Limited. The officers and directors are: R. A. Bryce, president; L. Soliague, vice-president; H. W. Salthouse, secretary-treasurer; J. D. Bryce, G. A. Howes, and H. M. Porteous, directors. The head office is at 85 Richmond Street West, Toronto. The mine address is Renabie.

The company owns 32 claims in Leeson and Rennie townships, district of Sudbury.

The mine and mill continued to operate throughout 1952. The mine is served by two vertical three-compartment shafts: No. 1 shaft is 281 feet deep, and No. 2 shaft is 1,430 feet deep. There was no shaft-sinking in 1952.

The following development work was done during the year: drifting, 1,388 feet; crosscutting, 555 feet; raising, 1,338 feet. The total amount of development at the end of 1952 was: drifting, 13,013 feet; crosscutting, 4,817 feet; raising, 5,528 feet. Diamond-drilling in 1952 consisted of three holes, totalling 1,934 feet, from surface, and 73 feet, totalling 10,217 feet, from underground. A total of 169,899 tons of ore were hoisted and the mill treated 169,674 tons.

A 36- by 105-foot addition to the mill and a two-storey frame house were built. A 50,000-gallon steel water tank was erected, and a sprinkler system was installed to serve all the buildings in the No. 2 shaft area. With a view to increasing over-all extraction, two additional thickeners and a new agitator were installed in the mill.

The following is taken from the mine manager's report for the year ending December 31, 1952:

Production

The following figures show the production for 1952 with comparable figures for 1951 (197 days) and 1950:

	1952	1951 (197 days)	1950
Gross recovery	$1,406,342.51	$873,084.19	$1,411,237.87
Tons milled	169,674	88,736	157,948
Recovery per ton	$8.29	$9.84	$8.93

The average Mint settlement value per ounce of gold was $34.21 compared with $36.58 in 1951. Under provisions of The Emergency Gold Mining Assistance Act, it is estimated that the company is entitled to receive the sum of $119,678.75 for the year, which is $0.711 per ton milled, or $2.985 per ounce of gold recovered. Of this amount $71,537.74 was received on account.

From the commencement of milling operations in July, 1947, 697,222 tons of ore have been milled from which have been recovered 162,795.898 ounces of gold and 52,662.32 ounces of silver having a gross value of $5,894.353.53, equivalent to $8.45 per ton milled, exclusive of cost-aid.

Development

Work was confined to developing the known orebodies lying between the 250- and 1,100-foot level; driving an ore pass between the 1,345- and 925-foot level at No. 2 shaft; drifting to C orebody on the 675-foot level, and raising between the 675- and 250-foot level in the No. 1 shaft area. Two new small lenses were partly developed within 200 feet of D orebody.

Ore Reserves

The technical position of ore reserves at the year's end, after allowing for dilution, was as follows:

	Tons	Ounces per ton	Value (gold at $35 per ounce)
Unbroken ore	406,500	0.253	$8.86
Broken ore	88,500	0.240	8.40
Total	495,000	0.250	$8.75

Milling

The mill operated at an average of 463.6 tons per day. Over-all extraction was 92.2 percent. Bullion recovery comprised 40,818.602 ounces of gold and 12,225.26 ounces of silver.

Operating Costs

The operating and other costs per ton milled and per ounce of gold recovered were as follows:

	1952		1951 (197 days)	
	Per ton milled (169,674 tons)	Per ounce recovered (40,818.602 ounces)	Per ton milled (88,736 tons)	Per ounce recovered (23,672.988 ounces)
Development and exploration	$0.721	$ 2.996	$0.539	$ 2.021
Mining	2.398	9.968	2.708	10.152
Milling	1.359	5.650	1.716	6.430
Undistributed operating charges, including administration and head office	0.689	2.866	0.879	3.294
Total operating cost	$5.167	$21.480	$5.842	$21.897
Depreciation	1.496	6.218	1.385	5.192
Preliminary exploration and development write-off	0.648	2.696	0.669	2.509
Provision for municipal, federal, and provincial taxes	0.140	0.580	0.080	0.298
Total cost	$7.451	$30.974	$7.976	$29.896

Capital Expenditure

The total capital expenditure amounted to $183,253.67 and was as follows:

Mill addition	$ 23,911.66
Mill equipment	31,324.56
Mine equipment	8,531.30
Dwellings	37,939.40
Machine shop equipment and miscellaneous	27,791.44
Water tank and sprinkler system	53,755.31
Total	$183,253.67

General

The community at the Renabie townsite comprised 71 families, 76 houses, and a total population of 326. A new 45-pupil classroom was added to the public school. The present enrolment is 58 pupils. The Renabie Recreation Club built a curling rink to provide winter recreation for the community.

An average of 161 men was employed, of whom 70 were in the mine, and 91 on surface. A. A. McCloskey is mine manager.

Rowan Consolidated Mines, Limited

Lake Rowan (1945) Mines, Limited, was incorporated in July, 1945. In January, 1951, the name was changed to Rowan Consolidated Mines, Limited. The authorized capitalization is 3,500,000 shares of $1 par value, of which 2,005,000 have been issued. The officers and directors are: A. W. White, president; T. M. Fyshe, secretary; L. W. McIlmurray, treasurer; J. C. Allen, W. L. Downes, and E. D. Kippen, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Red Lake.

The company owns 49 claims in Todd township, Red Lake area, Patricia portion of Kenora district.

During previous operations a vertical three-compartment shaft was sunk to a depth of approximately 434 feet on claim K.R.L. 6181, and some development work was done on levels at 100, 250, and 400 feet.

Surface operations were resumed in 1952 in preparation for reopening the mine. A dry-house, a machine shop, a powder magazine, a two-storey building to serve as office and warehouse, and a 12,000-gallon water tank were built.

A 42- by 24-inch, double-drum Fullerton, Hodgart, and Barclay hoist, formerly used at the Gold Eagle mine, a new 1,000-cubic-foot Canadian Ingersoll-Rand compressor, and two 333-kilovolt-ampere transformers were installed.

Five men were employed. F. A. Fell is manager.

Starratt Olsen Gold Mines, Limited

Starratt Olsen Gold Mines, Limited, was incorporated in June, 1945, with an authorized capitalization of 3,000,000 shares of $1 par value, all of which have been issued. The officers and directors are: J. E. Hammell, president and managing director; C. S. Hamilton, vice-president; A. G. Hattie, director of mining; G. M. Huycke, secretary-treasurer; John Bland, assistant secretary-treasurer. The executive office is at 25 King Street West, Toronto. The head office and mine office are at Madsen.

The property consists of 18 claims in Baird township, Red Lake area, Patricia portion of Kenora district, and adjoins the Madsen Red Lake mine to the west. It is reached by an eight-mile road from Red Lake.

Mining and milling operations continued throughout 1952. The shaft-sinking program begun in 1951 was continued in 1952, and the vertical three-compartment main shaft was deepened a further 412 feet to a total depth of 1,975 feet. New levels were established at 1,660, 1,810, and 1,960 feet below the collar. The new section of the shaft permits development of the 1,325- and 1,475-foot levels.

The following development work was done in 1952; drifting, 5,386 feet; raising, 2,200 feet. The total development at the end of the year was: drifting, 22,605 feet; crosscutting, 1,226 feet; raising, 7,012 feet.

The following is taken from the report of the mine manager for the year ending December 31, 1952:

Deferred Development

Total deferred development consisted of 1,326.5 feet of advance and 54,090 cubic feet of slashing in raising, shaft-sinking, and stations.

Mine Development

The west drift on the 1,325-foot level was driven from the shaft to the west end of the "26" ore zone, 1,510 feet west of the shaft. The heading was driven in the north tuff zone and was tested with flat diamond-drill holes at 100-foot intervals.

The No. 13-18 ore zone was encountered 900 feet west of the shaft, exposing a length of 57 feet averaging $4.09 across an average width of 4.2 feet. Estimated tonnage above the level is 6,200 at $5.15 per ton.

The No. 13-22 ore zone started 1,065 feet west of the shaft and showed a length of 75 feet averaging $6.51 per ton across an average width of 15.5 feet. Estimated tonnage above the level is 14,500 at $5.08, cut, and $5.58, uncut, per ton.

The No. 13-26 ore zone was intersected in its expected position, immediately west of the "26" fault, 1,200 feet west of the shaft for a length of 183 feet averaging $8.19, cut, and $12.25, uncut, across an average width of 12.5 feet. This No. 13-26 ore zone, between the 1,325- and the 1,150-foot level, is estimated to contain 64,000 tons averaging $6.25 cut and $6.65 uncut per ton. The above tonnage and grade figures include a dilution factor of 10 percent at a grade of $1.05 per ton.

The west drift on the 1,475-foot level was driven from the shaft to the west end of the "26" zone, 1,500 feet west of the shaft. The heading was driven off the tuff zone to permit vertical diamond-drill exploration. The north-tuff zone was tested with flat drill holes and inclined holes above and below the level at 100-foot intervals.

No ore-grade material was encountered between the shaft and the "26" fault on the 1,475-foot level.

The No. 14-26 ore zone was encountered west of the No. 26 fault but contained only limited areas of mineralization with erratic assays, and no orebody could be outlined on the level.

Diamond-drill hole intersections between the 1,325- and 1,475-foot levels, indicate the presence of a small amount of ore in the "26" zone. Insufficient information is available to estimate accurately the dimensions and average grade of this block.

Stope Preparation

Total stope preparation consisted of 2,530 feet of advance and 22,884 cubic feet of slashing in drifting, subdrifting, and raising.

Diamond-Drilling

Type of drilling	Number of holes	Footage
Exploration	124	14,155
Blast holes	803	33,717

Exploration drilling was continued throughout the year. The bulk of the drilling was done from the 1,325- and 1,475-foot levels. Outlining of known ore zones was kept ahead of stoping.

Ore Reserves[1]

	Total	Grade	
		Cut	Uncut
	tons		
Mine total above 1,475-foot level	109,600	$6.03	$6.50

Milling and Production[2]

Ore milled	tons	155,690
Average milled per day	tons	426.5
Gold recovered (26,239.387 ounces)		$918,378.54
Silver recovered (5,342.39 ounces)		$4,421.43
Recovery	percent	91.19

[1]All grades and tonnages include 10 percent dilution at $1.05 per ton.
[2]All values in the report based on gold at $35 per ounce.

Operating Costs

	Cost	Per ton	Per ounce
Development, including diamond-drilling	$126,383.35	$0.812	$ 4.817
Stope preparation	67,578.07	0.434	2.575
Stoping	283,988.37	1.824	10.823
Milling	216,319.62	1.389	8.244
Surface and general	49,975.82	0.321	1.905
Administration at mine	53,420.22	0.343	2.036
Total	$797,665.45	$5.123	$30.400

Capital Expenditures

The following table shows the additions made to the capital accounts for the year 1952:

Deferred development	$140,580.68
Buildings	.....
Machinery and equipment	35,341.33
Total	$175,922.01

An average of 139 men was employed, of whom 77 were underground, and 62 on surface. J. K. Whatmough is manager.

Sylvanite Gold Mines, Limited

Sylvanite Gold Mines, Limited, was incorporated in June, 1913, with an authorized capitalization of 3,300,000 shares of $1 par value, of which 3,299,500 have been issued. The officers and directors are: W. V. Moot, president and managing director; K. C. Gray, vice-president and general manager; W. S. Walton, secretary; C. L. Ingham, treasurer; A. H. Sharpe, H. Yates, and L. R. Gulick, directors. The executive office is at Erie County Bank Building, Buffalo, N.Y. The secretary's office is at 44 King Street West, Toronto. The head office and mine office address is Box 670, Kirkland Lake.

The main property is located in Teck township, Kirkland Lake area, district of Timiskaming.

Mining and milling operations continued throughout the year. There was no shaft-sinking during 1952.[1]

During the year the following development work was completed: drifting, 2,027 feet; crosscutting, 888 feet; raising, 2,701 feet. Total development work to December 31, 1952, was as follows: drifting, 209,918 feet; crosscutting, 65,413 feet; raising, 48,403 feet. Diamond-drilling consisted of 195 underground holes totalling 12,492 feet.

Throughout 1952, some 171,868 tons of ore were milled, a daily average of 469 tons.

The following is taken from the report of the general manager for the year ending December 31, 1952:

Development

During the year, 2,193 feet of ore was developed in drifting and development subdrifting. The work was distributed through the mine from the 250- to the 4,500-foot level.

In drifting, 301 feet of ore was developed in a total advance of 2,027 feet, of which 155 feet of ore was found on the south and the incline veins between the 500- and 1,250-foot levels. On the 1,625-foot level, a drift on the north A vein reached and exposed 32 feet of ore with ore still in the face.

On the north B vein, drifting on the 1,250- and 1,750-foot levels developed 114 feet of ore. This vein, between the 2,000-foot level and surface, lies 700 to 1,000 feet north of the shaft, and

[1]A table showing the depths of the shafts appears in Ont. Dept. Mines, Vol. LIX, 1950, pt. 2, p. 72.

development work in this area has been done chiefly on the two levels mentioned. The sections of ore developed and partly mined on it during this and the previous year do not, under present conditions of increased mining costs and the low price of gold, carry enough margin of profit to warrant the gamble of the large expenditure necessary to fully explore and develop this fracture throughout its indicated length in the mine. A small amount of work will be continued to open up the more accessible sections of the vein.

In subdrifting, 1,892 feet of ore was developed in a total advance of 4,368 feet. The more important results of this work were as follows:

A block of good ore was developed in the No. 5 shaft section where a continuous length of 432 feet of ore was opened up in subdrifting on the north A vein, at its intersection with the No. 2 strike fault above the 3,900-foot level. The average height of this block, as indicated by raises at both ends, is 80 feet.

A subdrift served by a 40-foot winze below the 4,508-foot drift opened up and prepared for stoping a 229-foot length of high-grade ore.

In the upper section of the mine, above the 3,600-foot level, the subdrifting was done on shorter lengths of ore in the various vein systems, from the 250- down to the 3,150-foot level. On the north vein system, 513 feet of ore was developed in faulted remnants and in sills. On the south, incline, and north A vein systems, there were developed respectively 116, 356, and 244 feet of ore. The most important single development of these was in an incline vein above the 250-foot level where a tight fracture opened up into a strong vein. Here subdrifting developed 217 feet of ore of a grade above mine average.

In No. 5 interior shaft section, two small stopes were commenced during the year but the 4,283 feet of ore previously developed remains available for stoping.

The source of ore milled was as follows:

Levels	Tons	Percent
125- to 1,125-foot	92,076	53.5
1,250- to 1,875-foot	44,656	26.1
2,000- to 2,875-foot	22,339	13.0
3,000- to 3,600-foot	5,557	3.2
No. 5 shaft:		
3,750- to 5,500-foot	7,240	4.2
Total	171,868	100.0

Operating Costs

	Total, 1952	Per ton ore milled	Per ounce fine gold produced
Development and exploration	$ 249,329	$1.451	$ 4.596
Mining	890,944	5.184	16.423
Milling (including tailings disposal expense)	248,550	1.446	4.582
General charges, after deducting sundry revenue	83,268	0.484	1.535
Administration expense	51,127	0.298	0.942
Bullion selling expense:			
Insurance, shipping and Mint refining charges	3,428	0.020	0.063
Mint handling charges	10,850	0.063	0.200
Total	$1,537,496	$8.946	$28.341

The main charges to operations in the fiscal year were:

Wages and mine salaries	$960,777
Supplies, including power and water	437,082
Provision for taxes on mining income	112,000

Capital Expenditures

Of $8,105 spent on capital account during the year, $1,057 was expended on buildings and $7,048 on equipment. In the normal replacement of rock drills, nine of the pusher-leg type drills were introduced, using tungsten-carbide insert rods. An automatic grinder was added to the steel-shop equipment for grinding the tungsten carbide points. Improvements and additions to employee recreational facilities were made, and a storage tank was installed to permit bulk purchase of muriatic acid. Other equipment installations were for property protection and for improved handling of payroll records.

Production

During the year, 171,868 tons were milled producing 54,249.834 troy ounces of gold and 13,522.74 troy ounces of silver with a value of $1,866,401. The mill averaged 469.6 tons per day, which is 1.1 tons more per day than in the previous year.

Year	Tons milled	Ounces fine gold produced	Average price per ounce gold	Total gold and silver production	Average gold recovery, ounces per ton
1948	167,440	44,501.936	$35.00	$1,565,036	0.27
1949	171,442	47,841.222	36.17	1,738.606	0.28
1950	170,552	48,034.186	38.00	1,833,687	0.28
1951	171,017	46,573.063	36.80	1,722,843	0.27
1952	171,868	54,249.834	34.20	1,866,401	0.32

Broken Ore Reserves

Broken ore reserves were 97,622 tons at the end of the year, an increase for the year of 24,220 tons.

General Summary

The average price received for an ounce of gold during 1952 was $34.20. This is the lowest amount received in 19 years. The average price received per ounce in 1951 was $36.80, and in 1950 the average was $38. This drop in price of $3.80 an ounce in two years coupled with rising costs has compelled an upgrading selection of ore mined and milled.

Although the profit position was slightly above the 1951 figure, this was only achieved by increasing the grade of ore milled and curtailing development. The effect of this policy, if it has to be continued, on the future of the mine can be readily understood.

Costs on a per-ton-milled basis were up by 25 cents per ton. The increased gold content of the ore milled is reflected in a lowering of the cost on a per ounce basis.

It is estimated that during 1952 amounts received under the Emergency Gold Mining Assistance Act will be increased by approximately $1.00 per ounce produced. As our power contract has still about two years to run, we will not have to face higher rates during the coming year.

Sylvanite commenced milling in May, 1927, and in May, 1952, completed 25 years of continuous production. With this in mind a brief review of total production statistics may be of interest to the shareholders. The following figures are from May, 1927, and include the fiscal year 1952:

Milled	tons	3,688,016
Gold produced	ounces	1,278,469
Silver produced	ounces	252,442
Value of production		$43,176,422.65
Dividends paid or declared (Canadian dollars)		$11,070,278.00

W. S. Maguire is mine superintendent. An average of 275 men was employed.

Teck-Hughes Gold Mines, Limited

Teck-Hughes Gold Mines, Limited, was incorporated in March, 1923, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 4,807,144 have been issued. The officers and directors are: Dr. D. L. H. Forbes, president and general manager; H. C. McCloskey, vice-president; R. N. Tapley, treasurer; J. W. Stephenson, secretary; R. A. Jodrey, W. H. Keith, G. A. La Bine, and C. G. Williams, directors. The executive office is at 25 King Street West, Toronto. The mine office is at Kirkland Lake.

The main property is in Teck township, Kirkland Lake area, district of Timiskaming.

Mining and milling operations continued throughout 1952. Work was begun on the new vertical No. 4 winze from the 30th to the 36th level. A 319-foot pilot raise was driven from the 36th to the 32nd level, and preparations for sinking from the 30th to the 32nd level were continued.[1]

[1]For a detailed description of the other shafts and winzes see Ont. Dept. Mines, Vol. LX, 1951, pt. 2, p. 72.

During the year the following development work was completed: drifting, 646 feet; crosscutting, 850 feet; raising, 919 feet. The total development work at December 31, 1952, was as follows: drifting, 133,489 feet; crosscutting, 48,838 feet; raising, 74,381 feet. Diamond-drilling in 1952 consisted of 10 holes, totalling 1,028 feet, from underground.

Some 218,879 tons of ore were milled, an average of 598 tons per day.

The following is taken from the manager's report for the year ending December 31, 1952:

During the year, 218,930 tons of ore from the mine were milled. Recovery of bullion amounted to 40,359.180 ounces of fine gold and 9,963.25 ounces of fine silver. The value of bullion production was $1,454,359.98 or $6.64 per ton, which includes Emergency Gold Mining Assistance Act payments of $8,644.15 and premium on gold sales of $24,903.94. Operating costs amounted to $1,243,813.90 or $5.68 per ton, leaving an operating profit of $210,546.08 or $0.96 per ton.

Income on general investments and dividents on shares of Lamaque Gold Mines, Limited, amounted to $548,558.83. The net profit for the fiscal year was $756,973.71.

Ore Reserves

Following our practice of recent years, ore reserves have been divided into two classes, positive and potential. The latter includes proved ore from which the ultimate profitable recovery is still dubious at the present time.

The large increase in blocked potential ore is due to the inclusion of south extension shaft pillars between the 34th and 36th levels.

	Tons	Gold content in troy ounces	Average grade in pennyweights per ton
Positive ore:			
Blocked	35,593	14,550.7	8.18
Broken	32,304	7,357.1	4.55
Total	67,897	21,907.8	6.45
Potential ore:			
Blocked	214,104	48,512.6	4.53
Broken	27,307	7,222.0	5.29
Total	241,411	55,734.6	4.62

General

Production from different sections of the mine during 1952 and 1951 was as follows:

Section	Production		Gold content		Average grade	
	1952	1951	1952	1951	1952	1951
	tons	tons	ounces	ounces	dwt. per ton	dwt. per ton
Levels:						
Surface to 20th	none	42	none	5.6	none	2.67
20th to 30th	105,564	57,600	15,615.1	15,462.3	2.96	5.37
30th to 40th	39,805	29,033	12,643.8	10,313.2	6.35	7.10
40th to 47th	73,561	111,185	15,148.4	25,921.9	4.12	4.66
Total	218,930	197,860	43,407.3	51,703.0	3.97	5.23

Most of the production from 20th–30th levels came from low-grade, low-cost caved ore obtained at the 21st and 24th levels.

In the 30th–40th-level section, most of the production came from the cut-and-fill mining of remaining portions of the main break near the south-extension shaft, between the 30th and 32nd levels. In the course of this stoping, varied minor quantities of new ore were discovered including an ore-bearing extension of a narrow hanging-wall branch vein known as the "T." Following diamond-drilling, this was picked up on the 32nd level late in the year, and some 30 feet of ore developed by drifting west. (A raise has since been driven up the 40 degree dip nearly to the 31st level, 85 percent of it in ore; drifting will be resumed later.)

In order to prolong the life of the mine, plans have been made to extract a 180-foot length of the main break between 36th level and 50 feet above the 34th level, estimated to contain 160,000 tons grading 3.74 pennyweights over widths ranging from 12 to 60 feet. As this orebody crosses the

south extension shaft at an angle of about 10 degrees, it is necessary to provide alternative hoisting facilities, and work has been started on the No. 4 vertical winze, 300 feet south of the south extension shaft, to connect the 30th with the 36th level and the 33rd, 34th, and 35th, intermediate levels. The winze will be sunk to the 32nd level where it will connect with a pilot raise, which will then be slashed and timbered to full-shaft size. Preliminary work on the 30th level including headframe, hoistroom, ore bin, etc., is finished and pilot raising completed from the 36th to above the 34th level.

Production from the levels below 40th had a reduction of 34 percent in tonnage and 42 percent in gold production. There are still some small remnants and old stopes to clean up.

The average tons milled per day was 598 compared with 542 during 1951. Grade, however, was down to 3.97 pennyweights per ton from 5.23 pennyweights the previous year. Value of bullion production was $6.64 per ton compared with $9.63 during 1951. Operating costs were reduced to $5.68 per ton from $6.30 the previous year, leaving an operating profit of $0.96 as compared with $3.33 in 1951.

The average price received for 34,300 ounces of gold sold on the free market during 1952 was $36.52 per ounce. The average price received for all gold sold in 1951, including cost-aid earned, was $38.09 per ounce. The average price of silver during 1952 was 82.71 cents per ounce compared with 93.92 cents the previous year. The estimated loss of revenue attributable to these lower prices during 1952 was about $64,000.

Wage rates and cost of supplies remained about the same during the year. Reductions in the costs of items such as lumber, scraper cable, rubber goods, and explosives, were offset by increases in others.

The plant and equipment were maintained in good repair.

A number of minor rock bursts occurred in the intermediate levels during the year, but no one was injured, nor was any serious damage done.

Operating Costs

	Total	Per ton of ore treated	Per ounce of gold produced
Development	$ 142,134.80	$0.65	$ 3.522
Mining	728,323.06	3.32	18.046
Milling	275,186.82	1.26	6.818
General expense	93,605.78	0.43	2.319
Depreciation	4,563.44	0.02	0.113
Total	$1,243,813.90	$5.68	$30.818

An average of 223 men was employed, of whom 146 were underground, and 77 on the surface. G. G. Gilchrist is manager.

Theresa Gold Mines, Limited

Theresa Gold Mines, Limited, was incorporated in April, 1938, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,299,620 have been issued. The officers and directors are: A. Caouette, president; J. E. R. Page, vice-president; M. D. Caouette, secretary-treasurer and manager; M. Halle and I. Turcotte, directors. The head office and mine office are at Theresa.

The company holds a group of claims east of the Making Ground River, about seven and a half miles south and slightly east of Longlac in the district of Thunder Bay.

The mine continued to operate throughout 1952. The operation is conducted through a vertical three-compartment shaft, 986 feet deep. The following development work was done during the year: drifting, 470 feet; crosscutting, 1,577 feet; raising, 120 feet. The total development work at the end of 1952 was: drifting, 1,955 feet; crosscutting, 8,040 feet; raising, 880 feet. Diamond-drilling in 1952 consisted of 55 holes, totalling 12,704 feet.

There were 13,904 tons of ore hoisted. The mill operated from April to December and treated 13,792 tons at an average daily rate of 102 tons.

Hydro-electric power was turned on at the property on January 27, 1952. An 800-cubic-foot Sentinel compressor was installed in the hoist-room.

An average of 59 men was employed, of whom 29 were in the mine, and 30 on surface. M. D. Caouette is manager.

Tisdale-Ankerite Gold Mines, Limited

Tisdale-Ankerite Gold Mines, Limited, was incorporated in August, 1952, with a capitalization of 1,000,000 shares of no par value, all of which have been issued. Buffalo Ankerite Gold Mines, Limited, owns 666,662 shares. The officers and directors are: Dr. F. R. Burton, president; C. C. Calvin, vice-president; E. E. Ritchie, secretary-treasurer; A. Cockshutt, W. V. Griffin, and J. J. Weldon, directors. The secretary's address is 320 Bay Street, Toronto. The mine address is Box 340, South Porcupine.

The company owns eight claims adjoining the Buffalo Ankerite mine in Deloro township, Porcupine area, district of Cochrane. The claims, known as the Tisdale or Dobie, were held under option in 1951 by Buffalo Ankerite Gold Mines, Limited, and operations continued under that company's direction in 1952.

Exploration and development work was done from the 1,550- and 2,500-foot levels of the Buffalo Ankerite mine. The following table shows the amount of work done during 1952, and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1952	Total	1952	Total	1952	Total
	feet	feet	feet	feet	feet	feet
1,500-foot	1,155	1,728	66	640	167	167
2,500-foot	493	493	986	986	77	77

Diamond-drilling amounted to 77 holes, totalling 22,611 feet, all from underground.

The following is taken from the mine manager's report for the year ending December 31, 1952:

Exploration and Development

On the 1,550-foot level, two parallel ore zones with a general east-west strike were developed. The south zone contains two vein structures, but the ore shoots are short and erratic. A small amount of stoping indicated that they are not persistent vertically. In the north zone, 1,070 feet of drifting developed three ore shoots with a combined length of 395 feet and a calculated stoping grade of 0.20 ounces per ton across an average width of 4.7 feet. The two ore zones were explored by diamond-drilling for 250 feet above and below the level with results similar to those obtained in level development.

On the 2,500-foot level, the exploration work was less extensive than on the 1,500-foot level. Only two small ore shoots were developed; one with a length of 45 feet and calculated stoping grade of 0.22 ounces per ton across an average width of 5.1 feet; the other 45 feet long with 0.20-ounce grade across 5.7 feet. Diamond-drilling for 250 feet above and below the level did not indicate the presence of larger ore shoots.

Mining

Considerable test stoping was done on the indicated ore shoots with results as follows:

Stope	Distance stope carried above rail	Average length of stope	Average width of stope	Hoisted	Cut grade of muck samples
	feet	feet	feet	tons	ounces per ton
T-15-3 No. 1	140	50	5.1	3,044	0.26
T-15-3 No. 2	95	80	4.0	2,400	0.17
T-15-3 No. 2 E	45	85	3.7	1,200	0.17
T-25-2 W	103	35	5.6	1,615	0.22
T-25-3	40	30	6.6	663	0.16

Milling

In 1952, 14,655 tons of ore were treated in the mill of Buffalo Ankerite Gold Mines, Limited. Bullion recovery was 2,236.380 ounces or 0.15 ounces per ton. Total production, including silver, was $78,808.12 or $5.38 per ton. The ore was refractory, and recovery was only 83.64 percent.

Work on the property was discontinued at the end of the year.

The employment figures are included in those given for Buffalo Ankerite Gold Mines, Limited, on page 10. C. E. Bowker was mine manager.

Toburn Gold Mines, Limited

Toburn Gold Mines, Limited, was incorporated in January, 1931, with an authorized capitalization of 2,000,000 shares of $1 par value, of which 1,850,000 have been issued. The officers and directors are: R. F. Goodwin, president; J. C. Emison, vice-president and treasurer; G. A. Brockington, secretary; J. E. Dempsey, C. P. Pollock, and A. W. Holmested, directors. The head office is at 1809 Royal Bank Building, Toronto, and the executive office is at 120 Broadway, New York, N.Y. The mine address is Kirkland Lake.

The property, originally called the Tough-Oakes Burnside, consists of 10 claims in Teck and Lebel townships, Kirkland Lake area, district of Timiskaming.

Mining and milling operations continued throughout 1952. No further sinking was done. Development during the year was curtailed because of the approaching exhaustion of ore reserves and the company's decision to discontinue operations early in 1953. Some 306 feet of drifting, 75 feet of crosscutting, and 252 feet of raising were done. The total amount of development at the end of 1952 was: drifting, 52,974 feet; crosscutting, 22,984 feet; raising, 16,785 feet.

The following is taken from the general manager's report for the year ending December 31, 1952:

Underground development completed during 1952 totalled 633 feet compared with 1,036 feet during 1951. Of the 1952 total, 381 feet, or 60 percent, were on ore yielding 1,329 tons compared with 382 feet, or 37 percent, on ore yielding 1,135 tons during 1951.

During the year, 48 diamond-drill holes were completed, and 4 holes deepened for a total of 7,837 feet. Underground drilling of 41 holes, including the 4 holes deepened, totaled 4,633 feet. Surface drilling completed in 11 holes amounted to 3,204 feet. Of these, 9 holes were drilled to test the upward projection of the No. 4 vein system, but nothing of economic importance was disclosed.

Production figures for 1952 compared with 1951 are:

Year	Milled	Average grade	Produced	Mill recovery
	tons	ounces per ton	fine ounces	percentage
1951	40,525	0.402	15,543	95.44
1952	41,300	0.384	15,143	95.59

The estimated ore reserves, both broken and unbroken, at December 31, 1952, were 6,385 tons averaging 0.417 ounces gold per ton as compared with 12,000 tons averaging 0.41 ounces gold per ton at December 31, 1951.

A limited amount of development work, diamond-drilling, and stoping was carried out on the No. 4 vein structure during 1952. As a result, about 4,000 tons of good-grade ore were mined before a series of faults were encountered, which displaced the ore, making further mining uneconomical.

The limited exploration program carried out during the year was completed with disappointing results. The mine was placed on a final salvage basis.

It now appears that all known ore will be exhausted sometime during February, 1953.

Your company's income for 1952 includes $61,347.68 estimated to be recoverable under The Emergency Gold Mining Assistance Act, which is equivalent to $4.05 per ounce of gold produced during the year. This compares with $3.70 per ounce of gold produced in 1951.

An average of 115 men was employed, of whom 65 were in the mine, and 50 on surface. M. W. Hotchkin was general manager.

Upper Canada Mines, Limited

Upper Canada Mines, Limited, was incorporated in April, 1929, with an authorized capitalization of 3,500,000 shares of $1 par value, of which 3,274,827 have been issued. The officers and directors are: R. R. Brown, president; W. H. Despard, vice-president; G. F. Summers, secretary-treasurer; J. A. W. Brown, T. J. Day, Oliver Hall, and Dr. J. A. Dickson, directors. The head office is at 85 Richmond Street West, Toronto. The mine address is Dobie.

The company's property consists of 35 claims in Gauthier township, Kirkland Lake area, district of Timiskaming.

Mining and milling operations continued throughout 1952. The operation is conducted through two vertical shafts. No. 1 shaft is 2,889 feet deep, and has three compartments from surface to the 1,750-foot level and four compartments from that point to the bottom. No. 2 shaft is 1,877 feet deep and has three compartments. The two shafts are connected on the 375- and 1,000-foot levels. There was no shaft-sinking in 1952.

The following development work was done in 1952: drifting, 9,318 feet; crosscutting, 970 feet; raising, 2,265 feet. The total amount of development at the end of 1952 was: drifting, 87,051 feet; crosscutting, 20,304 feet; raising, 19,886 feet. Diamond-drilling in 1952 consisted of 21 holes, totalling 5,936 feet, from surface, and 458 holes, totalling 35,768 feet, from underground.

The following is taken from the general manager's report for the year ending December 31, 1952:

Exploration

In the latter half of 1952, a comprehensive exploration program was begun for the purpose of thoroughly testing large unexplored areas of the company's property. This consists of surface prospecting and diamond-drilling, a drive west from No. 2 shaft workings into the area where former surface drilling gave commercial ore intersections, underground drilling to continue the search for parallel ore structures, and long exploration drives on the 2,750-foot level. This program will continue throughout the greater part of 1953.

Prospecting on the north group of claims disclosed free gold on the extension of a shear zone discovered by previous work. Further trenching uncovered a small body of ore lying about 2,000 feet north of No. 1 shaft. Surface drilling established the continuity of the ore to a vertical depth of 300 feet. Although deeper drilling has not as yet extended this depth or proved a greater length of ore, the fact that orebodies can be found this far off the strike of present workings greatly enlarges the area which must be considered as possible ore-bearing ground, and which warrants detailed exploration.

Underground exploration included the commencement of the 3,000-foot drive on the 1,000-foot level from No. 2 shaft into the far-west zone mentioned above. Recent underground drilling from the 1,750-foot horizon has confirmed the downward continuation of this western structure. Drifting, on the 2,750-foot, or bottom, level, east and west of the developed ore, continues in favourable structural conditions, with approximately 2,000 feet of the zone remaining to be opened and explored from the No. 1 shaft workings.

Development

Development footage for the year was the greatest in the mine's history. Most of this work was done from No. 1 shaft, where the L zone is being developed between the 1,750- and 2,750-foot horizons. The amount of drifting to develop this block of ground is unusually high as the average distance to drive from the shaft to the beginning of the ore is about 900 feet. This distance will decrease with depth, however, owing to the easterly pitch of the ore.

Less than 40 percent of the L zone in this block has been opened by drifting, and so far little has been done on parallel orebodies or drift widening to include ore indicated by drill holes. Ore development footages tabulated below represent only ore exposed in the drifts.

Some of the best grade of ore developed so far in this area is on the 2,750-foot level, which would seem to indicate a general improvement in ore conditions commencing somewhere below the 1,750-foot horizon.

Development at No. 2 shaft was limited to parallel orebodies and the east end of the L zone on the lower levels. Some excellent ore has been disclosed in subdrifting, resulting in a slight increase in the grade of No. 2 ore reserves.

DEVELOPMENT SUMMARY[1]

Zone	Level	Exposed length	Drifting	Ore developed			Ore milled from lateral development		
				Length	Width	Estimated stoping grade	Tons	Grade	Total value
		feet	feet	feet	feet				
	No. 1 shaft:								
	2,000-foot	880	926.0				116	$ 1.91	$ 221
	2,250-foot	1,480	2,041.4	368	5.8	$ 7.43	2,568	8.02	20,608
	2,375-foot	570	593.0						
L	2,500-foot	640	656.5	46	6.6	13.00	469	8.82	4,135
	2,625-foot	1,000	1,049.8	214	6.0	6.83	1,900	6.64	12,619
	2,750-foot	2,590	3,002.6	226	6.8	11.47	1,400	11.14	15,597
				263	6.3	7.38	1,637	7.00	11,459
	Total	7,160	8,269.3	1,117	6.2	$ 8.45	8,090	$ 7.99	$ 64,639
	No. 2 shaft:								
B	875-foot	25	27.8				399	$ 5.89	$ 2,351
L	1,000-foot	305	306.3				58	8.33	483
B	1,125-foot						1,315	5.53	7,280
	1,125-foot		140.9	84	5.7	$ 7.00	594	6.72	3,992
	1,250-foot	95	253.5				292	8.79	2,567
L	1,375-foot	80	80.1				33	8.30	274
	1,500-foot	150	153.2				124	2.87	356
	1,750-foot	70	86.6						
	Total	725	1,048.4	84	5.7	$ 7.00	2,815	$ 6.15	$ 17,303
	Total	7,885	9,317.7	1,201	6.2	$ 8.37	10,905	$ 7.51	$ 81,942

MINE PRODUCTION[1]

Zone	Tons	Grade	Value
No. 1 shaft:			
L	11,041	$ 8.65	$ 95,490
No. 2 shaft:			
L	136,181	$11.10	$1,511,388
B	30,246	8.60	260,106
Total	166,427	$10.64	$1,771,494
Total mine	177,468	$10.52	$1,866,984

Operating Costs and Revenue

Cost per ounce of fine gold produced before depreciation, taxes, etc., was $29.63, compared with $26.26 in 1951. Operating costs per ton milled over the last four years are tabulated below.

	1949	1950	1951	1952
Diamond-drilling and development	$3.05	$2.08	$1.22	$2.13
Mining	3.96	3.74	3.89	3.92
Milling	1.10	1.19	1.24	1.22
General expense and head office	1.02	0.95	0.99	0.91
Total	$9.13	$7.96	$7.34	$8.18

The rise in the cost per ton handled is almost entirely the result of the enlarged exploration and development program.

The figures in the following table show the decline in the price received for gold, including cost-aid, over the past three years.

	1950	1951	1952
Received per ounce fine gold before cost-aid	$38.00	$36.80	$34.21
Cost-aid per ounce	1.94	2.47	3.28
Total	$39.94	$39.27	$37.49

[1]Gold at $35 an ounce.

Milling

Daily mill tonnage rose during the year from 460 to over 500, with an average for the year of 484.9. The increased was obtained with very little additional equipment and was due partly to improvements in operating practice and partly to a change in the milling characteristics of the ore treated. Although tonnage increased and there was some reduction in grade, the extraction was slightly higher than that obtained in the previous year. Comparative mill figures for the last three years follow:

	1952	1951	1950
Total milled.....tons	177,468	151,568	138,969
Average per day.....tons	484.9	415.3	380.7
Heads at $35 per ounce gold.....	$10.522	$10.642	$10.771
Total tails.....	$0.753	$0.766	$0.767
Recovered.....	$9.769	$9.876	$10.004
Recovery.....percent	92.84	92.80	92.88
Possible running time.....percent	97.55	97.65	97.50
Cost per ton.....	$1.22	$1.24	$1.19

An average of 221 men was employed, of whom 144 were in the mine and 77 on the surface. J. H. Botsford is general manager.

Windward Gold Mines, Limited

Windward Gold Mines, Limited, was incorporated in November, 1946, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,100,000 have been issued. The officers and directors are: J. Ingram, president; J. A. Grant, vice-president; G. C. Andrew, secretary-treasurer; R. D. Stewart, assistant secretary-treasurer; J. R. Bradfield, G. Ehrlich, D. A. Macintosh and J. M. Macintosh, directors. The head office is at 44 King Street West, Toronto.

The company owns 19 claims, adjoining the Newlund mine, in Echo and McAree townships, district of Kenora.

Operations in 1952 were carried on from January 1 to January 16 and from September 20 to October 20, when all work was discontinued. The vertical, three-compartment shaft on the property is 225 feet deep. No shaft-sinking was done in 1952. The drift on the 200-foot level was continued westward for 350 feet. The work was done from the 200-foot level of the Newlund mine. The total lateral development when operations ceased was 2,735 feet of drifting and 244 feet of crosscutting. Diamond-drilling in 1952 consisted of 6 holes, totalling 1,122 feet, from underground. The total amount of diamond-drilling on the property was 17 holes, totalling 8,183 feet, from underground, and 11 holes, totalling 5,111 feet, from surface.

D. B. Angus was mine manager. The work was done by men supplied by Newlund Mines, Limited, and the employment figures are included in the report on that company on page 60.

Wright-Hargreaves Mines, Limited

Wright-Hargreaves Mines, Limited, was incorporated in June, 1916, with an authorized capitalization of 5,500,000 shares of no par value, all of which have been issued. The officers and directors are: E. L. Miller, president; J. Y. Murdoch, vice-president; G. F. Miller, treasurer; P. H. Gerhard, secretary; W. E. Kreiner, W. J. Craig, R. L. Healy, F. V. C. Hewett, and C. George McCullagh,[1] directors. The head office is at Fort Erie. The mine address is Kirkland Lake.

The company's main property is in Teck township, Kirkland Lake area, district of Timiskaming.

[1]Deceased August 5, 1952.

Mining and milling continued throughout 1952. There was no further shaft-sinking during the year.[1] Development work consisted of: drifting, 2,280 feet; crosscutting, 1,821 feet; raising, 5,455 feet. The total amount of development work to December 31, 1952, was: drifting, 296,099 feet; crosscutting, 94,680 feet; raising, 55,889 feet. Diamond-drilling in 1952 consisted of 146 holes, totalling 17,549 feet, from underground.

There were 189,770 tons of ore hoisted and milled during the calendar year, a daily average of 518.5 tons.

The following is taken from the general manager's report for the fiscal year ending August 31, 1952:

Some 190,630 dry tons of ore, averaging 0.436 ounces of gold, were milled from which were recovered 80,195.635 ounces of gold and 14,721.87 ounces of silver; $2,873,461.98 was received from marketing this bullion. In addition to the bullion produced, $92,262.20 is estimated as receivable under The Emergency Gold Mining Assistance Act for the fiscal year 1952. An average price for gold of $35.70 per ounce was received, compared with $36.88 in the previous fiscal year, which reflects the adverse effect on the gold-mining industry of the appreciated Canadian dollar in terms of the United States dollar; $0.87 per ounce was received for silver.

The tonnage produced and milled was some 6,000 tons greater than last year, and development 5.3 percent more. Diamond-drilling footage was approximately the same.

There was a continual shortage of experienced underground men and, for a portion of the year, of inexperienced mine labour. The average turnover was slightly less.

An increase of 1 cent per hour for hourly rated employees, effective February 1, was made. A fifth paid statutory holiday was granted. Cost of supplies, services, and freight increased. Some $603,251.17 was charged out for supplies consumed, plus services and power. Daily tonnage milled was 520.85 per day as compared with 503.32 last year.

The over-all production record shows that from the commencement of operations in 1921, a total of 7,666,903 tons of ore was milled at a value per ton of $17.45, a gross value of $133,820,598, a recovery per ton of $16.65, and a bullion value of $127,655,269.

Milling Statistics
(September 1, 1951, to August 31, 1952)

Ore milled	tons	190,630
Average grade per ton		$15.51
Average grade gold	ounces	0.436
Gross value	$2,957,002.96	
Loss in tailings	83,540.98	
Net value recovered		$2,873,461.98
Average tons milled per day		520.85
Solution precipitated	tons	760,350
Solution precipitated per ton of ore	tons	3.99
Recovery	percent	97.17
Zinc consumed per ton of solution	ounces	0.189
Zinc consumed per ton of ore	ounces	0.755
Cyanide consumed per ton of ore	pounds	0.487
Lime consumed per ton of ore	pounds	4.826
Steel consumed per ton of ore, ball mills	pounds	1.280
Average load, crushing and milling	horsepower	1,484
Average per ton milled per day, crushing and milling	horsepower	2.84
Power cost per horsepower year		$28.53
Yield per ton of ore		$15.07
Value per ton in tailings		$0.438
Average grade of gold in tailings	ounces	$0.012
Average value of pregnant solution per ton		$3.77
Cost of flotation reagents consumed per ton of ore		$0.011
Cost of crushing per ton of ore milled	$0.108	
Cost of ball-milling per ton of ore milled	$0.190	
Cost of tube-milling per ton of ore milled	$0.161	
Cost of all other milling per ton of ore milled	$0.843	
Total milling costs per ton of ore milled		$1.302

An average of 439 men was employed, of whom 289 were in the mine, and 150 on the surface. R. L. Healy is general manager.

[1] A table showing the depth of the shafts and winzes is shown in Ont. Dept. Mines, Vol. LIX, 1950, pt. 2, p. 80.

Young-Davidson Mines, Limited

Young-Davidson Mines, Limited, was incorporated in April, 1926, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,584,108 have been issued. The officers and directors are: A. R. McKay, president; W. T. Davidson, vice-president; G. W. Adams, secretary-treasurer; A. C. Ross and A. R. W. McKay, directors. The head office is at 320 Bay Street, Toronto. The mine address is Matachewan.

The property, consisting of 13 claims and surface rights to parts of 5 claims, is in Powell township, district of Timiskaming. It is operated under agreement by Hollinger Consolidated Gold Mines, Limited. A reference to the 1952 operations appears on page 31 of this report.

Mining and milling operations continued throughout 1952. The mine is served by the vertical three-compartment No. 1 shaft, 1,075 feet deep, and a vertical two-compartment winze, collared at the 463-foot level about 250 feet west and slightly to the north of the shaft.

Development work during the year amounted to 55 feet of drifting, 86 feet of crosscutting, and 14 feet of raising. The total development work at December 31, 1952, was as follows: drifting, 10,243 feet; crosscutting, 6,071 feet; raising, 9,495 feet.

Two large blasts were conducted during the year in Nos. 406 and 408 pillars, giving approximately 170,000 and 207,000 tons of ore respectively.

Some 287,275 tons of ore were milled, at an average rate of 826 tons per day. The daily rate was increased to 960 tons at the end of the year.

The average number of men employed was 128, of whom 75 were in the mine, 23 in the mill, and 30 on general surface work. J. G. Sparrow is resident manager.

GRAPHITE

Frobisher, Limited
(Black Donald Graphite Division)

Frobisher, Limited, carried on surface operations in 1952 at the Black Donald mine on lots 17, 18, and 19, concession III, and lots 15 and 16, concession IV, Brougham township, Renfrew county.

The graphite ore on the surface of the orebody at the old mine was excavated. Some 25,226 tons of ore from this operation were milled.

A search for a new mine was carried on at outside properties, and about 12,000 feet of diamond-drilling was done. A considerable amount of exploratory work was done on lot 4, concession IV, Bedford township, Frontenac county.

B. G. Edward was manager, employing an average of 57 men. The mine address is Black Donald Mines. The company's head office is at 25 King Street West, Toronto.

GYPSUM

Canadian Gypsum Company, Limited

The Canadian Gypsum Company, Limited, was incoporated in September, 1907. The authorized capitalization is 3,000 shares of $100 par value, of which 2,710 have been issued. The officers are: O. M. Knode, president; H. F. Sadler and Edward Rembert, vice-presidents; C. H. Shaver, treasurer; A. W. Irwin, secretary. The head office is at Windsor, N.S. The business office is at 170 Bloor Street West, Toronto. The mine address is Box 99, Hagersville.

The company operates a gypsum mine and plant near Hagersville in Oneida township, Haldimand county.

The mine is operated through a main vertical shaft 102 feet deep. There is also a vent and escapement shaft 90 feet deep.

A total of 156,165 tons of gypsum ore was hoisted in 1952. The mill treated 167,689 tons including 11,524 tons taken from the stockpile.

W. E. Allen is works manager. An average of 60 men was employed, of whom 60 were in the mine, and 4 on the surface.

Gypsum, Lime and Alabastine, Canada, Limited

Gypsum, Lime and Alabastine, Canada, Limited, was incorporated in July, 1927, with an authorized capitalization of 500,000 shares of no par value, of which 440,043 have been issued. The officers and directors are: P. P. Tyler, president; J. E. McConnell and S. G. Dixon, vice-presidents; C. G. Cockshutt, chairman of the board; F. Andrews, comptroller and treasurer; S. H. J. Reid, secretary; J. H. Robinson, director and general manager; W. H. Cooper, R. A. Bryce, and G. H. Dobbie, directors. The head office is at Paris, and the mine address is Caledonia.

The company's mine and mill in Seneca township, Haldimand county, operated continuously throughout 1952.

During the early part of the year a Joy loader, operated by electric power, and a Joy shuttle buggy, operated by diesel power, were installed in the old mine to load and transfer ore from the face to the bottom of the shaft. This equipment speeded production and replaced some of the horses that have been used for hauling cars in the mine for many years.

A new mine was opened on lot 8, range 2, Seneca township. A concrete-lined shaft, 284 feet deep, inclined at an angle of 16 degrees, was sunk. The work was done by a contractor. A level was cut at a depth of 75 feet from surface. Further excavation was carried out in the gypsum seam to establish ore transfer points for a crusher and conveyer apparatus. A conveyer belt, to be installed in the coming year, will carry the gypsum from the mine to a bin at the shaft collar. A hoist was installed for the purpose of lowering supplies to the mine.

A diesel-powered caterpillar loader was used when mining started from the bottom of the new shaft.

Some 114,860 tons of ore were hoisted during the year, and the mill operated at an average daily rate of 396 tons.

L. V. Robinson is manager. An average of 60 men was employed, 56 underground, and 4 in the mill.

IRON

Algoma Ore Properties, Limited

Algoma Ore Properties, Limited, was incorporated in February, 1936, with an authorized capitalization of 50,000 shares of no par value, all of which have been issued. The officers and directors are: Sir James Dunn, president; D. S. Holbrook, executive vice-president; G. W. MacLeod, vice-president and general manager; J. A. McPhail, vice-president; H. G. MacAdam, secretary; E. W. Shell, treasurer; J. B. Barber, comptroller; Lady Marcia Dunn, E. G. McMillan, G. C. Bateman, and H. S. Hamilton, directors. The head office is at Sault Ste. Marie. The mine address is Jamestown.

The company is a wholly owned subsidiary of the Algoma Steel Corporation, Limited, from which various iron properties in the district of Algoma, including the Helen and Victoria mines in township 29, range 24, were acquired.

Mining operations on the Helen orebody were continued throughout 1952. Production came from the stopes in the Nos. 1 and 2 blocks of the orebody, and from development in the Nos. 3 and 4 blocks. There are still about 2,150,000 tons of caved ore in the stope in No. 1 block. Stope preparations were completed in the No. 3 block, which lies directly under No. 1 block, and also in No. 4 block, which is under the Victoria pit. Mining in these two blocks will begin in 1953.

A drive was started eastward, from the second level in the west end of the Helen orebody, towards the east end of the Alexander orebody. The drive will be about a mile long.

The following diamond-drilling was done in 1952:

	From surface		From underground	
	Number of holes	feet	Number of holes	feet
Helen	10	8,257	166	53,486
Victoria	11	10,178	25	4,475
Alexander	17	18,179	.....	.....

Dewatering of the old Helen mine workings was begun.

A total of 1,141,678 tons of sinter was shipped.

An average of 627 men was employed, of whom 249 were underground, and 378 on the surface. M. A. Twidale was mine manager.

Bethlehem Mines Corporation

Bethlehem Mines Corporation is a wholly owned subsidiary of the Bethlehem Steel Corporation. It was incorporated in the State of West Virginia, U.S.A., in 1916. It operates property in Marmora and Rawdon townships, Hastings county, under lease from Marmoraton Mining Company, Limited.

The development of the property began early in 1952. A body of iron ore, about 700 feet wide and 2,000 feet long, had been outlined by diamond-drilling. The ore is overlain by about 120 feet of sedimentary limestone, which must be stripped to permit open-pit operations. The overburden to be removed amounts to some 20,000,000 tons. About two years will be required for the stripping operation. By the end of 1952, about 700,000 tons were being removed each month.

The equipment used includes two 300-cubic-foot Canadian Ingersoll-Rand compressors, a 500-cubic-foot Worthington compressor, two heavyweight Joy Champion drills, three 6-yard Marion electric shovels, one 2½-yard Manitowoc shovel, one 22- by 36-inch Cedar Rapid crusher, three D8 caterpillar bulldozers, one Tournadozer, twenty 22-ton Euclid trucks, and four 10-ton General Motors trucks.

During the early part of the operation, a 40- by 200-foot Quonset hut was used for shop and warehouse purposes, while a more permanent building for offices and warehouse was being erected.

An average of 108 men was employed. H. O. Olsen is general superintendent. The mine address is Marmora.

Mag-Iron Mining and Milling, Limited

Mag-Iron Mining and Milling, Limited, was incorporated in April, 1949, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 2,560,786 have been issued. The officers and directors are: A. L. Laing, president; B. D.

Smith, vice-president; W. G. Chipp, secretary-treasurer; F. N. McCallum and H. C. Elliott, directors. The head office is at 49 Wellington Street East, Toronto. The mine address is Millbridge.

The property is located in Lake and Wollaston townships, Hastings county.

Operations in 1952 were carried on from August to December and consisted of extending the open cut along the magnetite-bearing zone. The ore was sorted and hauled to Bannockburn, then shipped by rail. By the end of the year, 140 tons of concentrates and 3,059 tons of ore had been shipped.

Stanley Lavender is superintendent. An average of 10 men was employed during operations.

Steep Rock Iron Mines, Limited

Steep Rock Iron Mines, Limited, was incorporated in February, 1939. The authorized capitalization is 10,000,000 shares of common stock at $1 par value, and 30,000 shares of preferred stock at $100 par value. The number of shares issued at the end of 1952 was: common, 7,194,777; preferred, 20,000. The officers and directors are: C. S. Eaton, chairman of the board; M. S. Fotheringham, president and general manager; Neil Edmonstone, secretary-treasurer; W. R. Daley, J. G. Cross, D. H. McDougall, Hon. G. E. Allen, Mark McKee, John Paterson, F. H. Black, and C. J. Burchell, directors. The head office and mine office are at Steep Rock Lake.

The company owns 161 claims in Freeborn and Schwenger townships, district of Rainy River.

Operations continued throughout 1952. Mining in the Errington open pit on B orebody was completed by the end of the year. It is expected that the removal of the ore from the southeast extension of the B orebody in 1953 will complete open-pit mining in this area.

The new three-compartment vertical No. 1 Errington shaft (sometimes referred to as the Float Ore Island No. 1 B shaft) was sunk from 915 feet to its objective depth of 1,263 feet. A new level was established at 1,100 feet. The following table shows the development work done on the various levels from the new shaft:

Level	Drifting	Crosscutting	Raising
	feet	feet	feet
175-foot	162	.....	633
500-foot	.....	536	751
700-foot	192	1,367	564
900-foot	645	680	288
1,100-foot	128	1,415	303

Diamond-drilling during the year consisted of 55 holes, totalling 18,437 feet, from surface, and 25 holes, totalling 2,920 feet, from underground.

Stripping operations continued on the Hogarth or A orebody. In October a second dredge was put into operation. By the end of the year, a total of 29,000,000 cubic yards of material had been removed. As the A orebody is uncovered, the dredges are to be moved southward and will be used to strip the G orebody, which lies between the A and B orebodies.

The total production in 1952 amounted to 1,274,356 tons, all of which came from the Errington pit, B orebody.

A 99-year lease on a section at the east end of the Steep Rock property, in C zone, has been given to the Caland Ore Company, Limited, a Canadian subsidiary

of the Inland Steel Company, of Chicago. At the end of 1952, six diamond-drills were ready to start drilling operations from the ice.

The following is taken from the president's report for the year ending December 31, 1952:

> Exploration continued during the year on the 6,000-foot section known as the G ore zone, which lies between the Hogarth and Errington orebodies. An orebody over 4,000 feet long and as wide or wider than the Errington zone has already been established in this area. Additional exploration is necessary to delineate this zone fully. The Hogarth, Errington, and G zones are all located in the middle arm of Steep Rock Lake. These deposits, with a combined length of some 13,000 feet, can be operated to best advantage as an integrated group of mines.

An average of 631 men was employed, of whom 332 were underground and 299 on the surface. W. E. Bennett is general superintendent.

LEAD AND ZINC

Burco Consolidated Mines, Limited

Burco Consolidated Mines, Limited, has a property on lot 2, concession V, Somerville township, Victoria county; it was operated some years ago by Summerville Lead Mines, Limited, and Consolidated Lead Mines, Limited, and is known as the Victoria mine.

The work of assembling equipment to pump out the old 125-foot shaft was begun in 1951, and two men continued to work at this at intervals throughout 1952.

M. F. Burrows is in charge of operations.

Draper Lake Frontenac Lead-Zinc Mines, Limited

Draper Lake Frontenac Lead-Zinc Mines, Limited, was incorporated in February, 1951, to succeed Picairium Gold Mines, Limited, on a share-for-share basis. The authorized capitalization is 3,000,000 shares of $1 par value, of which 1,691,655 have been issued. The officers and directors are: R. B. Phipps, president; W. N. Mellow, vice-president; L. A. Clark, secretary-treasurer; L. M. Reilly, S. J. Randall, and H. J. Picard, directors. The head office is at 20 Temperance Street, Toronto. The mine address is Perth Road.

The company holds 820 acres, including the old Frontenac lead property, in concessions IX and X, Loughborough township, Frontenac county, about 18 miles north of Kingston.

The dewatering of the 150-foot No. 3 shaft was completed in the early part of the year. On the 140-foot level there is a drift which runs 242 feet south and about 160 feet north. The back of the drift was sampled, and the shaft was allowed to flood again. There were no further operations during the year.

C. N. Thompson was manager. Three men were employed.

Geneva Lake Mines, Limited

Geneva Lake Mines, Limited, was incorporated in March, 1949, succeeding Geneva Lake Mining Company, Limited, on a share-for-share basis. The authorized capitalization is 5,000,000 shares of $1 par value, of which 4,056,671 shares have been issued. The officers and directors are: W. J. Lawson, president; C. H. Walker, vice-president; R. L. McDonell, secretary-treasurer; J. A. Whalen, A. H. Blackburn, and A. C. Turner, directors. The head office is at 357 Bay Street, Toronto. S. A. Pain is manager.

The company owns the former Geneva Lake property in Hess township, district of Sudbury.

The construction of new plant buildings at the mine commenced in June, 1952. The following frame buildings were erected: a headframe, 72 feet high, a mill, powerhouse and hoistroom, machine shop, dryhouse, duplex residence, and bungalow. A 24- by 42-inch, double-drum Canadian Ingersoll-Rand hoist and an 850-cubic-foot compressor were installed, and preparations were made for the installation of three 175-kilovolt-ampere diesel-driven generators. Most of the equipment for a 125-ton concentrator was in place when work ceased at the end of October. The old workings were not dewatered.

An average of 10 men was employed.

Jardun Mines, Limited

Jardun Mines, Limited, was incorporated in October, 1951, with an authorzed capitalization of 4,000,000 shares of $1 par value, of which 2,150,007 have been issued. The officers and directors are: F. J. McFarlane, president; W. B. Milner, vice-president; R. A. Whitely, secretary; A. B. Ward, treasurer; J. S. Brown, J. L. Elliot, I. A. MacDonald, and A. A. Stollery, directors. The head office and mine office are at Sault Ste. Marie.

The company holds a group of claims in Jarvis and Duncan townships, district of Algoma.

Operations have been confined to the section formerly known as the Victoria mine.

There are two old inclined shafts, 100 and 410 feet deep, on the property, with eight levels to a depth of 400 feet.

The surface work and diamond-drilling begun in 1951 was continued until October, 1952, when work was suspended. No underground work was done.

Ten men were employed.

Matarrow Lead Mines, Limited

Matarrow Lead Mines, Limited, was incorporated in July, 1948, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 2,924,838 have been issued. The officers and directors are: John Pump, president; C. A. Martin, vice-president; R. A. Cranston, secretary-treasurer; D. R. Michener and J. C. Rogers, directors. The head office is at 50 King Street West, Toronto. The mine address is Matachewan.

The company owns 75 claims in Yarrow township, Matachewan area, district of Timiskaming.

A three-compartment vertical shaft was sunk to a depth of 347 feet during 1951, and levels were established at 150 and 300 feet.

Mining operations continued throughout 1952. The following development work was done: drifting, 1,780 feet; crosscutting, 212 feet; raising, 520 feet. The total development work at the end of 1952 was: drifting, 2,570 feet; crosscutting, 316 feet; raising, 520 feet.

Diamond-drilling in 1952 consisted of 14 holes, totalling 2,816 feet, from surface, and 43 holes, totalling 4,879 feet, from underground.

Some 32,870 tons of ore were hoisted during the year. The ore was treated in the mill of Matachewan Consolidated Mines, Limited, between June 24 and December 31. About 33,780 tons were milled, at a rate of 177 tons per day.

A 90-foot headframe, with ore and waste bins, a hoist- and compressor house, a pump-house and a boiler house were built.

G. H. McDougall was manager, employing an average of 40 men.

Saratoga Exploration Company, Limited

The Saratoga Exploration Company, Limited, was incorporated in February, 1947, with an authorized capitalization of 3,000,000 shares of no par value, 2,195,000 of which have been issued. The officers and directors are: R. F. Hardy, president; W. J. Wilson, vice-president; J. M. Anderson, secretary-treasurer; W. G. Jones, and A. W. Symons, directors. The head office is at 22 Toronto Street, Toronto. The mine address is Ripple.

The company's main property is a lead-zinc-silver prospect, consisting of 15 claims, in township 80, district of Thunder Bay, about 25 miles east of Schreiber, on the Canadian Pacific railway. Its holdings also include 5 claims in Hearst township, district of Timiskaming, and 11 claims in Dent township, Patricia portion of Kenora district.

Mining operations were carried on at the property in township 80, Thunder Bay district, throughout 1952. A 20- by 40-foot camp building, pump-house, machine shop, compressor house, and explosives magazine were built. A Gardner-Denver tugger-hoist and a 90-cubic-foot Canadian Ingersoll-Rand portable compressor were installed.

A vertical two-compartment prospect shaft was sunk to a depth of 51 feet, and 70 feet of drifting was done at 47 feet below the collar.

Fourteen holes, totalling 5,514 feet in length, were diamond-drilled from surface.

W. S. Rice was superintendent. An average of 10 men was employed, 7 of whom were on the surface, and 3 underground.

MAGNESIUM

Dominion Magnesium, Limited

Dominion Magnesium, Limited, was incorporated in February, 1941, with an authorized capitalization of 500,000 shares of no par value, of which 400,000 have been issued. The officers and directors are: R. J. Jowsey, president; Maurice Crabtree, secretary; H. B. Clearihue, treasurer; W. B. Maxwell, J. G. Weir, F. R. Burton, C. C. Calvin, Thayer Lindsley, H. D. Scully, and Dr. L. M. Pidgeon, directors. The head office is at 320 Bay Street, Toronto. The mine address is Haley.

Operations continued throughout 1952 at the company's quarry and plant about three miles from Haley in concessions V and VI, Ross township, Renfrew county.

An average of 475 persons was employed. L. W. White is general manager and D. J. McPhail is manager in charge at the property.

NEPHELINE SYENITE

American Nepheline, Limited

American Nepheline, Limited, was incorporated in January, 1945, with an authorized capitalization of 3,000,000 shares of no par value, all of which have been issued. The officers and directors are: J. S. Dickson, president; Ernest Craig and H. R. Deeth, vice-presidents; M. R. Jennings, secretary; J. C. Rix, treasurer; C. R. Archibald and W. G. Hubler, directors. The head office is at Lakefield. The mine address is Nephton, via Lakefield.

The mine is on lot 14, concession IX, Methuen township, Peterborough county.

Operations continued throughout 1952. The ore was mined by benching methods from the open pit in the Cabin Ridge section of the property.

A total of 106,442 tons of ore was mined, and 103,789 tons were milled after sorting.

Ernest Craig is manager. An average of 77 men was employed.

NICKEL AND COPPER

East Rim Nickel Mines, Limited

East Rim Nickel Mines, Limited, was incorporated in October, 1950, with an authorized capitalization of 3,500,000 shares of $1 par value. In September, 1952, the number of shares was increased to 4,500,000. Of these, 3,700,000 have been issued. The officers and directors are: G. H. Johnson, president; N. F. Tisdale, vice-president; W. C. Campbell, secretary; Fernand Dufresne, Hector Authier, J. H. Westell, and R. L. Brophy, directors. The head office is at 350 Bay Street, Toronto. The mine address is Box 393, Sudbury.

The company owns nine claims in MacLennan township, district of Sudbury; they were formerly known as the Ontario Nickel property.

Mining operations continued throughout 1952. The vertical three-compartment No. 2 shaft was sunk a further 244 feet to a total depth of 728 feet, and a third level, known as the 550-foot level, was established 583 feet below the collar. The workings from the No. 2 shaft are connected with the old workings from No. 1 shaft on the 250-foot level. The following development was done in 1952: drifting, 2,090 feet; crosscutting, 680 feet; raising, 594 feet. The total amount of development work done by the present operators to the end of 1952 was: drifting, 2,457 feet; crosscutting, 1,377 feet; raising, 594 feet. Diamond-drilling in 1952 consisted of 12 holes, totalling 4,562 feet, from surface, and 111 holes, totalling 10,670 feet, from underground.

An office building, machine shop, and crushing plant were built. The crusher equipment includes a 30- by 60-inch Jeffrey pan feeder, a 15- by 30-inch Farrell jaw crusher, and a 30-inch conveyer. A 20- by 12.5– 14-inch Canadian Ingersoll-Rand compressor, with a 200-horsepower motor, was installed.

The crushing plant operated from September 15 to December 31. A total of 15,663 tons of ore was mined, of which 8,313 tons were crushed and sent to the Falconbridge Nickel reduction plant for further treatment.

An average of 29 men was employed, of whom 10 were underground, and 19 on the surface. A. G. MacKenzie is mine manager.

Falconbridge Nickel Mines, Limited

Falconbridge Nickel Mines, Limited, was incorporated in August, 1928, with an authorized capitalization of 5,000,000 shares of no par value, of which 3,676,272 have been issued. The officers and directors are: Thayer Lindsley, president; H. J. Fraser, vice-president and general manager; R. Campbell, secretary; J. C. Rix, treasurer; A. W. Coome, assistant treasurer; W. B. Maxwell, W. S. Morlock, and J. M. Cunningham-Dunlop, directors. The head office is at 44 King Street West, Toronto. The mine address is Falconbridge.

The company operates nickel-copper mines, a concentrator and smelter in the Sudbury area, and a refinery at Kristiansand, Norway. R. C. Mott is manager of the Sudbury area operations.

An average of 1,586 men was employed in 1952, of whom 170 worked on the surface, and 725 underground at the company's mines, and 691 in the concentrator and smelter.

The following is taken from the annual report of the company for the year ending December 31, 1952:

Revenues and Expenses

The net profits of the company for 1952 amounted to $2,535,240 or 69 cents per share outstanding at the year's end, as compared with $3,010,975 or 88 cents per share for 1951. The dividend rate of 50 cents per share established in 1951 was maintained in 1952. The decline in net profits resulted primarily from higher operating costs which were not offset by a corresponding increase in price for nickel, the adverse effect on income of the exchange value of the United States dollar, and the substantially higher provisions for amortizing capital and development expenditures.

Metal sales and other operating revenues at $24,839,873 were at a record level for the third consecutive year, being well over twice the dollar amounts of either 1948 or 1949. Quantities of metals delivered in all forms were about 15 percent higher than in the preceding year.

The basic nickel price established in June, 1951, prevailed throughout the remainder of 1951 and the whole of 1952 although within this period there were three upward revisions in wage rates in our Canadian operations and two in our Norwegian operations. Copper prices declined during 1952.

The continuing increase in the cost of equipment and supplies coupled with continuing demands for higher wages, more fringe benefits, and shorter working hours are matters for increasing concern while nickel continues to remain at a low price.

Reference was made in our report last year to the deterimental effect on the company's revenue resulting from an appreciation of the exchange value of the Canadian dollar while prices for the company's products are established in terms of United States dollars. This condition became more unfavourable in 1952. For the year as a whole, sales proceeds in United States currency converted into Canadian currency at a rate of about 4.5 percent less than in 1951.

The amount of development and preproduction expenditures written off and the allowance for depreciation were each higher than in the preceding year by about 50 percent or a total of $1,180,000. The rate at which development and preproduction expenditures were written off was increased from $1.00 per ton of ore treated in 1951 to $1.50 per ton in 1952. The decision to increase the rate was based on the current rate of such expenditures and on forecasts of future development work, which indicated that these expenditures would be heavy for a few years. Depreciation was calculated on the same basis as in the previous year, but the values to which the rates applied were materially higher. The use of year-end values involves depreciating equipment whose benefit has not been realized throughout the entire year.

Provision for taxes on income was lower than in 1951. This was owing to reduced profits, to the effect of valuing inventory on a life basis, to a larger percentage of profit attributable to the tax-free McKim operations, and to slightly reduced tax rates which followed arrangements between the federal and provincial governments. Tax rates on mines imposed by the Province of Ontario continue at the highest of any province in Canada. Taxes in future years will be higher than otherwise would be the case as a result of the recent decision by the Ontario government not to continue to extend a tax benefit to new mines that are not now in production.

Operations

Production records were again established by the mines, smelter, and refinery. These were established during a year when both underground development and plant construction programs were being intensely carried on. Mining and treatment plants in Canada operated continuously throughout the year except for interruptions caused by bringing new units into operation. The process change-over at the refinery in March was effected with a minimum of disturbances to production. Operating difficulties with the new refining process have proved less than might have been expected and are being gradually eliminated or reduced.

Ore treated from company mines amounted to 1,118,854 tons, an increase over 1951 of more than 3 percent. In addition, 10,635 tons of ore produced from the East Rim and Milnet Nickel mines, were taken into the company's treatment plants in the latter months of the year. Metals in matte produced by the smelter exceeded the production of the previous year by over 5 percent and refinery production exceeded that of 1951 by over 9 percent.

Labour generally was available in both Canada and Norway, although, as usual, the supply at the refinery was inadequate during the summer months. Suitable skilled labour was scarce, and a shortage, during the first part of the year, of experienced engineers caused some difficulties in carrying out the expansion program.

Delays were experienced in the delivery of some of the more important equipment additions to plant, but otherwise the difficulties of procuring materials have eased.

Hydro-electric power was made available at the Hardy mine a few days before the end of the year, replacing the company's diesel electric plant, which had supplied power for development operations up to that time. On occasions, more power than was available could have been used at the refinery. Additional blocks of power now under contract will become available to the refinery in due course.

Increasing concern over the supply of adequate quantities of mine timber led to a decision to acquire the outstanding shares of the M. J. Poupore Lumber Company, Limited. For many years this operation has supplied the company with the bulk of its mine timber requirements. The timber limits are located in the near vicinity of the Falconbridge mine. Operations are planned to provide a uniform quantity of mining timber in perpetuity, although not necessarily the whole of the future timber requirements.

Adequate housing facilities for employees is a continuing problem. In order to encourage established employees to build their own homes on the Falconbridge townsite, a wholly owned subsidiary, Falconbridge Realty, Limited, was incorporated to financially assist properly qualified employees.

Falconbridge Mine

Ore production by the main Falconbridge mine of 888,082 tons in 1952 compared with 930,164 in the previous year. The underground reserve of broken ore was increased by 8,471 tons. During the year, 13 stopes were mined out, and 15 new stopes were developed or under preparation.

An exploratory drive west from the No. 1 shaft on the 2,625-foot level was extended 1,214 feet without encountering any ore. As conditions permit, this drift will be continued westward to explore the long stretch of contact held by the company.

The more important ore development work in the Falconbridge mine included drives along the main ore zone for lengths of 924 feet on the 2,975-foot level, 1,845 feet on the 3,325-foot level, 2,362 feet on the 3,850-foot level, and 891 feet on the 4,025-foot level. Average ore conditions were shown by these drives.

After completing the pilot raises in No. 5 shaft, slashing to full size and pouring of concrete rings commenced. Work was completed by the year's end to a point 107 feet below the 3,675-foot level. The ventilation raise was extended to three more levels, the No. 5 fill-pass system two more levels, and the main ore pass to four more levels.

By the year's end the revision in hoisting facilities of the main No. 5 shaft had been completed. The new 14-foot cage and skip hoists were operating to the 2,800-foot level in conjunction with the enlarged and revised headframe. Additional compressor capacity was also in operation.

The 1952 production year was difficult. The scheduling of surface and underground work at the mine was made difficult by construction work involving the installation of the new hoists, the rebuilding of the headframe, and the movement of materials underground, resulting from the work involved in deepening No. 5 shaft. The inefficiencies of the 40-hour week were first experienced for a full year of operations. High labour turnover during the first part of the year, coupled with the necessity of employing unskilled men, had an adverse effect on production. Another major factor affecting production, costs, and efficiency is the heavier ground conditions being encountered with depth and the consequent necessity of an ever-increasing proportion of square-set stoping.

FALCONBRIDGE MINE

		1952	1951
Ore hoisted	tons	888,082	930,164
Drifting	feet	10,330	14,693
Raising	feet	4,931	4,430
Shaft-raising	feet	293	519
Shaft-sinking	feet	.....	245
Station-cutting	cubic feet	36,018	20,256
Diamond-drilling	feet	24,914	22,587
Shaft-slashing	feet	564	.....

East Falconbridge Mine

Excellent progress was achieved throughout the year in this area. The shaft, commenced on this property in 1951, was sunk a further 2,001 feet to a depth of 2,251 feet below the collar, and stations were cut.

The No. 802 drift was extended 1,565 feet to the eastern boundary of the property and disclosed ore of slightly better grade and in substantially greater amounts than had been indicated by previous surface drilling. A crosscut was driven on the 2,800-foot level near the eastern boundary and used as a station for deep drilling. One hole was completed by the year's end that intersected better than average grade ore at the 3,150-foot level. Additional drilling was planned from this location.

EAST FALCONBRIDGE MINE

		1952
Drifting	feet	2,699
Raising	feet	217
Shaft-sinking	feet	2,001
Station-cutting	cubic feet	83,463
Diamond-drilling	feet	5,822

McKim Mine

Ore production at the McKim mine in 1952 was 45 percent greater than in 1951, and was of major importance as a contribution to the year's production record.

An easterly drive on the 650-foot level disclosed and opened a new ore shoot of average mine grade. On the 1,175-foot level, drifting was completed to the west boundary and to the present east ore limit. A northward crosscut, 1,139 feet in length, was driven on the 1,350-foot level to provide diamond-drill stations for testing the ore zone at depth. This drilling did not show any depth extension of the orebody within the area tested.

The ventilation escapement raise was completed by extension from the 1,175- to the 1,350-foot level

Provision was made for crushing ore underground by excavation of a station below the 1,175-foot level and installation of the necessary equipment.

McKim Mine

	1952	1951
Ore delivered.....tons	224,774	155,961
Drifting.....feet	2,309	3,179
Raising.....feet	417	1,023
Station-cutting.....cubic feet	33,918	6,637
Diamond-drilling.....feet	12,884	6,051

Hardy Mine

The shaft was completed in May to its planned depth of 1,427 feet with all stations cut. A permanent steel headframe was then erected, and an eight-foot hoist, released from the Falconbridge operation, was installed as part of the permanent plant.

Development work was commenced on all levels from the 250- to 1,000-foot levels. Practically all of this work was in waste and consisted of crosscutting towards the orebody, driving haulage drifts in the hanging wall, and establishing battery-charging stations. A main pumping station is being located on the 1,000-foot level, and excavation for a crusher station at the 1,060-foot level was under way at the year's end.

Other work at the Hardy mine consisted of completing the surface plant, townsite buildings, and mine facilities, as well as construction of a two-mile railway spur from the main line of the Canadian Pacific railway to the property. The only major construction remaining is a conveyer-way to transport ore from the headframe to the loading bin at the railway spur. Part of the underground and surface equipment required for the regular development and mining operations was on the property at the year's end.

Hardy Mine

	1952	1951
Shaft-sinking.....feet	399	1,022
Station-cutting.....cubic feet	114,156	55,087
Crosscutting.....feet	4,042	137
Raising.....feet	441	.....
Diamond-drilling.....feet	1,345	.....

Milling and Smelting

The expansion program, started in 1951 in the mill, was virtually completed during 1952. A new rodmill placed in operation during the year substantially increased the capacity of the crushing and grinding circuits. With the installation of larger flotation units and accessory equipment, the concentrator is now capable of handling 2,500 to 2,600 tons of mill ore per day.

A fourth converter was installed in the smelter and was in operation by July. Foundations have been prepared for a third blast furnace and settler, delivery of which is expected early in 1953. New matte casting and barrelling facilities are being built as part of the smelter expansion program.

The Falconbridge treatment plants processed 1,129,489 tons of which 695,524 tons, or 61.6 percent, were milled and the balance smelted direct. The smelter processed 576,718 tons of ores, concentrates, and refinery revert. The plants, with few minor exceptions, were in continuous operation throughout the year and operated at maximum capacity of the installed equipment. However, the treatment plants will not reach the capacity required by present production schedules until the third furnace and accompanying facilities are in operation.

Refining

Operating conditions at the refinery were complicated by the change-over to the chloride process in March and also during the summer months by the usual labour shortage. The change-over was attended by increased metal losses and corrosion problems. By the end of the year these difficulties were being progressively overcome.

Recovery of electrolytic cobalt of high purity was achieved following the change-over. Production gradually increased, and by the year's end had reached about 60 percent of the expected normal rate.

By the end of the year all phases of the modernization and expansion program to increase annual capacity to 30,000,000 pounds of nickel were virtually completed. In the last quarter of the year, production substantially exceeded the 30,000,000-pound rate.

The further expansion program designed to increase capacity to 35,000,000 pounds of nickel annually was well under way by the close of the year.

New Construction

Reference has been made throughout this report to the more important items of construction carried out during the year. Total expenditures for capital account, excluding development and preproduction, amounted to $4,507,367, of which $3,627,999 was spent in Canada. Some of the larger general items not referred to elsewhere in the report include the following in Canada: purchase of a 60-ton diesel locomotive and slag-dump cars, an extension to the central warehouse, installation of an ore-sampling plant, an extension to the ore-receiving station, and the erection of a new cafeteria to serve the employees.

Ore Position

As a result of the year's intensive and successful exploration efforts, the company's total ore reserves showed a marked increase. Little change is shown in developed ore at the Falconbridge and McKim mines, although over 1,100,000 tons of ore were withdrawn from these mines for treatment during the year. Development was not sufficiently advanced by the year's end at the Hardy and Falconbridge East mines to permit any ore being included in the developed category.

Indicated ore in the Sudbury district, however, showed an increase of 13,881,500 tons resulting from additional ore disclosed by drilling at the Fecunis Lake, East Falconbridge, and Strathcona West properties. At the current rate of ore consumption, the addition to indicated reserves in 1952 amounted to more than twelve years' requirements. The grade of the developed ore remains unchanged, but the average grade of the indicated ore is somewhat lower, resulting from the inclusion of lower grade ores at Strathcona West and Fecunis Lake. At Fecunis Lake the large tonnage of high-grade ore is accompanied by a substantial amount of low-grade ore. The grade of the indicated ore will be treated conservatively until underground information is available.

	Tons	Percent	
		Nickel	Copper
Developed ore, Falconbridge and McKim ores	10,091,500	1.64	0.87
Indicated ore, Sudbury district holdings	22,895,500	1.63	0.95
Total	32,987,000	1.63	0.93

Exploration and Research

In the Sudbury district a total of more than 50,000 feet of diamond-drilling was completed. The drilling program was concentrated in the Fecunis Lake–Strathcona section of the Levack area with the purpose of outlining ore zones indicated by previous exploration. In addition, further work was done on the low-grade Blezard ore zone and elsewhere in the district.

An active exploration program was continued in the concession area in Newfoundland throughout the year. A number of interesting discoveries were made which will require further work to determine their worth. Drilling on optioned properties in Newfoundland gave further information on geological conditions but was not very productive in finding ore.

The drilling program on the properties of Maskwa Nickel Chrome Mines, Limited, in southeastern Manitoba, to which reference was made in last year's report, could not be carried to completion owing to lack of water and the fire hazard in the district. Drilling done in the chrome horizon gave low chrome values. Drilling done in the nickel-copper zones was encouraging and indicated the need for further drilling when conditions permit.

During the year, some of the company ground in the northeast section of the Sudbury district, north of the norite contact, was consolidated with the holdings of others in Northbridge Mines, Limited, in which company, Falconbridge obtained the controlling interest. Subsequent exploration on this ground showed interesting mineralization. Further exploration is required.

A number of other prospects were examined during the year, several of which require further investigation.

Research staff and facilities have been expanded with increased emphasis on metallurgical problems and possible new processes, with a view to greater and more economical recovery of the constituents of the ore. Further investigations on the precious metal content of the ores and products are likewise underway.

International Nickel Company of Canada, Limited

The International Nickel Company of Canada, Limited, was incorporated in 1916 under Dominion of Canada charter. The authorized capitalization is $27,679,900 in preferred shares of $100 and $5 par value and 15,000,000 shares of common stock of no par value, of which 14,548,025 have been issued.

The officers are: J. F. Thompson, chairman of the board and president; P. D. Merica, executive vice-president; R. L. Beattie, vice-president; H. S. Wingate, vice-president and secretary; W. J. Hutchinson, treasurer; C. R. Whitehorne, comptroller.

The directors whose term expired in 1952 were: I. C. R. Atkin, G. R. Ball, J. S. Duncan, W. J. Hutchinson, Rt. Hon. Lord McGowan, D. H. McLaughlin, P. D. Merica, Sir O. E. Niemeyer, L. S. Rockefeller, G. B. Shipley, R. E. Stavert, J. C. Traphagen, and H. S. Wingate.

The directors whose term expires in 1953 are: E. G. Baker, R. L. Beattie, L. W. Douglas, Reg. Halladay, H. R. MacMillan, Rt. Hon. Viscount Margesson, R. S. McLaughlin, H. C. F. Mockridge, R. L. Prain, G. C. Sharp, J. F. Thompson, Rt. Hon. Viscount Weir.

The executive office is at 67 Wall Street, New York 5, N.Y., and the general offices are at Copper Cliff. The Toronto office is at 25 King Street West.

The company and its subsidiary companies operate hydro-electric plants at High Falls, Big Eddy, Wabageshik, and Nairn Falls, Ontario: nickel-copper mines in the district of Sudbury, Ontario: smelters at Copper Cliff and Coniston, Ontario: refineries at Copper Cliff and Port Colborne, Ontario; Acton, England; and Clydach, Wales: rolling mills at Birmingham, England; Huntingdon, W. Va.; and Glasgow, Scotland: and a foundry at Bayonne, N.J.

The following is taken from the annual report of the company for the year ending December 31, 1952:

Ore Mined

The following table presents the tonnages of ore mined from underground and surface during the year, with comparative data for preceding years:

Year	Underground	Surface	Total
	tons	tons	tons
1952	10,196,068	3,052,525	13,248,593
1951	7,780,143	4,019,177	11,799,320
1950	5,733,269	4,115,755	9,849,024

The 13,000,000 tons of ore mined established a new high record for the quantity mined in any year. We have substantially increased our rate of ore production from the level we were able to maintain during World War II, in spite of the large reduction in ore available from surface operations. The increase was made possible by our extensive program of converting from surface to underground mining. During the World War II period, an annual average of 6,000,000 tons of ore was produced from underground. We increased this in 1952 to over 10,000,000 tons. We are now in the course of increasing the hoisting capacity from underground to some 13,000,000 tons.

Ore Reserves

Proven ore reserves stood at 256,355,903 tons at December 31, 1952. This compares with 253,704,771 tons at the end of 1951 and 252,859,725 tons at the end of 1950. The nickel-copper content at the year's end was 7,795,326 tons, compared with 7,693,122 tons at the end of 1951 and 7,669,219 at the end of 1950.

Exploration

The company again expanded its exploration in search for new sources of nickel. The cost of the program was $4,967,450 compared with $2,593,908 in 1951 and $1,682,436 in 1950. The number of feet of exploration drilling in Canada was 499,906 compared with 289,677 in 1951 and 260,127 in 1950.

This program has involved continuous geological work on our known deposits and geological studies of other parts of the Sudbury Basin, including further exploration in our Crean Hill mine.

Important parts of our exploration program were the operation of exploration camps in Manitoba and the Northwest Territories, and property examinations and prospecting elsewhere in Canada and other parts of the world.

All phases of the exploration program will be continued intensively during 1953.

Mines

The underground development in the producing mines advanced 132,435 feet, approximately 25 miles, compared with 89,269 feet in 1951 and 87,963 feet in 1950. The total underground development in our operating mines now stands at 1,717,981 feet, or more than 325 miles.

As a consequence of the heavy war-time drain upon the open pits and of their large post-war output, we had anticipated that before the end of 1953 it would be no longer practicable to remove ore from the Frood-Stobie orebody through open-pit surface operations. During 1952 we were able, however, to block out more ore that could be mined from the surface. As our open pits give us ore of relatively low cost and provide valuable flexibility in our mining operations, production from this source is being continued.

The increase of approximately 2,400,000 tons in our underground ore production was due principally to the large tonnages produced from our Creighton caving project. This low-cost bulk mining method is an adaptation of a mining technique by which great masses of ore are induced to cave and disintegrate by their own weight. This project, together with new metallurgical processes, has made it practicable for the company to recover and treat ore lower in grade than it had ever worked before in underground mining. From the caving area alone we are currently mining more ore than from the Frood open pit. Additional blocks were developed sufficient to supply the Creighton concentrator at its increased capacity, which, by July, 1953, will be 12,000 tons per day. A second underground crusher installation, to handle ore from the new caving blocks, was practically completed and is scheduled for operation in April, 1953.

Development of the Creighton lower areas continued throughout the year. This is our deepest operation, the lowest working level being 5,425 feet below the surface, with the shaft to serve the area reaching 5,562 feet below the surface.

Production from the Stobie section of the Frood-Stobie mine was stepped up to 4,500 tons of ore daily, compared with 3,000 tons at the end of 1951. Further increases in production are planned for 1953. Work was continued on the 1,400-foot-level crusher and ore-pass installation. The development of new areas in the mine is progressing rapidly to meet requirements of the conversion schedule.

The new No. 8 shaft at Stobie was completed to the depth required for the present operations. By excavating this shaft from underground and working up from several different levels simultaneously, the project was finished some 20 months earlier than otherwise would have been possible, with a saving of many man-hours of labour. The headframe, hoist installation, crushing plant, and change-house addition required for the No. 8 shaft project were advanced sufficiently to assure this shaft being available for regular hoisting operations by about mid-year in 1953.

At the Frood section of the Frood-Stobie mine, another low-cost bulk mining technique called the blasthole method has now become our principal method of mining. This differs from induced caving only in that explosives are used to break the ore. Development of a new mining block in the south end of the mine above the 1,000-foot level continued during the year.

The daily production rate at the Murray mine was again lifted, and development is being carried on in anticipation of a further increase to meet the requirements of the complete conversion program. In the lower section of the Murray mine, shaft stations and rock pockets were excavated. Development in this lower area will be carried on in 1953, including work necessary for exploration at depth.

At Levack mine, the deepening of the existing main shaft and the sinking of the new internal shaft were both completed to the depths necessary to service the new area from the 1,600- to the 2,650-foot levels. Shaft stations have been cut, and development has been started in the area. Plans have been made, and preliminary work is under way to extend both shafts to the 4,000-foot level.

The deepening of the main shaft at Garson mine continued during the year. This will permit development of the lower area of the mine as well as further exploration at depth.

Water-borne sand fill from the Copper Cliff concentrator continued to be used in the lower levels of the Frood section of the Frood-Stobie mine for stabilizing older areas and for filling current working stopes. At Creighton mine, water-borne sand fill from the Creighton concentrator is now used for filling all current working stopes. At both these places the water-borne sand fill has practically eliminated the use of rock for mine filling, resulting in more economical mining, higher production from working places, and improved working conditions.

Concentrators and Smelters

The concentrating and smelting operations benefited from the first full year of the Creighton concentrator and handled record tonnages, permitting continued high output from the refineries. Process improvements were made without interrupting production.

Oxygen flash smelting of copper concentrates, a major result of our research, was carried out on a commercial basis during the past year. This new process, in which all smelting heat requirements are met by reacting the concentrates with oxygen, represents an important advance in

non-ferrous extraction metallurgy. Several operating problems encountered in this new method of smelting are under continuing study.

Large-scale production of liquid sulphur dioxide, obtained as a by-product from our oxygen flash smelting of copper concentrates, was initiated during the year by Canadian Industries, Limited, in a new plant built at Copper Cliff for the purpose. The resulting output of this valuable chemical is expected to supply a substantial portion of the sulphur requirements of the sulphite pulp industry in Ontario and western Quebec. The production of sulphuric acid by Canadian Industries, Limited, from Copper Cliff smelter gases was increased during the year.

Refineries

Important progress was made at both Port Colborne and Clydach leading to improvements in the electrolytic and carbonyl processes. Treatment of refinery residues by the Orford process at Clydach was replaced by a new plant utilizing a more efficient hydro-metallurgical process developed by the research staff. A new research laboratory is practically completed at the Port Colborne refinery providing larger and improved facilities for process research.

The Platinum Metals Refinery at Acton, England, has continued its work of improving the refining of platinum metals and has introduced the use of ion-exchange methods in connection with the refining of rhodium.

Rolling Mills

Many additions were made at our rolling mills at Huntington, West Virginia, and Birmingham, England, principally for expanded production of high temperature alloys of nickel and chromium. The extensions and additions include facilities for large-scale production of small ingots for direct extrusion, a new tube reducer and other equipment necessary for increased production of cold finished products to close tolerances, installation of additional heating equipment, enlargement of plant buildings, and other improvements. A unique installation at the Huntington works is a new foundation for an eight-ton forging hammer, which eliminates previous ground vibrations disturbing the operation of equipment in other portions of the plant.

The reduction pilot plant operated at the Huntington works for the Atomic Energy Commission of the United States has shown very satisfactory results. A considerable expansion of this plant is now under way at the request of the United States government.

Henry Wiggin and Company, Limited, our British rolling-mill subsidiary, is constructing, and will operate, a plant in the west of England for the manufacture of certain non-ferrous alloys, under arrangements with Her Majesty's Government.

Research

Research activities continued on the development of an economic process for treating nickel-bearing pyrrhotite for the recovery of nickel and iron oxide. The high-quality iron ore obtained in pilot plant operations has been employed in successful full-scale experiments carried out in co-operation with the steel industry.

Our laboratories at Birmingham, England; Huntington, West Virginia; and Bayonne, New Jersey; gave top priority to the further development of high-strength alloys for jet engines. In their broad investigations, which cover Nimonic, Inconel "X," and other alloys, attention has been given to the conservation, wherever possible, of strategic metals, including nickel.

Metallurgical and development work for our customers continued to receive major attention by our laboratories and field offices. This work, which is a fundamental part of our entire program, includes not only problems in metallurgy, corrosion, fabrication, and welding in the well established mechanical, chemical and electrical fields, but also problems concerning the less known applications of platinum metals, nickel, and nickel alloys in the electronic and atomic fields.

Work to advance the science and art of welding nickel alloys is one of the major projects of the Bayonne research laboratory, which is responsible for the development of welding rods, to handle new situations with new materials and methods as they are developed. The production of these rods is carried out at the Bayonne works under careful laboratory control.

A project stemming from our research activities was the production of the motion picture, "Corrosion in Action." The film presents in animated form the fundamentals of corrosion as developed through years of work in our laboratories, in our corrosion-testing stations at Kure Beach and Harbor Island, North Carolina, and in the plants of our customers. By the year's-end, the film had been shown to 1,096 technical groups in Canada and the United States.

Ductile iron, discovered and developed by the company after many years of research, is now manufactured by 200 licencees throughout the world. This alloy combines the ductility of steel with the good casting properties of cast iron. Reflecting its wide adoption by industry, various code-making bodies, including the armed services, have adopted specifications covering the physical properties of ductile iron.

Deliveries of Metal

Deliveries of nickel in all forms increased 5,000,000 pounds over 1951 reflecting the further increase in our production. Deliveries of mill and foundry products increased 13,000,000 pounds, much of which was in the form of nickel-chromium alloys for jet engines.

Deliveries of the platinum-group metals decreased 88,000 ounces from 1951. The decrease was caused principally by the offering to the market of a considerable volume of palladium from other sources and does not reflect reduction in the requirements of the trade. Deliveries of platinum itself are in pace with production capacity.

In the following table there are presented comparative statements of the deliveries of our principal products and also of gold and silver.

	1952	1951	1950
	pounds	pounds	pounds
Nickel:			
In refinery products	177,993,304	180,947,930	173,094,879
In rolling mill and foundry products	67,599,186	60,175,252	80,309,723
In salts and chemicals	3,424,868	2,741,848	3,005,941
Total	249,017,358	243,865,030	256,410,543
Refined copper	234,323,432	236,954,595	212,947,394
Mill and foundry products[1]	92,350,688	79,159,996	97,262,779
	ounces	ounces	ounces
Platinum metals	287,135	375,438	267,316
Gold	42,396	38,016	36,586
Silver	1,076,327	1,027,921	956,928

Capital Expenditures

Capital expenditures amounted to $19,315,391, compared with $23,737,575 in 1951, and $18,683,606 in 1950.

The major expenditure during the year, as for a number of years past, was for the expansion of underground mining. This accounted for $9,733,747 of our capital expenditures. In addition, $2,793,736 was spent for process improvements in smelting and refining, $2,297,373 for employees' homes in the Sudbury district, $1,292,634 for the new lumber mill of our subsidiary, Geo. Gordon and Company, Limited, at Cache Bay, Ontario, and $2,007,115 for expansion and improvements at our rolling mills. The remainder of $1,190,786 was expended for numerous other capital requirements in Canada, the United States, the United Kingdom, and elsewhere.

To provide for our $19,315,391 of capital expenditures, new funds of $29,515,582 were available during the year, consisting of $19,054,144 of undistributed net earnings and $10,461,438 set aside for depreciation and depletion. The excess of $10,200,191 was added to working capital.

Early in World War II, we began our program for major expansion in the mining and treating of underground ores. Since the beginning of this program, our capital expenditures for all purposes have aggregated over $150,000,000. Without these expenditures it would not have been possible to achieve the present output of nickel and other metals or to improve our production methods so as to counteract increased costs beyond our control. We estimate that for 1953 our capital expenditures will approximate $18,000,000.

R. L. Beattie is general manager; R. D. Parker, general superintendent; C. H. Stewart, superintendent of the Frood-Stobie mine; J. M. McAndrew, superintendent of the Frood-Stobie open pits; E. E. Mumford, superintendent of the Creighton mine; F. M. McAteer, superintendent of the Levack mine; N. H. Wadge, superintendent of the Garson mine; H. W. Smith, superintendent of the Murray mine; William Vaananen, superintendent of the Crean Hill mine; E. G. Stoneman, superintendent of the Copper Cliff and Creighton concentrators; D. Finlayson, superintendent of the Copper Cliff smelter; F. G. Murphy, superintendent of the Coniston smelter; R. Hewgill, superintendent of the Copper Cliff refinery; R. G. Dow, superintendent of the Lawson quarry; and R. C. McQuire, superintendent of the Port Colborne nickel refinery.

During 1952 an average of 4,502 persons was employed at the Copper Cliff concentrator and smelter; 710 at the Copper Cliff refinery; 1,406 at the Port Colborne nickel refinery; 515 at the Coniston smelter; 2,015 at the Creighton mine; 2,625 at the Frood-Stobie mine; 254 at the Frood-Stobie open pit; 867 at the Garson mine; 643 at the Levack mine; 385 at the Murray mine; 39 at the Crean Hill mine; and 31 at the Lawson quarry.

[1]The nickel content of the Mill and Foundry Products is reported above opposite the caption "In rolling mill and foundry products."

Milnet Mines, Limited

Milnet Mines, Limited, was incorporated in November, 1951, with an authorized capitalization of 40,000 shares of no par value, all of which have been issued. The officers and directors are: Dr. F. R. Burton, president; John Drybrough, vice-president; E. E. Ritchie, secretary-treasurer; A. W. Burt, C. C. Calvin, and E. C. MacLeod, directors. The head office is at 320 Bay Street, Toronto. The mine address is Capreol.

The company has a lease on part of the Jonsmith property, on lot 2, concession V, Parkin township, district of Sudbury.

Operations began in October, 1952, and continued for the rest of the year.

The buildings erected included a hoist- and compressor-house, a headframe and crusher-house, a 600-ton ore bin, a machine shop, an office, and two residences. The mining plant includes the following: a used 1,000-cubic-foot XVHE compressor and a used 48- by 36-inch PE-I hoist, both made by Canadian Ingersoll-Rand; a used 36- by 24-inch Allis-Chalmers crusher; a 24-inch belt conveyer; and a 750-kilovolt-ampere transformer.

A vertical three-compartment shaft was sunk to a depth of 478 feet, and levels were established at 190 and 300 feet. A loading-pocket was cut at 428 feet and a spill-pocket at 467 feet. The following development work was done: drifting, 152 feet; crosscutting, 209 feet; raising, 245 feet. Sixteen diamond-drill holes, totalling 1,414 feet, were drilled from underground.

There were 1,917 tons of ore mined. The crusher operated from December 9 to December 31. Shipments of the crushed ore to the Falconbridge Nickel smelter were commenced in mid-December. A total of 1,812 tons was shipped.

An average of 7 men was employed, of whom 5 were underground, and 2 on the surface. R. C. Staveley is manager.

Nickel Offsets, Limited

Nickel Offsets, Limited, was incorporated in April, 1938, with an authorized capitalization of 3,000,000 shares of no par value, of which 2,642,457 have been issued. The officers and directors are: D. W. Lang, president; Albert Wende, vice-president and general manager; Thomas Cantwell, secretary-treasurer; Ralph Hochstetter, H. H. Wende, and S. H. Knox, directors. The head office is at 50 King Street West, Toronto. The mine address is Chelmsford.

The company owns fifty-one claims in Foy and Bowell townships, district of Sudbury.

Mining operations continued throughout 1952. There are two vertical, three-compartment shafts on the property; No. 1 shaft is 1,600 feet deep, and No. 2 is 1,106 feet deep. Development work in 1952 was carried out on the 1,250- and 1,550-foot levels from No. 1 shaft. The following work was done: drifting, 3,311 feet; crosscutting, 22 feet. The total amount of development work, from both shafts, at the end of 1952, was as follows: drifting, 13,169 feet; crosscutting, 1,745 feet; raising, 597 feet. Diamond-drilling in 1952 consisted of 100 holes, totalling 17,573 feet, from underground.

The construction of a 300-ton concentrator was commenced near No. 2 shaft in the autumn.

An average of 28 men was employed, of whom 8 were underground, and 20 on the surface. Walter Riddell was superintendent during the early part of the year, and was followed by A. H. Swanson.

QUARTZ CRYSTALS

Quartz Crystal Mining Corporation, Limited

Operations at the company's property in lot 9, concession IX, Leeds township, Leeds county, were continuous throughout 1952.

A quantity of quartz crystals was supplied to the Canadian Government. At the end of the year the north pit was about 60 feet long and 35 feet wide; the west face was 50 feet high.

J. B. Steele was in charge, and seven men were employed.

SILICA SAND

F. W. Huggins

F. W. Huggins, 160 Barrette Street, Ottawa, acquired a lease on lots 4, 5, 6, and 7, concession II, and lot 4, concession III, Nepean township, Carleton county, in 1950. A vertical two-compartment shaft was sunk by a contractor to a depth of 100 feet on lot 5, concession II, in the same year. The purpose of the shaft was the sampling of the lowest of a series of sandstone beds, about 100 feet thick, under these lots. The bottom sandstone layer, about 8 feet thick, had been found, by diamond-drilling, to be of glass-sand grade.

In the winter of 1951-52, some 500 feet of drifting was done on a level at a depth of 100 feet. A large bulk sample was obtained. Work was then suspended, pending tests on the sandstone and further financing.

SILVER AND COBALT

Caneonti Mines, Limited

Caneonti Mines, Limited, was incorporated in March, 1951, with an authorized capitalization of 2,000,000 shares of $1 par value, of which 1,400,000 have been issued. The officers and directors are: H. W. Norrington, president; P. W. Matthews, vice-president; E. S. Loughrin, secretary-treasurer; W. W. Smith, R. C. Wallace, and R. C. Sharp, directors. The head office is at 185 Bay Street, Toronto. The mine address is Kennabeek.

The company holds 22 claims in the township of Cane, district of Timiskaming, and has a lease-option agreement with Cane Silver Mines, Limited, to purchase four additional claims in the same township.

The silver-cobalt veins occur along the south and east slopes of a large diabase ridge. During the summer of 1952, approximately 2,000 feet of trenching was done. One of the old shafts was dewatered to a depth of 80 feet. The collar was retimbered, and ladders were installed as far as the 75-foot level. Sampling was done for a length of 200 feet west of the shaft. The work was temporarily suspended in October.

Four men were employed. Murray Watts is consulting engineer, and Gordon Cook is foreman.

Car-Pete Lease

During 1952, Cobalt Lode Silver Mines, Limited, and J. Koza and Associates acquired a lease from the Peterson Lake Mining Company, Limited, on the mining rights to the ground underlying Peterson and Cart lakes, in Coleman township, district of Timiskaming. The operation was known as the Car-Pete Lease.

J. Koza and Associates held a 45 percent interest, and Cobalt Lode Silver Mines, Limited, a 55 percent interest in the lease.

The work was done under the management of Cobalt Lode Silver Mines, Limited, between May and December, 1952. The former Seneca No. 2 shaft at Cart Lake was dewatered to the 200-foot level, and diamond-drilling and exploration work were done on the 100- and 200-foot levels of the Seneca and adjacent Gauld claims. Nine diamond-drill holes, having a total length of 3,447 feet, were drilled. A new headframe and hoist-room were built.

M. J. de Bastiani was manager, employing four men.

Castle-Trethewey Mines, Limited

Castle-Trethewey Mines, Limited, was incorporated in January, 1922, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,709,002 have been issued. The officers and directors are: Balmer Neilly, chairman of the board; W. B. Dix, president; D. H. McDougall, vice-president; F. T. McKinney, secretary; S. R. Varley, treasurer; B. E. Smith and Kelley Butler, directors. The address of the head office and the mine is O'Brien. The executive office is at 25 King Street West, Toronto.

The company's property is in Haultain and Nicol townships, Gowanda area, district of Timiskaming.

Mining operations continued throughout 1952. Early in the year the inclined Capitol winze from the 1,125-foot level was completed to the 1,275-foot level. Shaft-sinking was resumed at the beginning of December. By the end of the year the winze had reached a point 75 feet below the 1,275-foot level. Development work during the year amounted to: drifting, 1,569 feet; crosscutting, 560 feet; raising, 373 feet. The total development work at December 31, 1952, was as follows: drifting, 6,418 feet; crosscutting, 6,307 feet; raising, 1,421 feet. Diamond-drilling in 1952 consisted of 64 holes, totalling 7,592 feet, from underground.

The mill operated from the beginning of May to the end of November and treated 15,276 tons ore, an average of 85 tons per day.

The following is taken from the report of the consulting engineer for the year ending March 31, 1953:

Production

Concentrates produced and shipped	dry tons	257.7
Grade	ounces per ton	2,837
Silver recovered	fine ounces	731,172
Cobalt recovered	pounds	15,296
Value:		
Silver (731,172 ounces at 82.1 cents per ounce)	$600,301.30	
Cobalt (15,296 pounds at 34.4 cents per pound)	5,262.50	
Total value		$605,563.80

Development

Underground exploration and development was carried on throughout the year along with stoping. Most of the lateral development and that most productive of new ore was done on the new 1,275-foot level of the 25-degree-incline haulageway from the 1,125-foot level.

That haulageway was extended during the past winter a further 358 feet, and new levels were established at 1,350-feet and 1,425-feet below the surface. This incline follows down the slope of the 1,000-foot-thick diabase sill in the upper 300 feet of which most of the silver ore shoots of this and other mines of the area have been found.

On the 1,275-foot level, vein No. 130, on which drifting was being done in ore at the beginning of the fiscal year, was extended for a stoping length of 250 feet. Stoping to the present upper limits of this ore at about the 1,200-foot level produced 400,000 ounces of silver.

The easterly 1,275-foot level drift extension on vein No. 130 into mining claim L.M.111, cut a new vein, No. 133, extending nearly due north from vein No. 130. A drift was driven 200 feet

north on vein No. 133. This length showed some very rich and some leaner ore and averaged over 50 ounces to the ton. There is low-grade ore still in the north face. Stoping is now being done on this ore, but fault E, 20 feet above the level, shifts the vein horizontally and vertically and necessitates sublevelling. Such a fault, dipping somewhat steeper than the overlying Keewatin contact, although making development and mining more difficult, is nevertheless the ore maker. This has been true of previously known faults in these Capitol workings and in the old Castle shaft. These faults are the general guide to finding ore shoots in the numerous calcite veins in the upper diabase.

The new 1,350-foot level crosscuts have now cut veins Nos. 130 and 133, which, as above, had good lengths of ore on the 1,275-foot-level floor. Drifting now underway has developed some rich but patchy ore. This ore is at the greatest depth at which ore is being mined in the Cobalt-Gowganda area. Development of ore on and below the 1,350-foot level, in the favourably located vein areas to the north and east of the present drifting, is the present development objective.

Mining

The ore hoisted for milling was mined from veins Nos. 122, 124, 130, and a new vein, No. 133. The silver content was estimated as:

	Ounces
Vein No. 122, chiefly above the 1,125-foot level	87,596
Vein No. 124, above the 1,275-foot level	48,910
Vein No. 130, 1,275- to 1,200-foot level	403,862
Vein No. 133, on and above the 1,275-foot level	58,240
Total	598,608

For the commencement of milling on May 1, there are 5,600 tons of broken ore estimated to contain 220,000 ounces of silver.

Milling

Milling was recommenced early in May, 1952, and continued until December 1.

Ore treated from mine and surface dump	tons	15,276
Silver recovered (47.9 ounces per ton)	ounces	731,172
Silver put into the mill (53.2 ounces per ton)	ounces	812,932
Concentrates produced:		
Metallics	ounces	7,460
Jig and table concentrate (451,617 pounds)	ounces	721,156
Flotation concentrate (64,880 pounds)	ounces	2,556
Total concentrates	ounces	731,172

A higher percentage of recovery was made, and a higher-grade jig and table concentrate made and shipped. This reduced shipping and smelting charges. Part of the higher recovery was owing to the use, for part of the year, of a flotation cell on approximately one-fifth of the feed to the fine tables. The other tailings were stored for possible future treatment by flotation.

Flotation on this ore and on similar ores in the area having proven successful, flotation equipment has been installed in the fine-tabling floor of the mill and will be in use when milling recommences. This equipment consists of a 20-foot thickener, a bank of five flotation cells, and flotation concentrate filter. The flotation concentrate will be tabled to make high-grade and low-grade concentrate. The former will be shipped to the Deloro smelter, the latter probably to Noranda, Quebec.

It is expected that the increased extraction will pay for the flotation installation in a few months of milling. The cost of storing tailings will also be eliminated.

Operating Costs

Development and exploration:	
Drifting and crosscutting	$ 81,387.76
Raising	25,151.54
Incline haulageway	37,188.52
Station cutting	10,401.04
Diamond-drilling	16,100.65
Total	$170,229.51
Mining	110,375.43
Milling	52,979.93
Total production costs	$333,584.87
Administration and general expense	2,514.98
Total	$336,099.85

Plant and Equipment

Capital expenditures totalled $39,218.13, being chiefly for milling plant and underground equipment. The larger items of underground equipment were for extension of the inclined haulageway for another two levels. A larger air hoist and new ore and man skips were provided. Mill expenditures were chiefly for the provision of a mill flotation unit. The expenditures so made were:

Buildings	$ 3,303.97
Mill equipment	12,082.96
Other surface equipment	6,293.03
Underground equipment	17,538.17
Total	$39,218.13

No heavy capital expenditures are contemplated.

General

The year's production of 731,172 ounces of silver was about 55,000 ounces short of the average output during the eight years we were in full production from 1924 to 1931. The dollar value at $605,563.80, however, exceeded the average value during that same period by a wide margin.

While the broken and developed ore is sufficient only to ensure milling for a limited time, there is sufficient ore to provide profitable operation during the coming summer. Some high-grade ore has already been found in the limited amount of work already done on the 1,350-foot level. Development is projected into favourable areas of the diabase sill to the north and east. The future depends on continued good fortune in locating rich ore shoots in the extensive calcite vein areas, and on the price of silver.

G. D. McLeod is general superintendent and A. D. Campbell is consulting engineer. An average of 62 men was employed, of whom 37 were underground.

Cobalt Chemicals, Limited

The Cobalt Chemical and Refinery Company, Limited, was incorporated in January, 1939. In May, 1952, the company was reorganized, and the name was changed to Cobalt Chemicals, Limited. The authorized capitalization is 3,000,000 shares of no par value, of which 1,191,500 have been issued. The officers and directors are: P. H. Hershey, president; A. D. Hellens, vice-president; Samuel Ciglen, secretary-treasurer; J. T. Symons, assistant secretary-treasurer; L. J. Lichty, managing director. The address of the head office and the plant is Cobalt.

The company's custom smelting and refining plant in the Gillies Limit, district of Timiskaming, about six miles south of Cobalt, was partially destroyed by fire in 1950. Rehabilitation of the plant was begun in July, 1952. The cobalt building was repaired and remodelled, and reconstruction of the smelter section and the erection of a new silver refinery were started. A two-storey office and administration building, a change-house, a warehouse, and a machine and electrical shop were built.

The plant is being designed and constructed to smelt and refine arsenious cobalt-silver and associated ores from the Cobalt area and other sources. The operation will be carried on under contract agreement by Quebec Metallurgical Industries, Limited, an affiliate of Ventures, Limited, and Frobisher, Limited.

No production was undertaken in 1952. Experimental work on the metallurgical problems involved was done at the Ottawa laboratories of Quebec Metallurgical Industries, Limited, under the direction of L. J. Lichty.

About 22 men were employed at the plant. C. W. Eggert is plant superintendent.

Cobalt Lode Silver Mines, Limited

Cobalt Lode Silver Mines, Limited, was incorporated in February, 1949, with an authorized capitalization of 3,000,000 shares of $1 par value, all of which have been issued. The officers are: P. H. Hershey, president; Louis Cadesky, vice-president; G. E. Buchanan, secretary; Samuel Ciglen, treasurer; J. T. Symons,

assistant secretary-treasurer. The head office is at 100 Adelaide Street West, Toronto, and the mine address is Box 510, Cobalt.

The property comprises three, 20-acre claims formerly known as the Adanac mine, in lot 2, concession III, Coleman township, district of Timiskaming.

Mining and milling operations continued throughout 1952. The work was done through the vertical two-compartment No. 1 shaft, which is 519 feet deep, with levels at 100, 200, 275, 321, 400, and 500 feet. The No. 401 winze, which extends from the 400- to the 455-foot level, was not in use during the year.

The air hoist at the No. 1 shaft was replaced by a 125-horsepower, 48-inch, single-drum electric hoist. The mill capacity was increased by the installation of a 7- by 5-foot Canadian Allis-Chalmers ball mill.

The following development work was done in 1952: drifting, 2,867 feet; crosscutting, 385 feet; raising, 2,139 feet. The total development work at December 31, 1952, was as follows: drifting, 7,610 feet; crosscutting, 4,096 feet; raising 3,449 feet.

Diamond-drilling in 1952 consisted of 90 holes, totalling 18,032 feet, from underground.

Some 34,198 tons of ore were hoisted.

The mill, at mileage 104 on the Ontario Northland railway, operated throughout the year, treating 35,394 tons of ore, at a daily average rate of 96.7 tons.

A. D. Hellens is consulting engineer and M. J. de Bastiani is mine manager. An average force of 75 men was employed, of whom 36 were underground, and 18 in the mill.

Cob-Sil-Ore Mines, Limited

Cob-Sil-Ore Mines, Limited, was incorporated in August, 1950, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,325,005 have been issued. The officers and directors of the company are: G. E. Buchanan, president; D. S. Morse, vice-president; J. T. Symons, secretary-treasurer; Forbes Hibbert and H. T. Hooper, directors. The executive office is at 100 Adelaide Street West, Toronto, and the mine address is Cobalt.

The company holds leases on three claims on lots 12 and 14, concession I, township of Bucke, district of Timiskaming. The property has been variously known as the Cobnor, Windsor Cobalt, and Cobalt Contact.

There is a three-compartment vertical shaft on the property, with about 2,000 feet of lateral development on levels at 120 and 195 feet, all done during previous operations.

The present company continued work from January to the end of March, 1952. Nine diamond-drill holes, totalling 2,212 feet, were drilled from surface, and 6 holes, totalling 1,529 feet, were drilled from underground. No development work was done.

L. J. Cunningham was consulting engineer. During the period of operation one man was employed part time.

Consolidated Silver Banner Mines, Limited

Consolidated Silver Banner Mines, Limited, was incorporated in January, 1950, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 3,274,074 have been issued. The officers and directors are: W. H. Gifford, president; W. R. Branch, vice-president; Herbert Cole, secretary-treasurer; C. A. Campbell and E. B. E. de Camps, directors. The head office is at 15 King Street West, Toronto, and the mine address is Box 60, Cobalt.

The company acquired about 60 acres in Coleman and South Lorrain townships, district of Timiskaming, from Silver Banner Mines, Limited, and Silba Silver Mines, Limited. The holdings include the old Victory or Silver Banner mine, in Coleman township, and the Little Keeley claim, in South Lorrain.

Operations in 1952 were carried on at the Victory property from January until July 31, when work was suspended. During that period the following development work was done: drifting, 212 feet; crosscutting, 245 feet; raising, 131 feet.

Seventeen diamond-drill holes, totalling 3,190 feet, were drilled from underground.

About 137 tons of picked ore were hoisted.

R. I. Benner was consulting engineer in charge. An average of 10 men was employed.

Cordon Cobalt Mines, Limited

Cordon Cobalt Mines, Limited, was incorporated in February, 1951, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,518,080 have been issued. The officers and directors are: J. J. Chalmers, president; D. G. McGowan, secretary-treasurer; A. G. Smith, E. E. Ott, and A. S. Taylor, directors. The head office is at 129 Adelaide Street West, Toronto. The mine address is Cobalt.

The company owns two claims in the north half of lot 6, concession VI, Coleman township, district of Timiskaming. The property was a former silver producer known as the Hudson Bay mine. In addition, the company owns two claims in block 8, in the Gillies Limit, district of Timiskaming.

Work was commenced in July, 1952, at the Hudson Bay mine and continued until December 20. A small one-compartment shaft, 85 feet deep, inclined at 75 degrees, was reconditioned and equipped with a utility hoist. The shaft is located near the old Hudson Bay mill foundation and is connected with the second and third levels of the main shaft workings.

Underground work in 1952 consisted of dewatering, sampling, and geological examination. Diamond-drilling consisted of five holes, totalling 546 feet, from surface.

A. E. Broadley was general manager, employing an average of four men.

Cross Lake Lease

The partnership known as the Cross Lake Lease, formed in 1940, and composed of H. L. Umphrey, C. J. Donegan, and D. M. McLeod, continued operations at the O'Brien mine on the south half of lot 4, concession VI, Coleman township, district of Timiskaming, during the first two months of 1952. The lease under which the partnership operated expired at the end of February, and the property was taken over by the newly formed Nipissing O'Brien Mines, Limited.

During the two-month period of operation, 511 tons of hand-picked ore were taken from the 205- and 240-foot levels of the O'Brien No. 2 shaft workings.

H. L. Umphrey was manager, employing an average of 10 men.

Gardiner-Johnston Property Syndicate

The partners in the Gardiner-Johnston Property Syndicate are: A. D. Hellens, Samuel Ciglen, Louis Cadesky, P. H. Hershey, Isidore Levinter, and M. J. de Bastiani. The head office address is Cobalt.

The syndicate has an option on two claims at mile 24 on the Elk Lake–Gowganda road, in Nicol township, district of Timiskaming.

The property, at one time known as the Hylands-Johnston-Gardiner, was last operated in 1926 and 1927 by Plata Mines, Limited. There is a vertical shaft, 283 feet deep, with levels at 200 and 263 feet, on which a total of 2,800 feet of drifting and crosscutting was done by the former operators.

In 1952 the shaft was dewatered, a new 32-foot headframe was erected, and sampling and diamond-drilling were done on both levels between February and August. The operation was then suspended.

An average of five men was employed under the direction of M. J. de Bastiani.

Gilgreer Mines, Limited

Gilgreer Mines, Limited, was incorporated in October, 1923, with an authorized capitalization of 2,000,000 shares of $1 par value. In November, 1951, the capitalization was increased to 4,000,000 shares, of which 3,357,009 have been issued. The officers and directors are: G. E. Buchanan, president; D. S. Morse, vice-president; J. T. Symons, secretary-treasurer; H. T. Hooper and Forbes Hibbert, directors. The head office is at 100 Adelaide Street West, Toronto. The mine address is Cobalt.

The property, known at various times as the Canadian Lorrain, Miller-Elliott, and Millwights mine, is in South Lorrain township, district of Timiskaming.

During 1952 the underground workings was dewatered to the 410-foot level. There are four other levels, at 70, 150, 250, and 350 feet. Development by former operators is reported to amount to about 12,880 feet of lateral work and 262 feet of raising. The present company did 95 feet of drifting and 140 feet of raising on the 250-foot level in 1952.

About 700 tons of ore were hoisted.

A frame bunk-house, a cookery, and a compressor house were built. A shorter road is being built from the mine to the Cobalt–Silver Centre road.

S. B. Bond is mine manager, employing an average of 14 men, of whom 6 were underground.

Harrison-Hibbert Mines, Limited

Harrison-Hibbert Mines, Limited, was incorporated in May, 1935, with an authorized capitalization of 2,000,000 shares of $1 par value. In June, 1950, the capitalization was increased to 3,000,000 shares of $1 par value, all of which have been issued. The officers and directors are: A. W. White, president; J. D. Reilly, vice-president; L. W. McIlmurray, secretary-treasurer; Matthew Grimes, C. E. Love, and R. C. Harrison, directors. The head office is at 145 Yonge Street, Toronto, and the mine address is Box 148, Cobalt.

The company owns three claims and has an option on one claim owned by Pittsonto Mines, Limited, near the village of North Cobalt, in Bucke township, district of Timiskaming. Of the three claims owned by the company, the Harrison-Hibbert and the Ruby claims are on lot 13, concession I, and the Law claim is on lot 13, concession II. The Pittsonto claim is immediately south of the Ruby claim.

Operations are conducted through the vertical two-compartment No. 1 shaft on the Harrison-Hibbert claim, which is 258 feet deep with levels at 150, 190, and 240 feet, and a sublevel at 120 feet. There is an electric hoisting plant at this shaft.

On the Ruby claim there is a vertical shaft 150 feet deep, a winze from the

140- to the 220-foot level, and a 50-foot winze below the 220-foot level. No hoisting is done through these shafts.

Operations continued throughout 1952. The 190-foot level of the Harrison-Hibbert area was connected to the 220-foot level of the Ruby workings, and from the south part of the Ruby 220-foot level, a drift was extended southward into the Pittsonto claim.

The following development work was done during the year: drifting, 1,401 feet; crosscutting, 408 feet; raising, 1,001 feet. The total development work at December 31, 1952, was: drifting, 2,887 feet; crosscutting, 962 feet; raising, 1,186 feet.

Diamond-drilling consisted of 5 holes, totalling 1,368 feet, from surface, and 66 holes, totalling 3,663 feet, from underground.

An addition to the change-house was built, and a 500-cubic-foot compressor was installed to give a total capacity of 1,000 cubic feet.

Ore was obtained mainly from eight stopes on the 190- and 240-foot levels. About half of it came from the Harrison-Hibbert section and half from the Ruby. Approximately 95 percent was from the Keewatin formation which underlies the conglomerate sediments. The ore is predominantly silver, with some cobalt and small amounts of copper. A total of 17,180 tons of ore was hoisted, of which 16,046 tons were treated at the United Cobalt mill.

An average force of 39 men was employed, of whom 33 were underground and 6 on the surface. J. E. Armstrong is manager.

Hellens Mining and Reduction Company, Limited

The Hellens Mining and Reduction Company, Limited, was incorporated in June, 1951, with an authorized capitalization of 500,000 shares of $1 par value, all of which have been issued. The officers and directors are: P. H. Hershey, president; A. D. Hellens, vice-president; J. T. Symons, secretary; Samuel Ciglen, treasurer; Louis Cadesky, Martial Dumulon, and L. E. Morin, directors. The head office is at 100 Adelaide Street West, Toronto. The mine address is Cobalt.

The company controls a group of properties in the Cobalt area, Coleman township, district of Timiskaming, including the McKinley-Darragh, Cobalt Lake, Right-of-Way, Townsite, and Buffalo mines.

The cyanide mill erected in 1951 on the Cobalt Lake property continued to operate in 1952, treating tailings from the bed of Cobalt Lake. The tailings were handled by a Sauerman dragline in the summer and by shovel and truck in the winter. A total of 109,029 tons of tailings was treated during 1952.

No mining was done during the year. The Right-of-Way No. 2 shaft and headframe were reconditioned, and the workings were dewatered to a depth of 185 feet, then allowed to refill. The Cobalt Lake No. 4 shaft was pumped out, and the water was kept at a point 65 feet below the surface to lower the water table of the tailings basin where operations were being conducted.

An average of 29 men was employed. G. P. Thoday is manager.

Holwood Mines, Limited

Holwood Mines, Limited, was incorporated in October, 1951, with an authorized capitalization of 4,000,000 shares of $1 par value. There are 1,100,000 shares issued, of which 720,000 are pooled. The officers and directors are: C. W. Miller, president; L. G. Hilts, secretary-treasurer; R. E. Goodson, C. G. Syer, and Anthony Fiorrello, directors. The head office is at Schumacher, and the mine address is Elk Lake.

The company owns five claims and leases seven in the western section of Van Hise township, northwest of Spawning Lake, in the district of Timiskaming. The property is approximately five miles off the Gowganda highway, and a truck road has been cleared to the camp site.

The mine was operated in 1920 and 1921 by Alpine Silver Mines, Limited, and at that time an adit, 575 feet long, was driven westward from the base of a diabase ridge.

In 1952 the present operators reopened the adit but did no further development work. Seven diamond-drill holes, totalling 1,200 feet, were drilled from surface during the year.

A mill capable of handling 50 tons a day was erected, and some of the milling equipment was taken in to the property by truck. A bunk-house and cookery were built.

C. W. Miller is manager. An average of 10 men was employed.

Mayfair Mines, Limited

Mayfair Mines, Limited, was incorporated in May, 1945, with an authorized capitalization of 3,000,000 shares of $1 par value. In February, 1951, the number of shares was increased to 4,000,000, of which 3,289,642 had been issued at December 31, 1952. The officers and directors are: N. E. Gough, president; P. M. Klopstock, Jr., vice-president; W. G. White, secretary-treasurer; A. L. Campbell, A. E. Hilliard, and L. N. Gough, directors. The head office is at 331 Bay Street, Toronto. The mine address is Haileybury.

The company's property is on lot 2, concession II, in the extreme southeast corner of Coleman township, district of Timiskaming, and extends across the Coleman township boundary into Gillies Limit to the west. It includes the property that has been known as both the John Black and Peoples mine.

The vertical two-compartment No. 1 shaft is 420 feet deep. The two-compartment No. 3 winze is collared at the 400-foot level, approximately 1,500 feet west of No. 1 shaft, and runs at an angle of 20 degrees to an incline depth of 557 feet below the collar.

Operations were conducted intermittently in 1952. About 109 feet of drifting was done on the 550-foot level from the No. 3 winze. The total development work at December 31, 1952, was as follows: drifting, 1,807 feet; crosscutting, 2,600 feet. Diamond-drilling in 1952 consisted of two holes, totalling 200 feet, from surface, and four holes, totalling 652 feet, from underground.

An average of five men was employed. W. R. Garbutt is manager.

Mensilvo Mines, Limited

Mensilvo Mines, Limited, was incorporated in November, 1946, with an authorized capitalization of 2,000,000 shares of $1 par value, of which 1,881,525 have been issued. The officers are: L. C. Herdman, president; H. D. Baker, vice-president; J. C. Wylie, secretary-treasurer. The head office is at 73 King Street West, Toronto. The mine address is Cobalt.

The company owns a property consisting of 25 acres in lot 5, concession IV, Coleman township, district of Timiskaming, formerly known as the Silver Bar mine.

Operations continued throughout 1952. Most of the work was done from the vertical two-compartment No. 7 shaft, which is 157 feet deep. About 175 feet of drifting was done on the No. 10 vein, east and west of the shaft, on the 105-foot

level. Diamond-drilling consisted of seven holes, totalling 693 feet, from underground.

A total of 11,375 tons of ore was hoisted, and 9,057 tons, mostly cobalt ore, were treated in the mill. Some ore was also shipped to the customs mill of the United Cobalt Mines.

An addition to the mill was built, and the installation of the new equipment was begun. The new mill circuit will include a bumping-table, primary jaw-crusher, vibrating screen, secondary jaw-crusher, 50-ton Gibson ball mill, and two Wilfley tables.

The change-house burned down during the year and was replaced by a new building. A new low-pressure steam-heating boiler was installed.

An average force of 25 men was employed, of whom 19 were underground, and 6 on the surface. W. D. Taylor is mine manager.

New Bailey Mines, Limited

New Bailey Mines, Limited, was incorporated in October, 1951, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,520,799 have been issued. The officers and directors are: G. E. Buchanan, president; D. S. Morse, vice-president; J. T. Symons, secretary-treasurer; D. J. Gravelle and K. L. Carter, directors. The head office is at 100 Adelaide Street West, Toronto. The mine address is Cobalt.

The property is on parts of lots 4 and 5, concession IV, Coleman township, district of Timiskaming, and includes the former Bailey mine.

Some work had been done on the property during 1951 by Penn-Cobalt Silver Mines, Limited. New Bailey Mines, Limited, took over the operation in February, 1952, and continued until October, 1952, when work was suspended.

Former operators had sunk a two-compartment vertical shaft, known as the Bailey, to a depth of 275 feet. During 1952 this shaft was deepened 10 feet to provide a sump. There are five levels at 60-, 90-, 150-, 225-, and 275-foot horizons. The 60-foot level has an adit connection on the hillside.

Work in 1952 consisted of 210 feet of drifting on the 275-foot level towards the Foster property of Penn-Cobalt Silver Mines, Limited. The total amount of development work, when operations ceased in the fall of 1952, was: 2,130 feet of drifting and 2,340 feet of crosscutting. Diamond-drilling in 1952 consisted of three holes, totalling 499 feet, from surface, and seven holes, totalling 2,298 feet, from underground.

A small quantity of ore was hoisted and milled at the Cobalt Lode mill for test purposes.

A new 30-foot headframe, a hoist-room, and a building to serve as an office and dry-house were built. A reconditioned Jenckes air-hoist was installed.

About 10 men were employed. L. J. Cunningham is mine manager.

New Morrison Mines, Limited

New Morrison Mines, Limited, was incorporated in April, 1951, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,750,005 have been issued. The officers and directors are: James Ingram, president; G. C. Andrew, secretary-treasurer; R. D. Stewart, assistant secretary-treasurer; H. F. Strong, J. G. Carrique, and Gustav Ehrlich, directors. The head office is at 44 King Street West, Toronto. The mine address is O'Brien.

The company holds leases on four claims, including the Morrison and W.J.9 properties, four miles east of Gowganda, in Nicol township, district of Timiskaming.

Two shafts were sunk by previous operators: one, 590 feet deep, on the Morrison claim; and one, 400 feet deep, on claim W.J.9. All work by the present operators has been centred at the Morrison shaft.

Mining operations were carried on throughout 1952. Most of the development work was done on the 425- and 500-foot levels. The driving of a 600-foot crosscut was begun on the 425-foot level to explore the area under the old workings of the W.J.9 shaft.

The development work during the year consisted of: drifting, 1,397 feet; crosscutting, 640 feet; raising, 101 feet. The total development work at December 31, 1952, was as follows: drifting, 1,794 feet; crosscutting, 640 feet; raising, 101 feet. Diamond-drilling in 1952 consisted of 82 holes, totalling 5,693 feet, from underground.

A new 42- by 30-inch double-drum, 75-horsepower Canadian Ingersoll-Rand electric hoist was installed to replace the air hoist. A new 55-foot headframe and ore bin were built.

Early in October the company rented the old Siscoe Metals mill on a monthly basis. The ore is carried by truck to the mill, a distance of 3 miles. From October 6 to the end of December, 3,306 tons of ore were milled, an average of 45 tons per day.

W. F. Gowans was manager. An average of 27 men was employed.

Nipissing-O'Brien Mines, Limited

Nipissing-O'Brien Mines, Limited, was incorporated in January, 1952, with an authorized capitalization of 2,500,000 shares of $1 par value, of which 1,600,005 have been issued. The officers and directors are: B. A. O'Brien, president; J. M. Cunningham-Dunlop, vice-president; C. C. Calvin, secretary-treasurer; W. H. Woods and Alan Scott, directors. The head office is at 25 King Street West, Toronto. The mine address is Cobalt.

The company acquired the properties of M. J. O'Brien, Limited, and Nipissing Mines Company, Limited, in the township of Coleman, district of Timiskaming.

The O'Brien property had been operated under lease for some years prior to 1952 by the Cross Lake Lease partnership. The lease expired at the end of February, 1952, and the newly formed Nipissing-O'Brien Mines, Limited, began its operations in March.

There are two shafts, both vertical, on the O'Brien property. The three-compartment main shaft is 345 feet deep, and the two-compartment No. 2 shaft is 250 feet deep. Development work in 1952 was all done in the No. 2-shaft area, and consisted of: drifting, 549 feet; crosscutting, 90 feet; raising, 196 feet. Diamond-drilling consisted of 45 holes, totalling 8,854 feet, from surface, and 27 holes, totalling 2,944 feet, from underground.

A new 55-foot headframe, shaft-house, hoist-house, switch-house, and dry-house were built at the main shaft, and the shaft timber was repaired. A reconditioned 36- by 45-inch double-drum Canadian Ingersoll-Rand electric hoist was installed.

An average force of 17 men was employed, of whom 10 were underground, and 7 on the surface. B. L. Jackson is mine manager.

Norbert Silver Mines, Limited

Norbert Silver Mines, Limited, was incorporated in February, 1952, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,980,000 have been issued. The officers and directors are: Robert Slutzky, president; D. R. Richardson, secretary-treasurer; George Jerris, C. G. MacDonald, and A. D. Cherniak, directors. The head office is at 29 Park Street West, Windsor. The mine address is Box 705, Cobalt.

The company was formed to develop two adjoining properties, formerly known as the Harris and the Montrose, in South Lorrain township, district of Timiskaming.

Operations were carried on from March 20 to December 31, 1952. No. 1 shaft was dewatered to a depth of 280 feet. This shaft is vertical for 30 feet from the collar, then inclined to the north at 80 degrees. The No. 2 shaft, 400 feet northwest of No. 1, is inclined at 88 degrees to the south. It was dewatered to a depth of 165 feet. The 175-foot level of No. 1 shaft was connected to the 150-foot level of No. 2 shaft by a short raise.

Underground development during the year amounted to 165 feet of drifting and 10 feet of raising. Diamond-drilling consisted of seven holes, totalling 1,512 feet, from surface, and nine holes, totalling 808 feet, from underground.

An office, bunk-house, warehouse, hoist- and compressor-houses, powder magazine and two headframes were built.

N. W. McCartney is mine manager. An average of 16 men was employed.

Penn-Cobalt Silver Mines, Limited

Penn-Cobalt Silver Mines, Limited, was incorporated in August, 1950, with an authorized capitalization of 3,000,000 shares of $1 par value. In June, 1952, the number of shares was increased to 5,000,000, of which 4,300,000 have been issued. The officers and directors are: P. H. Hershey, president; D. S. Morse, vice-president; G. E. Buchanan, secretary-treasurer; J. T. Symons, assistant secretary-treasurer; H. T. Hooper, director. The head office is at 100 Adelaide Street West Toronto. The mine address is Cobalt.

The company's property is on lots 3 and 4, concession IV, Coleman township, district of Timiskaming, and includes the former Penn-Canadian, Foster, Crown Reserve, and Kerr Lake mines. During 1952, work was done on all except the Penn-Canadian.

Crown Reserve Mine

The Crown Reserve property consists of a 23-acre claim underlying the basin of Kerr Lake. The vertical two-compartment main shaft is 315 feet deep, with levels at 100, 200, and 300 feet. The reconditioning of the shaft was begun in June, 1952. A 75-foot headframe and hoist-room were built, and a single-drum air-hoist was installed. The shaft was dewatered to the 300-foot level, and about 100 feet of new timbering was installed.

About 43 feet of crosscutting was done on the 200-foot level to make a connection with No. 10 stope on the 225-foot level of the Kerr Lake mine. Thirteen diamond-drill holes, totalling 1,753 feet, were drilled from underground.

Foster Mine

The vertical No. 5 shaft of the Foster mine is 225 feet deep, with levels at 70, 140, and 210 feet. During 1952 it was enlarged to three compartments, from surface to the 210-foot level. The 70-foot level was broken through to the hillside

near the southeast shore of Glenn Lake, and mining was carried on from this level, the ore being removed through the adit entrance provided.

Development work during 1952 amounted to: drifting, 515 feet; crosscutting, 155 feet; raising, 118 feet. Diamond-drilling consisted of 8 holes, totalling 830 feet, from surface, and 29 holes, totalling 2,827 feet, from underground.

About 1,297 tons of ore were sent to the Colonial mill at the Silanco Mining and Refining Company, Limited, for treatment.

Mining operations were supended in September.

A crusher-house, boiler-house, machine shop, and warehouse were built, and a mill building, designed for the treating of 100 tons per day, had been partially completed when construction work was discontinued in October.

Kerr Lake Mine

The Kerr Lake property consists of three, 40-acre claims, plus a small fraction lying south of Kerr Lake.

The vertical two-compartment No. 13 shaft was deepened from 90 to 155 feet in 1952, and a new level was established at 140 feet. A new 30-foot headframe and hoist-house were built, and the single-drum air-hoist from the Foster No. 5 shaft was installed.

A long drive to the north was made on the 140-foot level, to connect with the 140-foot-level workings of the old Kerr Lake No. 7 shaft. Five raises were driven along this drift, and some stoping was done.

Other work was done on the Kerr Lake main east vein from the bed of Kerr Lake, which has been kept drained. About 510 tons of ore were broken on the 175-foot level of these workings, and hoisted to the stockpile.

The connection made between the 200-foot level of the Crown Reserve mine and the 225-foot level of the Kerr Lake has been mentioned above.

The development work during 1952 on the Kerr Lake property amounted to: drifting, 685 feet; crosscutting, 56 feet; raising, 312 feet. Diamond-drilling consisted of 12 holes, totalling 1,065 feet, from underground.

About 1,265 tons of ore were hoisted.

J. H. Price is manager of the company's operations. An average of 35 men was employed at the three operations, 7 at the Crown Reserve, 18 at the Foster, and 10 at the Kerr Lake.

Roy Silver Mines, Limited

Roy Silver Mines, Limited, was incorporated in July, 1949, with an authorized capitalization of 3,000,000 shares of $1 par value. In October, 1952, the capitalization was increased to 4,500,000 shares, of which 3,000,000 have been issued. The officers and directors are: Maurice Marcus, president; S. M. Goldberg, vice-president; R. J. McQueen, secretary; I. A. Wechsler, treasurer; L. S. Joseph and Z. M. Rosenthal, directors. The head office is at 357 Bay Street, Toronto. The mine address is Elk Lake.

The company holds claims in Haultain, South Lorrain, and Coleman townships, district of Timiskaming, and Farr and Strathy townships, district of Nipissing. Work at the Haultain and Wigwam properties, in Haultain township, was suspended in November, 1951. In the spring of 1952, operations were begun at the company's cobalt-copper property in Farr township, on the west shore of Hubert Lake, 7 miles west of the town of Elk Lake. A 2½-mile mining-access road has been built from the Matachewan highway to the property.

The headframe and other buildings, and the hoist and compressor, were

moved from the Haultain shaft to the new operation and installed at the No. 1 shaft.

The vertical two-compartment No. 1 shaft is 120 feet deep. It was dewatered, straightened, and retimbered to the 66-foot level, where 87 feet of drifting and 72 feet of crosscutting were done. Twenty diamond-drill holes, totalling 2,741 feet, were drilled from surface.

About 120 tons of ore were hoisted.

J. G. Pollard is manager. An average of 10 men was employed.

Shag Silver Mines, Limited

Shag Silver Mines, Limited, was incorporated in August, 1942, with an authorized capitalization of 1,500,000 shares of $1 par value, of which 500,000 have been issued. The officers and directors are: R. D. Cumming, president; Dr. P. E. O'Shaughnessy, vice-president; Miss B. O'Hara, secretary; Mrs. Iris O'Shaughnessy, director; and L. J. O'Shaughnessy, director and general manager. The head office and mine office are at Cobalt.

The property consists of a group of claims, held under leases and options, near Cross Lake in lot 2, concession V, township of Coleman, district of Timiskaming.

Operations were conducted on a small scale throughout 1952, except for a six-week period in September and October during which operations were suspended.

The work was done through the vertical two-compartment Michael shaft of the former O'Brien Cross Lake mine. The shaft is 590 feet deep, with levels at 270, 395, and 450 feet. About 25 feet of drifting and 20 feet of raising were done on the 270-foot level, and 110 feet of crosscutting and 22 feet of raising on the 395-foot level. Three diamond-drill holes, totalling 236 feet, were drilled from underground.

About three tons of hand-picked ore were hoisted during the year.

During 1952 the company dropped its option on all the claims held, but the claims that were part of the properties transferred from M. J. O'Brien Mines, Limited, to the newly formed Nipissing-O'Brien Mines, Limited, were re-optioned by L. J. O'Shaughnessy, who continued to operate them through Shag Silver Mines, Limited. The lease on the Reinhardt claim was not renewed.

An average of five men was employed.

Silanco Mining and Refining Company, Limited

The Silanco Mining and Refining Company, Limited, was incorporated in November, 1945, with an authorized capitalization of 4,000,000 shares of $1 par value. In October, 1950, the number of shares was increased to 5,000,000, all of which have been issued. The officers and directors are: P. H. Hershey, president; Louis Cadesky, vice-president; Samuel Ciglen, treasurer; G. E. Buchanan, secretary; J. T. Symons, assistant secretary-treasurer; Martial Dumulon and W. C. Knight, directors. The head office is at 100 Adelaide Street West, Toronto. The mine address is Cobalt.

The company owns a number of mining properties in Coleman, Bucke, and South Lorrain townships, district of Timiskaming.

Agaunico and Ruethel Mines

The Agaunico and Ruethel mines are on lot 15, concession I, township of Bucke, and lie partly on the shore and partly under the bed of Lake Timiskaming.

Operations were carried on throughout 1952. Most of the lateral development work done was on the 200-foot level, where a drift was extended east and west of the shaft, under the bed of the lake, for the purpose of developing a silver-vein system. No stoping was done under the lake. Test-holing indicated about 120 feet of rock between the back of the drift and the bed of the lake. An escapement raise was driven from the 200-foot level to surface.

Stoping operations were carried out from the 200- and 275-foot levels of the Ruethel area, southwest of the shaft.

The development work during the year amounted to: drifting, 1,937 feet; crosscutting, 34 feet; raising, 88 feet. Diamond-drilling consisted of 28 holes, totalling 4,396 feet from surface, and 20 holes, totalling 2,502 feet, from underground.

About 24,212 tons of ore were hoisted and sent to the Colonial mill during the year, a daily average of 84 tons. The ore is mainly cobalt.

An average of 25 men was employed.

Colonial and Violet Mines

The Colonial and Violet mines are on adjoining claims in lot 3, concession VI, township of Coleman.

The vertical, three-compartment No. 1 shaft of the Colonial mine is 980 feet deep, with a level at 930 feet and sublevels at 770 and 880 feet. There are two inclined winzes on the property: No. 1, dipping 20 degrees to the east, runs from the 930- to the 1,130-foot level, with an intermediate level at 1,020 feet; No. 2, dipping at 25 degrees to the southeast, runs from the 930- to the 1,080-foot level. The two winzes are connected on the 1,020-foot level.

The Violet shaft is 700 feet deep, with levels at 635 and 685 feet and sublevels at 250, 330, 410, 470, 530, and 600 feet. The sublevels are connected to the 635-foot level of the Violet mine, and also to the Violet shaft of Nipissing-O'Brien Mines, Limited.

The only connection between the Violet and Colonial mines is by way of the adjacent O'Brien mine workings, which are not open for travel. The levels of the Colonial mine are about 85 feet higher than the levels of the Violet mine.

During 1952 a drift-and-raise connection was made from the 930-foot level of the Colonial shaft to the O'Brien workings as an escapement route, but it was found to be unusable because of the heavy flow of water encountered. In December a concrete bulkhead, 9 feet thick, was installed in the main drift of the Colonial 930-foot level to close off the water-flow from the O'Brien workings.

The development work done during the year amounted to 263 feet of drifting, and 152 feet of raising. Diamond-drilling consisted of 14 holes, totalling 2,479 feet, from underground.

About 3,410 tons of ore were hoisted and treated at the Colonial mill.

At the end of the year all underground work had been discontinued except some exploration that was being carried on from adit levels.

An average of 23 men was employed.

Colonial Mill

The Colonial mill, which is on the Colonial property, operated continuously throughout 1952, treating 28,020 tons of ore from the company's own mines and surface dumps, and 2,221 tons of custom ore from other operations.

An average of 16 men was employed. C. Hutt was mill superintendent.

H. A. Kenty was mine manager during part of the year and was succeeded by M. L. Smith.

Silver Jackpot Mines, Limited

Silver Jackpot Mines, Limited, was incorporated in May, 1952, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 1,125,257 have been issued. The officers and directors are: D. F. Hurd, president and manager; J. M. MacPherson, vice-president; T. R. Rowe, secretary-treasurer; R. V. Curtis and R. E. Evans, directors. The head office and mine office are at Kirkland Lake.

The company owns four claims in Tudhope township, district of Timiskaming, four miles northeast of Elk Lake.

In 1909 former operators sank a two-compartment shaft, 105 feet deep. In 1952 the present company dewatered the shaft and retimbered it. No underground development work was done. A headframe, hoist-room, shaft-house, compressor-house, and core-shack were built.

A road, one mile long, from the Elk Lake–Charlton highway to the property, has been completed.

Two men were employed from the middle of May to the end of December.

Silver-Miller Mines, Limited

Silver-Miller Mines, Limited, was incorporated in January 1946, with an authorized capitalization of 3,000,000 shares of $1 par value. In April, 1952, the number of shares was increased to 4,000,000, of which 3,920,400 have been issued. The officers and directors are: H. G. Miller, president and general manager; Murray Cooper, vice-president and treasurer; C. A. Colville, secretary; Harry Harris, Maurice Hill, Maurice Marcus, and John Meyers, directors. The head office is at 66 King Street West, Toronto. The mine address is Box 142, Cobalt.

The company owns the Brady Lake mine and the La Rose mine, both in Coleman township, district of Timiskaming.

Brady Lake Mine

This property, recently known as the Silver Miller mine, consists of five claims in lots 2 and 3, concession III, Coleman township, and includes the old Lumsden, Rochester, Gillies, Cobalt Central, and Coleman Development (Pan Silver) mines.

Operations were carried on throughout 1952. Work on the 180-foot sublevel and the 285-foot level was done from the No. 1 (Lumsden) shaft, which is about 400 feet deep. Development on the 360-foot level was carried on from the No. 1 winze, which runs from the 285- to the 440-foot level.

The Rochester shaft was dewatered to the 75-foot level, where some sampling and diamond-drilling were done.

Most of the production was from stopes on the 440- and 610-foot levels of the No. 4 shaft workings. The shaft is vertical, has two compartments, and is 632 feet deep.

During 1952 the following development work was done: drifting, 1,232 feet; crosscutting, 1,032 feet; raising, 423 feet.

The total development work at December 31, 1952, was as follows: drifting, 9,764 feet; crosscutting, 1,888 feet; raising, 461 feet. Diamond-drilling in 1952 consisted of 65 holes, totalling 11,180 feet, from underground.

The mill capacity was increased by the addition of a Marcy ball mill and an Akins classifier.

About 22,413 tons of ore from underground work and surface dumps were milled during the year, at an average daily rate of 76 tons.

An average of 68 men was employed, of whom 30 were on the surface, and 38 underground.

La Rose Mine

The La Rose property consists of one claim on lots 4 and 5, concession VI, Coleman township, on the Ontario Northland railway.

Operations were carried on throughout 1952. The vertical two-compartment main shaft is 250 feet deep, with levels at 62, 157, and 240 feet. During the year a new single-drum, electric hoist was installed to replace the air hoist.

The company carried on some stoping operations from the 205-foot level of the Nipissing-O'Brien mine, and a connection was made between that level and the 157-foot level of the La Rose mine. The La Rose 157-foot level is 65 feet below the Nipissing-O'Brien 205-foot level.

A winze, which runs from the 240-foot to the 665-foot level, was partially dewatered.

A crosscut on the 157-foot level was driven across the Right-of-Way property under the Ontario Northland railway to develop the No. 10 vein system.

The following development work was done during the year: drifting, 2,911 feet; crosscutting, 848 feet; raising, 756 feet. The total development work at December 31, 1952, was as follows: drifting, 3,375 feet; crosscutting, 1,082 feet; raising, 1,012 feet. Diamond-drilling in 1952 consisted of 3 holes, totalling 883 feet, from surface, and 36 holes, totalling 5,610 feet, from underground.

About 31,021 tons of ore, mainly cobalt, were hoisted.

A new mill was built at the La Rose mine and began production in September. About 11,588 tons of ore were treated at an average daily rate of 104 tons.

An average of 106 men was employed, of whom 55 were on the surface, and 51 underground.

M. C. Halstead was assistant manager and Roger Gareau was superintendent of the La Rose mine.

Siscoe Metals of Ontario, Limited

Siscoe Metals of Ontario, Limited, is a wholly-owned subsidiary of Siscoe Gold Mines, Limited. It was incorporated in September, 1950, to succeed Siscoe Metals, Limited. The authorized capitalization is 4,000 shares of no par value, of which 2,000 have been issued. The officers and directors are: J. B. Lynch, president; Auguste Desilets, vice-president; Thomas Guerin, comptroller; C. M Masterman, secretary-treasurer; G. C. Smith, Dr. W. F. James, and A. K. Cameron, directors. The head office is at 907 Dominion Square Building, Montreal. The mine address is O'Brien.

The company's property consists of approximately 547 acres in Nicol and Haultain townships, Gowganda area, district of Timiskaming.

Operations were continued throughout 1952. During the summer the 75-ton mill at the main shaft was used to treat approximately 3,000 tons of ore from the Mann and 1,000 tons from the Bartlett property. At the end of September the mill was leased on a monthly basis to New Morrison Mines, Limited.

The No. 2 mill treated 64,248 tons of old tailings and 29,446 tons of ore from the mine and surface dumps, an average of 181 tons per day.

The development of the No. 20 winze area, begun in 1951, was continued. The winze was dewatered. Later, stoping operations from the 350-foot level of the main zone reached the bottom level of the winze.

Development work during 1952 consisted of: drifting, 356 feet; crosscutting, 140 feet; raising, 287 feet. The total development work at December 31, 1952, was as follows: drifting, 42,370 feet; crosscutting, 12,419 feet; raising, 2,201 feet

Diamond-drilling in 1952 consisted of 6 holes, totalling 1,845 feet, from surface, and 152 holes, totalling 11,627 feet, from underground.

An average of 94 men was employed, of whom 43 were underground and 51 on the surface. G. Shartner is mine manager.

Mann Option

Early in 1952 the company took an option on 13 claims of the Mann property, in concessions II, III, and IV, Milner township, district of Timiskaming. The property is on a diabase ridge half a mile west of the northwest arm of Gowganda Lake.

The two-compartment, vertical No. 3 shaft was dewatered to the third, or 200-foot level. The No. 4 shaft, which is connected to No. 3 on the 80-foot level, was also dewatered.

No development work was done, and no ore was hoisted. Diamond-drilling consisted of 36 holes, totalling 2,867 feet, from underground.

About 3,094 tons of ore from the surface dump were milled.

A frame building was erected to house the compressor and diesel engine.

The option was dropped at the end of the year.

An average of three men was employed under the direction of E. Pearson.

United Cobalt Mines, Limited

United Cobalt Mines, Limited, was incorporated in April, 1944, to succeed the Ausic Mining and Reduction Company. In June, 1951, the company was reorganized, and new shares were issued on a basis of one new for two old shares. The authorized capitalization is 4,000,000 shares of $1 par value, of which 1,360,973 have been issued. The officers and directors are: A. W. White, president; T. M. Fyshe, vice-president; L. W. McIlmurray, secretary-treasurer; A. B. Pilliner, W. R. Salter, and H. G. Miller, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Box 250, Cobalt.

The company owns four claims in lot 9, concession I, Bucke township, district of Timiskaming, known as the Genesee group, and one claim in lot 3, concession VI, Coleman township, district of Timiskaming, known as the Silver Cliff.

No underground work was done in 1952. The mill on the Silver Cliff property continued to operate throughout the year. About 29,523 tons of custom ore, mainly from the Harrison-Hibbert and Mensilvo mines, was treated, at an average daily rate of 81 tons.

An average of 16 men was employed. K. J. Benner is manager.

TALC

Canada Talc Industries, Limited

Canada Talc Industries, Limited, was incorporated in July, 1951, with an authorized capitalization of 1,000,000 shares of no par value, of which 850,007 have been issued. The officers are: H. L. Roscoe, president; N. C. Urquhart, vice-president; J. R. Bradfield, secretary; C. H. Windeler, treasurer. The head office and mine office are at Madoc.

The company's property in Huntingdon, Elzevir, and Madoc townships, Hastings country, includes the Conley and Henderson mines.

Operations continued throughout 1952. Ore was drawn mainly from shrinkage stopes on the 270-foot level of the Conley section. Development on this level during the year consisted of 42 feet of drifting, 33 feet of crosscutting, and 78 feet

of raising. On the 7th level of the Henderson section, about 56 feet of drifting and 75 feet of crosscutting were done. Diamond-drilling amounted to seven holes, totalling 615 feet, from underground.

About 12,973 tons of ore were hoisted and milled, at an average daily rate of 50 tons.

H. E. Roscoe is manager, employing an average of 18 men.

METALLURGICAL WORKS

Algoma Steel Corporation, Limited

The Algoma Steel Corporation, Limited, was incorporated in December, 1934. The authorized capitalization is 4,000,000 shares of no par value, 1,650,800 of which have been issued. The officers and directors are: Sir James Dunn, president; H. G. MacAdam, secretary; E. W. Shell, treasurer; J. A. McPhail, E. G. McMillan J. A. Simard, L. H. Timmins, Hon. T. A. Crerar, H. S. Hamilton, D. S. Holbrook, G. C. Bateman, P. G. Dunn, and T. R. McLagan, directors. The head office and blast furnaces are at Sault Ste. Marie.

Operations continued throughout 1952. Nos. 1, 3, 4, and 5 blast furnaces operated continuously. No. 3 furnace was shut down from April 1 to May 11 for relining. A total of 1,101,352 tons of iron was produced.

A sinter plant to agglomerate fines and calcines into suitable feed for blast furnaces was constructed, and operated from October 8 to December 31, producing 85,404 tons of sinter.

The construction of a sixth blast furnace was well advanced at the end of the year.

O. H. Hugill is blast-furnace superintendent. An average of 500 men was employed.

Canadian Furnace Company, Limited

The Canadian Furnace Company, Limited, was incorporated in June, 1951, to succeed Canadian Furnace, Limited. The authorized capitalization is 50,000 shares of no par value, of which 25,000 have been issued. The officers and directors are: Sir James Dunn, president; H. J. Allen, vice-president and general manager; D. S. Holbrook and E. G. McMillan, vice-presidents; H. G. MacAdam, secretary; J. B. Barber, treasurer; T. R. McLagan, director. The head office is at Sault Ste. Marie. The plant is at Port Colborne.

During 1952 the No. 1 furnace produced 157,847 tons of pig iron, and the No. 2 furnace 61,461 tons.

Thomas Cordner is superintendent. An average of 190 men was employed.

Canadian Industries, Limited

The sulphuric acid plant of Canadian Industries, Limited, at Copper Cliff, continued to operate throughout 1952 and produced 51,214 tons of sulphuric acid, a daily average of 140 tons.

A new plant for the manufacture of liquid sulphur dioxide was built and equipped. It operated from October 22 to the end of the year, and produced 2,909 tons of liquid sulphur dioxide.

An average of 51 men was employed. R. W. Allgood is works manager.

Deloro Smelting and Refining Company, Limited

The Deloro Smelting and Refining Company, Limited, was incorporated under Dominion charter in July, 1916. In November, 1936, it was converted into a private company by supplementary letters patent. The officers and directors are: B. A. O'Brien, president; Alan Scott, managing director; N. P. Langford, secretary-treasurer; J. A. O'Brien, M. J. O'Brien, Jr., J. S. Carter, and W. S. Kirkpatrick, directors. The head office and plant are at Deloro.

Operations at the plant continued throughout 1952.

An average of 263 men was employed. R. G. Walsh is general manager.

Dominion Foundries and Steel, Limited

Dominion Foundries and Steel, Limited, was incorporated in May, 1917, with an authorized capitalization of 80,000 shares of preferred stock of $100 par value and 5,000,000 shares of common stock of no par value. The officers are: F. A. Sherman, president; F. A. Loosley and F. H. Sherman, executive vice-presidents; D. O. Davis, A. C. Anderson, R. R. Craig, and D. F. Hassel, vice-presidents. The head office and plant are at Hamilton.

The plant operated throughout 1952.

An average of 72 men was employed. H. C. Taylor is blast furnace superintendent.

Steel Company of Canada, Limited

The Steel Company of Canada, Limited, was incorporated in June, 1910, with an authorized capitalization of 2,000,000, 7 percent, cumulative preference shares of $5 par value, of which 1,299,260 have been issued, and 3,000,000 common shares of no par value, of which 2,300,000 have been issued. The officers and directors are: H. G. Hilton, president; G. B. Elwin, vice-president and treasurer; H. S. Alexander, secretary; E. G. Baker, Hon. C. A. Dunning, H. M. Jaquays,[1] Frederick Johnson, L. L. Lang, R. H. McMaster, Hon. S. C. Mewburn, W. Taylor-Bailey, The Rt. Hon. Sir Thomas White, and R. A. Laidlaw, directors. The address is Hamilton.

The construction of the new D furnace was completed in 1952.

The following table shows the number of days each furnace operated in 1952 and the number of tons of pig iron produced:

Furnace	Operated	Pig iron produced
	days	tons
A	356	106,033
B	365	249,250
C	320	339,080
D	21	18,560

An average of 326 men was employed. J. S. McMahan was blast furnace superintendent.

[1]Deceased.

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PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-SECOND ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXII, PART 3, 1953

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PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO
Printed and Published by Baptist Johnston, Printer to the Queen's Most Excellent Majesty
1954

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Natural Gas in 1952

By R. B. Harkness

General[1]

The total quantity of natural gas produced in Ontario in 1952 was 8,302,190 M cubic feet, which is 120,652 M cubic feet less than in 1951. The total quantity of gas imported was 5,982,383 M cubic feet, and of supplementary gases 243,621 M cubic feet, making a grand total of 14,528,194 M cubic feet available for distribution as against 13,859,841 M cubic feet in 1951; this is an increase of 668,353 M cubic feet. Details are given in Table I.

Imports of natural gas from the United States increased in 1952 by 2,300,344 M cubic feet. This has greatly improved the pressure of the storage fields and the reserve of gas underground. These storage fields are in Dawn township, Lambton county, and Humberstone township, Welland county.

The quantity of propane and oil gas used is again less than that of the previous year. They are much more expensive than natural gas, and their measurement and combustion present certain difficulties because of their greater specific gravity. These gases are only used on very cold days to meet peak demands. During the war years, consumers from St. Thomas to Ancaster were supplied entirely with propane gas in the winter months.

In the eastern part of the gas fields, activity continues; three new syndicates entered the Welland field in 1952. Inspector G. H. Smith reports that the pool in Humberstone township, which is being used for storage purposes, is a success; there are 17 wells used for injecting gas. When this work was begun, the pressure in the field was 23 pounds per square inch. In 1951 this was increased to 100 pounds per square inch. In 1952 a 150-horsepower compressor was installed, and the pressure raised to 200 pounds per square inch. Two 75-horsepower compressors at the Peace Bridge at Fort Erie help push this gas, imported from Buffalo, to the storage field. When gas is drawn from the field in the winter months, these compressors change the direction of the flow to Niagara Falls.

In the Haldimand field, pressure has been greatly reduced, and in winter, compressors must be used to market this gas. Local demands cannot now be met from the Haldimand field, and additional supplies are procured from the Dawn gas storage through an 8-inch pipeline, 9 miles long, from Ancaster to Caledonia, where there is a compressor. The Dominion Natural Gas Company, Limited, installed a 300-horsepower compressor at their 10-inch transmission line south of London to assist in moving the gas received from the Union Gas Company of Canada, Limited's, Dawn field to markets between St. Thomas and Brantford.

W. D. Brittain, gas and oil inspector, reports that in the year 1952 the Union Gas company had a greater available supply of gas and greater reserves than for many years in the past. Their rates were favourable, and their sales increased 2½ percent. Exploration results were encouraging, and large additional reserves were assured by contracts with Imperial Oil, Limited, which now owns many gas wells of large capacity.

[1]An error in last year's report (Volume LXI, part 3, 1952) gave the probable capacity of reefs in the Guelph formation of Lambton county as, "from 10,000 M to 15,000 M cubic feet." This should read, "from 10,000,000 M to 15,000,000 M cubic feet."

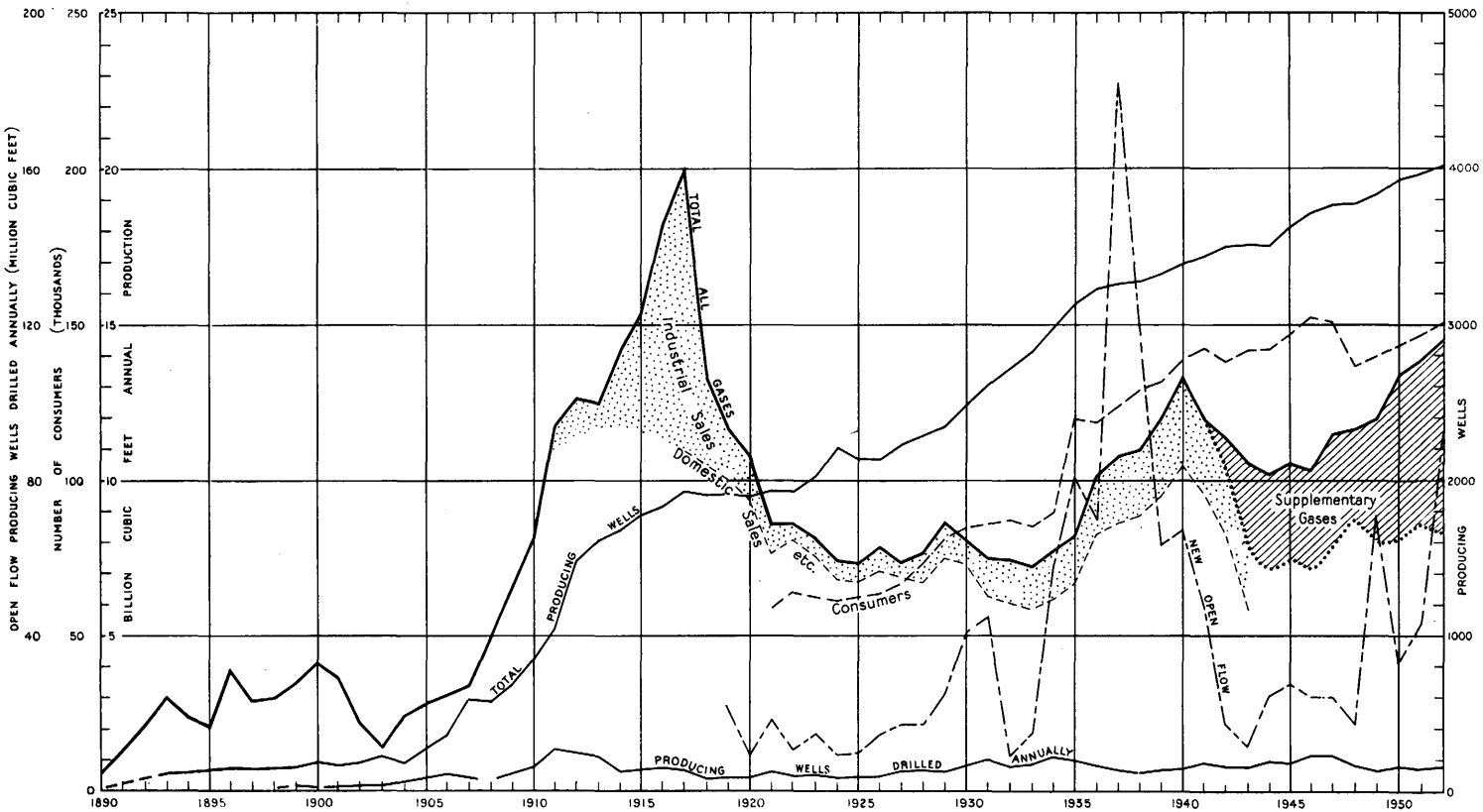
The Union Gas Company of Canada, Limited, made many changes and extensions in its system to insure efficient service to its consumers. The most important work was the doubling of the Dawn-London line from Oakdale to the Thames River crossing to complete the work of former years. Field lines were laid in the Wardsville field, connecting all wells and a transmission line from this field to the Dawn-London line. A low-pressure distributing plant was installed in Newberry and supplied from this pipeline.

TABLE I—NATURAL GAS PRODUCTION BY FIELDS, 1952

County	Field	Quantity
		M cu. ft.
Essex	Kingsville and Leamington	17,183
Kent	Tilbury	1,623,281
	Dover	110,853
	Electric	11,416
	Declute	289,395
	Chatham and Camden gore	87,577
	Zone	115,100
Lambton	Dawn	744
	Moore (Kimball-Payne)	2,651,432
	Becher	44,707
Middlesex and Elgin	Mosald	298,246
Elgin	Bayham and Malahide	20,429
Haldimand, Lincoln, Wentworth	Haldimand	1,594,783
Brant	Brant	21,519
Norfolk	Norfolk	546,282
Oxford	Brownsville	21,661
	Norwich	34,554
Welland	Welland	686,528
Wells in surface drift	Harwich and Howard	6,500
Private wells		120,000
Total produced		8,302,190
Retail value		$9,946,024
		M cu. ft.
Gas distributed other than natural gas produced in Ontario:		
Still gas		193,655
Imported mixed gas		482,102
Natural gas imported from U.S.A. (Texas panhandle)		5,500,281
Oil gas		41,194
Propane gas		8,772
Total of other gases		6,226,004
Total of all gases distributed		14,528,194

For the past 45 years, Windsor has been supplied with gas from the Port Alma station in the Tilbury field. The imports of natural gas from the United States and the laying of the 16-inch line from Windsor to the Dawn field have completely changed these conditions. From May to October, Windsor can be supplied directly with this imported gas as it passes through Windsor on its way to the storage field in Dawn township. For the remainder of the year, the flow of gas is reversed, and gas stored in the Dawn field may return to Windsor; however, there is sufficient gas in the old Tilbury field to supply part of Windsor's demand.

A rotary drilling rig was tried out in Ontario a few years ago with indifferent success; lack of the right parts for the rig was blamed. In 1952 the Dow Chemical of Canada, Limited, brought a rotary drilling rig from the United States and



The Development of the Natural Gas Industry in Ontario, 1890–1952.

drilled two wells to the salt beds at approximately 2,000 feet. The Sun Oil Company, Limited, also used the same drilling rig to drill two wells to the salt beds. These wells will be used by the Sun Oil company to introduce liquid petroleum gases into underground storage. After the wells were drilled, fresh water was poured underground. This dissolved the salt, which was pumped out as brine, and left a cavity that will be filled with liquid petroleum gases, propane or butane, under pressure.

Gravimetric exploration was continued in 1952 by Imperial Oil, Limited, and the Union Gas company. New fields were found in Dawn, Enniskillen, and Moore townships, Lambton county, and a well in Harwich township, Kent

TABLE II—GAS WELLS AND THEIR PRODUCTION, 1952

County and township	Wells as at December 31, 1952			New wells drilled 1952			Production	Rock pressure
	Producing	Idle	Abandoned	Dry	Producers	Open flow		
						M cu. ft.	M cu ft.	lb. per sq. in.
ESSEX:								
Gosfield South	16	3	3	1			15,183	165
Malden		5		1				395
Mersea	3						2,000	285
Tilbury West		3						445
KENT:								
Camden gore	15	2					2,377	586
Chatham	21		2				85,200	422
Chatham gore		2		1				745
Dover	12						122,269	137
Harwich		1		4	1	450		768
Raleigh (Declute)	28	3	7				289,395	235
Raleigh	17	1	1					253
Romney	119	5	3		2	1,230	1,623,281	127
Tilbury East	105	1						141
Zone	49						115,100	414
LAMBTON:								
Bosanquet				1				
Brooke				1				
Dawn	12	12	1	2	1	6,014	744	399
Enniskillen	1		3	10	1	353		500
Euphemia				1				
Moore	18	8		5	4	51,475	2,651,432	774
Plympton				3				
Sarnia				3				
Sombra	2	14		14	3	22,010	44,707	775
Warwick				2				
MIDDLESEX:								
Mosa	10	2			3	830		738
ELGIN:							298,246	
Aldborough	20	5		2	10	2,902		695
Dunwich	1	5						704
Bayham	26	6						165
Malahide	3	12	2		1	17	20,429	320
Yarmouth		5						320
Bayham (Brownsville)	5							335
OXFORD:							21,661	
Dereham (Brownsville)	6							340
South Norwich	7		1	1	2	75	34,554	400
West Oxford				3				

TABLE II—GAS WELLS AND THEIR PRODUCTION, 1952—*Continued*

County and township	Wells as at December 31, 1952			New wells drilled 1952			Production	Rock pressure
	Producing	Idle	Abandoned	Dry	Producers	Open flow		
						M cu. ft.	M cu ft.	lb. per sq. in.
NORFOLK:								
Charlotteville	25	.....	.....	3	6	335		217
Houghton	7	.....	.....	.....	.....	.....		350
Middleton	41	.....	.....	2	4	279		200
North Walsingham	45	.....	.....	5	8	919	546,282	306
South Walsingham	24	.....	.....	.....	.....	.....		289
Townsend	57	2	2	.....	.....	.....		202
Windham	39	1	.....	3	8	1,133		263
Woodhouse	135	5	6	5	2	317		194
BRANT:								
Onondaga	3	4	.....	.....	.....	.....	21,519	55
Tuscarora	22	.....	3	.....	.....	.....		106
WENTWORTH:								
Binbrook	28	1	4	.....	4	57		52
Glanford	8	.....	.....	.....	.....	.....		36
HALDIMAND:								
Canborough	139	.....	12	1	3	38		86
Dunn	180	1	1	5	16	844		170
Moulton	125	1	9	5	13	352		143
North Cayuga	204	3	13	.....	4	99		129
Oneida	121	.....	7	4	8	335		90
Rainham	232	13	7	.....	3	58	1,594,783	127
Seneca	102	4	5	.....	.....	.....		61
Sherbrooke	24	.....	.....	1	2	105		163
South Cayuga	120	1	2	2	.....	.....		155
Walpole	495	8	7	4	6	177		160
LINCOLN:								
Caistor	102	.....	2	1	5	105		77
Gainsborough	6	1	1	.....	.....	.....		62
Louth	.....	.....	.....	1	.....	.....		.....
WELLAND:								
Bertie	238	6	14	6	8	142		100
Crowland	50	.....	2	3	4	35		25
Humberstone	119	24	1	4	21	1,874		60
Pelham	2	.....	.....	4	2	46	686,528	153
Stamford	5	.....	.....	.....	.....	.....		45
Thorold	29	.....	2	2	1	3		110
Wainfleet	35	4	1	4	3	44		58
Willoughby	86	.....	2	2	6	69		70
SURFACE WELLS:								
Harwich and Howard	55	.....	.....	.....	.....	.....	6,500	.....
PRIVATE WELLS	447	.....	.....	.....	.....	.....	120,000	.....
Total	3,846	174	126	122	165	92,722	8,302,190	.....

The columns "Acres under lease" and "Rentals paid," formerly included in this table have been omitted. These figures are not available by townships, and it is impossible to obtain an accurate break-down. The totals for the province are:

Acres under lease	931,765
Rentals paid	$577,097

county, may indicate a gas pool. One well in lot 18, concession VII, of Moore township is as large as the well brought in, in lot 21, concession VII, Moore township, in 1949. Development work continued in Lambton and adjacent counties. The Sun Oil company has entered the Province, and an extensive leasing campaign is in progress. With these large companies in the field, the oil and gas resources of Ontario should be throughly tested.

Changes and Improvements

Inspector Brittain reports that the Union Gas Company of Canada, Limited, has made many changes and extensions to its system to insure efficient service to customers.

As well as the changes already mentioned, this company has laid field lines in the Wardsville pool and connected it to the London line. Fifty-three miles of double and triple sections of the Port Alma–Windsor line, now very old, were replaced by 40 miles of single line of 8-inch and 10-inch diameter. In addition to this, the Union Gas company laid 1⅕ miles of 4-inch, 2 miles of 3-inch, and ½ mile of 2-inch pipe in the gas fields, and 2 miles of 4-inch, 2¼ miles of 3-inch, and 6¼ miles of 2-inch pipe in low-pressure distribution plants. Major extensions were made in low-pressure distributing plants. In Windsor, 9 miles, and in Chatham, 1¾ miles, of all sizes of pipe were laid.

Considerable extensions were made in low-pressure distributing plants by the Union Gas company; 9 miles of pipe were laid in Windsor, 7 miles in Sarnia, and 1¾ miles in Chatham of all sizes of pipe. Other replacements were, 1⅕ miles of 4-inch, 2 miles of 3-inch, and ½ mile of 2-inch pipe in the gas fields. In distributing plants, 2 miles of 4-inch, 2¼ miles of 3-inch, and 6¼ miles of 2-inch pipe were laid.

The Western Ashley Minerals, Limited, have several producing wells in the Wardsville field. The production from these wells has been contracted for by the Dominion Natural Gas Company, Limited, and the Western Ashley company has laid 6½ miles of 6-inch pipe to connect these wells to the Dominion company's transmission line at Rodney.

Inspector G. H. Smith reports also that The Provincial Gas Company, Limited, has replaced 8,200 feet of 8-inch pipe with the same length of 10-inch pipe to the west of the Peace Bridge to facilitate the transmission of natural gas from Buffalo to the storage pool in Humberstone township and, in the winter months, in the opposite direction to Fort Erie and Niagara Falls. A 150-horsepower compressor was installed at the storage pool and greatly increased the storage pressure; two 75-horsepower compressors were placed at the western outskirts of Fort Erie to assist deliveries.

Production

Table I gives the production of natural gas by fields and the amounts of supplementary and imported gases used to make up the deficiency of natural gas in Ontario. The increased supply of imported natural gas has given operators an opportunity to shut in wells that have been in continuous operation for many years and to make repairs hitherto difficult or impossible when the wells were being operated.

Of the old gas fields, only Norfolk and Welland counties show an increase in production. This is because of increased drilling. The Welland field has not been enlarged, but new wells of small capacity are being drilled in areas that are known to have a thinner "pay." The Norfolk field is gradually expanding to the southwest into Walsingham township. The Moore field shows an increase in production

of just over 10 percent; another large well has increased the potential of this field, and it is now the largest single gas field in Ontario, covering 1,900 acres. Slight variations in the production of any one field, with the exception of the Haldimand field, are now of little significance. With present reserves in Kent and Lambton counties, any of the older fields could be closed in the summer months without affecting the service to consumers or, by operating the present compressor capacity, the production of a field might be abnormally increased. In order to gauge the condition of any field in Ontario, it is better to examine the number of wells and the rock pressures given in Table II.

Table II gives details of gas wells and their production in Ontario. This table has been published since 1921, and an examination of former annual reports will give the story of their growth or decline.

Lambton county again has the wells with the greatest open flow. A study of the table shows that the average new well in Kent county had an open flow of 560 M cubic feet; Lambton county, 8,984 M cubic feet; Elgin county, 341 M cubic feet; Oxford county, 32 M cubic feet; Norfolk county, 103 M cubic feet; Haldimand county, 32 M cubic feet; and Welland county, 49 M cubic feet. The total open flow of new wells was 92,727 M cubic feet. This is 50,785 M cubic feet more than in 1951.

A total of 287 wells was drilled in 1952, or 24 more than in 1951. Of these, 122 were dry, and 165 were producing wells. In 1951, 146 dry holes and 117 producing wells were drilled. The total footage drilled in 1952 was 341,099; for dry holes, 177,684, and for producing wells, 163,415.

A new column, "Idle," appears in this table. Idle wells have been a matter of concern for many years, and the question has been discussed in the report for 1950.[1] Since then an effort has been made to report idle wells, and Table II shows the number idle at the end of the year. This figure differs for every month of the year as there are wells idle, from time to time, in every field.

TABLE III—SUMMARY OF GAS DISTRIBUTION, 1948–52

	1948	1949	1950	1951	1952
	M cu. ft.	M cu. ft.	M cu. ft.	M cu. ft.	M cu. ft.
Total distribution to customers	9,422,845	9,025,107	10,460,830	11,206,441	11,682,773
Used by companies for all purposes	306,085	403,055	457,912	603,300	477,253
Used by private well owners	66,500	86,500	126,500	126,500	126,500
Leakage in transmission lines	162,541	456,048	515,353	527,877	207,733
Leakage in distribution plants	359,661	364,219	314,242	245,503	183,970
Leakage in rural lines	35,162	33,379	34,348	35,949	36,525
Used in gas-manufacturing plant (Hamilton)	.....	.....	.....	.....	64,816
Natural and still gas to storage	1,162,932	1,748,065	1,499,560	1,114,271	1,748,624
Total amount distributed	11,515,726	11,916,373	13,408,745	13,859,841	14,528,194
Amount other than natural gas produced in Ontario included in totals (see Table I)	2,925,297	3,892,160	5,399,257	5,416,499	6,226,004

Distribution and Rates

Distribution continues to increase annually. The total for 1952, 14,528,194 M cubic feet, shown in Table III, includes 6,226,004 M cubic feet of supplementary gases. Details of these gases are given in Table I.

[1] R. B. Harkness, *Natural Gas in 1950*, Ont. Dept. Mines, Vol. LX, 1951, pt. 3, p. 16.

Table IV gives the rates charged for gas delivered in Ontario. A revision made in November, 1951, has simplified the hitherto complicated system of rates charged by the Dominion Natural Gas Company, Limited.

TABLE IV—NATURAL GAS RATES, 1952

Classification	Company	Amount of gas used	Net rate
A[1]	Dominion Natural Gas	First 1,000 cu. ft. or less Over 1,000 cu. ft.	$1.60 $1.09
B	Central Pipe Line	Minimum bill and meter rental First 1,000 cu. ft. Second 1,000 cu. ft. Next 2,000 cu. ft. Next 3,000 cu. ft. Over 7,000 cu. ft.	$2.00 $2.00 per M cu. ft. $1.10 per M cu. ft. $1.25 per M cu. ft. $1.75 per M cu. ft. $2.00 per M cu. ft.
C	Norotto Gas	First 200 cu. ft. Over 200 cu. ft. Minimum bill	40c. per C cu. ft. $1.00 per M cu. ft. $1.50
D	Provincial Gas (where imported mixed gas is used) (summer consumers)	Minimum bill 1,000 cu. ft. and over ..... Minimum bill 1,000 cu. ft. and over	$1.00 $1.00 per M cu. ft. Same as above plus pro rata share of duty $1.30 $1.30 per M cu. ft.
E	Pure Gas and Oil	First 1,000 cu. ft. Over 1,000 cu. ft.	$1.50 $1.06
F	Union Gas	First 200 cu. ft. Next 1,800 cu. ft. Next 8,000 cu. ft. Over 10,000 cu. ft.	50c. per C cu. ft. 95c. per M cu. ft. $1.05 per M cu. ft. $1.00 per M cu. ft.
G	United Development	First 1,000 cu. ft. 1,000–6,000 cu. ft. Over 6,000 cu. ft. effective Dec. 1, 1952	$2.35 $1.50 $1.35

[1]This classification is liable to a surcharge as directed by The Natural Gas Referee in an order dated November 29, 1951, as follows:

(a) for all gas sold and supplied by the Applicant [the Dominion Natural Gas Co.] in the Counties aforesaid . . . after the 1st day of December 1951 a supplemental rate shall be fixed in addition to the uniform standard rates . . . and that such supplemental rate shall be based on the actual expenses incurred exclusively in manufacturing oil-gas and other liquefied petroleum gases and/or in purchasing other gas to supplement the Applicant's supply of natural gas at a price in excess of the highest price paid to any producer of natural gas in Ontario who sells substantially his whole output thereof to the Applicant on an annual basis, which supplemental rate shall be determined and adjusted from year to year in accordance with the following requirements and shall apply per 1000 cubic feet of gas sold by the Applicant:

(i) prior to the 1st day of October in each year the Applicant shall estimate the total expenses to be incurred in manufacturing oil-gas and/or acquiring supplemental gases for the next ensuing twelve (12) months; from such estimate, the Applicant shall deduct the sum of $33,000, established as the stand-by expense of the plants of the Applicant available for the production of manufactured gas (oil-gas, propane and other liquefied petroleum gases); the supplemental rate shall be determined by dividing the balance of such estimate by the estimated total sales of gas (in thousands of cubic feet) to be made by the Applicant during the next ensuing twelve (12) months;

(ii) the estimated supplemental rate fixed from time to time in accordance with the next foregoing clause (a) shall be operative for the appropriate period of twelve (12) months after the 1st day of October, 1948;.....

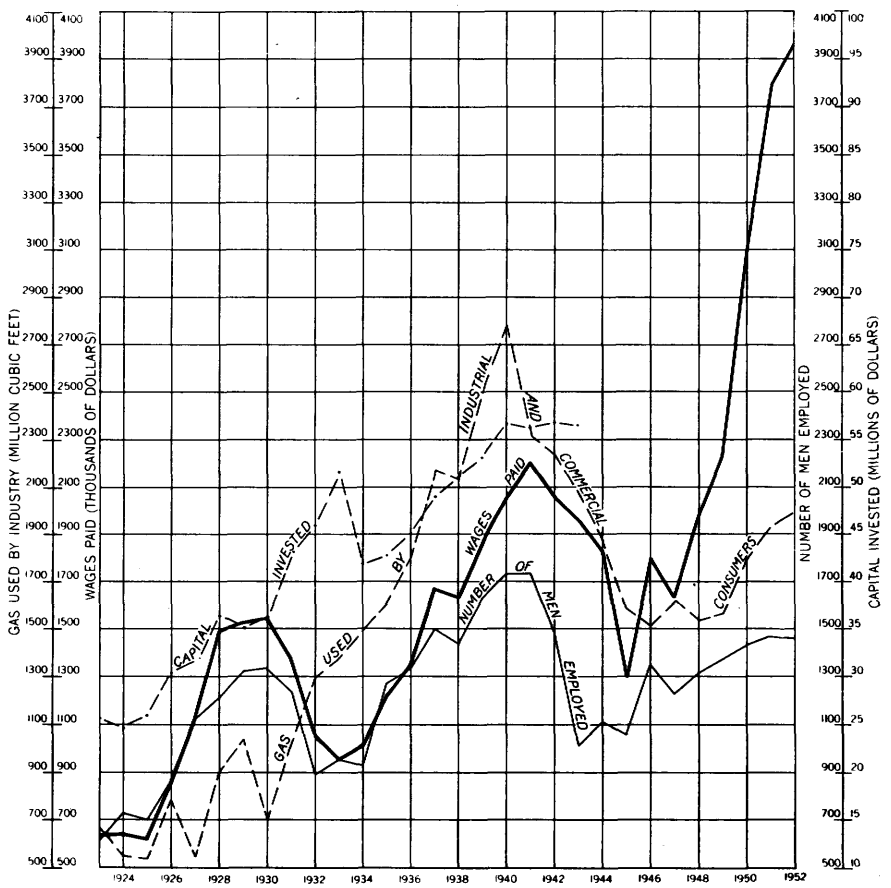
(iii) prior to the 1st day of October in each year after the 1st of October 1949 . . . the Applicant shall determine from its books and records the actual expenses incurred exclusively in manufacturing and acquiring supplemental gas for the period of twelve (12) months next preceding

Consumption

Table V, formerly an extensive table, which had been published since 1921, has been, to a large extent, replaced by the graphs shown on this page and on page 10. The old table had become too cumbersome for further extension. Exact figures for past years may be obtained in reports prior to 1950.

TABLE V—DOMESTIC CONSUMPTION AND EMPLOYMENT STATISTICS, 1952

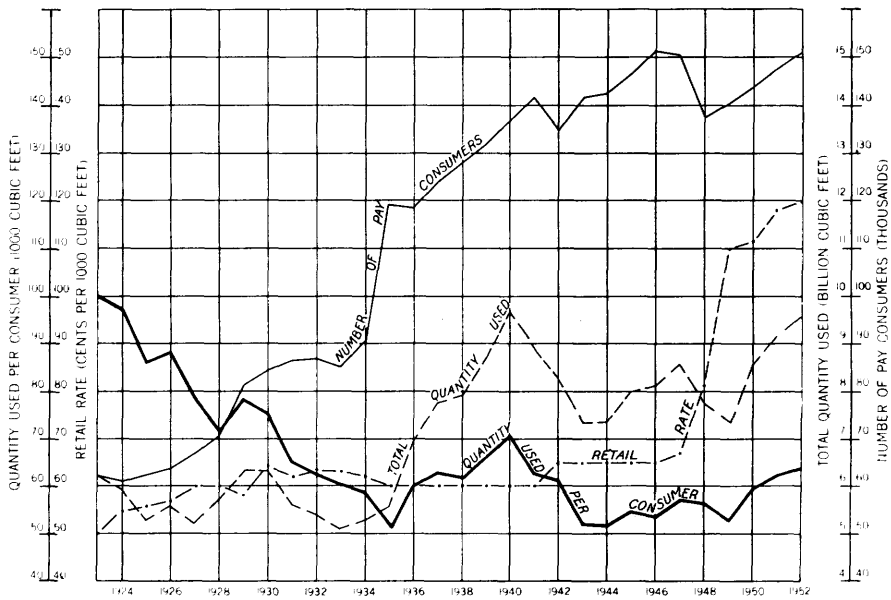
PRIVATE:		
Number of consumers		151,747
Total consumption	M cu. ft.	9,619,670
Average consumption	M cu. ft.	63.4
Average retail rate per M cu. ft.		$1,198
INDUSTRIAL:		
Total consumption	M cu. ft.	1,994,953
EMPLOYMENT:		
Total employees		1,461
Total salaries and wages paid		$3,968,682



Data relating to natural gas in Ontario, 1923–52.

the 1st day of September of such year and if such actual expenses are greater or less than the total sum collected by the Applicant by means of the supplemental rate for the period of twelve (12) months next preceding the 1st day of September of such year then the estimate of the total expenses to be incurred during the period of twelve (12) months next ensuing after the 1st day of October in such year (to be calculated as aforesaid) shall be debited or credited with the amount of such difference;

(iv) that such supplemental rate shall be charged and bill as a net rate and no deduction shall be made at the time of payment;



Data relating to the domestic use of natural gas in Ontario, 1923–52.

TABLE VI—GAS CONSUMPTION IN CITIES AND TOWNS, 1952

City or town	Population	Number of consumers		Quantity consumed			Net rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
				M cu. ft.	M cu. ft.	M cu. ft.	
Alvinston	678	284	....	24,494	.....	25	F
Aylmer	3,645	1,041	....	33,054	.....	.....	B
Beachville	660	42	....	2,777	.....	.....	$1.00
Belle River	1,487	375	....	31,856	.....	259	F
Belmont	428	182	....	5,835	.....	.....	F
Blenheim	2,598	891	....	84,559	.....	1,251	F
Bothwell	727	235	....	23,238	.....	577	F
Brantford	37,295	6,211	....	231,111	.....	26,484	A
Brownsville	232	81	....	7,002	.....	.....	A and D
Caledonia	1,700	626	3	36,588	450	1,256	80c
Cayuga	716	236	....	17,677	.....	150	A
Chatham	21,730	6,893	....	637,545	.....	36,559	F
Chippawa	1,720	438	....	18,970	.....	.....	D
Comber	545	184	....	20,582	.....	1,544	F
Cottam	564	110	2	6,517	191	458	A
Courtright	571	185	....	16,914	.....	.....	F
Crystal Beach	1,543	735	....	65,217	.....	.....	$1.00
Delhi	2,605	711	1	49,446	155	224	A
Dresden	2,140	767	....	72,821	.....	6,614	F
Dunnville	4,593	1,419	1	120,990	457	979	A
Dutton	820	268	2	18,809	258	592	A
Essex	2,931	848	....	70,113	.....	6,525	F
Fenwick	567	151	....	6,100	.....	269	A

TABLE VI—GAS CONSUMPTION IN CITIES AND TOWNS, 1952—*Continued*

City or town	Population	Number of consumers		Quantity consumed			Net rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
				M cu. ft.	M cu. ft.	M cu. ft.	
Fisherville	216	50	....	3,790	.....	.....	$1.00
Fonthill	1,532	273	....	6,777	.....	.....	A
Fort Erie	8,071	2,195	1	194,771	176	5,694	A
Galt	20,801	2,619	....	98,390	.....	12,486	A
Glencoe	1,305	376	....	40,206	.....	780	F
Grimsby	2,934	572	1	22,533	141	3,122	$1.00
Grimsby Beach	405	178	....	9,904	.....	.....	$1.00
Hagersville	1,718	559	....	38,179	.....	67	A
Hespeler	3,780	681	....	25,215	.....	1,323	A
Highgate	382	132	2	9,609	425	.....	A
Ingersoll	6,448	1,416	....	64,712	.....	5,557	A
Jarvis	651	218	....	15,859	.....	.....	A
Kingsville	2,668	759	....	56,534	.....	1,171	A
Lambeth	1,210	181	....	13,824	.....	389	A
Leamington	7,552	2,102	....	153,000	.....	2,406	$1.05 and $1.34
London	97,109	20,389	....	1,427,530	.....	248,414	A and F
Merlin	673	183	....	18,996	.....	409	F
Merritton	4,909	701	....	26,802	.....	10,887	A
Mount Brydges	666	182	....	15,830	.....	389	F
Niagara Falls	24,158	4,710	5	205,137	905	56,242	B
Norwich	1,419	168	....	10,162	.....	.....	F
Oil Springs	477	114	....	9,376	.....	.....	F
Otterville	600	96	....	6,724	.....	.....	F
Paris	5,337	1,069	....	39,747	.....	933	A
Petrolia	3,130	974	....	79,780	.....	7,011	F
Port Burwell	688	258	....	7,111	.....	.....	A
Port Colborne	12,744	2,995	1	132,446	93	2,241	A
Port Dover	2,411	776	....	53,901	.....	.....	A
Port Rowan	792	258	....	18,781	.....	.....	A
Preston	8,189	1,207	....	44,531	.....	16,366	A
Ridgetown	2,280	863	....	80,596	.....	2,435	F
Rodney	940	304	1	21,020	407	.....	A
St. Catharines	38,619	6,784	....	259,938	.....	109,104	A
St. George	646	151	....	6,318	.....	.....	A
St. Thomas	18,844	3,124	....	141,448	.....	1,548	A
Sarnia	37,480	7,147	....	500,142	.....	153,448	F
Simcoe	7,138	2,199	....	180,294	.....	5,679	A
Smithville	725	249	....	15,180	.....	.....	B
Sombra and Port Lambton	679	293	....	23,347	.....	683	F
Springfield	531	140	....	4,296	.....	.....	B
Thamesville	950	375	....	38,895	.....	875	F
Thorold	6,705	1,305	....	47,759	.....	2,275	A
Tilbury	2,920	811	....	76,503	.....	24,820	F
Tillsonburg	5,387	1,549	....	92,794	.....	1,184	A
Vienna	323	125	3	3,581	513	.....	B
Wallaceburg	7,355	2,426	....	204,201	.....	260,837	F
Waterford	1,695	394	....	22,420	.....	.....	A
Welland	16,292	5,718	5	234,308	647	16,768	D
West Lorne	1,038	248	2	17,919	178	13	A
Wheatley	1,047	306	....	26,489	.....	.....	A
Windsor	125,760	28,253	....	1,873,171	.....	794,467	F
Woodstock	15,834	2,493	....	102,205	.....	2,220	A
Wyoming	777	204	....	15,446	.....	78	F
Total	607,435	134,765	30	8,422,642	4,996	1,836,087	.....

Tables VI and VII show consumption of gas, the number of domestic consumers, and the quantity used by them and by industries in all municipalities in Ontario. The rate per M cubic foot in each municipality is indicated by a letter, details of which can be found in Table IV. These tables have been published every year since 1922.

TABLE VII—GAS CONSUMPTION IN TOWNSHIPS, 1952

County and township	Population	Number of consumers		Quantity consumed			Net rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
				M cu. ft.	M cu. ft.	M cu. ft.	
BRANT:							
Brantford	17,866	435	....	11,642	.....	.....	A
Burford	4,842	30	....	2,449	.....	10,533	A
Onondaga	1,152	55	2	2,931	87	.....	A
South Dumfries	3,116	10	....	675	.....	.....	A
Tuscarora	2,857	54	....	4,779	.....	.....	A
ELGIN:							
Aldborough	2,717	26	....	2,287	.....	9,974	A
Bayham	3,473	412	....	14,783	.....	4,228	A and B
Dunwich	2,138	122	....	7,749	.....	.....	A
Malahide	3,422	207	2	8,471	243	.....	B
Southwold	3,516	307	1	19,106	64	248	A
Yarmouth	6,931	105	....	3,843	.....	.....	A
ESSEX:							
Gosfield North	2,639	160	1	8,413	225	.....	A
Gosfield South	3,242	424	....	30,889	.....	5,864	A
Maidstone	4,369	604	....	37,888	.....	2,516	F
Mersea	6,811	536	3	39,520	347	12,342	A
Rochester	2,285	229	....	18,957	.....	301	F
Sandwich East	17,560	24	....	2,485	.....	.....	F
Sandwich South	3,119	199	....	14,053	.....	1,652	F
Tilbury North	1,963	61	....	4,430	.....	400	F
Tilbury West	1,542	35	....	3,131	.....	.....	F
HALDIMAND:							
Canborough	981	167	30	12,286	8,305	.....	A
Dunn	810	151	6	11,417	2,359	192	A
Moulton	1,865	223	9	13,983	1,843	104	A
North Cayuga	1,311	135	6	8,667	1,138	.....	A
Oneida	1,226	66	6	6,779	994	.....	A
Rainham	1,526	284	20	23,008	3,052	1,500	A
Seneca	1,626	183	15	9,765	2,214	102	A
Sherbrooke	427	49	1	3,746	280	50	A
South Cayuga	599	81	13	4,472	2,221	.....	A
Walpole	3,129	454	39	32,511	5,608	325	A
KENT:							
Camden	2,237	56	....	4,473	.....	.....	F
Chatham	8,541	201	....	15,885	.....	1,092	F
Dover	5,456	534	....	55,725	.....	2,084	A and F
Harwich	6,011	817	....	62,242	.....	126	A and F
Howard	2,878	182	....	15,622	.....	134	A and F
Orford	1,730	51	2	4,786	418	.....	A
Raleigh	5,250	964	6	84,132	1,419	1,517	A and F
Romney	1,538	128	15	11,839	3,750	650	A and F
Tilbury East	2,945	296	6	26,486	1,421	1,077	A and F
Zone	873	73	....	5,119	.....	3,407	F
LAMBTON:							
Brooke	2,060	137	....	10,696	.....	.....	F
Dawn	2,009	211	....	17,808	.....	1,589	F
Enniskillen	2,501	219	....	13,858	.....	2,053	F

TABLE VII—GAS CONSUMPTION IN TOWNSHIPS, 1952—*Continued*

County and township	Population	Number of consumers		Quantity consumed			Net rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
				M cu. ft.	M cu. ft.	M cu. ft.	
LAMBTON—*Continued:*							
Euphemia	1,242	13	....	1,023	.....	.....	F
Moore	4,589	911	....	77,958	.....	1,120	F
Plympton	2,815	7	....	387	.....	.....	F
Sombra	3,279	157	....	10,875	.....	2,611	F
LINCOLN:							
Caistor	1,284	57	....	3,571	.....	16	A and $1.20
Gainsborough	2,137	101	8	6,054	1,315	.....	$1.50
Grantham	16,736	136	....	5,493	.....	.....	A
Louth	4,312	10	....	404	.....	.....	A
MIDDLESEX:							
Caradoc	3,384	36	....	3,124	.....	10,138	F
Delaware	1,406	7	....	486	.....	3,732	F
Ekfrid	1,808	85	....	7,146	.....	120	F
Lobo	2,211	1	....	180	.....	8,409	F
Mosa	1,386	137	....	7,393	.....	50	F
North Dorchester	3,339	198	....	8,019	.....	8,793	A
Westminster	15,793	278	....	19,453	.....	1,235	A and F
NORFOLK:							
Charlotteville	4,418	292	5	16,150	1,022	10,422	A and 77½c.
Houghton	1,852	69	....	2,292	.....	.....	B
Middleton	2,973	272	2	18,960	442	21,231	A
North Walsingham	2,305	38	5	2,054	1,065	10,228	A
South Walsingham	1,933	109	4	4,378	543	666	77½c.
Townsend	4,481	121	....	4,066	.....	5,832	A
Windham	4,519	115	3	6,498	820	3,472	A
Woodhouse	3,446	359	10	21,937	1,925	3,332	A
OXFORD:							
Dereham	3,696	33	....	1,106	.....	.....	B
East Oxford	2,025	14	....	1,162	.....	.....	A
North Oxford	1,276	3	....	159	.....	.....	A
South Norwich	2,414	107	....	8,829	.....	.....	F
West Oxford	2,655	62	1	2,903	150	83	A
WATERLOO:							
North Dumfries	3,076	18	....	798	.....	.....	A
Waterloo	9,535	14	....	900	.....	.....	A
WELLAND:							
Bertie	5,721	1,302	33	116,302	6,029	994	D
Crowland	12,526	122	13	8,424	1,804	.....	D
Humberstone	4,335	549	24	41,275	4,265	1,834	D
Pelham	4,044	116	2	3,765	407	.....	A
Stamford	20,633	433	3	18,970	543	.....	D
Wainfleet	3,516	269	10	22,083	1,805	.....	A
Willoughby	1,182	61	15	5,413	2,644	.....	F
WENTWORTH:							
Ancaster	7,572	320	....	21,843	.....	.....	A
Barton	3,420	42	....	2,054	.....	.....	A
Binbrook	1,414	120	9	8,711	1,642	.....	A
Glanford	2,349	191	2	10,644	745	488	A
Total	336,106	16,982	332	1,197,028	63,154	[1]158,866	.....

[1]Included in this figure is 129,380 M cu. ft. used in tobacco curing and 4,189 M cu. ft. used in drilling.

Leakage

Tables VIII and IX give the details of the leakage in low-pressure distribution plants and rural lines. These tables have been published since 1922 and give information regarding the uncontrollable waste of gas. The report of leakage in transmission lines has been discontinued because of difficulties in measurement. When gas flows in reverse or contains a variety of gases of different and constantly changing specific gravities, orifice-meter measurements are unsatisfactory; for this reason the table has been discontinued.

TABLE VIII—LEAKAGE ON RURAL LINES, 1952

Division	Equivalent feet of 3-inch pipe in rural lines	Leakage for year		Average number of consumers	Leakage per consumer	Average pressure on pipelines	
		Actual	Allowable			Low pressure	High pressure
		M cu. ft.	M cu. ft.		cu. ft.	oz.	lb.
Windsor system	123,730	6,808	4,686	789	8,630	6	5–25
Sarnia system	312,904	18,826	11,852	1,464	12,860	6	3–20
London system	71,138	437	2,694	60	7,280	6	.....
Ridgetown system	129,803	5,208	4,916	810	6,430	6	5–10
Chatham-Dover system	14,518	1,290	550	47	27,450	6	8–12
Raleigh standard line (Blake system)	32,314	3,956	1,224	94	42,090	.....	4
Total	684,407	36,525	25,922	3,264	.....	.....	.....

TABLE IX—LEAKAGE IN DISTRIBUTION PLANTS, 1952

City or town	Company	Equivalent miles of 3-inch pipe in distribution plants	Leakage for year		Average number of consumers	Leakage per consumer	Pressure
			Actual	Allowable			
			M cu. ft.	M cu. ft.		cu. ft.	oz. per sq. in.
Alvinston	Union Gas	6.31	.....	1,262	284	.....	6
Ancaster	Dom. Natural Gas	1.40	105	280	100	1,050	4
Appin	Union Gas	1.05	91	210	53	1,710	5
Belle River	Union Gas	5.54	.....	1,108	375	.....	5
Belmont	Belmont Gas	8.00	7,610	1,600	182	41,810	6
Blenheim	Union Gas	13.92	.....	2,784	891	.....	5
Bothwell	Union Gas	5.69	.....	1,138	235	.....	5
Brantford	Dom. Natural Gas	94.25	14,712	18,850	6,211	2,360	4
Brigden	Union Gas	4.04	475	808	195	2,430	6
Byron	Union Gas	3.12	569	624	105	5,410	6
Cainsville	Dom. Natural Gas	5.57	735	1,114	140	5,220	4
Cayuga	Dom. Natural Gas	5.86	1,004	1,172	236	4,250	4
Chatham	Union Gas	108.16	.....	21,632	6,893	.....	5
Comber	Union Gas	3.54	168	708	184	910	6
Corunna	Union Gas	3.93	18	786	250	70	6
Courtright	Union Gas	4.66	90	932	185	480	6
Delhi	Dom. Natural Gas	7.08	2,538	1,416	711	3,570	4
Dorchester	Dom. Natural Gas	2.86	532	572	155	3,430	4
Dresden	Union Gas	14.00	2,226	2,800	767	2,900	5
Dunnville	Dom. Natural Gas	13.87	2,147	2,774	1,419	1,510	4

TABLE IX—LEAKAGE IN DISTRIBUTION PLANTS, 1952—*Continued*

City or town	Company	Equivalent miles of 3-inch pipe in distribution plants	Leakage for year		Average number of consumers	Leakage per consumer	Pressure
			Actual	Allowable			
			M cu. ft.	M cu. ft.		cu. ft.	oz. per sq. in.
Dutton	Dom. Natural Gas	8.16	2,903	1,632	268	10,830	4
Essex	Union Gas	14.88	.....	2,976	848	.....	5
Fenwick	Dom. Natural Gas	1.51	127	302	151	840	4
Florence	Union Gas	1.89	.....	378	80	.....	6
Glencoe	Union Gas	8.34	.....	1,668	376	.....	5
Hagersville	Dom. Natural Gas	7.38	3,300	1,476	559	5,900	4
Hespeler	Dom. Natural Gas	8.97	.....	1,794	681	.....	4
Highgate	Dom. Natural Gas	2.00	721	400	132	5,460	4
Ingersoll	Dom. Natural Gas	20.82	3,368	4,164	1,416	2,370	4
Inwood	Union Gas	2.12	.....	424	95	.....	6
Jarvis	Dom. Natural Gas	4.05	1,134	810	218	5,200	4
Kingsville	Dom. Natural Gas	13.49	2,023	2,698	759	2,660	4
Lambeth	Dom. Natural Gas	3.84	1,023	768	181	5,650	4
Leamington	Town of Leamington	25.00	17,147	5,000	2,102	8,150	6
London	City Gas	332.85	55,262	66,570	20,389	2,170	5
Merlin	Union Gas	2.78	.....	556	183	.....	6
Merritton	Dom. Natural Gas	4.52	1,380	904	701	1,970	4
Mount Brydges	Union Gas	3.82	.....	764	182	.....	6
North Pelham	Dom. Natural Gas	.72	.....	144	55	.....	4
Norwich	Norotto Gas	25.50	8,681	5,100	371	23,390	4
Oil Springs	Union Gas	1.94	.....	388	114	.....	6
Paris	Dom. Natural Gas	14.92	4,890	2,984	1,069	4,570	4
Petrolia	Union Gas	17.93	4,107	2,586	974	4,220	5
Port Colborne	Dom. Natural Gas	30.40	8,541	6,080	2,995	2,850	4
Port Dover	Dom. Natural Gas	7.94	4,261	1,588	776	5,490	4
Port Lambton	Union Gas	2.36	.....	472	100	.....	6
Preston	Dom. Natural Gas	20.96	403	806	1,207	330	4
Ridgetown	Union Gas	18.32	263	526	863	300	5
Rodney	Dom. Natural Gas	5.39	1,788	1,078	304	5,880	4
St. Catharines	Dom. Natural Gas	68.80	13,291	13,760	6,784	1,960	4
St. George	Dom. Natural Gas	2.11	596	422	151	3,940	4
St. Thomas	Dom. Natural Gas	55.85	5,450	11,170	3,124	1,740	4
Sarnia	Union Gas	116.36	.....	23,272	7,147	.....	5
Sheddon and Fingal	Dom. Natural Gas	6.11	1,283	1,222	165	7,770	4
Simcoe	Dom. Natural Gas	29.69	4,219	5,838	2,199	1,920	4
Sombra	Union Gas	2.72	.....	544	293	.....	6
South London	Dom. Natural Gas	8.87	2,948	1,774	470	6,270	4
Thamesville	Union Gas	7.11	.....	1,422	375	.....	5
Thorold	Dom. Natural Gas	13.19	2,669	2,638	1,305	2,040	4
Tilbury	Union Gas	12.16	.....	2,432	811	.....	5
Tillsonburg	Dom. Natural Gas	23.49	.....	4,698	1,549	.....	4
Wallaceburg	Union Gas	34.59	.....	6,918	2,426	.....	5
Waterford	Dom. Natural Gas	5.88	1,111	1,176	394	2,800	4
West Lorne	Dom. Natural Gas	3.89	1,498	778	248	6,040	4
Wheatley	Dom. Natural Gas	3.46	628	692	306	2,050	4
Windsor	Union Gas	548.20	37,466	109,640	28,253	1,320	5
Woodburn	Dom. Natural Gas	2.03	823	406	54	15,260	4
Woodstock	Dom. Natural Gas	48.45	4,806	9,690	2,493	1,960	4
Wyoming	Union Gas	5.23	296	1,046	204	1,450	6
Total	.....	1,923.84	231,426	377,144	116,471	.....	.....

	M cu. ft.
Actual leakage	231,426
Gain	47,456
Net loss	183,970

Licences Issued in 1952

The Natural Gas Conservation Act, R. S. O. 1950, The Well Drillers Act, R. S. O. 1950, and the Regulations made under these Acts require that the several operations carried out shall be done under licence. Tables X to XIV show lists of those to whom licences were issued during 1952. The licences required under the above acts and the cost of each are as follows:

To Lease and Prospect for Natural Gas	$ 5.00
To Drill or Bore for Natural Gas or Oil	5.00
To Produce Natural Gas	10.00
To Distribute Natural Gas	10.00
To Operate Natural Gas Pipelines	10.00

TABLE X—OPERATORS LICENSED TO LEASE AND PROSPECT FOR NATURAL GAS, 1952

Licence No.	Name	Address
6762	Allen, W.	Grand Bend, Ont.
6750	Altus Oil and Gas Co.	Windsor, Ont.
6728	Anger, G.	Simcoe, Ont.
6755	Ashton, J.	Chatham, Ont.
6711	Austin, G.	Toronto, Ont.
6760	Bass, G.	Toronto, Ont.
6773	Beattie, J.	Glencoe, Ont.
6724	Beattie, J. A.	Glencoe, Ont.
6725	Beattie, R.	Glencoe, Ont.
6729	Blackwell, G.	Port Colborne, Ont.
6743	Blain, J.	Wardsville, Ont.
6721	Boyce, G.	Chatham, Ont.
6744	Burns, R.	Rochester, N.Y.
6746	Caldwell, R.	Chatham, Ont.
6680	Cameron, W.	Blenheim, Ont.
6767	Carrothers, I.	Kerwood, Ont.
6676	Chalton, W.	Ingersoll, Ont.
6696	Coatsworth, T.	Chatham, Ont.
6700	Cole, A.	Chatham, Ont.
6745	Coleman, L.	Blenheim, Ont.
6710	Comfort, A.	Chatham, Ont.
6707	Coste, E. F.	Toronto, Ont.
6703	Coste, L.	Chatham, Ont.
6733	Cronenberg, M.	Toronto, Ont.
6706	Crowland Gas Syndicate	Welland, Ont.
6713	Culver, G.	Dunnville, Ont.
6764	Denison, H.	Napanee, Ont.
6769	Dickinson, C.	Toronto, Ont.
6757	Earl, S.	Kerwood, Ont.
6687	Eaton, B.	Philadelphia, Pa.
6751	Edgar, M.	Dunnville, Ont.
6766	Etienne, A.	Detroit, Mich.
6741	Flum, J.	Rodney, Ont.
6770	Foy, M.	Chatham, Ont.
6768	Fraser, L.	Kirkfield, Ont.
6771	Fraser, W.	Toronto, Ont.
6758	Furry, L.	Dunnville, Ont.
6736	Givens, W.	Philadelphia, Pa.
6777	Green, C.	Wallaceburg, Ont.
6688	Hancock, C.	Philadelphia, Pa.
6752	Hillman, H.	Windsor, Ont.

TABLE X—OPERATORS LICENSED TO LEASE AND PROSPECT FOR NATURAL GAS, 1952 *(Continued)*

Licence No.	Name	Address
6727	House, C.	Stevensville, Ont.
6694	Imperial Oil, Ltd.	Toronto, Ont.
6677	Jamieson, A.	Tillsonburg, Ont.
6704	Julian, S.	London, Ont.
6701	Kenny, A.	Chatham, Ont.
6714	Kerr, C.	Strathroy, Ont.
6719	Kiff, H.	Leamington, Ont.
6720	Kiff, W.	Leamington, Ont.
6749	Killins, H.	Niagara Falls, Ont.
6753	Killins, R.	Niagara Falls, Ont.
6756	Kolko, D.	Windsor, Ont.
6765	L'Heureux, M.	Sarnia, Ont.
6715	McGaffey, E.	Bothwell, Ont.
6683	McKenzie, D.	Sarnia, Ont.
6692	McKillop, W.	Hamilton, Ont.
6682	McLean, A.	Rodney, Ont.
6679	McMillan, G.	London, Ont.
6739	Mahaffy, A.	Toronto, Ont.
6734	Maracarden Oil, Ltd.	Toronto, Ont.
6705	Morningstar, R.	Ridgeway, Ont.
6674	Mount Petroleum Corporation of Canada, Ltd.	Montreal, Que.
6675	Mountcliff Petroleum Corporation of Canada, Ltd.	Montreal, Que.
6754	Nemec, J.	Windsor, Ont.
6709	Oestricher, W.	Crediton, Ont.
6695	Parkinson, C.	Detroit, Mich.
6737	Patterson, R.	Goderich, Ont.
6772	Paulin, B.	Toronto, Ont.
6723	Quinn, M.	Buffalo, N.Y.
6678	Rawlings, F.	Chatham, Ont.
6697	Rayment, O.	Chatham, Ont.
6699	Reaume, H.	Chatham, Ont.
6748	Reddick, J.	Chatham, Ont.
6691	Reicheld, F.	Jarvis, Ont.
6761	Roberts, J.	Windsor, Ont.
6681	Rose, G.	Chatham, Ont.
6759	Rose, W.	Wainfleet, Ont.
6730	Roth, E. A.	Hillsdale, Mich.
6731	Roth, E. L.	Hillsdale, Mich.
6702	Sadlier, L.	Chatham, Ont.
6693	Savage, J.	Norwich, Ont.
6735	Scott, R.	Brucefield, Ont.
6722	Sider, R.	Ridgeway, Ont.
6716	Simpson, W.	Toronto, Ont.
6742	Smiley, T.	Blackheath, Ont.
6726	Smith, H.	Windsor, Ont.
6708	Stewart, E.	Jarvis, Ont.
6763	Stewart, G.	New York, N.Y.
6690	Sun Oil Co., Ltd.	Philadelphia, Pa.
6686	Stork, C.	Rodney, Ont.
6712	Stover, R.	Ridgetown, Ont.
6684	Sykes, H.	Chatham, Ont.
6718	Tyrrill, E.	Fort Erie North, Ont.
6717	Walsh, J.	Buffalo, N.Y.
6747	Whittal, F.	Amherstburg, Ont.
6740	Whittington, C.	Chatham, Ont.
6698	Whyte, J.	Chatham, Ont.
6685	Wilton, H.	Chatham, Ont.
6689	Yergey, J.	Philadelphia, Pa.
6738	Zuk, G.	Walkerton, Ont.

TABLE XI—OPERATORS LICENSED TO DRILL OR BORE FOR NATURAL GAS OR OIL, 1952

Licence No.	Name	Address
1978	Ashton, J. L.	Chatham, Ont.
1979	Ashton, J. L.	Chatham, Ont.
1999	Benner, E. J.	Port Dover, Ont.
1975	Carter, C. M.	Wallaceburg, Ont.
13	Central Pipe Line Co., Ltd.	Chatham, Ont.
4	Comfort, A.	Chatham, Ont.
1992	Crowland Gas Syndicate	Welland, Ont.
14	Culver, M. and Son	Rainham Centre, Ont.
1971	Culver, O.	Stevensville, Ont.
27	Davidson, W.	Wingham, Ont.
1974	Dell-Burn Gas Co., Ltd.	Dunnville, Ont.
1967	Donald, T.	Hagersville, Ont.
1989	Ehde and Meier	Thamesville, Ont.
34	Emerson, H.	Dunnville, Ont.
35	Emerson, H.	Dunnville, Ont.
28	Emerson and Rose	Wainfleet, Ont.
29	Emerson and Rose	Wainfleet, Ont.
42	Evans, H.	Tillsonburg, Ont.
43	Evans, H.	Tillsonburg, Ont.
39	Earl, S.	Kerwood, Ont.
1976	Garringer, W.	Dunnville, Ont.
1977	Garringer, W.	Dunnville, Ont.
41	Goodberry, C.	Verona, Ont.
1998	Goodfellow, G.	Dunnville, Ont.
8	Grand River Gas and Oil Syndicate	Canfield, Ont.
110	Harris, W.	Welland, Ont.
44	Heal, A.	Watford, Ont.
9	Held, C. and Son	Fort Erie, Ont.
32	Hodgson, R.	Cayuga, Ont.
20	Hoover, A. E. estate	Selkirk, Ont.
21	Hoover, A. E. estate	Selkirk, Ont.
1996	House, C.	Stevensville, Ont.
1997	House, C.	Stevensville, Ont.
33	Hussey, W.	Petrolia, Ont.
1983	Imperial Oil, Ltd.	Toronto, Ont.
1987	Irving, D.	Dunnville, Ont.
1968	Kin-Mar Gas Syndicate	Fort Erie, Ont.
1984	Kiser, W. and Son	Chatham, Ont.
1985	Kiser, W. and Son	Chatham, Ont.
40	Knight and Neale	Dunnville, Ont.
1993	Laramie, C.	Kingsville, Ont.
5	Lather, D.	Thamesville, Ont.
1962	Lymburner Bros. and Webber	Dunnville, Ont.
1	Lyons, S. and Son	Simcoe, Ont.
1988	McCutcheon, T.	Dunnville, Ont.
12	McGaffey, E.	Bothwell, Ont.
1982	McGregor, W.	Kippen, Ont.
1973	McKillop, W.	Hamilton, Ont.
18	McLaughlin, E.	Waterloo, Ont.
1964	McMaster, R. and Sons	Caledonia, Ont.
1965	McMaster, R. and Sons	Caledonia, Ont.
1966	McMaster, R. and Sons	Caledonia, Ont.
36	McPherson, R.	Riverside, Ont.
37	McPherson, R.	Riverside, Ont.
38	McPherson, R.	Riverside, Ont.
10	Mandley, R. and Son	Dunnville, Ont.
11	Mandley, R. and Son	Dunnville, Ont.
46	Morningstar, H.	Oil Springs, Ont.
16	Nagel, E.	Stevensville, Ont.
1981	Nauman, H.	Fisherville, Ont.
48	Nauman, J.	Fisherville, Ont.
1986	Nauman, J.	Fisherville, Ont.
26	P. B. R. Drilling Co.	Dunnville, Ont.
23	Palenkas, P.	West Lorne, Ont.
6	Patterson and Culver	Dunnville, Ont.

TABLE XI—OPERATORS LICENSED TO DRILL OR BORE FOR NATURAL GAS OR OIL, 1952—*Continued*

Licence No.	Name	Address
7	Patterson and Culver	Dunnville, Ont.
19	Port Colborne Gas and Oil Co., Ltd.	Port Colborne, Ont.
31	Ramsey Drilling Co.	Manitowaning, Ont.
1969	Reicheld, F.	Jarvis, Ont.
30	Ricker, E.	Canboro, Ont.
15	Roth, H.	Dunnville, Ont.
1980	Schramok, W.	Tilbury, Ont.
1970	Shank, E.	Selkirk, Ont.
17	Sider, R.	Ridgeway, Ont.
2	Stewart, E.	Jarvis, Ont.
24	Stover and Rawlings	Chatham, Ont.
25	Stover and Rawlings	Chatham, Ont.
1994	Stubble and Stubble	Merlin, Ont.
1995	Stubble and Stubble	Merlin, Ont.
1990	Stubble, H. H., and Son	Chatham, Ont.
1991	Stubble, H. H., and Son	Chatham, Ont.
45	Tichoniuk, D.	Fort Frances, Ont.
3	Walter Gas Syndicate, Ltd.	Simcoe, Ont.
1972	Warren, G.	Tillsonburg, Ont.
1963	Werner, D.	Fisherville, Ont.
47	Werner, D.	Fisherville, Ont.
22	Wilson-Sullivan Development Co., Ltd.	Sarnia, Ont.

TABLE XII—OPERATORS LICENSED TO PRODUCE NATURAL GAS, 1952

Licence No.	Name	Address
184	Bain, Lyons and Werner	Fisherville, Ont.
190	Barnhart, Mrs. E.	Stevensville, Ont.
189	Bates, N.	Port Colborne, Ont.
297	Beaver Oil and Gas Syndicate and P. L. Jackson	Ridgeway, Ont.
287	Benner and Tinney	Fisherville, Ont.
288	Benner, K. W.	Fisherville, Ont.
293	Bertie Township Gas and Oil Syndicate	Fisherville, Ont.
292	Big Seven Gas Syndicate	Fisherville, Ont.
253	Buck, C. S.	Port Rowan, Ont.
208	Campbell, L. G.	Kingsville, Ont.
231	Canfield Natural Gas Co., Ltd.	Dunnville, Ont.
186	Caughell Bros.	Dunnville, Ont.
268	Central Pipe Line Co., Ltd.	Chatham, Ont.
248	Central Seneca Gas Syndicate	Cayuga, Ont.
252	Consolidated West Petroleum, Ltd.	Toronto, Ont.
245	Coronation Gas Syndicate	Stevensville, Ont.
226	Crowland Gas Syndicate	Welland, Ont.
242	Dawson, R.	Merlin, Ont.
197	Deanna Lee Gas Syndicate	Fort Erie, Ont.
203	Dell-Burn Gas Co., Ltd.	Dunnville, Ont.
262	Dickout, L.	Lowbanks, Ont.
178	Dominion Natural Gas Co., Ltd.	Buffalo, N. Y.
250	Dover Gas Syndicate	Fort Erie North, Ont.
181	Earleejune Gas Co.	Port Maitland, Ont.
285	Emerson, H.	Dunnville, Ont.
239	Edwards, Fairbank	Petrolia, Ont.
261	Erie Prospecting Syndicate	Ridgeway, Ont.
237	Falls View Gas Syndicate	Fort Erie North, Ont.
216	Fletcher, E.	Glanford Station, Ont.
188	Fox, E.	Welland, Ont.
185	George, A.	Fort Erie, Ont.
243	Grand River Gas and Oil Syndicate	Canfield, Ont.
251	Grimsby Natural Gas Co., Ltd.	Grimsby, Ont.
256	Haldimand Gas Syndicate	Cayuga, Ont.
276	Haldimand Natural Gas Syndicate	Stevensville, Ont.

TABLE XII—OPERATORS LICENSED TO PRODUCE NATURAL GAS, 1952—*Continued*

Licence No.	Name	Address
266	High Grade Natural Gas Co., Ltd.	Chatham, Ont.
267	Highbank Oil, Ltd.	Chatham, Ont.
187	Houk Syndicate	Dunnville, Ont.
265	House, C. C.	Stevensville, Ont.
260	Ideal Gas Syndicate	Fisherville, Ont.
214	Imperial Oil, Ltd.	Toronto, Ont.
230	Jackson, P. L.	Dunnville, Ont.
229	Jenkins, S. S.	Buffalo, N. Y.
263	Kerr, R.	York, Ont.
198	Kin-Mar Syndicate	Fort Erie, Ont.
219	Kinsey, Levi	Lowbanks, Ont.
205	Lake Erie Gas Co.	Toronto, Ont.
222	Lake Shore Gas and Oil Syndicate	Stevensville, Ont.
213	Lapp and Arendt	Stevensville, Ont.
241	Lincoln Natural Gas, Ltd.	Dunnville, Ont.
209	Locators Oils, Ltd.	New Toronto, Ont.
179	Lymburner Bros. and Webber	Dunnville, Ont.
202	MacAnn-Wall Gas Syndicate	Fort Erie, Ont.
240	McIntyre and Hawkins	Welland, Ont.
283	McKechnie, S. estate	Dunnville, Ont.
234	Magee, C.	Port Colborne, Ont.
223	Maguire, J.	Clifford, Ont.
258	Manock Gas Syndicate	Fort Erie, Ont.
225	Maple Leaf Gas Syndicate	Stevensville, Ont.
282	Meyers, P.	Fort Erie, Ont.
232	Medina Gas Syndicate	Welland, Ont.
249	Mehlenbacher, L. B.	Cayuga, Ont.
191	Minor and Luck	Barrie, Ont.
217	Mitchell, S.	Dunnville, Ont.
294	Monarch Gas and Oil Syndicate	Fisherville, Ont.
207	Mohawk Gas and Oil Syndicate	Hamilton, Ont.
220	Morningstar, R.	Ridgeway, Ont.
257	Neff, R.	Sherkston, Ont.
290	Niagara Gas Syndicate	Fisherville, Ont.
278	Niece, E.	Lowbanks, Ont.
281	North Cayuga Gas Syndicate	Cayuga, Ont.
210	North Shore Gas Co.	Selkirk, Ont.
272	Noyes, L. A. Estate	Stevensville, Ont.
289	Peacock Point Gas and Oil Syndicate	Fisherville, Ont.
228	Petrol Oil and Gas Co., Ltd.	Toronto, Ont.
271	Port Colborne–Welland Gas and Oil Co., Ltd.	Port Colborne, Ont.
218	Prairie Gas and Oil Co., Ltd.	Toronto, Ont.
212	Provincial Gas Co., Ltd.	Fort Erie North, Ont.
194	Purcifer and Ferguson	Stevensville, Ont.
236	Queenston Gas and Oil Co., Ltd.	Ridgeway, Ont.
204	Raydis Oil and Gas Co., Ltd.	Chatham, Ont.
199	Reicheld, F. W.	Jarvis, Ont.
182	Riverside Syndicate	Welland, Ont.
259	Romney Oil and Gas Co., Ltd.	Toronto, Ont.
195	Roth, F.	Ridgeway, Ont.
264	Royal Gas Syndicate	Stevensville, Ont.
296	Ruegg, J.	Ridgeway, Ont.
273	Salina Gas Co., Ltd.	Chatham, Ont.
201	Shank and Snively	Selkirk, Ont.
240	Sherbrooke Gas Syndicate	Dunnville, Ont.
269	Sherk and Nagel	Stevensville, Ont.
281	Shurr, I.	South Cayuga, Ont.
246	Sider, A. and J.	Stevensville, Ont.
275	Sider, N.	Sherkston, Ont.
270	Sider, R.	Ridgeway, Ont.
200	Smith and Ehde	Lowbanks, Ont.
291	Standard Gas and Oil Syndicate	Fisherville, Ont.
221	Star Gas Syndicate	Ridgeway, Ont.
224	Stevensville Natural Gas and Fuel Co.	Stevensville, Ont.
277	Stover and Rawlings	Chatham, Ont.
284	Sundy Gas Wells	Dunnville, Ont.

TABLE XII—OPERATORS LICENSED TO PRODUCE NATURAL GAS, 1952—*Continued*

Licence No.	Name	Address
235	Sunnyside Gas Syndicate	Welland, Ont.
196	T. H. and G. Gas Syndicate	Fort Erie, Ont.
206	Tanke, E.	Buffalo, N. Y.
280	Till Gas Syndicate	Tillsonburg, Ont.
211	Tri-County Gas and Oil Co., Ltd.	Tillsonburg, Ont.
279	Twin City Gas Syndicate	Fort Erie, Ont.
215	Union Gas Co of Canada, Ltd.	Chatham, Ont.
298	Valencourt Gas Syndicate	Welland, Ont.
193	Valencourt, L.	Welland, Ont.
254	Walpole Gas Syndicate No. 1	Cayuga, Ont.
247	Walpole Gas Syndicate No. 2	Cayuga, Ont.
233	Walter Gas Syndicate, Ltd.	Simcoe, Ont.
255	Warren Gas Syndicate	Cayuga, Ont.
274	Welland County Gas Syndicate	Stevensville, Ont.
238	Welland Gas Syndicate	Dunnville, Ont.
227	Wilkinson Gas Syndicate	Fort Erie North,Ont.
180	Zielski, E.	Port Colborne, Ont.
192	Zuba, A.	Stevensville, Ont.

TABLE XIII—OPERATORS LICENSED TO DISTRIBUTE NATURAL GAS, 1952

Licence No.	Name	Address
871	Campbell, L.	Kingsville, Ont.
879	Canfield Natural Gas Co., Ltd.	Dunnville, Ont.
874	City Gas Co. of London	London, Ont.
886	Central Pipe Line Co., Ltd.	Chatham, Ont.
875	Crowland Gas Syndicate	Welland, Ont.
868	Dell-Burn Gas Co., Ltd.	Dunnville, Ont.
866	Dominion Natural Gas Co., Ltd.	Buffalo, N. Y.
889	Emerson, H.	Dunnville, Ont.
885	Fisherville Gas Co.	Fisherville, Ont.
880	Grand River Gas and Oil Syndicate	Canfield, Ont.
877	Grimsby Natural Gas Co., Ltd.	Grimsby, Ont.
884	Haldimand Gas Syndicate	Cayuga, Ont.
888	Haldimand Natural Gas Syndicate	Stevensville, Ont.
867	Houk Syndicate	Dunnville, Ont.
883	Mehlenbacher, L. B., Gas Syndicate	Cayuga, Ont.
869	Norotto Gas Co., Ltd.	Norwich, Ont.
870	Palesco, J.	Wainfleet, Ont.
876	Petrol Oil and Gas Co., Ltd.	Toronto, Ont.
887	Port Colborne-Welland Gas and Oil Co., Ltd.	Port Colborne, Ont.
872	Provincial Gas Co., Ltd.	Fort Erie North, Ont.
878	Public Utilities Commission	Leamington, Ont.
881	Sider, A. and J.	Stevensville, Ont.
873	Union Gas Co. of Canada, Ltd.	Chatham, Ont.
882	Walpole Gas Syndicate No. 2	Cayuga, Ont.

TABLE XIV—OPERATORS LICENSED TO OPERATE PIPELINES, 1952

Licence No.	Name	Address
165	Dominion Natural Gas Co., Ltd.	Buffalo, N. Y.
166	Union Gas Co. of Canada, Ltd.	Chatham, Ont.

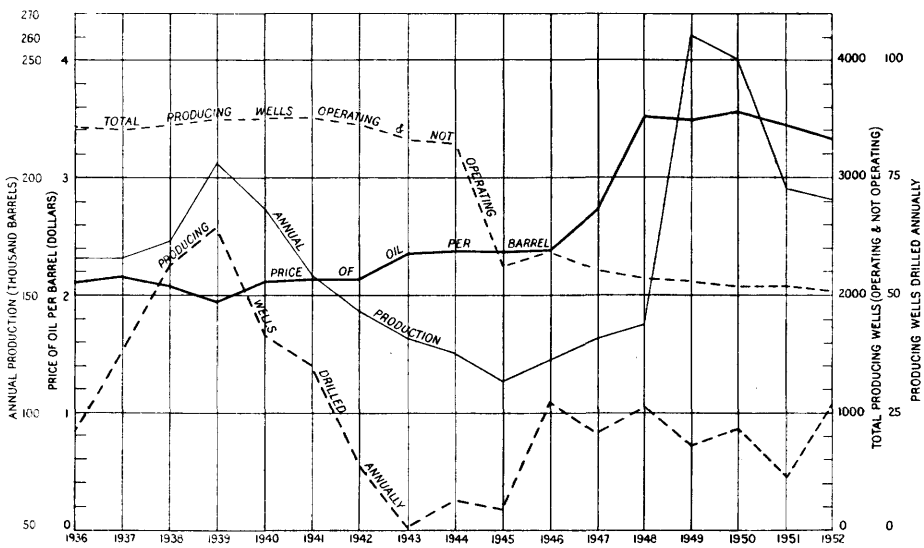
Petroleum in 1952

By R. B. Harkness

General

The total production of petroleum in Ontario in 1952 was 191,813 barrels, 5,358 less than in 1951. This decline was mainly due to the falling off of production in the Sombra field but was partially offset by important gains in the Rodney field in Aldborough township.

The total value of Ontario's crude petroleum, delivered to refineries or receiving stations in 1952, was $641,400, an average of $3.35 per barrel.



The development of the petroleum industry in Ontario, 1936–52.

There were 90 oil producers in the Province, 68 individuals, 11 companies, 8 partnerships, and 3 estates. In addition to working owners and occasional specialists, 70 men were employed full time and 30 part time or as casual labour. About $175,000 was paid in wages to these workmen and about $120,000 to 38 office and administrative personnel. Tank-truck owners received about $43,000 in haulage fees. The industry also provided considerable employment for electricians, machinists, and other specialists.

In 1952 the industry saw considerable exploration and development, most of it in the Dundee producing horizon. Of a total of 63 wells drilled, 58 were Dundee "shallow" tests. No new large fields were discovered. The most important event was the indication of a considerable southward extension of the oil field in Aldborough township, northwest of the village of Rodney, which was originally discovered in 1949 by diamond-drilling. A small Salina pool was also discovered in Moore township.

Exploration by means of geophysical surveying continues to be used over ever wider areas. The gravimeter is now the accepted method for this work, but a completely satisfactory method for exploratory work in Ontario has not yet been discovered. Faults may be located in exploratory work, but such small features as reefs at a depth of 2,000 feet or less present greater problems, and much more detailed surveys are necessary. Nature is probably protecting our future supplies of gas and oil by imposing these difficulties.

TABLE I—OIL FIELDS AND THEIR PRODUCTION, 1952

Field	Number of wells				Number of wells drilled		Production
	Active	Idle	Abandoned	Reopened	Producing	Dry	
							barrels
ESSEX COUNTY:							
Tilbury West tp.	.....	2	.....	.....	.....	1	.....
KENT COUNTY:							
Bothwell-Thamesville	111	89	12	.....	1	1	12,035
Dover tp.	7	.....	.....	.....	.....	.....	2,704
Raleigh tp.	3	2	1	.....	.....	.....	112
Romney tp.	.....	2	.....	.....	.....	.....	.....
Chatham tp.	.....	2	.....	.....	.....	.....	.....
Harwich tp.	1	1	.....	.....	1	2	73
LAMBTON COUNTY:							
Petrolia and Enniskillen	380	244	15	.....	.....	1	36,330
Oil Springs	623	105	8	.....	1	.....	26,957
Moore tp. Devonian	5	33	.....	.....	.....	.....	159
Moore tp. Silurian	6	.....	.....	.....	1	.....	1,585
Sarnia tp.	3	9	.....	.....	.....	1	147
Plympton tp.	.....	4	2	.....	.....	2	.....
Euphemia tp.	6	15	1	.....	3	10	2,997
Brooke tp.	3	3	4	.....	3	3	1,482
Warwick tp.	3	23	1	.....	.....	1	988
Sombra tp.	32	4	.....	.....	.....	.....	75,981
ELGIN COUNTY:							
Aldborough tp.	13	2	4	.....	11	5	12,043
Dunwich tp.	23	39	4	.....	.....	1	1,923
MIDDLESEX COUNTY:							
Adelaide tp.	.....	7	.....	.....	.....	.....	.....
Metcalfe tp.	2	9	5	.....	.....	.....	357
Mosa tp.	157	47	7	.....	6	3	15,925
BRANT COUNTY:							
Onondaga tp.	3	5	.....	.....	.....	.....	16
MANITOULIN DISTRICT:							
Assiginack tp.	.....	2	.....	.....	.....	.....	.....
Other	.....	.....	.....	.....	.....	[1]5	.....
Total	1,381	649	64	.....	27	36	191,814

Production

Table I gives the details of oil wells and production in all fields. Comments on individual fields follow:

Petrolia

A decline of 2,700 barrels was due to the continued idleness of several large properties.

[1]Two in Ekfrid tp., and one each in Caradoc, Eldon, and Gosfield South tps.

Oil Springs

There was a slight gain of 380 barrels. The normal decline was more than offset by the re-pressuring of a small area.

Bothwell-Thamesville

A decline of 1,100 barrels was caused by the shut-down of one major operator.

TABLE II—OIL PRODUCTION BY FIELDS, 1945–52

Field	1945	1946	1947	1948	1949	1950	1951	1952
	barrels	barrels	barrels	barrels	barrels	barrels	barrels	barrels
ESSEX COUNTY:								
Tilbury West tp.	.....	.....	.....	609	.....	.....	.....	.....
KENT COUNTY:								
Dover and	.....	.....	.....	.....	.....	.....	.....	2,704
Raleigh tps....	5,935	4,643	4,545	3,830	3,762	3,714	3,607	112
Bothwell and Thamesville...	22,791	18,610	16,025	15,238	17,940	17,067	13,135	12,035
Harwich tp.....	.....	.....	.....	.....	.....	.....	.....	73
LAMBTON AND MIDDLESEX COUNTIES:								
Sombra tp.....	.....	2,347	20,264	59,846	146,617	140,578	88,651	75,981
Moore tp.....	247	259	132	544	301	931	1,683	1,744
Sarnia tp.....	190	152	80	124	141	124	144	147
Petrolia and Enniskillen tp.	39,350	44,343	41,028	40,603	42,632	40,548	39,053	36,330
Oil Springs.....	25,657	27,995	25,683	26,165	25,692	25,310	26,576	26,957
Plympton.....	9	28	.....	8	.....	.....	.....	.....
Dawn and Euphemia tps.	362	238	163	7,312	999	2,281	1,488	2,997
Brooke tp.....	.....	.....	.....	.....	.....	1,006	746	1,482
Adelaide, Metcalfe, and Warwick tps.	2,739	5,400	2,390	2,479	2,010	1,670	1,264	1,345
Mosa tp.....	13,344	17,351	19,165	18,341	18,580	15,494	14,935	15,925
ELGIN COUNTY:								
Dunwich tp.....	1,676	1,621	1,740	1,821	1,929	1,006	1,793	1,923
Aldborough tp...	.....	.....	.....	.....	.....	.....	4,050	12,043
BRANT COUNTY:								
Onondaga tp....	24	89	80	69	67	37	46	16
Total production.....	113,324	123,082	131,295	176,989	260,760	250,656	197,171	191,814
Total value...	$268,478	$291,719	$349,895	$608,109	$905,143	$892,335	$677,905	$641,400
Average price.	$2.37	$2.37	$2.67	$3.44	$3.47	$3.56	$3.43½	$3.35

Aldborough Township

There was a significant increase of 8,000 barrels because of the extension and development of the Rodney field. Nearly all shallow exploration was concentrated here at the year's end. This field will be a leading producer in 1953.

Dover Township

This old Trenton field showed a decline of 600 barrels.

Raleigh Township

Operations ceased at mid-year; the wells are to be abandoned.

Mosa Township

Because of six new wells that were drilled, there was an increase of nearly 1,000 barrels.

Euphemia Township

This field showed an increase of 500 barrels. The sharp decline in production of the existing wells was more than offset by the discovery of a small new pool in lot 28, concession IX.

Dunwich Township

There was a small increase in this old field because of the skill of the operator.

Brooke Township

New wells drilled in the old pool in lot 8, concession II, produced an increase of 100 percent.

Warwick and Metcalfe Townships

This field showed a slight increase.

Sombra Township

There was a decline of 12,300 barrels. No new wells have been drilled, and the decline is natural.

Harwich Township

The year saw the re-activation of the old Richardson Siding field.

Other Fields

No significant changes were reported.

Drilling

In 1952, 63 wells, classified as oil tests, were completed in Ontario. Three of these were Trenton tests, a fourth a Salina producer, a fifth a Guelph test, and the remaining 58 were all Devonian "shallow" tests; 26 were producers.

These 63 wells were distributed as shown in Table I and were drilled by 17 contractors who nearly all work as drillers and employed 24 men. These men received $33,500 in wages, twenty-four rigs were active, in most cases only part time. The total footage of the 63 wells was 36,107. It should be noted that Salina-Guelph tests, unless oil producers, are classified as gas tests and are tabulated under natural gas.

Drilling by individual townships was as follows:

Aldborough Township

Five wildcat and eleven development wells, all in the Devonian, were drilled. One important result was the discovery of a considerable southward extension of what is known as the Rodney field. This discovery initiated the present development activity by several operators in that area.

Brooke Township

Six development wells were drilled in the old "Little Ireland" field in the Devonian.

Caradoc Township

One unsuccessful wildcat well was drilled to the Trenton.

Dunwich Township

A Devonian, wildcat well was drilled; it was dry.

Eldon Township

An unsuccessful Trenton, wildcat well was completed.

Ekfrid Township

Two dry wildcat shallow wells were drilled through the Dundee formation.

Enniskillen Township

One producer was drilled in the Oil Springs field, and one dry shallow wildcat was completed.

Euphemia Township

Two shallow, development wells were drilled in the Dante area, and a third two miles east; all were dry. The other ten wells were drilled in lots 25–29, concessions VIII, IX, and X. A wildcat well discovered a small pool on lot 28, concession IX. Two of the other eight development wells were producers.

Gosfield South Township

An old well of 1905, drilled to the Trenton, where the tools were lost, was re-opened and deepened. A show of oil had been reported on the top of the Trenton, but no oil was found at deeper levels.

Harwich Township

Three development wells were drilled in the old Richardson Siding shallow field; one was a producer, the other two were dry.

Moore Township

A small Salina-Guelph producing well was drilled on the flank of a reef.

Mosa Township

Six development wells were drilled in the old Glencoe field and three dry wildcats elsewhere; all nine were in the Devonian.

Plympton Township

Two Devonian wildcats were drilled in concession I.

Tilbury West Township

An unsuccessful development well was drilled in the Staples area; it was in the Guelph formation.

Sarnia Township

A dry wildcat was drilled to the Dundee formation.

Warwick Township

A dry wildcat was drilled to the Devonian formation.

Zone Township

Two development wells were drilled in the Dante area, both were dry; one producer was drilled in the Bothwell field.

Expansion

The year 1952 saw the activation of the new Canadian Oil Companies, Limited's, refinery at Froomfield and the beginning of the new Sun Oil Company, Limited's, refinery at Sarnia, as well as major changes and additions to the Imperial Oil, Limited's, Sarnia refinery.

Two pipelines to carry petroleum products were completed in 1952. One was laid by the Imperial Oil, Limited, a 10-inch line from Sarnia to Toronto, and the other by the Shell Oil Company of Canada, Limited, an 8-inch line from Montreal to Toronto and Hamilton. At the end of the year, planning was under way for a Sun Oil line from Sarnia to Toronto and extension of the Alberta-Superior crude-oil line from the present terminus at Superior, Wisconsin, through Wisconsin and Michigan, across Mackinac Strait to Port Huron, Michigan, and under the St. Clair River to Sarnia, Ontario.

Petroleum Importation and Refining Operations

Table III supplements Table IV; they show the consumption of petroleum products in Ontario.

Imported refined petroleum shows an increase of just over 15 percent more than 1951, of total gallonage, whereas petroleum products show a decrease. Those that show a marked increase are: aviation gasoline not produced in Ontario, motor gasoline, kerosene, lubricating oil of cheaper quality, and stove oil. Those that show a decrease are, solvent naphtha, light furnace oil, and heavy fuel oil.

The trend over the last few years shows a steady increase in the importation of motor gasoline and kerosene, lubricating oil of cheaper quality, and stove oil, and a decrease in the quantity of lubricating oil of more expensive quality and furnace and heavy fuel oils.

Table IV has been published since 1920, and an examination of this table in the reports covering those years will show the growth of the petroleum refining industry in the Province. The material is furnished by the Dominion Bureau of Statistics, and their classification or schedule changes from year to year, as refiners bring out new products to satisfy the demand, or as products not in demand disappear. There is usually a time lag until a new product has been established or perfected. In wartime some item may be on a confidential or secret list, and some products are known to have only a temporary demand. In consequence, some hitherto unpublished items appear in this table. In past years these new products were included with the products that they most nearly resembled, and the products that were produced and used within the refinery were included in the "value of refined products sold." As the industry has grown so rapidly and to such proportions, it has been deemed advisable to show the products, produced and used in the refining process, separate from the products for sale. These products are mainly fuel oil and refinery gases, used for heating the crude oil charge. It is hoped that this new table will be more useful than previous ones.

The feature of the year is the continued increase of Canadian crude oil used, from 40 percent in 1951 to 64.7 percent in 1952. With the completion of the pipeline from Superior, Wisconsin, to Sarnia, Ontario, in late 1953, the percentage of Canadian crude will approach 100 percent. A small quantity of Trinidad crude oil will probably continue to be used in Trinidad Leaseholds'

refinery at Clarkson. When the new pipeline from Alberta to Sarnia is in operation, the refineries at Sarnia will be in a preferred position and will be able to purchase crude oil from any field in eastern, middle, or western Canada.

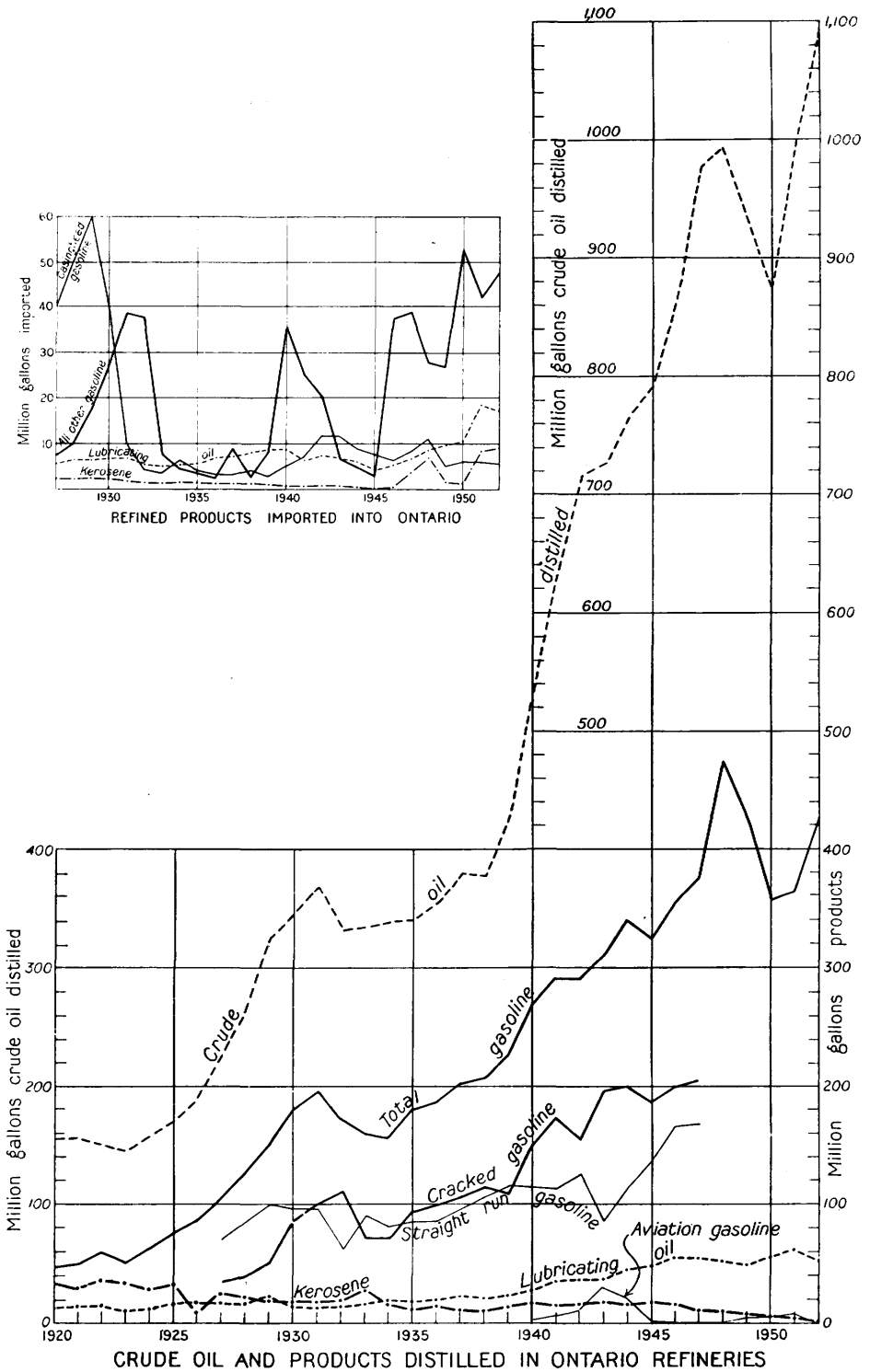
One new refinery began operating in early 1952. This was The Canadian Oil Companies, Limited's, plant at Corunna. This company had been operating a refinery for 45 years at Petrolia, Ontario. The Petrolia plant was closed as the

TABLE III—PETROLEUM AND REFINED PRODUCTS IMPORTED IN 1951 AND 1952

Import	1951		1952	
	Imperial gallons	Value	Imperial gallons	Value
CRUDE PETROLEUM FOR REFINING:				
Petroleum, 0.8155 (A.P.I.) specific gravity or heavier, for refining	508,323,000	$40,015,775	415,186,450	$31,455,118
REFINED PETROLEUM:				
Oil for the concentration of ores	157,924	$ 165,905	158,908	155,527
Aviation gasoline	8,086,748	1,711,157	10,763,721	2,095,796
Gasoline lighter than 0.6852 specific gravity (casing-head)	5,590,556	579,877	5,739,124	548,527
Gasoline lighter than 0.8236 specific gravity	34,759,922	6,003,334	36,790,919	5,603,662
Naphtha, including solvent naphtha	7,750,211	1,745,076	4,079,570	950,792
Kerosene and all illuminating oils	7,484,462	1,020,387	9,097,345	1,164,462
Lubricating oils costing less than 25 cents a gallon	3,832,538	774,823	7,661,981	1,452,985
Lubricating oils costing 25 cents or more per gallon	13,902,441	5,315,023	9,557,727	3,462,182
Engine distillate, 0.8017 specific gravity and heavier	1,799	391	14,717	1,405
Stove oil (No. 1 fuel oil)	15,020,547	1,815,127	21,793,374	2,689,412
Light fuel and furnace oil (No. 2 and No. 3)	120,047,403	13,552,770	161,492,817	18,108,313
Heavy fuel oil (Nos. 4, 5 and 6, Bunker A, B, and C)	83,463,240	7,692,697	74,206,346	6,500,014
Diesel and tractor fuel	2,349,896	280,374	2,798,037	325,926
Oils, all other	1,458,841	2,296,444	1,872,479	2,543,057
Total	303,906,528	$42,935,385	346,027,085	$45,557,060
PETROLEUM PRODUCTS:				
Petroleum and lubricating greases, n.o.p. lb.	6,705,629	$ 672,879	11,210,005	$ 767,022
Petroleum jellies, toilet and medicinal oils	.....	396,074	.....	344,752
Paraffin wax lb.	25,768,641	1,951,507	16,840,791	1,147,790
Paraffin wax candles lb.	83,634	37,577	97,325	30,666
Products of petroleum gals.	1,874,873	1,611,489	3,540,522	1,720,771
Liquefied petroleum gases lb.	175,937,459	2,981,382	172,161,534	2,656,473
Total	.....	$7,650,908	.....	$6,667,474
Total value	.....	$90,620,068	.....	$83,679,652
Total net value of petroleum and refined products imported[1]	$ 90,620,068		$83,679,652	
Duty paid, calculated on existing tariff schedule	3,447,587		3,340,827	
Sales tax at 8 percent	7,525,413		6,961,638	
Total value delivered in Ontario[2]	$101,593,068		$93,982,117	

[1]These statistics are furnished through the courtesy of the Canadian Department of Customs and Excise.

[2]Freight charges of between 15 and 20 million dollars are not included.



The Development of the Petroleum Industry in Ontario, 1920–52.

TABLE IV—PETROLEUM REFINING OPERATIONS, 1947–52[1]

Schedule	Unit of measure	1947	1948	1949	1950	1951	1952
Imported crude distilled	Gallons[2]	961,889,280	982,150,834	934,432,803	867,454,648	664,039,963	456,436,390
	Value	$70,775,738	$91,023,462	$88,996,864	$85,925,373	$52,169,743	$42,121,315
Canadian crude distilled	Gallons	4,613,234	6,462,189	8,982,963	8,795,095	375,232,386	628,310,026
	Value	$358,131	$642,475	$909,390	$907,662	$38,615,085	$57,900,379
Percentage of total		0.49	0.67	0.97	0.99	40.0	64.7
Total value of crude		$71,133,869	$91,665,937	$89,906,254	$86,833,035	$90,784,828	$100,021,694
PRODUCTS							
Gasoline:							
Aviation grade	Gallons	71,260	33,145	894,705	1,137,430	361,585	
	Value	$12,144	$7,623	$223,676	$284,358	$90,396	
Motor fuel	Gallons	372,573,934	431,437,146	421,873,690	356,561,369	360,077,409	425,344,156
	Value	$46,608,320	$65,248,234	$65,648,080	$55,753,195	$55,411,573	$65,780,461
Kerosene	Gallons	10,757,332	10,898,616	6,149,392	5,217,505	1,754,502	783,368
	Value	$1,460,928	$1,833,093	$1,022,430	$781,054	$316,702	$134,818
Lubricating oil	Gallons	58,115,170	56,803,098	53,392,468	54,994,356	63,091,376	54,770,991
	Value	$15,985,155	$18,332,527	$18,099,940	$18,463,878	$22,967,340	$21,855,345
Aviation turbine fuel	Gallons					364,210	16,291
	Value					$62,316	$2,589
Tractor fuel	Gallons	9,656,881	11,585,361	1,840,070	2,510,090	1,741,215	346,885
	Value	$1,231,914	$1,813,825	$302,195	$390,877	$268,604	$54,704
Deisel fuel	Gallons	61,389,948	31,534,827	31,164,119	49,565,365	46,214,641	67,204,083
	Value	$4,682,221	$2,589,930	$2,765,656	$5,924,104	$5,788,480	$8,581,653
Solvent and special naphthas	Gallons	13,644,509	12,395,054	11,269,038	11,274,871	12,921,278	12,219,536
	Value	$1,895,712	$2,156,839	$2,002,675	$1,792,141	$2,412,125	$2,299,521
Stove oil, No. 1	Gallons	23,986,374	21,009,806	27,914,408	30,456,162	33,908,503	42,888,369
	Value	$2,120,569	$2,954,651	$3,976,091	$4,157,667	$5,165,287	$6,662,428
Furnace fuel oil, Nos. 2 and 3	Gallons	100,166,252	41,258,620	104,055,974	112,258,236	141,096,021	165,177,926
	Value	$8,406,304	$5,332,132	$10,384,348	$13,917,860	$17,504,220	$21,215,135
Heavy fuel oil, Nos. 4, 5, and 6	Gallons	149,560,716	157,364,024	137,702,143	99,736,947	108,120,057	134,260,775
	Value	$11,513,401	$14,351,953	$11,753,306	$9,055,333	$11,018,259	$13,636,908
Lubricating grease	Pounds	30,253,482	25,787,815	30,242,908	33,533,156	33,989,684	31,640,217
	Value	$1,471,502	$1,703,023	$2,015,261	$2,506,011	$2,609,499	$2,445,876
Asphalt	Gallons	37,782,693	37,000,172	38,317,321	39,499,213	42,480,639	42,374,770
	Value	$1,335,383	$4,912,866	$4,858,435	$5,309,241	$5,465,270	$5,583,741
Petroleum coke	Tons	71,987	73,951	79,129	82,707	101,396	104,141
	Value	$564,389	$981,154	$829,583	$867,966	$1,084,817	$1,334,093
Still gas	M cu. ft.	1,269,344	1,406,523	1,430,668	1,174,364	1,156,605	140,092
	Value	$520,431	$1,186,021	$728,210	$954,579	$860,844	$98,093
Liquid petroleum gases	Gallons	107,380	73,045	809,375	1,239,182	6,427,780	10,502,665
	Value	$8,666	$7,787	$70,416	$61,959	$449,945	$944,706
Wax, crude and refined	Pounds	52,788,696	31,310,813	27,189,029	27,583,758	31,249,182	31,902,290
	Value	$2,771,177	$1,731,119	$1,857,036	$4,643,597	$1,350,873	$1,316,909
Polymer feed stock	Gallons	14,968,905	16,837,135	16,242,345	24,076,115	24,397,695	25,851,980
	Value	$1,527,146	$2,311,701	$2,218,704	$3,251,760	$3,281,490	$3,081,048
Miscellaneous	Value	$36,505	$37,896	$11,115	$10,756	$11,386	$832,445
Value of refined products sold		$102,151,867	$127,492,375	$128,787,157	$128,126,336	$136,119,426	$155,860,473
Value of refined products made for own use		$4,919,273	$6,368,286	$5,682,057	$6,968,587	$7,891,452	$9,004,786
Total value of refined products		$107,071,140	$133,860,661	$134,469,214	$135,094,923	$144,010,878	$164,865,259
Employees	Number	3,389	3,683	3,507	3,174	3,255	3,574
	Wages paid	$8,133,595	$9,582,022	$9,788,882	$9,640,853	$11,336,027	$13,825,883

[1]Information furnished by the Dominion Bureau of Statistics, Ottawa.
[2]Gallons refer to Imperial gallons.

new plant opened. A new refinery is being built by the Sun Oil Company, Limited' south of Sarnia and will probably be in operation late in 1953.

The amount of crude oil run to stills increased by 45,474,067 gallons or 1,299,259 barrels over the year 1951. Looking back over six years, this increase is not impressive and scarcely represents the carryover from year to year.

TABLE V—PETROLEUM REFINERS IN ONTARIO

Company	Location of refinery	Capacity	Head office address
		barrels per day	
British American Oil Company, Ltd.	Clarkson, Ont.	12,700	B.A. Building, Bay and College Sts., Toronto.
Canadian Oil Companies, Ltd.	Petrolia, Ont.	3,700	204 Richmond St. West, Toronto.
	Corunna, Ont.	20,000	204 Richmond St. West, Toronto.
Imperial Oil, Ltd.	Sarnia, Ont.	57,000	Sarnia, Ont.
Trinidad Leaseholds (Canada), Ltd.	Port Credit, Ont.	6,800	Port Credit, Ont.

Among refined products, the most marked increase is in the production of fuel oils, both light and heavy; the Canadian industrialists and householders are turning more and more to oil for heating. Light stove oil also shows a healthy increase, as does Diesel fuel. Gasoline production has increased over 60,000,000 gallons. Among the products that show a decrease, that of lubricating oil is the most marked, the decrease being 8,300,000 gallons. Kerosene has decreased from year to year and may shortly pass from the list of products, whereas 40 to 45 years ago it was the principal product of refineries. Ontario refineries are turning to the production of liquid petroleum gases as the market for them increases. Facilities for storing these gases against a winter demand are provided underground at the refineries along the St. Clair River. Wells are drilled to the salt deposits, 1,500 to 2,000 feet underground, the salt is dissolved with fresh water and pumped out; the liquid petroleum gases are stored under pressure in the cavities in the salt.

Logs of Wells for 1952

The drillers' logs for the 348 gas and oil wells completed during 1952 are published in the following pages. The elevations shown on some of the logs are all taken from mean sea level. It is the intention of this Department to publish as many elevations as possible in the future.

While all information regarding water, oil, and gas horizons is given in the logs at the request of the companies concerned, open flow of gas wells is not shown. In compliance with regulations made under the Well Drillers Act, R. S. O. 1950, chapter 423, samples of rock cuttings have been taken from representative wells. These cuttings have been forwarded to the Department of Mines and Resources at Ottawa for detailed examination. Copies of the detailed logs are available through the office of the Natural Gas Commissioner in Toronto.

The following logs of wells are arranged alphabetically by counties, townships, and owners, respectively.

Elgin County

UNION GAS CO. OF CANADA, LTD.

J. Blain No. 1, lot 14, con. I, Aldborough tp.

Driller: Ehde and Meier.
Completed May 26, 1952.
Producing gas well.
Rock pressure: 730 lb.

Formation	Depth, feet
Surface	170
Hamilton	345
Brown lime	480
Water sand	490
Brown lime	630
Sharp lime	898
Brown lime	1,010
Brown and blue lime and gypsum	1,020
Brown and blue lime	1,350
Brown lime	1,430
Grey lime	1,448
Grey lime and gypsum	1,460
Brown lime	1,484

Gas at 1,460–72 feet.
Sulphur water at 480 feet.

UNION GAS CO. OF CANADA, LTD.

J. Blain No. 3, lot 13, con. I, Aldborough tp.

Driller: Ehde and Meier.
Completed June 16, 1952.
Producing gas well.
Rock pressure: 734 lb.

Formation	Depth, feet
Surface	200
Hamilton	338
Brown lime	480
Water sand	490
Brown lime	640
Sharp lime	890
Brown lime	970
Brown, blue lime and gypsum	1,140
Brown and blue lime	1,260
Brown and blue lime and gypsum	1,330
Brown and blue lime	1,414
Grey lime	1,444
Grey lime and gypsum	1,450
Brown lime	1,485

Gas at 1,456–68 feet.
Sulphur water at 480 feet.

E. L. ROTH

F. Downie No. 1, lot 4, con. VI, Aldborough tp.

Driller: Demaray and Nichols.
Completed December 2, 1952.
Producing oil well.

Formation	Depth, feet
Surface	245
Soft grey lime	411
Oil sand	429
Light-grey sand	431

Oil at 362–66 and 416–29 feet.
Fresh water at 230 feet; sulphur water at 429 feet.

E. L. ROTH

F. Downie No. 2, lot 5, con. VI, Aldborough tp.

Driller: Demaray and Nichols.
Completed December 18, 1952.
Producing oil well.

Formation	Depth, feet
Surface	255
Buff and grey lime	418
Oil sand	428
Grey water sand	432

Oil at 418–28 feet.
Fresh water at 235 feet; sulphur water at 428 feet.

WESTERN ASHLEY MINERALS, LTD.

A. Fulmer No. 1, lot 13, con. I, Aldborough tp.

Driller: G. Rawlings.
Completed June 3, 1952.
Producing gas well.
Rock pressure: 750 lb.

Formation	Depth, feet
Surface	191
Soap	250
Soap and lime shells	338
Grey lime	350
Brown lime	615
Brown lime and grey lime	700
Brown lime	860
Grey and brown lime	980
Brown, grey lime and gypsum	1,052
Brown and grey lime	1,212
Brown lime	1,262
Grey lime	1,350
Brown lime	1,393
Brown and grey lime	1,454
Grey lime and gypsum	1,461
Dark-brown lime	1,483
Brown lime	1,491

Gas at 1,463–73 and 1,483 feet.
Black water at 495 feet.

Elgin County—Continued

WESTERN ASHLEY MINERALS, LTD.

A. Fulmer No. 2, lot 13, con. I, Aldborough tp.

Driller: G. Rawlings.
Completed August 18, 1952.
Producing gas well.
Rock pressure: 710 lb.

Formation	Depth, feet
Surface	215
Soap and shells	354
Brown lime	720
Sharp brown lime	818
Sharp grey lime	890
Brown lime	1,010
Blue lime and gypsum	1,036
Brown lime	1,051
Brown and blue lime	1,115
Brown lime	1,150
Brown and blue lime	1,169
Brown lime	1,217
Brown and blue lime	1,322
Brown lime	1,370
Grey lime	1,457
Brown lime	1,476
Brown lime and gypsum	1,484
Brown lime	1,503

Gas at 1,484–95 feet.
Fresh water at 190 feet; black water at 496 feet.

WESTERN ASHLEY MINERALS, LTD.

A. Fulmer No. 3, lot 13, con. I, Aldborough tp.

Driller: G. Rawlings.
Completed October 9, 1952.
Producing gas well.
Rock pressure: 680 lb.

Formation	Depth, feet
Surface	177
Soap	298
Lime	313
Soap	333
Brown lime	800
Sharp grey lime	900
Brown lime	995
Blue lime and gypsum	1,000
Brown lime	1,025
Blue and brown lime and gypsum	1,070
Blue lime	1,155
Brown lime	1,176
Brown lime and gypsum	1,246
Brown lime	1,283
Blue lime and gypsum	1,328
Brown and blue lime	1,370
Brown lime	1,435
Blue lime	1,455
Blue lime and gypsum	1,470
Brown lime	1,512

Gas at 1,470–75 feet.
Fresh water at 149 feet; black water at 485 feet.

RICHFIELD OIL AND GAS CO.

A. and W. Gillies No. 1, lot 6, con. V, Aldborough tp.

Driller: C. Goodberry.
Completed July 12, 1952.
Producing oil well.

Formation	Depth, feet
Surface	242
Brown lime	369

Oil at 348–69 feet.
Fresh water at 190 and 230 feet.

RICHFIELD OIL AND GAS CO.

A. and W. Gillies No. 2, lot 6, con. V, Aldborough tp.

Driller: C. Goodberry.
Completed September 26, 1952.
Producing oil well.

Formation	Depth, feet
Surface	245
Lime	326
Sandy lime	381
Oil sand	391

Oil at 326, and 369–91 feet.
Fresh water at 226 and 265 feet.

RICHFIELD OIL AND GAS CO.

J. Graham No. 3, lot 6, con. IV, Aldborough tp.

Driller: H. Evans and Sons.
Completed September 5, 1952.
Producing oil well.

Formation	Depth, feet
Surface	233
Lime	370
Oil sand	388

Oil at 370–88 feet.
Fresh water at 279 feet.

RICHFIELD OIL AND GAS CO.

J. Graham No. 4, lot 6, con. IV, Aldborough tp.

Driller: H. Evans and Sons.
Completed October 8, 1952.
Producing oil well.

Formation	Depth, feet
Surface	235
Lime	387
Oil rock	405

Oil at 387–405 feet.
Fresh water at 260 feet.

C. STORK

R. Humphrey No. 6, lot 11, con. V, Aldborough tp.

Driller: H. H. Stubble and Son.
Completed September 17, 1952.
Dry hole.

Formation	Depth, feet
Surface	257
Hamilton	316
Brown and buff lime	420
Dark lime and chert	440
Light-buff lime	480
Sand and lime	530
Blue and brown lime	575
Buff lime and dark-brown dolomite lime	684
Lime and chert	924
Buff lime and dolomite lime	1,033
Brown and blue lime with gypsum	1,212
Buff and grey lime	1,230
Blue and brown lime and gypsum	1,406
Salt and lime	1,570
Brown lime and grey-brown dolomite	1,603
Light-brown and grey lime	1,637
Grey lime and shale	1,655
Blue lime and gypsum	1,662
Brown and blue lime and gypsum	1,670
Brown lime	1,748
Brown lime and gypsum	1,781
Grey, buff, and brown lime	1,900
Grey lime	1,950
Shale and lime	1,987
Grey lime	2,005
Red and green shale	2,017

Fresh water at 13 feet; sulphur water at 490 feet.

Elgin County—Continued

A. COMFORT

A. Johnston No. 1, lot 4, con. III, Aldborough tp.

Driller: A. Comfort.
Completed September 30, 1952.
Dry hole.

Formation	Depth, feet
Surface	339
Lime	350
Brown sand	360
Lime	435
Washed-out sand	440
Lime	450

Show of oil at 360 feet.
Fresh water at 275 feet; sulphur water at 440 feet.

C. STORK

F. Kozma No. 1, lot 10, con. V, Aldborough tp.

Driller: Palenkas Bros.
Completed August 14, 1952.
Dry hole.

Formation	Depth, feet
Surface	244
Top rock	247
Soap	256
Limy shale	265
Brown lime	272
Soap	282
Soap and shale	290
Blue and grey lime	296
Brown lime	320
Light-buff lime	396
Dark lime, chert	417
Light-buff lime	451
Light-buff lime and sand	461
Sandstone	470

Fresh water at 9 feet; black water at 469 feet.

C. STORK

C. Leith No. 1, lot 16, con. XIII, Aldborough tp.

Driller: Palenkas Bros.
Completed July 16, 1952.
Dry hole.

Formation	Depth, feet
Surface	262
Lime and shale	287
Soap	292
Grey lime	311
Soap	315
Grey lime	333
Brown lime	390
Brown lime and chert	404
Buff lime and chert	487
Brown lime and a few sand grains	494
Sand and lime	500

Fresh water at 191 feet; black water at 495 feet.

E. L. ROTH

G. Lond No. 1, lot 15, con. V, Aldborough tp.

Driller: D. Lather.
Completed January 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	305
Top soap	333
Middle lime	352
Lower soap	375
Big lime	530

Fresh water at 170 feet; black sulphur water at 530 feet.

JOHN L. BEATTIE

A. McCallum No. 1, lot 6, con. V, Aldborough tp.

Driller: H. Evans and Sons.
Completed November 25, 1952.
Producing oil well.

Formation	Depth, feet
Surface	247
Big lime	405
Oil rock	423

Oil at 405–23 feet.
Fresh water at 250 feet.

C. STORK

J. McMahon No. 1, lot 9, con. V, Aldborough tp.

Driller: Palenkas Bros.
Completed September 3, 1952.
Dry hole.

Formation	Depth, feet
Surface	260
Soap	270
Brown and grey lime	360
Light buff lime	385
Dark lime and chert	405
Light lime	430
Sand and lime	457

Show of gas at 320 feet.
Show of oil at 455 feet.
Black water at 457 feet.

RICHFIELD OIL AND GAS CO.

J. McMillan No. 1, lot 5, con. IV, Aldborough tp.

Driller: C. Laramie.
Completed April 23, 1952.
Producing oil well.

Formation	Depth, feet
Surface	242
Top lime	246
Brown lime	290
Light-brown lime	310
Sharp brown lime	325
Light-brown lime	330
Hard brown lime	340
Soft brown lime	345
Hard brown lime	355
Hard brown lime and sand	360
Oily sandstone	390
Hard brown lime	397

Fresh water at 177 feet; black water at 242 feet; salt water at 315 feet.

RICHFIELD OIL AND GAS CO.

J. McMillan No. 1, lot 5, con. V, Aldborough tp.

Driller: C. Laramie.
Completed January 11, 1952.
Producing oil well.

Formation	Depth, feet
Surface	247
Hard brown lime	280
Brown and grey lime	282
Soft brown lime	290
Brown and white lime	295
Hard, light-brown lime	310
Sharp lime	320
Light-brown lime	360
Soft brown lime	370
Dark-brown sandstone	378
Hard brown sandstone	379
White sand	380

Oil at 360, 370, and 378 feet.
Sulphur water at 246 feet; black and salt water at 290 feet; salt water at 380 feet.

Elgin County—Continued

RICHFIELD OIL AND GAS CO.

J. McMillan No. 2, lot 5, con. V, Aldborough tp.

Driller: H. Evans and Sons.
Completed July 29, 1952.
Producing oil well.

Formation	Depth, feet
Surface	249
Lime	372
Oil sand	390

Oil at 372–90 feet.
Fresh water at 290 feet.

WESTERN ASHLEY MINERALS, LTD.

R. Morrison No. 1, lot 14, con. I, Aldborough tp.

Driller: G. Rawlings.
Completed April 28, 1952.
Producing gas well.
Rock pressure: 750 lb.

Formation	Depth, feet
Surface	178
Soap	310
Lime	325
Soap	345
Lime	375
Brown lime	710
Sharp lime	790
Brown lime	870
Lime	950
Brown lime	980
Grey lime and gypsum	1,000
Brown lime	1,030
Grey and blue lime	1,135
Brown lime	1,160
Grey lime	1,200
Brown and grey lime	1,315
Grey lime and gypsum	1,350
Brown lime	1,400
Grey lime	1,460
Brown lime and gypsum	1,475
Brown lime	1,489

Gas at 1,467–78 feet.
Black water at 500 feet.

WESTERN ASHLEY MINERALS, LTD.

R. Morrison No. 2, lot 14, con. I, Aldborough tp.

Driller: G. Rawlings.
Completed October 30, 1953.
Dry hole.

Formation	Depth, feet
Surface	190
Hamilton	362
Brown lime	506
Sharp grey lime	526
Brown lime	680
Sharp lime	910
Brown lime	1,020
Brown, blue lime and gypsum	1,043
Brown and blue lime	1,166
Brown lime and gypsum	1,196
Brown lime	1,250
Brown and blue lime	1,324
Brown lime	1,471
Brown lime and gypsum	1,482
Brown lime	1,554
Lime and gypsum	1,571
Brown and grey lime	1,594

Sulphur water at 515 feet.

A. COMFORT

G. Tunks No. 1, lot 4, con. VI, Aldborough tp.

Driller: A. Comfort.
Completed December 20, 1952.
Producing oil well.

Formation	Depth, feet
Surface	251
Soft grey lime	255
Hard buff lime	305
Sharp brown lime	350
Grey shaly lime	360
Brown and white lime	366
Brown cherty lime	410
Hard brown oil sand	417
Soft blue-grey sandy lime	420
Soft brown oil sand	427

Oil at 360 and 410–27 feet.
Fresh water at 230 feet.

WESTERN ASHLEY MINERALS, LTD.

J. Waterworth No. 1, lot 12, con. I, Aldborough tp

Driller: G. Rawlings.
Completed July 21, 1952.
Producing gas well.
Rock pressure: 720 lb.

Formation	Depth, feet
Surface	208
Soap	318
Lime	333
Soap	346
Brown lime	492
Grey lime	512
Brown lime	690
Sharp grey lime	905
Brown lime	930
Grey lime	975
Brown lime	1,000
Grey lime and gypsum	1,045
Brown lime	1,051
Grey and brown lime	1,215
Brown lime	1,235
Grey lime	1,370
Brown lime	1,440
Grey lime	1,490

Gas at 1,471–80 feet.
Fresh water at 180 feet; black water at 492 feet.

WESTERN ASHLEY MINERALS, LTD.

J. Waterworth No. 2, lot 12, con. I, Aldborough tp.

Driller: G. Rawlings.
Completed September 6, 1952.
Producing gas well.
Rock pressure: 730 lb.

Formation	Depth, feet
Surface	168
Soap	241
Soap and lime	320
Soap	330
Brown lime	626
Brown and grey lime	714
Grey lime	875
Brown and grey lime	960
Brown lime	1,003
Grey lime and gypsum	1,043
Grey lime	1,082
Grey lime	1,145
Brown lime	1,220
Brown and grey lime	1,295
Grey lime	1,363
Brown lime	1,413
Grey lime	1,478
Brown lime	1,510

Gas at 1,380 and 1,478–85 feet.
Fresh water at 130 feet; black water at 485 feet.

Elgin County—Continued

WESTERN ASHLEY MINERALS, LTD.

J. Waterworth No. 3, lot 12, con. I, Aldborough tp.

Driller: G. Rawlings.
Completed November 29, 1952.
Producing gas well.
Rock pressure: 690 lb.

Formation	Depth, feet
Surface	200
Hamilton	359
Brown lime	475
Brown and grey lime	685
Sharp lime	905
Brown lime	965
Brown and blue lime	1,005
Brown and grey lime	1,015
Lime and gypsum	1,035
Brown and blue lime	1,075
Grey and brown lime	1,290
Blue and brown lime	1,345
Grey and brown lime	1,468
Brown lime and gypsum	1,476
Brown lime	1,493

Gas at 1,476–85 feet.
Sulphur water at 500 feet.

WESTERN ASHLEY MINERALS, LTD.

E. Wilson No. 1, lot 13, con. I, Aldborough tp.

Driller: G. Rawlings.
Completed October 27, 1952.
Producing gas well.
Rock pressure: 695 lb.

Formation	Depth, feet
Surface	201
Soap	263
Soap and lime	313
Soap	340
Brown lime	682
Sharp grey and brown lime	894
Brown and grey lime	992
Grey lime and gypsum	1,009
Brown, blue, and grey lime	1,057
Grey lime and gypsum	1,092
Grey and blue lime	1,159
Brown and grey lime	1,319
Blue lime	1,364
Brown lime	1,394
Brown and grey lime	1,424
Blue lime	1,449
Grey lime	1,459
Brown lime and gypsum	1,469
Brown lime	1,495

Gas at 1,375 and 1,470–82 feet.
Fresh water at 160 feet; black water at 490 feet.

GEORGE OGG

R. Humphrey No. 1, lot 22, con. V, Dunwich tp.

Driller: S. Earl.
Completed November 5, 1952.
Dry hole.

Formation	Depth, feet
Surface	277
Brown lime	297
Grey lime	400
Sharp sand	407

Sulphur water at 267 and 287 feet.

CENTRAL PIPE LINE CO., LTD.

E. Haney No. 1, lot 23, con. VIII, Malahide tp.

Driller: Central Pipe Line Co., Ltd.
Completed November 21, 1952.
Producing gas well.
Rock pressure: 445 lb.

Formation	Depth, feet
Surface	210
Grey lime	226
Brown lime	420
Sharp grey lime	490
Grey lime	538
Grey and brown gypsum and shale	605
Grey lime, shale and gypsum	673
Grey and brown lime and shale	800
Grey lime and shale	847
Grey lime	953
Guelph lime	988
Niagara	991

Gas at 275, 959, 971, 977, and 982 feet.
Fresh water at 56–68, 72–79, 270, and 484–514 feet.

Essex County

H. B. SMITH, TRUSTEE

O. Wigle No. 1, lot 6, con. I, east division, Gosfield South tp.

Driller: G. Rawlings.
Completed May 2, 1952.
Dry hole.

Formation	Depth, feet
This well deepened	
Bottom of hole	2,549
Brown lime	2,590
Grey lime	2,735
Dark grey lime	2,760
Buff lime	2,795
Buff and grey lime	3,000
Grey lime	3,175
Medium, granular, brown lime	3,190
Lime, green shale, pyrite	3,195
Medium, light-cream dolomite with sand and feldspar fragments	3,247

Gas at 3,235 and 3,247 feet.

R. SCHAEFFER

J. Wigle No. 1, lot 12, con. I, west division, Gosfield South tp.

Driller: E. English.
Completed October 30, 1952.
Dry hole.

Formation	Depth, feet
Surface	56
Brown lime	200
Sharp sand	250
Brown lime	450
Blue shale	500
Brown lime and gypsum	570
Blue shale	600
Brown lime	1,000
Water sand	1,005

Gas at 650, 950, and 980 feet.
Fresh water at 50 feet; sulphur water at 65 and 300 feet; salt water at 1,000 feet.

Essex County—Continued

ESSEX GAS AND OIL CO., LTD.

R. McKim No. 1, lot 14, con. II, Malden tp.

Driller: H. Stubble.
Completed March 1, 1952.
Producing gas well.
Rock pressure: 285 lb.

Formation	Depth, feet
Surface	41
Grey and brown lime	92
Sand	180
Grey lime and chert	291
Grey, buff, and brown lime and gypsum	482
Grey shale and gypsum	551
Grey and brown lime	740
Grey lime and shale	790
Grey and brown lime, gypsum and anhydrite	894
Grey and brown lime	962
Gypsum and anhydrite	972
Light-brown lime	983

Gas at 980 feet.
Fresh water at 41 and 120 feet; salt water at 980 feet.

WESTERN ASHLEY MINERALS, LTD., AND ANCHOR PETROLEUMS, LTD.

Crozier Estate No. 1, lot 5, con. X, Tilbury West tp.

Driller: G. Rawlings.
Completed June 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	113
Grey fine lime	123
Brown lime	165
Grey lime	327
Brown and grey lime	420
Brown lime	460
Sharp sand	525
Brown lime	580
Brown and grey lime	610

DELL-BURN GAS CO., LTD.

J. Wells No. 2, lot 2, con. III, Canborough tp.

Driller: Dell-Burn Gas Co., Ltd.
Completed February 7, 1952.
Producing oil well.

Formation	Depth, feet
Surface	40
Limestone	50
Lime and shale	262
Niagara	492
Shale	552
Clinton	580
Red Medina	622
Grey Shale	672
White Medina	689
Red Shale	737

Oil at 572 and 681–84 feet.
Fresh water at 47 feet; sulphur water at 147 feet.

DELL-BURN GAS, CO., LTD.

J. Wells No. 4, lot 1, con. III, Canborough tp.

Driller: Dell-Burn Gas, Co., Ltd.
Completed March 5, 1952.
Producing gas well.
Rock pressure: 135 lb.

Formation	Depth, feet
Surface	50
Sand and gravel	54
Lime and shale	274
Niagara	505
Shale	565
Clinton	595
Red Medina	637

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

J. Asher No. 2, lot 19, con. IV, south of Dover Road, Dunn tp.

Driller: T. McCutcheon.
Completed May 2, 1952.
Producing gas well.
Rock pressure: 275 lb.

Formation	Depth, feet
Surface	19
Flint	85
Lime and shale	455
Niagara	680
Shale	734
Clinton	764
Red Medina	804
Grey shale	858
White Medina	880
Red shale	882

Gas at 758-63 feet.
Black sulphur water at 34 and 85 feet; black water at 470 feet.

DOMINION NATURAL GAS CO., LTD.

J. Barnsdalle, Jr., No. 3, lot 19, con. V, south of Dover Road, Dunn tp.

Driller: E. Shank.
Completed December 3, 1952.
Producing gas well.
Rock pressure: 210 lb.

Formation	Depth, feet
Surface	13
Flint	104
Lime and shale	474
Niagara	695
Shale	756
Clinton	789
Red Medina	837
Grey shale	880
White Medina	898
Red shale	998

Gas at 789, 809, and 897 feet.
Sulphur water at 68 and 218 feet.

DOMINION NATURAL GAS CO., LTD.

M. and G. Battye No. 2, lot 12, con. I, south of Dover Road, Dunn tp.

Driller: T. McCutcheon.
Completed July 25, 1952.
Producing gas well.
Rock pressure: 290 lb.

Formation	Depth, feet
Surface	29
Flint	55
Brown lime	404
Niagara	629
Shale	688
Clinton	718
Red Medina	758
Grey shale	808
White Medina	830
Red shale	850

Gas at 695, 720, and 745-48 feet.
Sulphur water at 57, 90, 120, 220, and 450 feet.

A. DAUBARIS

A. Daubaris No. 3, lot 24, con. III, south of Dover Road, Dunn tp.

Driller: A. Daubaris.
Completed March 3, 1952.
Dry hole.

Formation	Depth, feet
Surface	20
Flint	60
Shale	440
Niagara	660
Shale	725
Clinton	760
Red Medina	805
Grey shale	870
White Medina	882

Show of gas at 740 feet.
Sulphur water at 25 feet.

A. DAUBARIS

A. Daubaris No. 4, lot 22, con IV, south of Dover Road, Dunn tp.

Driller: A. Daubaris.
Completed September 3, 1952.
Producing gas well.
Rock pressure: 250 lb.

Formation	Depth, feet
Surface	40
Flint	65
Shale	440
Niagara	665
Shale	730
Clinton	767
Red Medina	810
Grey shale	875
White Medina	890
Red shale	893

Gas at 740 and 770 feet.
Sulphur water at 40 feet.

DOMINION NATURAL GAS CO., LTD.

O. and M. Gould No. 1, lot 9, Earl tract, Dunn tp.

Driller: W. Garringer.
Completed March 10, 1952.
Producing gas well.
Rock pressure: 335 lb.

Formation	Depth, feet
Surface	38
Lime and shale	435
Niagara	660
Shale	715
Clinton	745
Red Medina	785
Grey shale	840
White Medina	856
Red shale	906

Gas at 848-54 feet.
Fresh water at 49 feet.

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

J. Griffith No. 1, lot 13, con. I, south of Dover Road, Dunn tp.

Driller: T. McCutcheon.
Completed September 24, 1952.
Dry hole.

Formation	Depth, feet
Surface	22
Flint	52
Lime and shale	407
Niagara	632
Shale	693
Clinton	723
Red Medina	763
Grey shale	813
White Medina	834
Red shale	835

Gas at 825–34 feet.
Fresh water at 54 feet; sulphur water at 75 feet; black water at 240 feet; black sulphur water at 410 and 512 feet.

DOMINION NATURAL GAS CO., LTD.

J. Griffith No. 2, lot 13, con. I, south of Dover Road, Dunn tp.

Driller: T. McCutcheon.
Completed December 31, 1952.
Producing gas well.
Rock pressure: 205 lb.

Formation	Depth, feet
Surface	19
Flint	29
Lime and shale	398
Niagara	623
Shale	680
Clinton	710
Red Medina	750
Grey shale	799
White Medina	818
Red shale	870

Gas at 700–5, 730–35, and 808–18 feet.
Sulphur water 57 feet; black sulphur water at 75, 110, 250, and 490 feet; salt water at 869 feet.

DOMINION NATURAL GAS CO., LTD.

K. Kapitan No. 3, lot 18, con. IV, south of Dover Road, Dunn tp.

Driller: T. McCutcheon.
Completed March 7, 1952.
Dry hole.

Formation	Depth, feet
Surface	21
Flint	75
Lime and shale	450
Niagara	675
Shale	730
Clinton	760
Red Medina	800
Grey shale	855
White Medina	878
Red shale	880

Gas at 765–69 feet.
Fresh water at 35 feet; sulphur water at 75 feet; black water at 102 feet; black sulphur water at 275 feet.

DOMINION NATURAL GAS CO., LTD.

H. King No. 3, lot 16, con. III, south of Dover Road, Dunn tp.

Driller: Shank Bros.
Completed February 8, 1952.
Producing gas well.
Rock pressure: 200 lb.

Formation	Depth, feet
Surface	26
Flint	59
Lime and shale	445
Niagara	661
Grey shale	720
Clinton	758
Red Medina	798
Grey shale	856
White Medina	866
Red shale	916

Gas at 856 feet.
Sulphur water at 92 and 274 feet.

DOMINION NATURAL GAS CO., LTD.

A. King No. 3, lot 17, con. III, south of Dover Road, Dunn tp.

Driller: E. Shank.
Completed March 15, 1952.
Dry hole.

Formation	Depth, feet
Surface	30
Flint	66
Lime and shale	440
Niagara	657
Shale	717
Clinton	752
Red Medina	800
Grey shale	853
White Medina	863
Red shale	865

Light sulphur water at 47 feet; black sulphur water at 76 feet.

DOMINION NATURAL GAS CO., LTD.

E. and Z. Lomacki No. 1, lot 18, con. V, south of Dover Road, Dunn tp.

Driller: E. Shank.
Completed June 10, 1952.
Producing gas well.
Rock pressure: 310 lb.

Formation	Depth, feet
Surface	9
Flint	98
Lime and shale	480
Niagara	704
Shale	759
Clinton	795
Red Medina	845
Grey shale	883
White Medina	896
Red shale	1,000

Gas at 788–95, 820–27, and 887–95 feet.
Fresh water at 47 feet; sulphur water at 120 feet.

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

E. and Z. Lomacki No. 2, lot 18, con. V, south of Dover Road, Dunn tp.

Driller: E. Shank.
Completed July 23, 1952.
Producing gas well.
Rock pressure: 320 lb.

Formation	Depth, feet
Surface	9
Flint	99
Lime and shale	472
Niagara	693
Grey shale	749
Clinton	785
Red Medina	834
Shale	872
White Medina	885
Red shale	900

Sulphur at 40, 364, and 584 feet.
Gas at 815–18 and 884–85 feet.

DOMINION NATURAL GAS CO., LTD.

E. and Z. Lomacki No. 3, lot 18, con. V, south of Dover Road, Dunn tp.

Driller: E. Shank.
Completed September 10, 1952.
Dry hole.

	Depth, feet
Surface	13
Flint	111
Lime and shale	479
Niagara	700
Shale	759
Clinton	790
Red Medina	839
Grey shale	887
White Medina	900
Red shale	902

Fresh water at 62 feet; sulphur water at 163 and 577 feet.

DOMINION NATURAL GAS CO., LTD.

E. and Z. Lomacki No. 4, lot 18, con. V, south of Dover Road, Dunn tp.

Driller: E. Shank.
Completed October 16, 1952.
Producing gas well.
Rock pressure: 142 lb.

Formation	Depth, feet
Surface	13
Flint	113
Lime and shale	479
Niagara	700
Shale	764
Clinton	798
Red Medina	848
Grey shale	896
White Medina	909
Red shale	923

Gas at 811–21 feet.
Sulphur water at 112, 197, and 280 feet.

DOMINION NATURAL GAS CO., LTD.

J. Newman No. 1, lot 19, con. III, south of Dover Road, Dunn tp.

Driller: W. Garringer.
Completed July 21, 1952.
Producing gas well.
Rock pressure: 315 lb.

	Depth, feet
Surface	39
Lime and shale	435
Niagara	660
Shale	719
Clinton	749
Red Medina	789
Blue shale	844
White Medina	859
Red shale	960

Gas at 745–48 feet and 850–57 feet.
Sulphur water at 50, 193, and 430 feet.

DOMINION NATURAL GAS CO., LTD.

J. Newman No. 2, lot 21, con. III, south of Dover Road, Dunn tp.

Driller: W. Garringer.
Completed January 10, 1952.
Producing gas well.
Rock pressure: 320 lb.

Formation	Depth, feet
Surface	41
Lime and shale	435
Niagara	660
Shale	720
Clinton	750
Red Medina	790
Blue shale	845
White Medina	865
Red Medina	915

Gas at 855–61 feet.
Fresh water at 44 feet; black water at 195 and 435 feet.

DOMINION NATURAL GAS CO., LTD.

J. Newman No. 3, lot 19, con. III, south of Dover Road, Dunn tp.

Driller: W. Garringer.
Completed May 12, 1952.
Producing gas well.
Rock pressure: 270 lb.

Formation	Depth, feet
Surface	42
Lime and shale	435
Niagara	660
Shale	715
Clinton	745
Red Medina	785
Grey shale	840
White Medina	858
Red shale	908

Gas at 854–58 feet.
Fresh water at 56 feet; sulphur water at 250 feet.

DOMINION NATURAL GAS CO., LTD.

R. Newman No. 1, lot 11, Earl tract, Dunn tp.

Driller: W. Garringer.
Completed November 8, 1952.
Producing gas well.
Rock pressure: 310 lb.

Formation	Depth, feet
Surface	31
Lime and shale	430
Niagara lime	655
Shale	710
Clinton	740
Red Medina	780
Blue shale	835
White Medina	850
Red shale	950

Gas at 711–16 and 837–47 feet.
Fresh water at 45 feet; sulphur water at 185 feet; black water at 410 feet.

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

R. and B. Newman No. 2, lot 20, con. III, south of Dover Road, Dunn tp.

Driller: W. Garringer.
Completed September 17, 1952.
Producing gas well.
Rock pressure: 243 lb.

Formation	Depth, feet
Surface	39
Lime and shale	435
Niagara lime	660
Shale	716
Clinton	746
Red Medina	786
Blue shale	841
White Medina	860
Red shale	960

Gas at 717–27 and 841–59 feet.
Black water at 52 and 195 feet; sulphur water at 435 feet.

LAKE SHORE GAS AND OIL SYNDICATE

H. Stewart No. 3, lot 19, con V, south of Dover Road, Dunn tp.

Driller: E. Ricker.
Completed March 4, 1952.
Producing gas well.
Rock pressure: 225 lb.

Formation	Depth, feet
Surface	17
Flint	80
Brown lime	138
Gypsum and lime	456
Niagara	692
Shale	752
Clinton	789
Red Medina	841
Grey shale	900
White Medina	916
Red shale	979

Gas at 756, 811, and 910 feet.
Sulphur water at 80 feet; black water at 190 feet.

WHITNEY ROOT

H. Hartsell No. 1, lot 11, town of Dunnville.

Driller: E. Ricker.
Completed May 3, 1952.
Producing gas well.
Rock pressure: 135 lb.

Formation	Depth, feet
Surface	83
Lime	133
Lime and gypsum	290
Brown lime	337
Niagara	537
Shale	607
Clinton	638
Red Medina	673
Grey shale	733
White Medina	748
Red shale	799

Gas at 612, 641, and 742 feet.
Fresh water at 80 and 96 feet.

W. B. PYLE

W. Pyle No. 1, lot 1, town of Dunnville.

Driller: H. Roth.
Completed July 25, 1952.
Producing gas well.
Rock pressure: 200 lb.

Formation	Depth, feet
Surface	84
Lime and shale	300
Niagara	520
Shale	591
Clinton	623
Red Medina	663
Shale	717
White Medina	732
Red shale	734

Gas at 653 feet.
Fresh water at 80 feet; sulphur water at 135 feet; black water at 400 feet.

GRAND GAS CO.

W. Root No. 1, lot 35, Plan 13558, town of Dunnville.

Driller: Patterson and Culver.
Completed January 15, 1952.
Producing gas well.
Rock pressure: 110 lb.

Formation	Depth, feet
Surface	78
Lime and shale	330
Niagara	555
Shale	610
Clinton	638
Red Medina	680
Shale	737
White Medina	757
Red shale	760

Gas at 618 and 750 feet.
Fresh water at 90 feet.

SMITH AND SONS

Smith and Sons No. 1, Queen St., town of Dunnville.

Driller: H. Roth.
Completed November 12, 1952.
Producing gas well.
Rock pressure: 110 lb.

Formation	Depth, feet
Surface	82
Lime and shale	310
Niagara	540
Shale	610
Clinton	640
Red Medina	681
Shale	736
White Medina	754
Red Shale	802

Gas at 638, 675, and 736–43 feet.
Fresh water at 82 feet; sulphur water at 170 feet; black water at 395 feet.

DOMINION NATURAL GAS CO., LTD.

G. Abraham No. 1, lot 7, con. I, cross concession, Moulton tp.

Driller: Lymburner and Webber.
Completed October 18, 1952.
Dry hole.

Formation	Depth, feet
Surface	117
Lime and shale	285
Niagara	510
Shale	557
Clinton	594
Red Medina	629
Shale	684
White Medina	696
Red shale	699

Sulphur water at 112, and 260 feet.

Haldimand County—Continued

GRAND GAS CO.

S. Brown No. 1, lot 6, range I from Grand River, Moulton tp.

Driller: Patterson and Culver.
Completed February 20, 1952.
Producing gas well.
Rock pressure: 150 lb.

Formation	Depth, feet
Surface	82
Lime and shale	335
Niagara	550
Shale	610
Clinton	635
Red Medina	680
Shale	732
White Medina	750
Red shale	770

Gas at 615, 655, and 748 feet.
Fresh water at 85 feet.

GRAND GAS CO.

S. Brown No. 2, lot 6, range I from Grand River, Moulton tp.

Driller: Patterson and Culver.
Completed March 22, 1952.
Dry hole.

Formation	Depth, feet
Surface	68
Lime and shale	330
Niagara	550
Shale	613
Clinton	642
Red Medina	680
Shale	740
White Medina	755
Red shale	760

Show of gas at 620 and 668 feet.
Fresh water at 70 feet.

PATTERSON AND CULVER

M. Cairns No. 1, lot 2, Indian reserve, Moulton tp.

Driller: Patterson and Culver.
Completed December 12, 1952.
Producing gas well.
Rock pressure: 110 lb.

Formation	Depth, feet
Surface	65
Lime and shale	300
Niagara	528
Shale	585
Clinton	610
Red Medina	650
Shale	715
White Medina	722
Red shale	730

Gas at 591 and 612 feet.
Fresh water at 80 feet; sulphur water at 115 feet.

DOMINION NATURAL GAS CO., LTD.

Can. Dept. Veterans Affairs No. 1, lot 1, con. IV, cross concession, Moulton tp.

Driller: H. Emerson.
Completed March 18, 1952.
Producing gas well.
Rock pressure: 210 lb.

Formation	Depth, feet
Surface	105
Lime and shale	340
Niagara	570
Shale	622
Clinton	654
Red Medina	700
Grey shale	750
White Medina	758
Red shale	818

Gas at 624, and 758 feet.
Sulphur water at 105, and 117 feet.

DOMINION NATURAL GAS CO., LTD.

Can. Dept. Veterans Affairs No. 2, lot 1, con. IV, cross concession, Moulton tp.

Driller: H. Emerson.
Completed May 12, 1952.
Producing gas well.
Rock pressure: 220 lb.

Formation	Depth, feet
Surface	110
Lime and shale	335
Niagara	560
Shale	620
Clinton	652
Red Medina	697
Grey shale	747
White Medina	758
Red shale	808

Gas at 747–57 feet.
Sulphur water at 110, 122, and 167 feet.

DOMINION NATURAL GAS CO., LTD.

D. Clark No. 1, lot 12, con. III, fronting Lake Erie, Moulton tp.

Driller: H. Emerson.
Completed November 7, 1952.
Producing gas well.
Rock pressure: 245 lb.

Formation	Depth, feet
Surface	125
Lime, shale and gypsum	340
Niagara	564
Shale	612
Clinton	653
Red Medina	686
Shale	737
White Medina	749
Red shale	854

Gas at 637 and 739–49 feet.
Sulphur water at 125 and 148 feet.

DOMINION NATURAL GAS CO., LTD.

R. House No. 1, lot 6, con. I, fronting Lake Erie, Moulton tp.

Driller: J. Webber.
Completed January 2, 1952.
Producing gas well.
Rock pressure: 210 lb.

Formation	Depth, feet
Surface	16
Flint	62
Lime and shale	431
Niagara	649
Shale	704
Clinton	739
Red Medina	794
Grey shale	836
White Medina	848
Red shale	850

Gas at 769–75 feet.
Sulphur water at 80 feet.

DOMINION NATURAL GAS CO., LTD.

G. Ireland No. 1, lot 14, con. III, fronting Lake Erie, Moulton tp.

Driller: H. Emerson.
Completed January 24, 1952.
Producing gas well.
Rock pressure: 230 lb.

Formation	Depth, feet
Surface	117
Lime and shale	342
Niagara	570
Shale	618
Clinton	653
Red Medina	695
Grey shale	743
White Medina	765
Red shale	823

Gas at 620 and 753–55 feet.
Fresh water at 100 feet; sulphur water at 119 feet.

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

K. Jones No. 2, lot 10, con. I, fronting Lake Erie, Moulton tp.

Driller: Lymburner and Webber.
Completed April 7, 1952.
Dry hole.

Formation	Depth, feet
Surface	15
Flint	55
Lime and shale	433
Niagara	669
Shale	720
Clinton	752
Red Medina	801
Grey shale	847
White Medina	859
Red shale	862

Sulphur water at 75 feet.

DOMINION NATURAL GAS CO., LTD.

J. and J. Popp No. 1, lot 8, con. I, cross concession, Moulton tp.

Driller: Lymburner and Webber.
Completed August 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	107
Lime and shale	285
Niagara	506
Shale	556
Clinton	594
Red Medina	629
Shale	678
White Medina	688
Red shale	690

Fresh water at 109 feet.

DOMINION NATURAL GAS CO., LTD.

J. Radics No. 1, lot 1, con. I, cross concession, Moulton tp.

Driller: Lymburner and Webber.
Completed December 17, 1952.
Dry hole.

Formation	Depth, feet
Surface	130
Lime and shale	320
Niagara	537
Shale	592
Clinton	629
Red Medina	673
Shale	721
White Medina	731
Red shale	734

Fresh water at 128 and 270 feet.

DOMINION NATURAL GAS CO., LTD.

J. Thompson No. 1, lot 2, con. IV, cross concession, Moulton tp.

Driller: H. Emerson.
Completed July 10, 1952.
Producing gas well.
Rock pressure: 210 lb.

Formation	Depth, feet
Surface	116
Lime, shale and gypsum	336
Niagara	560
Shale	616
Clinton	651
Red Medina	693
Shale	743
White Medina	753
Red shale	853

Gas at 616, 651, and 743 feet.
Sulphur water at 116 and 137 feet.

DOMINION NATURAL GAS CO., LTD.

J. Thompson No. 2, lot 2, con. IV, cross concession, Moulton tp.

Driller: H. Emerson.
Completed September 17, 1952.
Producing gas well.
Rock pressure: 235 lb.

Formation	Depth, feet
Surface	112
Lime, shale and gypsum	335
Niagara	565
Shale	611
Clinton	646
Red Medina	686
Shale	739
White Medina	758
Red shale	858

Gas at 611–15 and 739–43 feet.
Sulphur water at 35 and 117 feet.

C. MEHLENBACHER

C. Mehlenbacher No. 2, lot 9, con. I, North Cayuga tp.

Driller: Grand River Gas and Oil Syndicate.
Completed December 15, 1952.
Producing gas well.
Rock pressure: 90 lb.

Formation	Depth, feet
Surface	51
Lime and shale	227
Niagara	427
White lime shale	497
Shale	507
Clinton	539
Red Medina	574
Blue shale	639
White Medina	649
Red shale	652

Gas at 517 and 560 feet.
Fresh water at 48 feet; black water at 200 feet.

GRAND RIVER GAS AND OIL SYNDICATE

N. Stevens No. 1, lot 4, con. III, North Cayuga tp.

Driller: Grand River Gas and Oil Syndicate.
Completed July 5, 1952.
Producing gas well.
Rock pressure: 200 lb.

Formation	Depth, feet
Surface	58
Lime and shale	280
Niagara	480
White lime and shale	546
Shale	563
Clinton	593
Red Medina	628
Blue shale	693
White Medina	703
Red shale	705

Gas at 608 feet.
Fresh water at 65 feet; black water at 150 feet.

GRAND RIVER GAS AND OIL SYNDICATE

N. Stevens No. 4, lot 8, con. III, North Cayuga tp.

Driller: Grand River Gas and Oil Syndicate.
Completed October 11, 1952.
Producing gas well.
Rock pressure: 260 lb.

Formation	Depth, feet
Surface	68
Lime and shale	282
Niagara	482
Blue shale	546
Shale	562
Clinton	587
Red Medina	622
Blue shale	687
White Medina	699
Red shale	747

Gas at 597 and 695 feet.
Fresh water at 65 feet; black water at 90 feet.

Haldimand County—Continued

GRAND RIVER GAS AND OIL SYNDICATE

E. Swange No. 1, lot 7, con. II, North Cayuga tp.

Driller: Grand River Gas and Oil Syndicate.
Completed May 12, 1952.
Producing gas well.
Rock pressure: 120 lb.

Formation	Depth, feet
Surface	60
Lime and shale	280
Niagara	480
White lime and shale	550
Shale	562
Clinton	592
Red Medina	627
Blue shale	692
White Medina	702
Red shale	715

Gas at 596 feet.
Fresh water at 50 and 60 feet.

PETROL OIL AND GAS CO., LTD.

A. Curley No. 3, lot 2, con. IV, Oneida tp.

Driller: Patterson and Culver.
Completed May 30, 1952.
Dry hole.

Formation	Depth, feet
Surface	40
Lime and shale	260
Niagara	500
Shale	554
Clinton	587
Red Medina	602
Shale	663
White Medina	680
Red shale	683

Show of gas at 558 and 663 feet.
Fresh water at 45 and 130 feet.

MERCER AND DICKSON

J. Ferrel No. 1, lot 15, con. V, Oneida tp.

Driller: G. Schweyer.
Completed February 28, 1952.
Dry hole.

Formation	Depth, feet
Surface	32
Lime and shale	214
Niagara	434
Guelph lime	450
Shale	495
Clinton	516
Red Medina	548
Grey shale	605
White Medina	615
Red shale	621

Fresh water at 43, 52, and 430 feet; sulphur water at 466 feet.

PETROL OIL AND GAS CO., LTD.

J. Longboat No. 1, lot 4, con. IV, Oneida tp.

Driller: Patterson and Culver.
Completed July 25, 1952.
Producing gas well.
Rock pressure: 271 lb.

Formation	Depth, feet
Surface	33
Lime and shale	230
Niagara	468
Shale	518
Clinton	555
Red Medina	570
Shale	630
White Medina	650
Red shale	655

Gas at 521 feet.
Fresh water at 40 feet; sulphur water at 80 and 100 feet.

PETROL OIL AND GAS CO., LTD.

J. Longboat No. 1, lot 5, con. IV, Oneida tp.

Driller: Patterson and Culver.
Completed August 26, 1952.
Producing gas well.
Rock pressure: 301 lb.

Formation	Depth, feet
Surface	30
Lime and shale	240
Niagara	472
Shale	522
Clinton	563
Red Medina	588
Shale	638
White Medina	655
Red shale	660

Gas at 525 and 650 feet.
Fresh water at 55 feet; sulphur water at 100 and 270 feet.

PETROL OIL AND GAS CO., LTD.

J. Longboat No. 2, lot 5, con. IV, Oneida tp.

Driller: Patterson and Culver.
Completed September 26, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	30
Lime and shale	230
Niagara	470
Shale	512
Clinton	555
Red Medina	575
Shale	630
White Medina	645
Red shale	650

Gas at 515 and 524 feet.
Fresh water at 40 feet; sulphur water at 70 and 170 feet.

DOMINION NATURAL GAS CO., LTD.

J. Longboat No. 3, lot 5, con. IV, Oneida tp.

Driller: Patterson and Culver.
Completed October 30, 1952.
Producing gas well.
Rock pressure: 290 lb.

Formation	Depth, feet
Surface	30
Lime and shale	240
Niagara	465
Shale	515
Clinton	548
Red Medina	562
Shale	627
White Medina	648
Red shale	658

Gas at 525 and 545 feet.
Fresh water at 40 feet; sulphur water at 95 and 180 feet.

PORT COLBORNE-WELLAND GAS AND OIL CO., LTD.

R. Martindale No. 2, lot 57, River range, Oneida tp.

Driller: Port Colborne-Welland Gas and Oil Co., Ltd.
Completed July 16, 1952.
Producing gas well.
Rock pressure: 190 lb.

Formation	Depth, feet
Surface	46
Lime and shale	241
Niagara	461
Shale	517
Clinton	540
Red Medina	575
Grey shale	630
White Medina	640
Red shale	715

Gas at 523, 542, and 634 feet.
Fresh water at 40, 55, 65, and 445 feet; black water at 110 feet; salt water at 430 feet.

Haldimand County—Continued

PETROL OIL AND GAS CO., LTD.

J. Montour No. 1, lot 3, con. IV, Oneida tp.

Driller: Patterson and Culver.
Completed June 26, 1952.
Producing gas well.
Rock pressure: 270 lb.

Formation	Depth, feet
Surface	42
Lime and shale	235
Niagara	470
Shale	520
Clinton	555
Red Medina	570
Shale	633
White Medina	650
Red shale	700

Gas at 523 and 640 feet.
Fresh water at 60 feet; sulphur water at 95 and 180 feet.

PETROL OIL AND GAS CO., LTD.

J. Montour No. 2, lot 3, con. IV, Oneida tp.

Driller: Patterson and Culver.
Completed November 29, 1952.
Producing gas well.
Rock pressure: 280 lb.

Formation	Depth, feet
Surface	40
Lime and shale	250
Niagara	480
Shale	530
Clinton	565
Red Medina	585
Shale	640
White Medina	656
Red shale	660

Gas at 533 feet.
Fresh water at 55 feet; sulphur water at 90 feet.

PORT COLBORNE-WELLAND GAS AND OIL CO., LTD.

F. Moore No. 2, lot 55, River range, Oneida tp.

Driller: Port Colborne-Welland Gas and Oil Co., Ltd.
Completed September 24, 1952.
Dry hole.

Formation	Depth, feet
Surface	53
Lime and shale	235
Niagara	460
Shale	525
Clinton	548
Red Medina	585
Grey shale	638
White Medina	648
Red shale	651

Show of gas at 527 feet.
Fresh water at 35, 50, and 425 feet; black water at 165 and 375 feet.

PORT COLBORNE-WELLAND GAS AND OIL CO., LTD.

F. Moore No. 3, lot 55, con. V, River range, Oneida tp.

Driller: Port Colborne-Welland Gas and Oil Co., Ltd.
Completed December 22, 1952.
Producing gas well.
Rock pressure: 190 lb.

Formation	Depth, feet
Surface	36
Lime and shale	191
Niagara	421
Shale	481
Clinton	503
Red Medina	538
Grey shale	593
White Medina	608
Red shale	612

Gas at 485 and 499 feet.
Fresh water at 38, 45, and 68 feet; black water at 110 and 345 feet.

SHANK AND SNIVELY

L. Snively No. 5, lot 15, con. I, Oneida tp.

Driller: G. Schweyer.
Completed May 13, 1952.
Dry hole.

Formation	Depth, feet
Surface	1
Broken lime	11
Flint	36
Lime and shale	410
Niagara	640
Shale	692
Clinton	720
Red Medina	760
Grey shale	813
White Medina	825
Red shale	832

Fresh water at 5 and 11 feet.

BENNER AND TINNEY

S. Bier No. 2, lot 2, con. VII, Rainham tp.

Driller: G. Schweyer.
Completed June 30, 1952.
Producing gas well.
Rock pressure: 350 lb.

Formation	Depth, feet
Surface	26
Flint	66
Lime and shale	436
Niagara	666
Shale	728
Clinton	755
Red Medina	795
Grey shale	848
White Medina	860
Red shale	862

Gas at 730 and 744–55 feet.
Fresh water at 33 and 50 feet; black water at 210 feet.

BENNER AND TINNEY

S. Bier No. 3, lot 2, con. VII, Rainham tp.

Driller: G. Schweyer.
Completed September 1, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	16
Flint	54
Lime and shale	430
Niagara	660
Shale	725
Clinton	753
Red Medina	793
Grey shale	848
White Medina	860
Red shale	863

Gas 728, 740, 745, and 760 feet.
Fresh water at 30 and 34 feet; sulphur water at 89 feet; black water at 275 feet.

FISHERVILLE GAS CO.

H. Cronk No. 1, lot 6, con. IV, Rainham tp.

Driller: G. Schweyer.
Completed November 14, 1952.
Producing gas well.
Rock pressure: 250 lb.

Formation	Depth, feet
Surface	16
Flint	96
Lime and shale	465
Niagara	685
Shale	750
Clinton	780
Red Medina	820
Grey shale	880
White Medina	890
Red shale	894

Gas at 766, 768, 770, and 799 feet.
Fresh water at 42 feet; sulphur water at 52 and 60 feet.

Haldimand County—Continued

LEVI KINSEY

L. Kinsey No. 4, lot 2, con. I, Sherbrooke tp.

Driller: E. Ricker.
Completed July 24, 1952.
Producing gas well.
Rock pressure: 225 lb.

Formation	Depth, feet
Surface	66
Flint	103
Lime and gypsum	455
Niagara	677
Shale	733
Clinton	766
Red Medina	810
Grey shale	860
White Medina	876
Red shale	916

Gas at 743 and 868 feet.
Fresh water at 95 feet; black water at 190 feet.

NIECE BROS.

R. Niece No. 3, lot 3, con. I, Sherbrooke tp.

Driller: Patterson and Culver.
Completed October 30, 1952.
Producing gas well.
Rock pressure: 275 lb.

Formation	Depth, feet
Surface	55
Flint	70
Lime and shale	450
Niagara	665
Shale	725
Clinton	755
Red Medina	805
Shale	850
White Medina	870
Red shale	920

Gas at 728, 750, and 865 feet.
Black water at 75 feet; sulphur water at 145 feet.

DOMINION NATURAL GAS CO., LTD.

W. and A. Radzich No. 2, lot 6, con. I, Sherbrooke tp.

Driller: Lymburner and Webber.
Completed June 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	163
Lime and shale	430
Niagara	650
Shale	704
Clinton	734
Red Medina	778
Shale	834
White Medina	846
Red shale	848

Sulphur water at 162 feet.

BAIN, LYONS, AND WERNER

C. Bain No. 3, lot 10, con. V, South Cayuga tp.

Driller: D. Werner.
Completed September 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	21
Lime and shale	398
Niagara	614
Shale	687
Clinton	712
Red Medina	754
Grey shale	812
White Medina	823
Red shale	825

Show of gas at 689 and 819 feet.
Sulphur water at 28, 68, and 421 feet.

BAIN, LYONS, AND WERNER

C. Bain No. 4, lot 10, con. V, South Cayuga tp.

Driller: D. Werner.
Completed November 15, 1952.
Dry hole.

Formation	Depth, feet
Surface	47
Lime and shale	396
Niagara	618
Shale	686
Clinton	713
Red Medina	754
Grey shale	813
White Medina	823
Red shale	825

Show of gas at 690 and 717 feet.
Sulphur water at 60, 78, and 413 feet.

L. B. MEHLENBACHER GAS SYNDICATE

C. Benn No. 3, lot 8, con. XIV, Walpole tp.

Driller: T. Donald.
Completed October 15, 1951.
Producing gas well.
Rock pressure: 250 lb.

Formation	Depth, feet
Surface	21
Lime and shale	335
Niagara	616
Shale	646
Clinton	680
Red Medina	717
Grey shale	760
White Medina	772
Red shale	774

Gas at 678 feet.
Sulphur water at 50 feet; black water at 150 feet.

L. B. MEHLENBACHER GAS SYNDICATE

E. Benn No. 4, lot 14, con. VIII, Walpole tp.

Driller: T. Donald.
Completed January 15, 1952.
Dry hole.

Formation	Depth, feet
Surface	26
Lime and shale	335
Niagara	632
Shale	658
Clinton	698
Red Medina	729
Grey shale	772
White Medina	784
Red shale	787

Black water at 180 feet.

DOMINION NATURAL GAS CO., LTD.

L. Miller No. 1, lot 3, con. VII, Walpole tp.

Driller: R. Mandley and Son.
Completed February 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	33
Flint	111
Lime and shale	506
Niagara	723
Shale	816
Clinton	842
Red Medina	875
Shale	931
White Medina	945
Red shale	948

Show of gas at 849–51 feet.
Black water at 54 and 91 feet.

Haldimand County—Continued

WALPOLE GAS SYNDICATE NO. 2

J. Nichol No. 2, lot 16, con. XI, Walpole tp.

Driller: T. Donald.
Completed September 15, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	11
Flint	71
Lime and shale	435
Niagara	695
Shale	730
Clinton	768
Red Medina	807
Grey shale	844
White Medina	856
Red shale	857

Gas at 748 feet.
Sulphur water at 85 feet.

L. B. MEHLENBACHER GAS SYNDICATE

T. Petetesky No. 2, lot 9, con XIII, Walpole tp.

Driller: T. Donald.
Completed December 9, 1952.
Dry hole.

Formation	Depth, feet
Surface	99
Lime and shale	385
Niagara	692
Shale	713
Clinton	733
Red Medina	773
Grey shale	816
White Medina	828
Red shale	830

Sulphur water at 100 feet.

F. W. REICHELD

F. Reicheld No. 2, lot 9, con. V, Walpole tp.

Driller: F. Reicheld.
Completed July 9, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	20
Flint	120
Lime and shale	495
Niagara	770
Shale	820
Clinton	847
Red Medina	887
Shale	942
White Medina	952
Red shale	957

Gas at 857 and 867 feet.
Sulphur water at 65 feet; black water at 120 feet.

F. W. REICHELD

F. Reicheld No. 3, lot 8, con. V, Walpole tp.

Driller: F. Reicheld.
Completed December 24, 1952.
Producing gas well.
Rock pressure: 400 lb.

Formation	Depth, feet
Surface	25
Flint	120
Lime and shale	500
Niagara	765
Shale	815
Clinton	843
Red Medina	883
Shale	933
White Medina	948
Red shale	953

Gas at 830, and 845 feet.
Sulphur water at 65 feet; black water at 85 feet.

WALPOLE GAS SYNDICATE NO. 2

R. Sitter No. 1, lot 17, con. XI, Walpole tp.

Driller: T. Donald.
Completed April 25, 1952.
Producing gas well.
Rock pressure: 325 lb.

Formation	Depth, feet
Surface	4
Flint	74
Lime and shale	425
Niagara	700
Shale	730
Clinton	770
Red Medina	800
Grey shale	844
White Medina	856
Red shale	858

Gas at 740 feet.
Sulphur water at 75 feet; black water at 200 feet.

WALPOLE GAS SYNDICATE NO. 2

R. Sitter No. 2, lot 17, con. XI, Walpole tp.

Driller: T. Donald.
Completed July 1, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	5
Flint	65
Lime and shale	435
Niagara	695
Shale	725
Clinton	764
Red Medina	796
Grey shale	840
White Medina	852
Red shale	854

Gas at 728 and 743 feet.
Sulphur water at 65 feet.

F. W. REICHELD

K. Stallwood No. 3, lot 9, con. VII, Walpole tp.

Driller: F. Reicheld.
Completed January 30, 1952.
Producing gas well.
Rock pressure: 420 lb.

Formation	Depth, feet
Surface	40
Flint	100
Lime and shale	480
Niagara	745
Shale	795
Clinton	823
Red Medina	863
Shale	913
White Medina	923
Red shale	928

Gas at 800 feet.
Fresh water at 65 feet; sulphur water at 110 feet.

F. W. REICHELD

K. Stallwood No. 4, lot 9, con. VII, Walpole tp.

Driller: F. Reicheld.
Completed April 15, 1952.
Dry hole.

Formation	Depth, feet
Surface	23
Flint	90
Lime and shale	475
Niagara	755
Shale	805
Clinton	842
Red Medina	872
Shale	922
White Medina	929
Red shale	933

Fresh water at 65 feet; sulphur water at 110 feet.

Kent County

IMPERIAL OIL, LTD.

J. and M. Foulon No. 1, lot 5, con. III, Chatham gore, Chatham tp.

Driller: Stubble and Stubble.
Completed June 13, 1952.
Dry hole.

Formation	Depth, feet
Surface	98
Black shale	346
Hamilton	547
Grey and brown lime	828
Sharp brown lime	942
Brown and grey lime	1,014
Sharp brown and grey lime	1,115
Brown and grey lime	1,226
Brown and blue lime	1,404
Blue lime and gypsum	1,412
Brown and blue lime	1,710
Brown lime	1,826
Grey lime	1,883
Brown lime	1,964
Grey lime	1,994
Brown lime	2,028
Grey lime	2,135
Grey shale	2,139

Sulphur water at 569 feet.

IMPERIAL OIL, LTD.

W. Evans No. 1, lot 22, con. VI, River Thames survey Harwich tp.

Driller: R. McMaster and Sons.
Completed May 1, 1952.
Dry hole.

Formation	Depth, feet
Surface	60
Black shale	140
Lime	150
Grey shale	163
Black shale	178
Hamilton	366
Brown lime	397
Water sand	398
Brown lime	546
Lime and gypsum	569
Brown and grey lime	1,072
Blue and grey shale	1,112
Brown and blue lime	1,395
Lime and gypsum	1,402
Brown lime	1,481
Shale and lime	1,534
Grey lime	1,613
Brown lime	1,624
Grey lime	1,661
Blue shale	1,682
Shale and gypsum	1,698
Brown and grey lime	2,002
Rochester	2,006

Oil at 1,823 feet.
Gas at 410–13 and 1,613–24 feet.
Sulphur water at 397 feet; salt water at 1,823 feet.

IMPERIAL OIL, LTD.

A. Fischer No. 1, lot 10, con. IV, River Thames survey, Harwich tp.

Driller: R. McPherson.
Completed June 10, 1952.
Producing gas well.
Rock pressure: 768 lb.

Formation	Depth, feet
Surface	62
Blue and black shale	170
Hamilton	394
Brown lime	535
Water sand	555
Brown lime	758
Sharp lime	953
Grey and brown lime	983
Brown lime	1,100
Blue shale and brown lime	1,520
Brown lime	1,553
Grey lime	1,577
Brown lime	1,645
Brown and grey lime	1,671
Grey lime	1,704
Brown lime	1,883
Grey lime	1,903
Blue shale	1,923

Gas at 1,535 and 1,552 feet.
Fresh water at 63 feet; sulphur water at 535 feet; salt water at 1,555 feet.

C. PARKINSON

L. Jenner No. 1, lot 4, con. V, west of boundary, Harwich tp.

Driller: Demaray and Nichols.
Completed January 30, 1952.
Dry hole.

Formation	Depth, feet
Surface	79
Black shale	128
Grey lime	141
Soap	236
Grey lime	246
Soap	268
Grey lime	283
Soap	314
Buff lime	400
Lime and chert	412

Fresh water at 79–82 feet.

IMPERIAL OIL, LTD.

C. Maw No. 1, lot 23, con. V, Harwich tp.

Driller: R. McMaster and Sons.
Completed June 25, 1952.
Dry hole.

Formation	Depth, feet
Surface	70
Black shale	133
Hamilton	358
Brown lime	675
Sharp lime	807
Brown lime	880
Grey lime	900
Lime and shale	1,016
Lime and gypsum	1,082
Brown and grey lime	1,143
Lime and shale	1,191
Blue lime	1,243
Shale and gypsum	1,285
Brown and grey lime	1,452
Lime and shale	1,576
Brown lime	1,971
Grey shale	1,979

Show of oil at 1,860 feet.
Gas at 402, 571, 1,584, 1,793–98, and 1,894–1,900 feet.

Kent County—Continued

IMPERIAL OIL, LTD.

R. McNaughton No. 1, lot 10, con. III, River Thames survey, Harwich tp.

Driller: T. McPherson.
Completed December 10, 1952.
Dry hole.

Formation	Depth, feet
Surface	62
Huron shale	158
Hamilton	363
Brown lime	680
Sharp brown lime	790
Bfown lime	996
Brown lime and gypsum	1,021
Brown lime	1,078
Brown and blue lime	1,467
Brown lime	1,561
Brown and grey lime	1,623
Brown lime	1,884
Grey lime	1,927
Blue shale	1,931

Gas at 185–90, 1,540, and 1,546 feet.
Fresh water at 50 feet; sulphur water at 483 feet; salt water at 1,678–84 and 1,712 feet.

C. PARKINSON

F. Pask No. 1, lot 4, con. IV, west of boundary, Harwich tp.

Driller: Demaray and Nichols.
Completed February 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	83
Black and blue shale	118
Lime	128
Soap	250
Grey lime	273
Soap	302
Lower lime	476

Fresh water at 60–83 feet; black water at 475 feet.

SWEET GRASS OILS, LTD.

R. Richardson No. 1, lot 5, con. V, west of boundary, Harwich tp.

Driller: Demaray and Nichols.
Completed September 18, 1952.
Producing oil well.

Formation	Depth, feet
Surface	81
Black shale	136
Top rock	145
Soap	271
Middle lime	290
Lower soap	319
Big lime	385

Oil at 342, 355, 367, and 376 feet.
Fresh water at 81 feet; sulphur water at 367 and 376 feet.

IMPERIAL OIL, LTD.

R. Webster No. 1, lot 24, con. VI, River Thames survey, Harwich tp.

Driller: R. McPherson.
Completed August 13, 1952.
Dry hole.

Formation	Depth, feet
Surface	60
Black shale	140
Hamilton	388
Grey and brown lime	525
Brown and blue lime and shale	712
Sharp lime	939
Grey lime	965
Blue shale and brown lime	1,032
Brown lime	1,150
Blue shale and brown lime	1,220
Blue shale	1,355
Brown lime and blue shale	1,427
Brown and blue lime	1,465
Blue shale	1,597
Brown lime	1,670
Blue shale	1,709
Brown lime	1,749
Grey lime	1,777
Brown lime	1,915
Brown shale	1,953
Grey lime	1,990
Grey shale	1,996

Show of oil at 1,785–95 feet.
Gas at 1,618 feet.
Fresh water at 60 feet; salt water at 1,150 and 1,970–76 feet; sulphur water at 525 feet.

CONSOLIDATED WEST PETROLEUM CO., LTD.

Province of Ontario No. 7, in Lake Erie, opposite lot 181, Talbot Road range, Romney tp.

Driller: R. McMaster and Sons.
Completed November 3, 1952.
Producing gas well.
Rock pressure: 255 lb.

Formation	Depth, feet
Rig floor to lake bottom	70
Clay, gravel and sand	171
Grey and grey-brown lime	443
Cherty lime, partly arenaceous	590
Brown and grey lime	758
Grey shale and gypsum	855
Brown lime with some anhydrite	876
Grey brown lime	903
Grey shale and gypsum	917
Grey to brown lime with little shale	977
Grey shale and shaly lime with gypsum and anhydrite	1,129
Grey and grey-brown lime	1,183
Anhydrite and gypsum	1,195
Grey lime	1,210
Brown lime	1,217
Light-grey lime	1,254
Light grey-brown lime	1,264

Gas at 1,130, 1,203, 1,238, and 1,254 feet.
Black sulphur water at 569 feet.

Kent County—Continued

CONSOLIDATED WEST PETROLEUM CO., LTD.

Province of Ontario No. 6, in Lake Erie, opposite lot 180, Talbot Road range, Romney tp.

Driller: R. McMaster and Sons.
Completed July 19, 1952.
Producing gas well.
Rock pressure: 498 lb.

Formation	Depth, feet
Rig floor to lake	20
Lake Erie	65
Drift	167
Grey and buff lime	480
Cherty lime	566
Arenaceous lime	581
Buff and grey lime	703
Grey lime and gypsum	842
Brown lime	848
Gypsum and blue shale	868
Grey and brown lime	898
Grey shaly lime and gypsum	1,080
Gypsum	1,100
Grey and buff lime	1,167
Gypsum	1,179
Grey and brown lime	1,197
Grey lime	1,215
Buff lime	1,237

Gas at 1,119, 1,130, and 1,203–27 feet.
Sulphur water at 573 feet.

D. W. MATHESON

C. Rolstone No. 1, lot 15, con. VI, Zone tp.

Driller: R. McPherson.
Completed August 16, 1952.
Producing oil well.

Formation	Depth, feet
Surface	120
Soap	125
Grey lime	130
Soap	170
Lime and soap	200
Middle lime	223
Lower soap	245
Dark-grey lime	250
Hard brown lime	327
Soft brown lime	373
White sand	386
Brown lime	411
Sandy lime	418
Brown lime	426

Oil at 260–65 feet.

J. W. FRASER

J. Tunks No. 1, lot 13, River range, Zone tp.

Driller: Palenkas Bros.
Completed December 22, 1952.
Producing oil well.

Formation	Depth, feet
Surface	180
Top rock	185
Soap	210
Grey and buff lime	285
Hard brown lime	345
Soft brown lime	360
Hard brown sand	370
Soft brown sand	400
White sand	405

Oil at 345–50 and 380–400 feet.
Fresh water at 117, 172, and 182 feet; sulphur water at 355 feet.

Lambton County

IMPERIAL OIL, LTD.

V. Stephenson No. 1, lot 9, south boundary, Bosanquet tp.

Driller: R. McMaster and Sons.
Completed October 1, 1952.
Dry hole.

Formation	Depth, feet
Surface	80
Hamilton	350
Brown lime	780
Sharp lime	990
Brown lime	1,094
Blue lime	1,210
Brown lime	1,265
Salt	1,325
Lime and salt	1,344
Brown lime	1,380
Lime and salt	1,443
Blue shale	1,497
Lime, blue shale, and salt	1,551
Salt	1,760
Brown lime	1,766
Lime and salt	1,795
Brown lime	1,911
Salt	1,987
Gypsum	1,993
Brown lime	2,127
Grey lime	2,222

Black water at 495 feet.

E. L. ROTH

A. Campbell No. 1, lot 9, con. II, Brooke tp.

Driller: D. Lather.
Completed April 2, 1952.
Dry hole.

Formation	Depth, feet
Surface	51
Black shale	68
Top rock	135
Soap	269
Middle lime	280
Soap	313
Brown lime	450

Show of oil at 333 feet.
Fresh water at 51 feet.

E. L. ROTH

W. Campbell No. 1, lot 8, con. II, Brooke tp.

Driller: W. Hussey.
Completed June 10, 1952.
Dry hole.

Formation	Depth, feet
Surface	52
Top rock	115
Upper soap	235
Lime and soap	306
Brown lime	420

Show of oil at 360 feet.
Fresh water at 53 feet; sulphur water at 360 feet.

Lambton County—Continued

IMPERIAL OIL, LTD.

R. Cates No. 1, lot 1, con. XIV, Brooke tp.

Driller: Stubble and Stubble.
Completed August 15, 1952.
Dry hole.

Formation	Depth, feet
Surface	48
Black shale	124
Hamilton	397
Brown and grey lime	628
Brown lime and gypsum	649
Brown and grey lime	825
Sharp brown and grey lime, and gypsum	890
Grey lime	965
Sharp grey lime	985
Grey and brown lime	1,033
Brown and blue lime	1,277
Brown and blue lime and salt	1,309
Brown and grey lime	1,350
Brown and blue lime and salt	1,395
Blue shale	1,457
Shale, salt, and lime	1,545
Salt	1,640
Salt and lime	1,652
Brown lime	1,684
Grey lime	1,708
Brown lime	1,737
Grey lime	1,761
Brown lime	1,887
Grey lime	2,247
Blue lime	2,260
Blue shale	2,265

Show of oil at 592 and 2,023 feet.
Black water at 525 feet; salt water at 2,084 and 2,127-38 feet.

E. L. ROTH

Meyers Bros. No. 3, lot 8, con. II, Brooke tp.

Driller: W. Hussey.
Completed February 19, 1952.
Producing oil well.

Formation	Depth, feet
Surface	51
Black shale	52
Top rock	125
Top soap	260
Middle lime	275
Lower soap	300
Big lime	450

Oil at 340 and 350–60 feet.

E. L. ROTH

R. Meyers No. 4, lot 8, con. II, Brooke tp.

Driller: W. Hussey.
Completed April 20, 1952.
Dry hole.

Formation	Depth, feet
Surface	53
Top rock	112
Upper soap	258
Middle lime	276
Lower soap	300
Brown lime	400

Show of oil at 360–80 feet.
Fresh water at 60 feet; sulphur water at 360–80 feet.

E. L. ROTH

R. Ward No. 1, lot 9, con. I, Brooke tp.

Driller: R. Lather.
Completed June 10, 1952.
Dry hole.

Formation	Depth, feet
Surface	49
Black shale	77
Top rock	140

Fresh water at 49 feet.

E. L. ROTH

O. Wilson No. 1, lot 7, con. II, Brooke tp.

Driller: R. Lather.
Completed May 14, 1952.
Dry hole.

Formation	Depth, feet
Surface	52
Black shale	60
Top rock	127
Soap	266
Middle lime	277
Soap	306
Black lime	311
Brown lime	425

Show of oil at 370 feet.
Show of gas at 125 feet.
Fresh water at 52 feet; sulphur water at 370 feet.

UNION GAS CO. OF CANADA, LTD.

L. Jinks No. 2, lot 32, con. IX, Dawn tp.

Driller: Ehde and Meier.
Completed February 25, 1952.
Dry hole.

Formation	Depth, feet
Surface	77
Huron shale	105
Hamilton	354
Brown lime	720
Sharp grey lime	930
Brown lime	990
Brown and blue lime and gypsum	1,050
Brown and blue lime	1,065
Blue lime and gypsum	1,180
Brown and blue lime	1,250
Brown and blue lime and gypsum	1,290
Brown and blue lime	1,360
Salt and lime streaks	1,600
Brown and grey lime	1,738
Salt	1,777
Brown and grey lime and gypsum	1,801
Brown lime	1,912
Brown and grey lime and gypsum	1,930
Brown and grey lime	1,982

Fresh water at 75 feet; sulphur water at 420 feet; salt water at 1,942 feet.

UNION GAS CO. OF CANADA, LTD.

M. and V. Oliver No. 1, lot 33, con. IX, Dawn tp.

Driller: Ehde and Meier.
Completed January 24, 1952.
Dry hole.

Formation	Depth, feet
Surface	62
Black shale	80
Hamilton	335
Brown lime	670
Sharp lime	925
Brown lime	990
Blue and brown lime, gypsum streaks	1,220
Brown and blue lime	1,340
Salt and brown lime	1,600
Brown lime	1,738
Salt	1,792
Brown lime and gypsum	1,798
Brown lime	1,906
Brown lime and gypsum	1,930
Grey and brown lime	1,984
Grey lime	2,039
Rochester shale	2,045

Sulphur water at 530 feet; salt water at 1,930 feet.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.

N. and V. Wilson No. 1, lot 33, con. II, Dawn tp.

Driller: W. Kiser and Son.
Completed January 28, 1952.
Producing gas well.
Rock pressure: 878 lb.

Formation	Depth, feet
Surface	72
Black shale	187
Hamilton	465
Grey lime	477
Brown lime	727
Brown lime and gypsum	733
Brown lime	970
Sharp brown and grey lime	1,123
Brown lime	1,183
Blue lime	1,213
Blue, brown lime and gypsum	1,219
Brown, blue, grey lime	1,285
Blue lime	1,382
Brown lime	1,498
Blue lime	1,605
Brown lime	1,662
Brown and grey lime	1,706
Brown lime	1,734

Gas at 1,621–27, 1,633–39, and 1,719–34 feet.
Fresh water at 72 feet; sulphur water at 600 feet.

UNION GAS CO. OF CANADA, LTD.

D. Brand No. 1, lot 11, con. VI, Enniskillen tp.

Driller: W. Kiser and Son.
Completed March 24, 1952.
Dry hole.

Formation	Depth, feet
Surface	70
Black shale	140
Hamilton	388
Brown lime	588
Brown lime and gypsum	631
Brown lime	800
Sharp lime	985
Brown lime	1,073
Blue and brown lime	1,093
Blue and brown lime and gypsum	1,148
Blue, brown and grey lime	1,360
Salt and lime	1,405
Blue lime	1,477
Salt and lime	1,723
Brown lime	1,753
Brown and grey lime	1,813
Brown lime	2,069
Grey lime	2,122
Brown lime	2,163
Grey lime	2,252
Rochester	2,258

Show of oil at 1,813–19, and 2,057–63 feet.
Fresh water at 70 feet; sulphur water at 580 feet; salt water at 1,813, 1,829, and 1,875 feet.

UNION GAS CO. OF CANADA, LTD.

A. and E. Bruce No. 1, lot 1, con. IV, Enniskillen tp.

Driller: W. Kiser and Son.
Completed December 11, 1952.
Dry hole.

Formation	Depth, feet
Surface	75
Brown shale	198
Hamilton	520
Grey lime	528
Brown lime	874
Brown lime and gypsum	880
Brown and grey lime	1,034
Sharp lime	1,220
Brown and grey lime	1,338
Blue lime and gypsum	1,350
Blue and brown lime	1,696
Grey and brown lime	1,726
Brown lime	1,792
Brown and grey lime	1,864
Salt and lime	1,906
Salt	1,958
Brown and grey lime	2,000
Brown and black lime	2,090
Brown lime	2,124
Grey lime	2,205
Grey shale	2,210

Gas at 1,756–74 feet.
Sulphur water at 630 and 730 feet.

UNION GAS CO. OF CANADA, LTD.

E. and E. Bruton No. 1, lot 1, con. VIII, Enniskillen tp.

Driller: W. Kiser and Son.
Completed July 26, 1952.
Dry hole.

Formation	Depth, feet
Surface	88
Black shale	130
Hamilton	386
Brown lime	810
Sharp lime	990
Brown lime	1,044
Brown lime and gypsum	1,054
Brown lime	1,074
Brown and grey lime and gypsum	1,084
Brown, blue and grey lime	1,295
Salt and lime	1,355
Brown and grey lime	1,420
Salt and lime	1,495
Blue and grey lime	1,728
Salt and lime	1,859
Brown lime	1,918
Brown and grey lime	2,050
Brown lime	2,172

Show of gas at 415 and 450 feet.
Show of oil at 2,104–18 feet.
Fresh water at 85 feet; sulphur water at 480 feet; salt water at 2,136–42 and 2,148–54 feet.

N. E. DE MERS

N. de Mers No. 1, lot 17, con. II, Enniskillen tp.

Driller: H. Morningstar.
Completed May 1, 1952.
Producing oil well.

Formation	Depth, feet
Surface	54
Top rock	75
Upper soap	185
Middle lime	210
Lower soap	245
Grey lime	330
Brown lime	380

Oil at 330–80 feet.
Fresh water at 52 feet; brackish water at 262 feet.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.

J. Hillis No. 1, lot 3, con. VIII, Enniskillen tp.

Driller: W. Kiser and Son.
Completed October 22, 1952.
Dry hole.

Formation	Depth, feet
Surface	62
Black shale	112
Hamilton	372
Brown lime	617
Brown lime and gypsum	627
Brown lime	797
Sharp lime	973
Brown lime	1,051
Blue, grey and brown lime	1,286
Salt and lime	1,366
Brown lime	1,426
Salt and lime	1,480
Blue, grey and brown lime	1,580
Salt and lime	1,825
Brown and grey lime	1,976
Salt	2,076
Brown lime	2,238
Grey lime	2,310
Blue shale	2,314

Sulphur water at 500 feet.

IMPERIAL OIL, LTD.

M. and R. Jeffs No. 1, lot 28, con. XII, Enniskillen tp.

Driller: R. McPherson.
Completed March 17, 1952.
Dry hole.

Formation	Depth, feet
Surface	60
Black shale	145
Grey lime	150
Soap	155
Grey lime	161
Soap and lime	165
Lime	180
Grey lime and soap	196
Brown lime	204
Grey lime and soap	225
Grey lime	235
Soap	350
Soap and lime	360
Middle lime	382
Middle lime and soap	392
Soap	400
Dark-grey shale and lime	406
Brown lime	650
Brown lime and gypsum	660
Brown lime	680

Show of gas at 66 feet.
Fresh water at 60 feet; sulphur water at 545 feet.

UNION GAS CO. OF CANADA, LTD.

J. Hills and Industrial Mortgage and Trust Co., lot 2, con. VIII, Enniskillen tp.

Driller: W. Kiser and Son.
Completed September 6, 1952.
Dry hole.

Formation	Depth, feet
Surface	64
Black shale	125
Hamilton	382
Brown lime	790
Sharp lime	970
Brown lime	1,060
Brown lime and gypsum	1,089
Grey, blue and brown lime	1,277
Salt and lime	1,327
Brown lime	1,404
Salt and lime	1,463
Grey and blue lime	1,595
Salt and lime	1,823
Brown and grey lime	1,950
Salt and lime	2,012
Brown lime	2,242
Grey lime	2,250

Gas at 410–17 feet.
Oil at 467–76 feet.
Sulphur water at 500 feet.

UNION GAS CO. OF CANADA, LTD.

E. Kells No. 1, lot 5, con. XIV, Enniskillen tp.

Driller: W. Kiser and Son.
Completed July 17, 1952.
Dry hole.

Formation	Depth, feet
Surface	178
Hamilton	427
Brown lime	557
Sharp grey lime	569
Brown lime	663
Brown lime and gypsum	669
Brown lime	687
Brown lime and gypsum	699
Brown lime	840
Grey lime	850
Brown lime	874
Sharp lime	1,034
Brown lime	1,126
Blue lime and gypsum	1,132
Brown lime	1,155
Blue lime and gypsum	1,161
Brown and blue lime	1,315
Lime and salt	1,355
Brown lime	1,375
Lime and salt	1,435
Brown lime	1,459
Lime and salt	1,533
Lime and gypsum	1,545
Brown lime	1,617
Lime and salt	1,671
Brown and blue lime	1,742
Lime and salt	1,768
Brown and grey lime	1,804
Lime and salt	2,029
Brown and grey lime	2,168
Salt	2,264
Brown lime	2,364
Black lime	2,409
Grey lime and gypsum	2,416
Brown lime	2,440
Grey lime	2,516
Grey shale	2,522

Show of oil at 484–90, 557–69, and 678–87 feet.
Fresh water at 80 and 187 feet; sulphur water at 557–69, 800, and 1,179 feet; salt water at 2,264 feet.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.

M. McDonald No. 1, lot 6, con. XIV, Enniskillen tp.

Driller: W. Kiser and Son.
Completed September 8, 1952.
Dry hole.

Formation	Depth, feet
Surface	189
Hamilton	439
Brown lime	699
Grey lime and gypsum	711
Brown lime	885
Sharp lime	1,042
Brown lime	1,128
Blue lime and gypsum	1,134
Brown lime	1,174
Blue lime and gypsum	1,180
Brown and blue lime	1,387
Salt and lime	1,429
Brown lime	1,465
Salt and lime	1,533
Brown and grey lime	1,629
Salt and lime	1,653
Grey and brown lime	1,755
Salt and lime	2,030
Brown lime	2,096
Grey lime	2,166
Brown and grey lime and gypsum	2,178
Salt	2,273
Brown lime	2,318
Dark-grey lime	2,396
Grey lime and gypsum	2,408
Grey lime	2,483

Show of gas at 450 feet.
Show of oil at 484–90 feet.
Fresh water at 185 feet; sulphur water at 504–10, 558–72, 777, and 837 feet.

IMPERIAL OIL, LTD.

A. and W. Smale No. 1, lot 19, con. XIII, Enniskillen tp.

Driller: R. McMaster and Sons.
Completed February 25, 1952.
Dry hole.

Formation	Depth, feet
Surface	71
Black shale	154
Hamilton	424
Brown lime	908
Sharp lime	1,034
Brown lime	1,190
Blue shale and brown lime	1,301
Salt	1,315
Brown lime	1,350
Lime and salt	1,413
Salt, lime and gypsum	1,431
Brown lime	1,472
Lime and salt	1,585
Shale	1,680
Lime and salt	1,713
Salt	1,906
Lime and shale	2,045
Salt	2,127
Gypsum	2,130
Brown lime	2,301
Grey lime	2,359
Shale	2,364

Sulphur water at 560 feet.

UNION GAS CO. OF CANADA, LTD.

S. and T. Mills No. 1, lot 29, con. I, Enniskillen tp.

Driller: Ehde and Meier.
Completed November 25, 1952.
Producing gas well.
Rock pressure: 805 lb.

Formation	Depth, feet
Surface	50
Black shale	160
Hamilton	445
Brown lime	810
Sharp sand	1,125
Brown lime	1,220
Brown and blue lime and gypsum	1,270
Blue and brown lime	1,290
Blue lime and gypsum	1,360
Brown and blue lime	1,610
Brown lime	1,666
Grey lime	1,732
Lime and gypsum	1,744
Brown lime	1,817
Grey lime	1,841
Brown lime	1,884

Gas at 1,618–48 and 1,744–51 feet.
Fresh water at 48 feet; sulphur water at 550 feet; salt water at 1,800 and 1,835 feet.

UNION GAS CO. OF CANADA, LTD.

J. Stapleton No. 1, lot 2, con. IX, Enniskillen tp.

Driller: W. Kiser and Son.
Completed June 5, 1952.
Dry hole.

Formation	Depth, feet
Surface	80
Black shale	120
Hamilton	370
Brown lime	545
Brown lime and gypsum	665
Brown lime	800
Sharp brown and grey lime	981
Brown and blue lime	1,069
Brown and blue lime and gypsum	1,082
Brown and grey lime	1,141
Brown lime and gypsum	1,149
Brown and grey lime	1,292
Salt and lime	1,328
Brown lime	1,338
Salt and lime	1,361
Grey, blue, and brown lime	1,442
Salt and lime	1,478
Grey and blue lime	1,601
Salt and lime	1,845
Brown lime	1,920
Blue and grey lime	1,992
Salt	2,085
Brown lime	2,127
Grey and brown lime	2,211
Brown and grey lime and gypsum	2,229
Brown lime	2,253
Grey lime	2,322
Grey shale	2,328

Fresh water at 80 feet; sulphur water at 520, 600, and 630 feet.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.

J. and G. Webb No. 1, lot 15, con. III, Enniskillen tp.

Driller: W. Kiser and Son.
Completed October 22, 1952.
Dry hole.

Formation	Depth, feet
Surface	75
Black shale	90
Hamilton	460
Brown lime	730
Brown lime and gypsum	736
Brown lime	898
Sharp lime	1,090
Brown lime	1,186
Blue and brown lime and gypsum	1,192
Brown lime	1,210
Blue and brown lime and gypsum	1,216
Grey, blue and brown lime	1,616
Brown lime and salt	1,676
Brown lime	1,688
Salt and lime	1,694
Brown lime	1,763
Grey lime	1,830
Salt and lime	1,875
Brown lime and gypsum	1,887
Brown lime	1,941
Brown and black lime	1,996
Grey and brown lime	2,008
Brown lime	2,038
Grey lime	2,116
Grey shale	2,122

Show of oil at 75 feet.
Show of gas at 1,899–1,905 feet.
Fresh water at 75 feet; sulphur water at 586 and 643 feet.

E. R. MCGAFFEY

C. and B. Brown No. 3, lot 17, con. V, Euphemia tp.

Driller: E. McGaffey.
Completed March 10, 1952.
Dry hole.

Formation	Depth, feet
Surface	78
Soap	109
Lime shell	112
Soap	138
Lime shell	148
Soap	193
Middle Lime	205
Lower soap	225
Dark streak	231
Soap	233

Show of oil at 234 feet.
Fresh water at 63 feet; salt water at 112 and 347 feet.

E. R. MCGAFFEY

C. and B. Brown No. 4, lot 17, con. V, Euphemia tp.

Driller: E. McGaffey.
Completed December 6, 1952.
Dry hole.

Formation	Depth, feet
Surface	72
Soap	107
Lime shell	111
Soap	135
Lime shell	138
Soap	140
Lime shell	148
Soap	158
Lime shell	165
Soap	184
Middle lime	205
Lower soap	225
Dark streak	233
Lower lime	368
Oriskney sand	370

Show of oil at 233 and 347 feet.

E. L. ROTH

L. Elliott No. 1, lot 25, con. X, Euphemia tp.

Driller: S. Earl.
Completed July 4, 1952.
Dry hole.

Formation	Depth, feet
Surface	65
Top rock	118
Upper soap	257
Middle lime	270
Lower soap	287
Grey and brown lime	398
Sharp sand	430
Buff lime	476

Fresh water at 100 feet; black water at 259 feet; sulphur water at 408 feet.

E. L. ROTH

L. Elliott No. 1, lot 26, con. IX, Euphemia tp.

Driller: R. Lather.
Completed August 8, 1952.
Dry hole.

Formation	Depth, feet
Surface	93
Top rock	113
Top soap	251
Middle lime	268
Lower soap	286
Grey lime	293
Brown lime	376
Sharp sand	420
Brown lime	475

Fresh water at 93 feet; sulphur water at 450 feet.

E. L. ROTH

L. Elliott No. 2, lot 28, con. X, Euphemia tp.

Driller: Demaray and Nichols.
Completed October 28, 1952.
Dry hole.

Formation	Depth, feet
Surface	78
Top rock	110
Soap	245
Middle lime	262
Lower soap	282
Grey and brown lime	580
Sharp grey lime	800

Fresh water at 77 feet; sulphur water at 450 and 570 feet.

E. L. ROTH

C. Johnson No. 1, lot 26, con. VIII, Euphemia tp.

Driller: R. Lather.
Completed December 6, 1952.
Dry hole.

Formation	Depth, feet
Surface	67
Top rock	112
Top soap	248
Middle lime	268
Lower soap	278
Grey lime	290
Brown lime	370
Sharp sand and lime	400

Show of oil at 310 feet.
Fresh water at 67 feet; sulphur water at 400 feet.

Lambton County—Continued

DEMARAY, NICHOLS, AND PARKINSON

Mrs. N. Macauley No. 1, lot 29, con. IX, Euphemia tp.

Driller: Demaray and Nichols.
Completed March 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	66
Top rock	117
Upper soap	249
Middle lime	269
Lower soap	295
Grey lime	301
Buff lime	385
Sharp lime and sand	403

Fresh water at 65 feet; sulphur water at 403 feet.

IMPERIAL OIL, LTD.

J. Mihalich No. 1, lot 29, con. VIII, Euphemia tp.

Driller: R. McPherson.
Completed July 16, 1952.
Dry hole.

Formation	Depth, feet
Surface	65
Top rock	75
Lime and soap	247
Lime	266
Lime and soap	280
Dark-grey lime	285
Brown lime	450

Fresh water at 70 and 260 feet; black water at 416 feet.

E. L. ROTH

J. Mihalich No. 1, lot 28, con. X, Euphemia tp.

Driller: E. Roth.
Completed July 3, 1952.
Dry hole.

Formation	Depth, feet
Surface	86
Top rock	134
Top soap	275
Middle lime	290
Lower soap	310
Grey lime	315
Brown lime	395
Sharp sand	435
Brown lime	466

Fresh water at 86 feet; sulphur water at 415 feet.

UNION GAS CO., OF CANADA, LTD.

G. and M. Prangley No. 1, lot 22, con. III, Euphemia tp.

Driller: Ehde and Meier.
Completed August 22, 1952.
Dry hole.

Formation	Depth, feet
Surface	60
Black shale	110
Hamilton	350
Brown lime	450
Water sand	480
Brown lime	530
Grey lime	610
Brown lime	720
Sharp lime	1,025
Brown lime	1,110
Brown and blue lime	1,130
Brown and blue lime and gypsum	1,140
Brown and blue lime	1,198
Blue lime and gypsum	1,260
Brown and blue lime	1,512
Lime and salt	1,530
Brown lime	1,638
Grey lime and gypsum	1,644
Brown lime	1,734
Black lime	1,752
Brown lime	1,764
Brown lime and gypsum	1,788
Grey lime	1,800
Brown lime	1,830
Grey lime	1,848
Brown lime	1,872
Grey lime	1,920
Grey shale	1,922

Fresh water at 56 feet; sulphur water at 450 feet.

WILSON-SULLIVAN DEVELOPMENT CO., LTD.

E. Stuart No. 2, lot 16, con. VIII, Euphemia tp.

Driller: Wilson-Sullivan Development Co.
Completed October 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	90
Top rock	136
Upper soap	259
Middle lime	269
Lower soap	295
Dark-grey lime	302
Grey lime	305
Brown lime	378

Show of oil at 307 feet.
Fresh water at 87 feet; sulphur water at 307 feet.

DEMARAY, NICHOLS, AND PARKINSON

M. Walker No. 1, lot 28, con. IX, Euphemia tp.

Driller: Demaray and Nichols.
Completed April 29, 1952.
Producing oil well.

Formation	Depth, feet
Surface	64
Top rock	109
Upper soap	247
Middle lime	264
Lower soap	286
Lower lime	310

Oil at 308–10 feet.
Fresh water at 64 and 84 feet.

Lambton County—Continued

DEMARAY, NICHOLS, AND PARKINSON

M. Walker No. 2, lot 28, con. IX, Euphemia tp.

Driller: Demaray and Nichols.
Completed May 14, 1952.
Producing oil well.

Formation	Depth, feet
Surface	72
Top rock	118
Upper soap	258
Middle lime	274
Lower soap	290
Lower lime	312

Oil at 310–12 feet.
Fresh water at 70 feet.

CASCADE OIL CO.

M. Walker No. 3, lot 28, con. IX, Euphemia tp.

Driller: Demaray and Nichols.
Completed October 30, 1952.
Producing oil well.

Formation	Depth, feet
Surface	67
Top rock	118
Soap	248
Middle lime	269
Lower soap	285
Dark-grey lime	290
Buff lime	385
Sharp sandy lime	413

Oil at 307 feet.
Fresh water at 65–67 feet; sulphur water at 410 feet.

IMPERIAL OIL, LTD.

C. and N. Iden No. 2, lot 17, con. VIII, Moore tp.

Driller: R. McPherson.
Completed April 2, 1952.
Dry hole.

Formation	Depth, feet
Surface	150
Brown shale	242
Hamilton	504
Brown lime	682
Brown lime and gypsum	786
Brown lime	846
Brown and grey lime	909
Sharp brown and grey lime	1,105
Brown and grey lime	1,176
Brown and grey lime and gypsum	1,220
Brown and blue lime and blue shale	1,294
Brown and blue lime and gypsum	1,330
Brown and blue lime	1,404
Salt and lime shells	1,422
Brown lime	1,432
Salt and lime shells	1,454
Brown lime	1,474
Brown and blue lime and salt	1,546
Brown and blue lime	1,620
Lime and salt	1,673
Blue shale and brown and blue lime	1,740
Lime and salt	2,030
Brown and blue lime	2,180
Lime and salt	2,215
Salt	2,277
Salt and gypsum	2,285
Brown lime and gypsum	2,295
Brown lime	2,343
Brown and grey lime	2,419
Brown lime and gypsum	2,445
Brown lime	2,455
Grey lime	2,530
Blue shale	2,536

Fresh water at 149 feet; sulphur water at 660 feet.
Show of oil at 2,285–95 feet.

IMPERIAL OIL, LTD.

J. Eyre No. 1, lot 18, con. VII, Moore tp.

Driller: Stubble and Stubble.
Completed December 13, 1952.
Producing gas well.
Rock pressure: 785 lb.

Formation	Depth, feet
Surface	142
Black shale	230
Hamilton	495
Grey and brown lime	678
Brown lime and gypsum	755
Brown and grey lime	958
Sharp grey lime	1,112
Grey and brown lime	1,185
Brown lime and gypsum	1,202
Blue, grey and brown lime	1,240
Blue and brown lime and gypsum	1,282
Brown and blue lime	1,426
Brown and blue lime and salt	1,440
Brown and blue lime	1,575
Brown lime and salt	1,600
Grey and blue shale	1,643
Brown lime and salt	1,865
Brown and grey lime	1,945
Grey lime and gypsum	1,965
Gypsum	1,982
Brown lime and gypsum	1,985
Brown lime	2,012

Gas at 510, 1,985–91, 1,994–97, 2,003–6, and 2,010–11 feet.
Fresh water and 140 feet; sulphur water at 620 feet.

IMPERIAL OIL, LTD.

R. Medley No. 1, lot 20, con. IX, Moore tp.

Driller: R. McPherson.
Completed November 14, 1952.
Producing gas well.
Rock pressure: 880 lb.

Formation	Depth, feet
Surface	155
Brown shale	270
Hamilton	537
Brown lime	967
Sharp brown and grey lime	1,165
Brown lime	1,265
Brown and blue lime and gypsum	1,280
Brown and blue lime	1,350
Brown and blue lime and gypsum	1,447
Brown lime	1,482
Lime and salt	1,502
Brown lime	1,529
Lime and salt	1,610
Brown and blue lime	1,680
Lime and salt	1,730
Brown and blue lime	1,787
Lime and salt	2,080
Brown lime	2,190
Brown and grey lime	2,207
Brown lime and gypsum	2,232
Lime and salt	2,323
Brown and grey lime	2,347
Brown lime	2,387

Gas at 2,344–62 feet.
Sulphur water at 670–80 feet.

Lambton County—Continued

IMPERIAL OIL, LTD.

R. Murray No. 1, lot 21, con. IX, Moore tp.

Driller: R. McPherson.
Completed July 28, 1952.
Producing gas well.
Rock pressure: 880 lb.

Formation	Depth, feet
Surface	151
Black, brown and grey shale	280
Hamilton	551
Brown lime	722
Brown lime and gypsum	822
Brown and grey lime	947
Sharp brown and grey lime	1,173
Brown and grey lime	1,201
Brown lime	1,261
Brown and blue lime and gypsum	1,271
Brown and blue lime	1,352
Brown lime and gypsum	1,412
Blue lime	1,432
Brown lime	1,452
Lime and salt	1,462
Brown lime	1,472
Lime and salt	1,502
Brown lime	1,532
Lime and salt	1,584
Brown lime	1,617
Brown and blue lime and salt	1,638
Brown lime and blue lime	1,670
Brown and blue lime and salt	1,710
Blue shale	1,742
Brown and blue lime and gypsum	1,780
Lime and salt	1,963
Brown and grey lime	2,055
Brown lime and gypsum	2,063
Gypsum	2,094
Brown lime and gypsum	2,099
Brown lime	2,137

Gas at 20, 98, 2,107–24, 2,124–32, and 2,132–37, feet.
Sulphur water at 208 feet; black water at 608 and 722–72 feet.

IMPERIAL OIL, LTD.

D. and W. Prentice No. 1, lot 18, con. VIII, Moore tp.

Driller: R. L. McPherson.
Completed February 16, 1952.
Dry hole.

Formation	Depth, feet
Surface	141
Brown shale	244
Hamilton	505
Brown lime	731
Brown lime and gypsum	797
Brown lime	910
Sharp brown and grey lime	1,095
Brown and grey lime	1,176
Brown lime and gypsum	1,197
Blue shale and brown lime	1,376
Blue lime and salt	1,389
Brown lime	1,399
Brown lime and salt	1,426
Brown lime	1,448
Brown lime and salt	1,511
Brown and blue lime	1,592
Brown lime and salt	1,630
Brown and blue lime	1,721
Lime and salt	1,985
Brown and grey lime	2,129
Brown lime and gypsum	2,140
Salt and lime	2,242
Brown lime and gypsum	2,252
Brown lime	2,292
Brown and grey lime	2,321
Brown lime	2,363
Brown lime and gypsum	2,374
Brown and grey lime	2,407
Grey lime	2,493
Shale	2,497

Sulphur water at 620 feet.

IMPERIAL OIL, LTD.

M. Neal No. 1, lot 21, con. VIII, Moore tp.

Driller: T. McMaster.
Completed December 31, 1952.
Producing gas well.
Rock pressure: 880 lb.

Formation	Depth, feet
Surface	135
Huron	281
Hamilton	546
Brown and grey lime	993
Sharp lime	1,193
Brown lime	1,270
Blue shale	1,305
Grey lime	1,334
Brown and blue lime	1,353
Blue shale and gypsum	1,440
Grey lime and shale	1,461
Salt and lime	1,654
Lime and gypsum	1,705
Salt and lime	1,712
Blue shale	1,780
Lime and salt	2,043
Brown lime	2,123
Lime and blue shale	2,183
Lime and gypsum	2,190
Gypsum and salt	2,198
Salt	2,262
Gypsum and salt	2,272
Lime and gypsum	2,278
Brown lime	2,314

Gas at 2,298–2,314 feet.
Show of oil at 2,278 feet.
Fresh water at 130 feet; sulphur water at 675 feet.

UNION GAS CO. OF CANADA, LTD.

J. Rattray No. 1, lot 1, con. IV, Moore tp.

Driller: Ehde and Meier.
Completed October 18, 1953.
Dry hole.

Formation	Depth, feet
Surface	87
Black shale	200
Hamilton	550
Brown lime	900
Brown lime and gypsum	980
Brown lime	1,030
Brown lime and gypsum	1,050
Brown lime	1,080
Sharp lime	1,260
Brown and grey lime	1,360
Blue and brown lime and gypsum	1,370
Grey, blue, brown lime	1,424
Blue and brown lime and gypsum	1,574
Brown and blue lime	1,895
Salt	1,979
Brown and grey lime	2,099
Lime and gypsum	2,117
Brown lime	2,135
Grey lime	2,220
Grey shale	2,223

Gas at 1,767, 1,787–93, and 2,123–35 feet.
Sulphur water at 700 and 730 feet.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.

W. Robinson No. 1, lot 2, con. IV, Moore tp.

Driller: W. Kiser and Son.
Completed March 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	100
Black shale	217
Hamilton	613
Brown lime	916
Brown lime and gypsum	922
Brown lime	1,078
Sharp lime	1,263
Brown lime	1,356
Blue lime and gypsum	1,362
Blue and brown lime	1,406
Blue lime and gypsum	1,412
Brown and blue lime	1,724
Brown and grey lime	1,895
Salt	1,978
Brown lime	2,045
Grey lime	2,136
Brown lime	2,152
Grey lime	2,247
Grey shale	2,250

Gas at 1,778–86, 1,858–64 and 2,141–52 feet.
Fresh water at 100 feet; sulphur water at 724 and 762 feet.

IMPERIAL OIL, LTD.

H. and M. Wellington No. 1, lot 20, con. XI, Moore tp.

Driller: Stubble and Stubble.
Completed January 15, 1952.
Dry hole.

Formation	Depth, feet
Surface	145
Black shale	234
Hamilton	510
Brown lime	745
Brown lime and gypsum	786
Brown lime	906
Sharp brown and grey lime and gypsum	965
Sharp brown lime	1,000
Brown lime and gypsum	1,038
Sharp brown and grey lime	1,088
Brown and blue lime	1,115
Brown lime	1,210
Brown and blue lime and gypsum	1,226
Blue, brown and grey lime	1,336
Brown and grey lime	1,380
Salt and grey lime	1,470
Brown and grey lime	1,506
Salt and brown lime	1,570
Hard brown lime	1,606
Salt and brown and grey lime	1,680
Brown lime	1,743
Brown and blue lime and gypsum	1,752
Brown and grey lime	1,761
Salt and grey lime	1,807
Brown and grey lime and shale	1,863
Brown lime and salt	2,164
Brown and grey lime	2,308
Salt	2,384
Brown lime and salt	2,393
Brown lime	2,518
Brown and grey lime	2,575
Grey lime	2,646
Blue shale	2,654

Show of oil at 2,388–409 feet.
Sulphur water at 640 feet; salt water at 2,418–25 feet.

IMPERIAL OIL, LTD.

A. and M. White No. 2, lot 17, con. VIII, Mocre tp.

Driller: R. McPherson.
Completed March 11, 1952.
Producing oil well.

Formation	Depth, feet
Surface	140
Black and blue shale	226
Hamilton	485
Brown lime	683
Brown lime and gypsum	768
Brown lime	990
Sharp brown lime and sand	1,090
Brown lime	1,178
Blue shale and brown lime	1,376
Brown lime and salt	1,410
Brown lime	1,445
Lime and salt	1,520
Blue and brown lime	1,599
Lime and salt	1,609
Brown lime	1,620
Salt and lime	1,635
Blue shale and brown lime	1,698
Brown lime and salt	1,750
Salt and lime	1,983
Lime	2,135
Salt	2,233
Gypsum	2,243
Brown lime	2,381

Oil at 2,230–45 and 2,245–87 feet.
Sulphur water at 495 feet.

A. E. ROTH

H. Drope No. 1, lot 5, con. I, Plympton tp.

Driller: Demaray and Nichols.
Completed August 13, 1952.
Dry hole.

Formation	Depth, feet
Surface	169
Top rock	242
Upper soap	358
Middle lime	368
Lower soap	418
Dark-grey lime	424
Buff lime	515
Brown lime	685
Lime and gypsum	699
Brown lime	707

Fresh water at 169 feet; sulphur water at 550 feet.

IMPERIAL OIL, LTD.

R. MacKinley No. 1, lot 19, lake front, Plympton tp.

Driller: R. McMaster and Sons.
Completed June 30, 1952.
Dry hole.

Formation	Depth, feet
Surface	103
Black shale	163
Hamilton	470
Grey and brown lime	706
Brown lime and gypsum	751
Brown and grey lime	810
Brown lime and gypsum	873
Brown lime	982
Sharp brown and grey lime	1,175
Brown lime	1,303
Brown and blue lime	1,417
Blue lime, shale and salt	1,503
Salt and lime	1,606
Brown lime	1,633
Salt	1,704
Brown, blue and grey lime	1,823
Salt	1,845
Blue shale and blue lime	1,962
Brown lime, blue lime and salt	2,230
Brown and blue lime	2,374
Salt	2,477
Gypsum and salt	2,484
Gypsum and lime	2,490
Brown lime	2,609
Brown and grey lime	2,707
Grey shale	2,712

Fresh water at 102 feet; black water at 615 feet.

Lambton County—Continued

IMPERIAL OIL, LTD.

J. McKinley No. 1, lot 16, con. II, Plympton tp.

Driller: R. McMaster and Sons.
Completed August 2, 1952.
Dry hole.

Formation	Depth, feet
Surface	112
Black shale	176
Hamilton	442
Brown lime	575
Water sand	587
Brown and grey lime	1,010
Sharp blue lime	1,080
Brown lime	1,174
Brown lime and blue shale	1,355
Lime and salt	1,420
Brown lime	1,451
Salt and lime	1,523
Brown lime	1,574
Lime, salt and blue shale	1,837
Salt	1,921
Lime and salt	2,041
Grey and blue lime	2,147
Shale and salt	2,159
Salt	2,245
Lime and gypsum	2,261
Brown and grey lime	2,474
Grey shale	2,481

Fresh water at 115 feet; sulphur water at 575 feet.

IMPERIAL OIL, LTD.

F. and J. Nicol No. 1, lot 19, con. VIII, Plympton tp.

Driller: R. McMaster and Sons.
Completed May 9, 1952.
Dry hole.

Formation	Depth, feet
Surface	85
Black shale	145
Hamilton	438
Brown lime	570
Water sand	578
Brown lime	906
Sharp lime	922
Brown lime	966
Sharp brown lime	1,080
Brown lime	1,192
Blue and brown lime	1,414
Brown lime and salt	1,454
Brown lime	1,474
Lime and salt	1,548
Blue lime and gypsum	1,554
Brown lime	1,632
Lime and salt	1,674
Blue shale	1,760
Salt	1,790
Brown lime	1,814
Brown lime and salt	2,036
Brown and grey lime	2,180
Salt	2,260
Gypsum	2,268
Brown lime	2,445
Grey lime	2,505
Shale	2,511

Fresh water at 78 feet; sulphur water at 570 feet.

IMPERIAL OIL, LTD.

H. and J. Zonnerville No. 1, lot 18, con. I, Plympton tp.

Driller: R. McPherson.
Completed February 14, 1952.
Dry hole.

Formation	Depth, feet
Surface	92
Black shale	135
Grey lime	190
Grey lime and soap	295
Soap	370
Brown lime	385
Soap	430
Brown lime	615
Blue and brown lime	620
Brown lime and gypsum	691
Brown lime	717
Brown and grey lime	764
Black and brown lime	792
Brown lime	890
Sharp brown lime	925
Brown lime	940

Show of oil at 790 feet.
Fresh water at 80 feet; sulphur water at 560 feet.

IMPERIAL OIL, LTD.

S. and B. Beatty No. 1, lot 8, con. VI, Sarnia tp.

Driller: R. McPherson.
Completed May 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	144
Black shale	151
Hamilton	404
Brown lime	550
Brown lime and gypsum	575

Show of gas at 412 feet.
Fresh water at 148 feet; sulphur water at 412 feet.

IMPERIAL OIL, LTD.

D. Kember No. 1, lot 13, con. V, Sarnia tp.

Driller: Stubble and Stubble.
Completed October 17, 1952.
Dry hole.

Formation	Depth, feet
Surface	114
Black shale	185
Hamilton	485
Brown and grey lime	863
Grey and brown lime and gypsum	995
Sharp grey lime	1,155
Grey and brown lime	1,260
Brown and blue lime	1,615
Grey lime and salt	1,755
Brown lime	1,803
Grey and brown lime and salt	1,866
Brown lime	1,896
Salt and lime	1,946
Blue, brown and grey lime	2,180
Grey and brown lime, salt, and shells	2,410
Brown lime	2,491
Grey lime	2,592
Brown lime	2,615
Grey lime	2,810
Grey shale	2,817

Fresh water at 112 feet; sulphur water 620–30 feet.

Lambton County—Continued

IMPERIAL OIL, LTD.

F. Robert and L. Pratt No. 1, lot 11, con. I, Sarnia tp.

Driller: Stubble and Stubble.
Completed March 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	130
Black shale	153
Hamilton	432
Brown lime	690
Brown lime and gypsum	758
Brown lime	898
Sharp brown and grey lime	1,070
Brown and grey lime	1,191
Blue lime and gypsum	1,202
Brown lime and gypsum	1,211
Grey, brown and blue lime	1,290
Blue and brown lime	1,358
Salt and lime	1,432
Brown and grey lime	1,450
Brown lime and salt	1,524
Brown lime	1,549
Grey lime, salt and brown lime	1,617
Brown and grey lime	1,657
Brown lime and gypsum	1,665
Brown lime	1,699
Brown lime and gypsum	1,706
Brown lime and salt	1,760
Lime and shale	1,856
Grey lime, salt and brown lime	2,156
Brown and grey lime	2,303
Salt and lime	2,406
Salt, lime and gypsum	2,411
Brown lime	2,547
Grey lime and gypsum	2,555
Brown and grey lime	2,576
Grey lime	2,645
Grey shale	2,651

Fresh water at 128 feet; sulphur water at 565-73 feet.

IMPERIAL OIL, LTD.

E. and H. Underwood, No. 1, lot 11, con. II, Sarnia tp.

Driller: Stubble and Stubble.
Completed June 4, 1952.
Dry hole.

Formation	Depth, feet
Surface	113
Black shale	128
Hamilton	410
Brown lime	592
Brown lime and gypsum	741
Brown lime	838
Sharp brown and grey lime	1,046
Brown lime	1,118
Brown and grey lime and gypsum	1,123
Brown lime	1,162
Brown lime and gypsum	1,184
Brown, blue, black and grey lime	1,342
Brown lime and salt	1,458
Brown lime	1,478
Grey lime and salt	1,546
Brown lime	1,578
Grey lime and salt	1,666
Brown lime and gypsum	1,703
Grey and brown lime	1,721
Grey lime and gypsum	1,740
Grey and brown lime and salt	1,775
Brown lime and shale	1,804
Grey shale and brown lime	1,858
Grey and brown lime and salt	2,166
Brown and grey lime	2,315
Salt and lime	2,356
Salt	2,404
Salt and gypsum	2,413
Brown lime	2,541
Lime and gypsum	2,568
Brown lime	2,587
Grey lime	2,648
Grey shale	2,653

Show of gas at 627 feet.
Show of oil at 618 feet.
Sulphur water at 550 feet.

IMPERIAL OIL, LTD.

S. Baker No. 1, lot 4, con. XI, Sombra tp.

Driller: C. Carter.
Completed August 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	172
Black shale	380
Hamilton	614
Grey lime and water sand	795
Brown lime and gypsum	828
Brown and grey lime	995
Sharp grey lime	1,120
Brown lime	1,197
Blue shale and grey lime	1,373
Grey lime and brown lime	1,441
Brown lime, blue shale and grey lime	1,585
Shale and salt	1,690
Salt	1,715
Grey lime	1,726
Lime and salt	1,820
Brown lime	1,948
Lime and shale	1,963
Gypsum and salt	1,983
Salt	2,035
Gypsum and salt	2,045
Brown lime	2,201
Blue lime	2,217
Grey lime	2,301
Grey shale and lime	2,320

Show of gas at 140, 168, 2,181, and 2,190 feet.
Show of oil at 2,181 feet.
Fresh water at 168 feet; sulphur water at 720 feet; black water at 945 feet; salt water at 2,181 feet.

IMPERIAL OIL, LTD.

B. Bicum No. 1, lot 21, con. XI, Sombra tp.

Driller: R. McMaster and Sons.
Completed March 10, 1952.
Dry hole.

Formation	Depth, feet
Surface	110
Black shale	300
Hamilton	523
Brown lime	596
Lime and water sand	751
Grey lime	820
Sharp sand and lime	1,006
Brown lime	1,100
Grey and blue lime and gypsum	1,138
Blue shale	1,199
Grey shale and lime	1,261
Brown lime	1,355
Blue shale, lime and gypsum	1,420
Lime and salt	1,621
Salt	1,700
Brown and grey lime	1,822
Lime and gypsum	1,836
Salt	1,890
Gypsum	1,896
Brown lime	2,008
Lime and gypsum	2,032
Brown lime	2,055
Brown and grey lime	2,168
Grey shale	2,175

Fresh water at 95 feet; sulphur water at 636 feet.

Lambton County—Continued

IMPERIAL OIL, LTD.

C. Blake No. 1, lot 22, con. XI, Sombra tp.

Driller: R. McPherson.
Completed May 20, 1952.
Dry hole.

Formation	Depth, feet
Surface	105
Port Lambton shale	146
Black shale	298
Hamilton	513
Brown lime	867
Sharp, brown and grey lime	994
Brown and grey lime	1,072
Brown and blue lime and gypsum	1,091
Brown and blue lime	1,123
Brown and blue lime and gypsum	1,158
Blue shale	1,229
Brown and blue lime	1,440
Salt and lime shells	1,687
Brown lime	1,738
Grey and brown lime	1,826
Salt	1,880
Brown lime	1,937
Brown and grey lime	2,085
Grey lime	2,150
Grey shale	2,155

Sulphur water at 610-19 feet; salt water at 2,060-70 feet.

IMPERIAL OIL, LTD.

A. Branton No. 1, lot 8, con. X, Sombra tp.

Driller: R. McMaster and Sons.
Completed January 30, 1952.
Dry hole.

Formation	Depth, feet
Surface	140
Port Lambton	180
Huron	360
Hamilton	565
Brown lime	1,176
Lime and gypsum	1,212
Lime and blue shale	1,240
Blue shale and gypsum	1,250
Blue shale and lime	1,305
Brown and grey lime	1,436
Lime and shale	1,535
Salt and lime	1,813
Brown and grey lime	1,920
Lime and salt	2,016
Gypsum	2,020
Brown and grey lime	2,250
Rochester shale	2,255

Fresh water at 140 feet; sulphur water at 600 feet; salt water at 2,195 feet.

IMPERIAL OIL, LTD.

A. and A. Boston No. 1, lot 15, con. XI, Sombra tp.

Driller: R. McMaster and Sons.
Completed June 6, 1952.
Dry hole.

Formation	Depth, feet
Surface	127
Blac nd grey shale	327
Hamilton	540
Brown lime	671
Grey sandy lime	753
Brown lime	925
Sharp lime	1,048
Brown lime	1,145
Brown and blue lime and shale	1,298
Brown and blue lime	1,500
Salt	1,518
Grey lime	1,526
Salt and lime	1,540
Grey lime	1,555
Salt	1,730
Brown and grey lime	1,879
Lime and salt	1,887
Salt	1,982
Brown and grey lime	2,208
Shale	2,214

Fresh water at 122 feet; sulphur water at 663 feet; salt water at 2,183 feet.

IMPERIAL OIL, LTD.

A. and N. Ellis No. 1, lot 1, con. IX, Sombra tp.

Driller: C. Carter.
Completed March 19, 1952.
Producing gas well.
Rock pressure: 935 lb.

Formation	Depth, feet
Surface	199
Black shale	427
Hamilton	660
Brown lime	785
Water sand	808
Brown lime	872
Grey lime and gypsum	900
Grey lime	1,000
Brown lime	1,064
Grey lime	1,303
Grey lime and shale	1,383
Brown lime	1,409
Blue shale	1,473
Blue shale and brown lime	1,491
Brown and grey lime	1,576
Blue shale	1,700
Lime and shale	1,718
Brown lime	1,787
Lime, shale and gypsum	1,813
Brown lime	1,993

Gas at 1,813–39, 1,866–82, 1,893–906, 1,913–22, and 1,944–91 feet.
Show of oil at 1,991–93 feet.
Sulphur water at 763 feet.

Lambton County—Continued

IMPERIAL OIL, LTD.

L. Gormley No. 1, lot 3, con. XI, Sombra tp.

Driller: C. Carter.
Completed May 29, 1952.
Dry hole.

Formation	Depth, feet
Surface	186
Black shale	440
Hamilton	650
Brown lime	765
Water sand	790
Grey lime	800
Water sand	814
Brown lime	863
Grey lime and gypsum	873
Grey lime	968
Brown lime and gypsum	978
Dark-grey lime	1,002
Sharp lime	1,110
Grey lime	1,132
Sharp grey lime	1,154
Grey lime	1,257
Blue shale	1,270
Grey lime	1,304
Blue shale and lime	1,310
Blue shale and gypsum	1,325
Blue shale	1,355
Blue shale and gypsum	1,387
Brown lime and blue shale	1,655
Salt and lime	1,868
Brown and grey lime	1,988
Lime and gypsum	2,015
Salt	2,070
Gypsum	2,077
Brown lime	2,127
Grey and brown lime	2,265
Grey lime	2,337

Fresh water at 105 feet; sulphur water at 725, 750, and 765 feet; black and salt water at 800 feet.

IMPERIAL OIL, LTD.

G. Hetherington No. 1, lot 11, con. IX, Sombra tp.

Driller: R. McPherson.
Completed December 31, 1952.
Dry hole.

Formation	Depth, feet
Surface	130
Huron shale	470
Hamilton	745
Brown lime	961

Fresh water at 130 feet; sulphur water at 858 feet.

IMPERIAL OIL, LTD.

W. Hinnegan No. 1, lot 5, con. XI, Sombra tp.

Driller: C. Carter.
Completed November 29, 1952.
Producing gas well.
Rock pressure: 865 lb.

Formation	Depth, feet
Surface	180
Black shale	380
Hamilton	591
Grey and brown lime	986
Sharp grey lime	1,108
Brown lime and grey lime	1,190
Lime and blue shale	1,268
Blue shale and gypsum	1,284
Blue shale	1,350
Blue shale and brown lime	1,392
Shale, lime and gypsum	1,440
Blue shale and brown lime	1,565
Salt shale and lime	1,833
Brown lime	1,905
Grey lime and shale	1,965
Gypsum and shale	2,016
Lime and gypsum	2,025
Brown lime	2,055

Gas at 2,040–50 feet.
Sulphur water at 700 feet.

IMPERIAL OIL, LTD.

J. Horley No. 1, lot 20, con. VII, Sombra tp.

Driller: R. McPherson.
Completed October 24, 1952.
Producing oil well.

Formation	Depth, feet
Surface	75
Black and grey shale	285
Hamilton	497
Brown lime	849
Sharp lime	965
Brown lime	1,073
Blue shale	1,195
Brown lime	1,240
Grey lime	1,285
Blue and brown lime	1,318
Grey lime	1,410
Salt	1,585
Brown lime	1,763
Salt	1,803
Brown lime	1,922
Gypsum	1,935
Brown and grey lime	2,065
Blue shale	2,075

Gas at 1,948–50 and 1,958–59 feet.
Oil at 1,950–52 feet.
Fresh water at 70 feet; sulphur water at 590 feet; salt water at 1,959 feet.

IMPERIAL OIL, LTD.

P. Johnston No. 1, lot A, con. IX, Sombra tp.

Driller: R. McMaster and Sons.
Completed April 24, 1952.
Dry hole.

Formation	Depth, feet
Surface	80
Gravel	220
Gravel and sand	260
Black shale	540
Hamilton	822
Brown lime	860
Sand	870
Brown lime	1,195
Sharp brown and grey lime	1,342
Brown lime	1,478
Blue shale	1,491
Brown lime	1,526
Brown and blue shaly lime	1,623
Brown and blue lime	1,880
Lime and gypsum	1,895
Grey lime, blue lime	2,022
Brown lime and gypsum	2,036
Brown and grey lime	2,300
Grey shale	2,305

Fresh water at 200 feet; sulphur water at 850 feet; salt water at 2,230 feet.

Lambton County—Continued

IMPERIAL OIL, LTD.

J. Jones No. 1, lot 14, con. VI, Sombra tp.

Driller: C. Carter.
Completed October 9, 1952.
Producing gas well.
Rock pressure: 901 lb.

Formation	Depth, feet
Surface	112
Grey and black shale	304
Hamilton	550
Brown lime	612
Grey and brown lime and water sand	742
Lime and gypsum	747
Brown and grey lime	770
Brown lime and gypsum	780
Grey lime	820
Brown lime	924
Sharp grey lime	1,126
Grey and blue lime	1,220
Blue shale and grey and brown lime	1,380
Blue shale and gypsum	1,390
Blue shale and brown lime	1,497
Grey lime and gypsum	1,504
Blue shale and brown lime	1,625
Water sand	1,645
Grey and brown lime	1,700
Blue shale	1,746
Gypsum and salt	1,791
Gypsum and dark lime	1,807
Brown and grey lime and slate	1,900
Gypsum	1,908
Gypsum and brown lime	1,911
Brown lime	1,944

Gas at 100, 1,796, 1,919–21, 1,922–27 feet.
Show of oil at 1,928 feet.
Fresh water at 100 feet; sulphur water at 635–60, 675, and 703–24 feet; salt water at 1,630 and 1,928 feet.

IMPERIAL OIL, LTD.

A. and A. Shepley No. 1, lot 13, con. XI, Sombra tp.

Driller: R. McMaster and Sons.
Completed January 17, 1952.
Dry hole.

Formation	Depth, feet
Surface	130
Huron	346
Hamilton	555
Brown lime	676
Sand lime	750
Brown lime	875
Lime and gypsum	891
Brown lime	927
Sharp lime	971
Brown lime	1,031
Sharp lime	1,087
Brown lime	1,183
Lime and shale	1,420
Lime and gypsum	1,430
Lime and shale	1,495
Shale and gypsum	1,517
Salt and lime streaks	1,762
Brown lime	1,894
Lime and gypsum	1,903
Salt	1,975
Lime and gypsum	1,981
Brown and grey lime	2,241
Shale	2,253

Fresh water at 126 feet; sulphur water at 676 feet.

UNION GAS CO. OF CANADA, LTD.

D., F., and J. Pettit No. 1, lot 29, con. XV, Sombra tp.

Driller: Wayne Kiser and Son.
Completed December 8, 1953.
Dry hole.

Formation	Depth, feet
Surface	82
Black shale	187
Hamilton	417
Brown lime	830
Sharp lime	985
Brown lime	1,081
Blue, brown and grey lime	1,155
Blue and grey lime and gypsum	1,175
Blue, grey and brown lime	1,460
Salt	1,480
Brown lime	1,489
Salt and lime	1,702
Brown lime	1,794
Brown and blue lime	1,842
Salt	1,915
Brown lime	2,097
Brown and grey lime and gypsum	2,083
Brown lime	2,089
Grey lime	2,165
Blue shale	2,170

Fresh water at 80 feet; sulphur water at 580 and 620 feet.

IMPERIAL OIL, LTD.

E. Smith No. 1, lot 15, con. X, Sombra tp.

Driller: R. McMaster and Sons.
Completed February 29, 1952.
Dry hole.

Formation	Depth, feet
Surface	130
Black shale	340
Hamilton	548
Brown lime	1,045
Sharp lime	1,085
Brown lime	1,162
Shale and lime	1,271
Brown, blue and grey lime	1,425
Grey shale and lime	1,494
Salt and lime	1,731
Brown and grey lime	1,880
Salt	1,940
Lime and gypsum	1,948
Brown lime	2,052
Brown and grey lime	2,197
Grey shale	2,200

Fresh water at 120 feet; sulphur water at 670 feet.

Lambton County—Continued

IMPERIAL OIL, LTD.

W. Tretheway No. 1, lot 2, con. XIII, Sombra tp.

Driller: Stubble and Stubble.
Completed April 16, 1952.
Dry hole.

Formation	Depth, feet
Surface	150
Dark grey shale	199
Black shale	409
Hamilton	648
Brown and grey lime	835
Brown lime and gypsum	872
Grey, brown and blue lime	998
Sharp brown and grey lime	1,165
Grey and brown lime	1,252
Blue lime and gypsum	1,260
Blue and brown lime	1,304
Brown lime and gypsum	1,310
Brown and blue and grey lime	1,552
Brown lime and salt	1,560
Blue shale and grey shale	1,645
Grey lime, salt and brown lime	1,815
Salt	1,885
Brown lime	1,902
Salt	1,919
Grey and brown lime	2,085
Salt	2,152
Brown lime and gypsum	2,157
Brown lime	2,193
Grey lime	2,214
Brown lime	2,268
Grey lime	2,286
Brown lime	2,306
Grey lime	2,406
Shale	2,411

Sulphur water at 734 and 776 feet.

IMPERIAL OIL, LTD.

G. and W. Young, No. 1, lot 2, con. XIII, Sombra tp.

Driller: Stubble and Stubble.
Completed February 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	160
Fort Lambton	199
Black shale	408
Hamilton	635
Grey lime and shells	654
Brown lime	831
Brown lime and gypsum	875
Brown lime	1,020
Brown and grey lime	1,160
Brown and grey lime	1,242
Brown and blue lime	1,273
Grey lime	1,297
Brown and blue lime	1,312
Brown lime and gypsum	1,319
Blue lime, blue shale and brown lime	1,635
Salt and lime	1,909
Brown and grey lime	2,070
Salt	2,140
Brown lime	2,260
Grey lime	2,276
Brown lime	2,299
Brown and grey lime	2,321
Grey lime	2,393
Rochester shale	2,402

Fresh water at 100 feet; sulphur water at 742 feet.

IMPERIAL OIL, LTD.

E. Faulds No. 1, lot 30, con. V, north of Egremont Road, Warwick tp.

Driller: R. McPherson.
Completed September 18, 1952.
Dry hole.

Formation	Depth, feet
Surface	130
Hamilton	368
Brown lime	767
Sharp brown and grey lime	988
Brown lime	1,098
Blue lime and gypsum	1,108
Brown and blue lime	1,339
Lime and salt	1,349
Blue shale	1,400
Lime and salt	1,410
Brown lime	1,425
Lime and salt	1,632
Brown lime	1,933
Brown and grey lime	1,992
Brown lime	2,017
Grey lime	2,061
Brown lime	2,150
Brown and blue lime	2,163
Grey lime	2,180
Grey shale	2,193

Black water at 475–85 feet.

IMPERIAL OIL, LTD.

C. Huctwith No. 1, lot 11, con. IV, north of Egremont Road, Warwick tp.

Driller: R. McMaster and Sons.
Completed October 28, 1952.
Dry hole.

Formation	Depth, feet
Surface	54
Black shale	124
Hamilton	408
Brown lime	525
Brown lime and gypsum	548
Brown lime	835
Sharp brown lime	995
Brown lime	1,060
Blue and brown lime	1,280
Brown lime and salt	1,440
Brown lime	1,510
Lime, shale and salt	1,602
Salt	1,640
Lime and salt	1,874
Brown and grey lime	2,020
Salt	2,106
Brown and grey lime	2,342
Grey shale	2,351

Gas at 215 feet.
Fresh water at 48 feet; sulphur water at 535 feet.

IMPERIAL OIL, LTD.

J. Moffatt No. 1, lot 14, con. VI, south of Egremont Road, Warwick tp.

Driller: R. McPherson.
Completed April 23, 1952.
Dry hole.

Formation	Depth, feet
Surface	90
Black shale	150
Grey lime and soap	173
Shale	185
Soap	190
Grey lime	195
Soap and lime	240
Soap	360
Lime	385
Soap	395
Soap and lime	417
Brown lime	450
Grey and brown lime	570

Sulphur water at 540 feet.

Lincoln County

GRIMSBY NATURAL GAS CO., LTD.

A. Mason No. 1, lot 5, con. VI, Caistor tp.

Driller: R. Mandley and Son.
Completed December 18, 1952.
Producing gas well.
Rock pressure: 169 lb.

Formation	Depth, feet
Surface	85
Niagara	283
Shale	318
Clinton	346
Red Medina	387
Shale	439
White Medina	453
Red shale	455

Gas at 323, 342, and 405 feet.
Fresh water at 97 and 131 feet.

GRIMSBY NATURAL GAS CO., LTD.

L. Muir No. 4, lot 8, con. IV, Caistor tp.

Driller: R. Mandley and Son.
Completed August 4, 1952.
Dry hole.

Formation	Depth, feet
Surface	57
Brown lime	61
Niagara	275
Shale	315
Clinton	347
Red Medina	385
Shale	430
White Medina	445
Red shale	447

Gas at 318, 354, and 438 feet.
Fresh water at 65, 107, and 204 feet.

GRIMSBY NATURAL GAS CO., LTD.

L. Muir No. 5, lot 8, con. IV, Caistor tp.

Driller: R. Mandley and Son.
Completed September 24, 1952.
Producing gas well.
Rock pressure: 157 lb.

Formation	Depth, feet
Surface	60
Brown lime	65
Niagara	284
Shale	327
Clinton	354
Red Medina	392
Shale	438
White Medina	453
Red shale	501

Gas at 362 and 445 feet.
Fresh water at 72 and 130 feet.

GRIMSBY NATURAL GAS CO., LTD.

N. Olaski No. 1, lot 13, con. V, Caistor tp.

Driller: R. Mandley and Son.
Completed December 30, 1952.
Dry hole.

Formation	Depth, feet
Surface	89
Niagara	290
Shale	316
Clinton	337
Red Medina	381
Shale	432
White Medina	446
Red shale	448

Show of gas at 337 feet.
Fresh water at 94 and 189 feet.

GRIMSBY NATURAL GAS CO., LTD.

E. Waite No. 1, lot 7, con. IV, Caistor tp.

Driller: R. Mandley and Son.
Completed November 4, 1952.
Producing gas well.
Rock pressure: 143 lb.

Formation	Depth, feet
Surface	80
Niagara	280
Shale	321
Clinton	350
Red Medina	389
Shale	431
White Medina	444
Red Medina	488

Gas at 352 and 436 feet.
Fresh water at 87 and 126 feet.

GRIMSBY NATURAL GAS CO., LTD.

E. Waite No. 2, lot 7, con. IV, Caistor tp.

Driller: R. Mandley and Son.
Completed November 23, 1952.
Producing gas well.
Rock pressure: 142 lb.

Formation	Depth, feet
Surface	60
Niagara	296
Shale	318
Clinton	353
Red Medina	389
Shale	445
White Medina	463
Red shale	464

Gas at 324 and 365 feet.
Fresh water at 73 and 261 feet; salt water at 460 feet.

MANOCK GAS SYNDICATE

C. Overholt estate No. 1, lot 22, con. II, Louth tp.

Driller: W. McKillop.
Completed September 25, 1952.
Dry hole.

Formation	Depth, feet
Surface	21
Red and blue shale	77
Red shale	202
Red and blue shale	403
Red shale	542
Oswegan shale	556
Red and blue shale	566
Blue and grey shale	576
Grey lime and shale	581
Grey lime	590
Red shale and grey lime	629
Grey lime and blue shale	653
Grey lime and red shale	706
Red shale	715
Red and blue shale	729
Grey lime and blue shale	781
Hudson River shale	1,380
Utica shale	1,519
Trenton lime	2,192
Potsdam sand	2,233
Arkose	2,313

Salt water at 18, 81, 261, 2,233, 2,252, and 2,306 feet.

Middlesex County

NEW BRITISH DOMINION OIL AND GAS CO.

J. McVicar No. 1, lot 21, con. VIII, Caradoc tp.

Driller: H. Stubble and J. Ashton.
Completed September 22, 1952.
Dry hole.

Formation	Depth, feet
Surface	220
Hamilton shale	295
Grey and brown lime	700
Sharp lime	785
Grey lime	870
Shaly lime and gypsum	970
Brown and grey lime	1,050
Grey and blue shaly lime	1,185
Salt	1,225
Lime and salt	1,260
Salt	1,340
Brown lime	1,383
Grey shaly lime	1,450
Brown and grey lime	1,620
Dark-brown and grey lime	1,673
Grey lime	1,732
Grey shale and limey shale	1,780
Clinton	1,810
Grey shale and lime	1,915
Red shale	2,240
Grey limy shale	2,694
Black shale	2,806
Trenton	3,197

Fresh water at 26 feet; sulphur water at 355, 430, and 1,610 feet.

IMPERIAL OIL, LTD.

J. McDonald No. 1, lot 5, range II N., Ekfrid tp.

Driller: Demaray and Nichols.
Completed June 27, 1952.
Dry hole.

Formation	Depth, feet
Surface	245
Lime and soap	260
Soap	284
Grey lime	308
Soap	322
Dark-grey lime	328
Buff lime	400
Lime and chert	422
Brown lime	475

Fresh water at 160 feet; black water at 470 feet.

IMPERIAL OIL, LTD.

B. and C. Perry No. 1, lot 9, range II N., Ekfrid tp.

Driller: R. McPherson.
Completed June 2, 1952.
Dry hole.

Formation	Depth, feet
Surface	238
Soap	270
Shale and lime	306
Soap	314
Dark-grey lime	324
Brown lime	400
Grey lime	427
Brown lime	475

Fresh water at 168 and 224 feet.

SYDNEY EARL

A. Clements No. 1, lot 16, con. V, Mosa tp.

Driller: S. Earl.
Completed October 1, 1952.
Dry hole.

Formation	Depth, feet
Surface	100
Top rock	120
Soap	267
Middle lime	287
Lower soap	311
Lime streak	314
Soap	316

Fresh water at 100 and 115 feet.

UNION GAS CO. OF CANADA, LTD.

A. Downie No. 2, lot 18, range I N., Mosa tp.

Driller: Ehde and Meier.
Completed July 14, 1952.
Producing gas well.
Rock pressure: 738 lb.

Formation	Depth, feet
Surface	130
Hamilton	360
Brown lime	640
Sharp lime	915
Brown lime	1,000
Brown and blue lime	1,040
Brown and blue lime and gypsum	1,140
Brown and blue lime	1,270
Brown and blue lime and gypsum	1,360
Brown and blue lime	1,380
Brown lime	1,434
Grey lime	1,476
Brown and grey lime and gypsum	1,482
Brown lime	1,509

Gas at 1,482–94 feet.
Fresh water at 108 feet; sulphur water at 510 and 610 feet.

WESTERN ASHLEY MINERALS, LTD., AND ANCHOR PETROLEUMS, LTD.

T. Fisher No. 1, lot 16, range II N., Mosa tp.

Driller: G. Rawlings.
Completed December 10, 1952.
Producing gas well.
Rock pressure: 740 lb.

Formation	Depth, feet
Surface	138
Hamilton	386
Brown lime	638
Brown and grey lime	702
Sharp lime	943
Brown lime	1,008
Blue and brown lime	1,095
Blue lime and gypsum	1,131
Brown and blue lime	1,216
Brown and grey lime	1,312
Blue and grey lime	1,389
Brown lime	1,430
Grey lime	1,491
Brown lime and gypsum	1,498
Brown lime	1,535

Gas at 1,498–508 feet.
Sulphur water at 586, 670, and 700 feet.

Middlesex County—Continued

IMPERIAL OIL, LTD.

G. and R. Gilbert No. 1, lot 2, con. I, Mosa tp.

Driller: Demaray and Nichols.
Completed May 16, 1952.
Dry hole.

Formation	Depth, feet
Surface	140
Shale and lime	155
Grey lime	158
Soap	258
Lime and soap	281
Soap	290
Lime	323
Soap	338
Brown lime	530

Show of gas at 168 feet.
Fresh water at 168 feet; sulphur water at 530 feet.

DOMINION PETROLEUM CO., LTD.

N. Gillies No. 30, lot 7, con. VI, Mosa tp.

Driller: E. McLaughlin and Son.
Completed September 15, 1952.
Producing oil well.

Formation	Depth, feet
Surface	80
Top rock	84
Upper soap	220
Middle lime	236
Soap	256
Grey lime	335
Soft buff lime	350
Hard buff lime	360
Soft brown lime	378
Hard brown lime	385

Oil at 345, and 360–78 feet.
Fresh water at 84 feet.

IMPERIAL OIL, LTD.

E. Pettman No. 1, lot 4, con. II, Mosa tp.

Driller: R. McPherson.
Completed June 21, 1952.
Dry hole.

Formation	Depth, feet
Surface	116
Lime and soap	157
Soap and lime	245
Middle lime	317
Soap	332
Dark-grey lime	335
Brown lime	510

Show of oil at 478 feet.
Fresh water at 100 feet.

WESTERN ASHLEY MINERALS, LTD.

G. Rogers No. 1, lot 17, range I N., Mosa tp.

Driller: G. Rawlings.
Completed August 23, 1952.
Producing gas well.
Rock pressure: 738 lb.

Formation	Depth, feet
Surface	130
Hamilton	360
Brown and grey lime	710
Sharp lime	925
Buff lime	999
Brown and blue lime and gypsum	1,015
Brown lime	1,039
Brown and blue lime and gypsum	1,070
Grey and blue lime	1,157
Brown and blue lime and gypsum	1,172
Brown lime	1,194
Brown and grey lime and gypsum	1,257
Brown and grey lime	1,375
Brown lime	1,454
Grey lime and gypsum	1,488
Brown lime	1,510

Gas at 1,488–500 feet.
Sulphur water at 580, 640, and 650 feet.

DOMINION PETROLEUM CO., LTD.

J. Simpson No. 14, lot 7, con. VI, Mosa tp.

Driller: D. A. McLaughlin.
Completed May 30, 1952.
Producing oil well.

Formation	Depth, feet
Surface	80
Top rock	85
Upper soap	220
Middle lime	240
Lower soap	260
Hard buff lime	340
Soft brown lime	350
Hard grey lime	360
Soft brown lime	378
Hard brown lime	387

Oil at 345, and 360–78 feet.
Fresh water at 90 feet.

DOMINION PETROLEUM CO., LTD.

J. Simpson No. 15, lot 7, con. VI, Mosa tp.

Driller: E. McLaughlin.
Completed June 20, 1952.
Producing oil well.

Formation	Depth, feet
Surface	82
Top rock	86
Soap, lime streaks	220
Middle lime	240
Lower soap	258
Hard grey lime	336
Soft brown lime	350
Hard brown lime	358
Soft brown lime	380
Hard buff lime	388

Oil at 285, 336–50, and 358–80 feet.
Fresh water at 82 feet.

DOMINION PETROLEUM CO., LTD.

J. Simpson No. 16, lot 7, con. VI, Mosa tp.

Driller: E. McLaughlin.
Completed July 16, 1952.
Producing oil well.

Formation	Depth, feet
Surface	82
Top rock	87
Soap, lime streaks	225
Middle lime	245
Lower soap	262
Hard buff lime	338
Soft brown lime	356
Hard brown lime	364
Soft brown lime	381
Hard buff lime	387

Oil at 205, 332–56, and 364–81 feet.
Fresh water at 82 feet; brackish water at 205 feet.

DOMINION NATURAL GAS CO., LTD.

J. Simpson No. 17, lot 7, con. VI, Mosa tp.

Driller: E. McLaughlin.
Completed August 5, 1952.
Producing oil well.

Formation	Depth, feet
Surface	82
Top rock	87
Soap, lime streaks	226
Middle lime	248
Lower soap	268
Hard buff lime	348
Soft buff lime	356
Hard brown lime	364
Soft brown lime	384
Hard buff lime	388

Oil at 364–84 feet.
Fresh water at 89 feet.

Middlesex County—Continued

DOMINION PETROLEUM CO., LTD.

Walker Bros. No. 52, lot 6, con. VI, Mosa tp.

Driller: E. McLaughlin.
Completed October 23, 1952.
Dry hole.

Formation	Depth, feet
Surface	50
Grey shaly lime	55
Soap	108
Grey lime	111
Soap	127
Grey lime	131
Soap	182
Hard buff lime	202
Soap	220
Grey lime	228
Soap	232
Hard grey lime	298
Soft brown lime	314
Hard buff lime	322
Soft brown lime	343
Hard grey lime	348
Soft buff lime	350

Show of oil at 298–314 and 322–43 feet.
Fresh water at 42 feet.

Norfolk County

DOMINION NATURAL GAS CO., LTD.

G. Caswell No. 1, lot 24, con. II, Charlotteville tp.

Driller: A. E. Hoover estate.
Completed February 11, 1952.
Dry hole.

Formation	Depth, feet
Surface	160
Lime	270
Flint	350
Sharp sand	425
Lime and shale	828
Niagara	1,050
Shale	1,105
Clinton	1,134
Red Medina	1,174
Grey shale	1,229
White Medina	1,238
Red shale	1,240

Show of gas at 1,121 feet.
Fresh water at 165 and 275 feet.

DOMINION NATURAL GAS CO., LTD.

J. Cruickshank No. 1, lot 19, con. VII, Charlotteville tp.

Driller: H. Emerson.
Completed December 29, 1952.
Producing gas well.
Rock pressure: 510 lb.

Formation	Depth, feet
Surface	247
Brown lime	335
Flint	454
Lime and shale	858
Niagara	1,079
Shale	1,140
Clinton	1,168
Red Medina	1,208
Shale	1,250
White Medina	1,264
Red shale	1,270

Gas at 1,162–68 feet.
Fresh water at 267 feet; black water at 340 feet.

DOMINION NATURAL GAS CO., LTD.

J. Lawrence No. 1, lot 22, con. I, Charlotteville tp.

Driller: H. Emerson.
Completed March 25, 1952.
Dry hole.

Formation	Depth, feet
Surface	186
Brown lime	231
Flint	370
Sharp sand	445
Lime, shale	840
Niagara	1,060
Shale	1,128
Clinton	1,152
Red Medina	1,187
Shale	1,242
White Medina	1,263
Red shale	1,265

Show of gas at 1,135, 1,148, 1,164, and 1,172 feet.
Fresh water at 189 feet; black water at 375 feet.

DOMINION NATURAL GAS CO., LTD.

M. and M. Margetan No. 1, lot 23, con. II, Charlotteville tp.

Driller: D. Werner.
Completed October 11, 1952.
Producing gas well.
Rock pressure: 291 lb.

Formation	Depth, feet
Surface	183
Lime	289
Flint	392
Sharp sand	448
Lime and shale	855
Niagara	1,065
Shale	1,129
Clinton	1,147
Red Medina	1,185
Grey shale	1,242

Gas at 1,150–54 and 1,182–84 feet.
Fresh water at 206 feet; sulphur water at 355 and 858 feet.

DOMINION NATURAL GAS CO., LTD.

F. Shearer No. 1, lot 21, con. VI, Charlotteville tp.

Driller: A. E. Hoover estate.
Completed June 20, 1952.
Producing gas well.
Rock pressure: 494 lb.

Formation	Depth, feet
Surface	226
Lime	330
Flint	470
Lime and shale	855
Niagara	1,071
Shale	1,127
Clinton	1,162
Red Medina	1,197
Grey shale	1,242
White Medina	1,251
Red shale	1,252

Gas at 1,150 feet.
Fresh water at 238 feet; sulphur water at 385 feet.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

F. and K. Spohn No. 1, lot 19, con. VI, Charlotteville tp.

Driller: H. Emerson.
Completed June 5, 1952.
Producing gas well.
Rock pressure: 525 lb.

Formation	Depth, feet
Surface	213
Brown lime	330
Flint	455
Lime and shale	856
Niagara	1,070
Shale	1,131
Clinton	1,171
Red Medina	1,206
Shale	1,250
White Medina	1,260
Red shale	1,270

Gas at 1,161 feet.
Fresh water at 215 and 275 feet; sulphur water at 550 feet.

DOMINION NATURAL GAS CO., LTD.

F. and K. Spohn No. 2, lot 19, con. VI, Charlotteville tp.

Driller: H. Emerson.
Completed August 1, 1952.
Producing gas well.
Rock pressure: 415 lb.

Formation	Depth, feet
Surface	225
Brown lime	330
Flint	455
Lime and shale	845
Niagara	1,070
Shale	1,136
Clinton	1,176
Red Medina	1,210
Shale	1,240
White Medina	1,264
Red shale	1,276

Gas at 1,151–58 feet.
Fresh water at 226 feet; sulphur water at 365 and 520 feet.

DOMINION NATURAL GAS CO., LTD.

F. and K. Spohn No. 3, lot 19, con. VI, Charlotteville tp.

Driller: H. Emerson.
Completed October 10, 1952.
Producing gas well.
Rock pressure: 520 lb.

Formation	Depth, feet
Surface	225
Brown lime	330
Flint	455
Lime and shale	850
Niagara	1,070
Shale	1,134
Clinton	1,170
Red Medina	1,210
Shale	1,250
White Medina	1,262
Red shale	1,275

Gas at 1,151–70 feet.
Fresh water at 225 feet; sulphur water at 240 feet.

DOMINION NATURAL GAS CO., LTD.

J. and J. Zurad No. 1, lot 16, con. X, Charlotteville tp.

Driller: A. E. Hoover estate.
Completed September 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	205
Lime and shale	320
Flint	405
Lime and shale	800
Niagara	1,037
Shale	1,095
Clinton	1,118
Red Medina	1,158
Shale	1,205
White Medina	1,217
Red shale	1,219

Show of gas at 1,114 feet.
Fresh water at 208 and 235 feet; black water at 258 and 295 feet.

DOMINION NATURAL GAS CO., LTD.

E. and J. Blizman No. 1, lot 34, con. I, south of Talbot Road, Middleton tp.

Driller: H. Nauman.
Completed December 18, 1952.
Producing gas well.
Rock pressure: 463 lb.

Formation	Depth, feet
Surface	174
Lime	317
Flint	410
Lime	457
Lime and shale	824
Niagara	1,066
Shale	1,124
Clinton	1,143
Red Medina	1,173
Grey shale	1,233
White Medina	1,242
Red shale	1,247

Gas at 1,137 and 1,149 feet.
Fresh water at 178 and 195 feet; salt water at 885 feet

DOMINION NATURAL GAS CO., LTD.

G. Gehring No. 1, lot 41, con. II, south of Talbot Road, Middleton tp.

Driller: W. Hodgson.
Completed December 16, 1952.
Producing gas well.
Rock pressure: 350 lb.

Formation	Depth, feet
Surface	195
Lime	320
Flint	430
Lime	480
Shale	580
Lime and shale	835
Niagara	1,068
Shale	1,124
Clinton	1,143
Red Medina	1,183
Grey shale	1,237
White Medina	1,249
Red shale	1,253

Gas at 1,140–41 feet.
Black water at 211, 325, and 795 feet; salt water at 920 feet.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

A. and J. Kirchner No. 1, lot 33, con. II, south of Talbot Road, Middleton tp.

Driller: H. Nauman.
Completed June 4, 1952.
Producing gas well.
Rock pressure: 360 lb.

Formation	Depth, feet
Surface	185
Lime	322
Flint	425
Lime	477
Lime and shale	832
Niagara	1,076
Shale	1,139
Clinton	1,158
Red Medina	1,188
Grey shale	1,248
White Medina	1,260
Red shale	1,262

Gas at 1,154–55 feet.
Fresh water at 194 and 202 feet; sulphur water at 242 and 410 feet; black water at 422 feet; salt water at 892 feet.

DOMINION NATURAL GAS CO., LTD.

A. and J. Kirchner No. 2, lot 33, con. II, south of Talbot Road, Middleton tp.

Driller: H. Nauman.
Completed September 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	198
Lime	333
Flint	442
Lime	495
Lime and shale	843
Niagara	1,090
Shale	1,150
Clinton	1,169
Red Medina	1,201
Grey shale	1,261
White Medina	1,269
Red shale	1,272

Show of gas at 1,164–65 feet.
Fresh water at 207 and 219 feet; sulphur water at 297 and 391 feet; salt water at 892 feet.

DOMINION NATURAL GAS CO., LTD.

K. and S. Koprich No. 2, lot 35, con. I, south of Talbot Road, Middleton tp.

Driller: H. Nauman.
Completed February 28, 1952.
Dry hole.

Formation	Depth, feet
Surface	186
Lime	318
Flint	412
Lime	465
Lime and shale	827
Niagara	1,068
Shale	1,128
Clinton	1,148
Red Medina	1,180
Grey shale	1,240
White Medina	1,248
Red shale	1,252

Show of gas at 1,132 feet.
Fresh water at 196, 202, and 211 feet; sulphur water at 238 feet; salt water at 878 feet.

DOMINION NATURAL GAS CO., LTD.

M. and J. Van Dewalle No. 1, lot 40, con. II, south of Talbot Road, Middleton tp.

Driller: W. Hodgson.
Completed July 26, 1952.
Producing gas well.
Rock pressure: 441 lb.

Formation	Depth, feet
Surface	180
Lime	321
Flint	416
Lime	456
Shale	560
Lime and shale	818
Niagara	1,052
Shale	1,109
Clinton	1,129
Red Medina	1,172
Grey shale	1,221
White Medina	1,231
Red shale	1,237

Gas at 1,126–28 and 1,227–31 feet.
Fresh water at 185, 230, and 265 feet; black water at 410 and 500 feet; salt water at 965 feet.

DOMINION NATURAL GAS CO., LTD.

M. Cattle and M. Cross No. 1, lot 19, con. XIII, North Walsingham tp.

Driller: D. Irving.
Completed December 4, 1952.
Producing gas well.
Rock pressure: 435 lb.

Formation	Depth, feet
Surface	195
Grey lime	360
Flint	495
Brown lime	540
Lime and shale	915
Niagara	1,130
Shale	1,195
Clinton	1,219
Red Medina	1,254
Shale	1,312
White Medina	1,316
Red shale	1,321

Gas at 1,212 feet.
Sulphur water at 196, 274, and 375 feet; salt water at 925 feet.

DOMINION NATURAL GAS CO., LTD.

C. and I. De Clair No. 3, lot 20, con. XIII, North Walsingham tp.

Driller: R. Nauman.
Completed January 18, 1952.
Producing gas well.
Rock pressure: 462 lb.

Formation	Depth, feet
Surface	198
Grey lime	352
Flint	493
Brown lime	562
Shale and gypsum	634
Lime and shale	916
Niagara	1,144
Shale	1,203
Clinton	1,229
Red Medina	1,257
Grey shale	1,271

Gas at 1,217–27 feet.
Sulphur water at 201 and 251 feet; salt water at 936 feet.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

T. and V. Kelly No. 4, lot 3, con. XIV, North Walsingham tp.

Driller: E. Benner.
Completed February 12, 1952.
Producing gas well.
Rock pressure: 585 lb.

Formation	Depth, feet
Surface	257
Brown lime	426
Flint	581
Lime and shale	1,005
Niagara	1,255
Grey shale	1,304
Clinton	1,328
Blue shale	1,370

Gas at 1,314–18 feet.
Fresh water at 265 feet; black salt water at 311 feet.

DOMINION NATURAL GAS CO., LTD.

T. and V. Kelly No. 5, lot 3, con. XIV, North Walsingham tp.

Driller: E. Benner.
Completed May 31, 1952.
Dry hole.

Formation	Depth, feet
Surface	255
Brown lime	425
Flint and sharp sand	580
Lime and shale	1,005
Niagara	1,243
Shale	1,303
Clinton	1,327
Red Medina	1,342
Blue shale	1,412
White Medina	1,427
Red shale	1,432

Fresh water at 283 feet; salt water at 303 feet.

DOMINION NATURAL GAS CO., LTD.

B. and J. Pake No. 2, lot 20, con. XII, North Walsingham tp.

Driller: R. Mandley and Son.
Completed October 22, 1952.
Producing gas well.
Rock pressure: 487 lb.

Formation	Depth, feet
Surface	194
Lime	345
Flint	475
Lime and shale	850
Niagara	1,120
Shale	1,190
Clinton	1,217
Red Medina	1,232
Shale	1,294
White Medina	1,306
Red shale	1,310

Gas at 1,204–9 feet.
Fresh water at 195 feet; sulphur water at 203 feet; black water at 350, 500, 585, 665, and 910 feet.

DOMINION NATURAL GAS CO., LTD.

G. Pepper No. 1, lot 17, con. XII, North Walsingham tp.

Driller: R. Nauman.
Completed July 7, 1952
Producing gas well.
Rock pressure: 598 lb.

Formation	Depth, feet
Surface	213
Grey lime	376
Flint	505
Brown lime	572
Shale and gypsum	648
Lime and shale	915
Niagara	1,152
Shale	1,215
Clinton	1,241
Red Medina	1,269
Grey shale	1,327
White Medina	1,337
Red shale	1,339

Gas at 1,230–332 feet.
Sulphur water at 248, 284, and 388 feet; black water at 965 feet.

DOMINION NATURAL GAS CO., LTD.

J. and M. Pepper No. 1, lot 18, con. XII, North Walsingham tp.

Driller: R. Nauman.
Completed March 31, 1952.
Producing gas well.
Rock pressure: 125 lb.

Formation	Depth, feet
Surface	215
Grey lime	376
Flint	495
Brown lime	567
Shale and gypsum	635
Lime and shale	915
Niagara	1,141
Shale	1,203
Clinton	1,231
Red Medina	1,257
Grey shale	1,276

Gas at 1,221 feet.
Sulphur water at 238, 272, and 942 feet.

DOMINION NATURAL GAS CO., LTD

J. and M. Pepper No. 2, lot 18, con. XII, North Walsingham tp.

Driller: J. Nauman.
Completed October 1, 1952.
Dry hole.

Formation	Depth, feet
Surface	205
Grey lime	378
Flint	498
Brown lime	580
Shale and gypsum	647
Lime and shale	918
Niagara	1,143
Shale	1,208
Clinton	1,234
Red Medina	1,262
Grey shale	1,320
White Medina	1,328
Red shale	1,332

Sulphur water at 248 and 286 feet; salt water at 942 feet.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

M. and M. Rimar No. 3, lot 21, con. XII, North Walsingham tp.

Driller: R. Mandley.
Completed April 4, 1952.
Dry hole.

Formation	Depth, feet
Surface	187
Lime	335
Flint	464
Lime, shale	891
Niagara	1,107
Shale	1,158
Clinton	1,182
Red Medina	1,216
Shale	1,284
White Medina	1,292
Red shale	1,295

Sulphur water at 194 feet; black water at 237, 340, and 1,040 feet.

DOMINION NATURAL GAS CO., LTD.

M. and M. Rimar No. 4, lot 21, con. XI, North Walsingham tp.

Driller: R. Mandley and Sons.
Completed July 9, 1952.
Producing gas well.
Rock pressure: 457 lb.

Formation	Depth, feet
Surface	197
Lime	350
Flint	480
Lime and shale	900
Niagara	1,117
Shale	1,177
Clinton	1,205
Red Medina	1,230
Shale	1,296
White Medina	1,304
Red shale	1,309

Gas at 1,192 feet.
Fresh water at 198 feet; sulphur water at 246, 440, and 920 feet.

DOMINION NATURAL GAS CO., LTD.

G. and M. Romel No. 2, lot 2, con. XIV, North Walsingham tp.

Driller: I. Benner.
Completed October 10, 1952.
Dry hole.

Formation	Depth, feet
Surface	255
Brown lime	420
Flint and sharp sand	575
Lime and shale	1,005
Niagara	1,244
Grey shale	1,302
Clinton	1,326
Red Medina	1,336
Shale	1,396

Gas at 1,317 feet.
Fresh water at 267 feet; sulphur water at 305 feet.

DOMINION NATURAL GAS CO., LTD.

A. and M. Verstraeton No. 4, lot 18, con. XIII, North Walsingham tp.

Driller: D. Irving.
Completed May 13, 1952.
Dry hole.

Formation	Depth, feet
Surface	198
Lime	365
Flint	500
Brown lime and shale	925
Niagara	1,138
Shale	1,203
Clinton	1,227
Red Medina	1,267
Shale	1,325
White Medina	1,333
Red shale	1,337

Show of gas at 1,218 feet.
Fresh water at 245 and 280 feet; black water at 390 feet; salt water at 951 feet.

DOMINION NATURAL GAS CO., LTD.

A. and M. Verstraeton No. 5, lot 19, con. XIII, North Walsingham tp.

Driller: D. Irving.
Completed September 23, 1952.
Producing gas well.
Rock pressure: 325 lb.

Formation	Depth, feet
Surface	199
Grey lime	355
Flint	475
Brown lime	525
Lime and shale	915
Niagara	1,138
Shale	1,198
Clinton	1,221
Red Medina	1,261
Shale	1,321
Red Medina	1,326

Gas at 1,216–18 feet.
Fresh water at 238 feet; sulphur water at 385 feet; salt water at 925 feet.

DOMINION NATURAL GAS CO., LTD.

M. and M. Barnucz No. 1, lot 9, con. XIII, Windham tp.

Driller: S. Lyons.
Completed August 25, 1952.
Dry hole.

Formation	Depth, feet
Surface	154
Brown lime	190
Flint	275
Brown lime	330
Shale	410
Lime and shale	660
Niagara	960
Grey shale	1,020
Clinton	1,050
Red Medina	1,095
Blue shale	1,142
White Medina	1,145
Red shale	1,147

Fresh water at 157, 275, and 330 feet; black water at 380 and 665 feet.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

F. Chanda No. 3, lot 7, con. XIV, Windham tp.

Driller: S. Lyons.
Completed January 31, 1952.
Producing gas well.
Rock pressure: 525 lb.

Formation	Depth, feet
Surface	149
Brown lime	200
Flint	265
Brown lime	330
Shale	402
Lime and shale	650
Niagara	960
Shale	1,021
Clinton	1,046
Red Medina	1,090
Shale	1,140
White Medina	1,150
Red shale	1,202

Gas at 1,029–32 and 1,146 feet.

WALTER GAS SYNDICATE, LTD.

B. Cole No. 1, lot 9, con. XIV, Windham tp.

Driller: S. Lyons and Son.
Completed October 20, 1952.
Producing gas well.
Rock pressure: 550 lb.

Formation	Depth, feet
Surface	187
Brown lime	240
Flint	310
Brown lime	353
Shale	411
Lime and shale	705
Niagara	995
Shale	1,053
Clinton	1,080
Red Medina	1,122
Shale	1,170
White Medina	1,179
Red shale	1,222

Gas at 1,170 feet.
Fresh water at 195, 250, and 290 feet; black water at 320 feet.

WALTER GAS SYNDICATE, LTD.

B. Cole No. 2, lot 9, con. XIV, Windham tp.

Driller: S. Lyons and Son.
Completed December 24, 1952.
Producing gas well.
Rock pressure: 550 lb.

Formation	Depth, feet
Surface	166
Brown lime	261
Flint	322
Brown lime	386
Shale	455
Lime and shale	713
Niagara	996
Shale	1,056
Clinton	1,081
Red Medina	1,126
Shale	1,176
White Medina	1,182
Red shale	1,212

Gas at 1,071 and 1,176 feet.
Fresh water at 167 feet; black water at 310 feet.

DOMINION NATURAL GAS CO., LTD.

J. Dedeyne No. 3, lot 6, con. XIV, Windham tp.

Driller: W. Garringer.
Completed November 27, 1952.
Dry hole.

Formation	Depth, feet
Surface	120
Lime and shale	195
Flint	255
Lime and shale	620
Niagara	950
Shale	1,025
Clinton	1,060
Red Medina	1,085
Blue shale	1,145
White Medina	1,154
Red shale	1,156

Fresh water at 122 feet; sulphur water at 172 and 183 feet.

DOMINION NATURAL GAS CO., LTD.

L. Goodlet No. 1, lot 8, con. XIII, Windham tp.

Driller: W. Garringer.
Completed March 26, 1952.
Producing gas well.
Rock pressure: 542 lb.

Formation	Depth, feet
Surface	151
Lime and shale	200
Flint	280
Lime and shale	660
Niagara	970
Shale	1,036
Clinton	1,061
Red Medina	1,086
Blue shale	1,141
White Medina	1,157
Red shale	1,200

Gas at 1,048 and 1,157 feet.
Fresh water at 156, 302, and 940 feet.

DOMINION NATURAL GAS CO., LTD.

E. and H. Hare No. 1, lot 7, con. XIII, Windham tp.

Driller: W. Garringer.
Completed September 24, 1952.
Producing gas well.
Rock pressure: 525 lb.

Formation	Depth, feet
Surface	160
Lime and shale	220
Flint	275
Lime and shale	655
Niagara	965
Shale	1,025
Clinton	1,060
Red Medina	1,085
Shale	1,145
White Medina	1,153

Gas at 1,031–35 feet.
Fresh water at 171 feet; sulphur water at 395 and 505 feet.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

P. Mahu No. 1, lot 8, con. XIII, Windham tp.

Driller: W. Garringer.
Completed July 7, 1952.
Producing gas well.
Rock pressure: 652 lb.

Formation	Depth, feet
Surface	161
Lime and shale	200
Flint	280
Lime and shale	670
Niagara lime	970
Shale	1,030
Clinton	1,060
Red Medina	1,085
Shale	1,040
White Medina	1,159
Red shale	1,260

Gas at 1,150 feet.
Fresh water at 162 and 170 feet; sulphur water at 390 feet.

DOMINION NATURAL GAS CO., LTD.

E. and J. Puskus No. 3, lot 8, con. XIII, Windham tp.

Driller: S. Lyons.
Completed October 24, 1952.
Producing gas well.
Rock pressure: 435 lb.

Formation	Depth, feet
Surface	150
Brown lime	192
Flint	265
Brown lime	330
Shale	400
Lime and shale	645
Niagara	960
Shale	1,017
Clinton	1,044
Red Medina	1,085
Shale	1,133
White Medina	1,136
Red shale	1,138

Gas at 1,037-44 feet.
Fresh water at 152 feet; black water at 310 feet.

DOMINION NATURAL GAS CO., LTD.

W. Smith and R. De Groot No. 3, lot 8, con. XIV, Windham tp.

Driller: S. Lyons.
Completed March 27, 1952.
Dry hole.

Formation	Depth, feet
Surface	161
Brown lime	230
Flint	295
Brown lime	350
Shale	423
Lime and shale	680
Niagara	982
Shale	1,051
Clinton	1,076
Red Medina	1,117
Blue shale	1,167
White Medina	1,175
Red shale	1,178

Fresh water at 165, 255, and 295 feet; black water at 360 and 555 feet.

DOMINION NATURAL GAS CO., LTD.

W. Smith and R. De Groot No. 4, lot 8, con. XIV, Windham tp.

Driller: S. Lyons.
Completed June 12, 1952.
Producing gas well.
Rock pressure: 688 lb.

Formation	Depth, feet
Surface	176
Brown lime	240
Flint	310
Brown lime	365
Shale	436
Lime and shale	701
Niagara	980
Shale	1,038
Clinton	1,066
Red Medina	1,107
Shale	1,156
White Medina	1,160
Red shale	1,200

Gas at 1,050 and 1,157 feet.
Fresh water at 180 and 320 feet; sulphur water at 365 feet.

DOMINION NATURAL GAS CO., LTD.

P. and A. McDonald No. 4, lot 6, broken front, Woodhouse tp.

Driller: D. Werner.
Completed February 2, 1952.
Dry hole.

Formation	Depth, feet
Surface	110
Lime	164
Flint	273
Sharp sand	303
Lime and shale	727
Niagara	943
Shale	1,007
Clinton	1,033
Red Medina	1,072
Grey shale	1,129
White Medina	1,144
Red shale	1,148

Show of gas at 1,010, 1,033, and 1,141 feet.
Fresh water at 115 feet; sulphur water at 273 feet; black water at 758 feet.

DOMINION NATURAL GAS CO., LTD.

A. and C. Mandryk No. 2, lot 3, con. I, Woodhouse tp.

Driller: D. Werner.
Completed April 26, 1952.
Dry hole.

Formation	Depth, feet
Surface	154
Lime	219
Flint	334
Sand	352
Lime and shale	751
Niagara	1,004
Shale	1,066
Clinton	1,095
Red Medina	1,125
Grey shale	1,193
White Medina	1,202
Red shale	1,204

Fresh water at 158 feet; sulphur water at 344 and 785 feet.

Norfolk County—Continued

J. T. MAGUIRE

F. Reeker No. 3, lot 4, con. III, Woodhouse tp.

Driller: E. Stewart.
Completed March 29, 1952.
Producing gas well.
Rock pressure: 485 lb.

Formation	Depth, feet
Surface	137
Flint	307
Sharp sand	357
Lime and shale	697
Niagara	971
Shale	1,039
Clinton	1,071
Red Medina	1,100

Gas at 1,045 and 1,086 feet.
Sulphur water at 185, 457, and 782 feet.

DOMINION NATURAL GAS CO., LTD.

O. Thompson No. 3, lot 2, broken front, Woodhouse tp.

Driller: H. Emerson.
Completed January 30, 1952.
Producing gas well.
Rock pressure: 407 lb.

Formation	Depth, feet
Surface	126
Flint	295
Sharp sand	345
Lime and shale	765
Niagara	970
Shale	1,035
Clinton	1,062
Red Medina	1,111
Shale	1,133

Gas at 1,067–79 feet.
Fresh water at 132 feet; black water at 300 feet.

WALTER GAS SYNDICATE, LTD.

A. Tisdale No. 2, lot 5, con. V, Woodhouse tp.

Driller: Walter Gas Syndicate, Ltd.
Completed June 14, 1952.
Dry hole.

Formation	Depth, feet
Surface	94
Lime	116
Flint	198
Lime and shale	557
Niagara	904
Black shale	982
Clinton	1,021
Red Medina	1,038
Grey shale	1,110
Red shale	1,114

Gas at 996 and 1,107 feet.
Fresh water at 112 feet; sulphur water at 174 feet; black water at 238 feet.

DOMINION NATURAL GAS CO., LTD.

B. and P. Urbas No. 2, lot 1, broken front, Woodhouse tp.

Driller: W. Hodgson.
Completed April 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	156
Lime	196
Flint	396
Lime and shale	788
Niagara	998
Shale	1,060
Clinton	1,083
Red Medina	1,130
Shale	1,190
White Medina	1,197
Red shale	1,202

Fresh water at 167 feet; sulphur water at 530 feet.

DOMINION NATURAL GAS CO., LTD.

K. Weselan No. 1, lot 3, con. I, Woodhouse tp.

Driller: D. Werner.
Completed July 3, 1952.
Dry hole.

Formation	Depth, feet
Surface	166
Lime	220
Flint	314
Sharp sand	337
Lime and shale	745
Niagara	985
Shale	1,058
Clinton	1,081
Red Medina	1,115
Grey shale	1,184
White Medina	1,193
Red shale	1,197

Show of gas at 1,060 feet.
Fresh water at 168 feet; black water at 314 and 838 feet.

Oxford County

TRI-COUNTY GAS AND OIL CO., LTD.

W. Dow No. 2, lot 22, con. XI, South Norwich tp.

Driller: W. McKillop.
Completed December 22, 1952.
Producing gas well.
Rock pressure: 525 lb.

Formation	Depth, feet
Surface	75
Brown lime	94
Brown lime and shale	130
Brown and grey lime	147
Brown lime	201
Brown lime and shale	214
Brown lime	236
Flint	357
Brown lime	386
Brown and grey lime	410
Brown lime and shale	441
Brown lime, shale and gypsum	488
Grey lime, shale and gypsum	514
Grey and brown lime	532
Brown lime and shale	566
Grey lime and gypsum	577
Brown and grey lime and gypsum	590
Brown and grey lime	632
Brown lime and blue shale	653
Brown and grey lime	681
Grey lime and black shale	719
Brown and grey lime	736
Brown lime and blue shale	755
Brown lime	777
Guelph	792
Niagara	1,013
Shale	1,067
Clinton	1,088
Red Medina	1,109
Shale	1,134

Oil at 1,071 and 1,074 feet.
Sulphur water at 77, 112, 217, and 863 feet.

Oxford County—Continued

TRI-COUNTY GAS AND OIL CO., LTD.

F. Stier No. 1, lot 22, con. XI, South Norwich tp.

Driller: W. McKillop.
Completed April 26, 1952.
Producing gas well.
Rock pressure: 515 lb.

Formation	Depth, feet
Surface	90
Brown and grey lime	114
Brown lime	156
Brown and grey lime, flint	172
Brown lime	216
Brown and grey lime	243
Brown and grey lime and shale	259
Flint	379
Brown lime	401
Brown and grey lime	424
Grey lime, shale and gypsum	458
Brown lime, shale and gypsum	477
Grey lime and shale and gypsum	519
Brown lime and shale	548
Brown lime	592
Brown lime and shale	601
Brown lime	648
Brown lime and shale	671
Grey lime and shale	705
Grey lime and shale	734
Brown lime	758
Brown, grey lime and shale	777
Grey lime, shale and gypsum	789
Brown lime	801
Guelph	812
Niagara	1,041
Shale	1,095
Clinton	1,118
Red Medina	1,139
Shale	1,168

Gas at 1,098, 1,103, and 1,106 feet.
Sulphur water at 106, 117, 126, and 346 feet; black sulphur water at 931 feet.

DOMINION NATURAL GAS CO., LTD.

A. and A. Lowes No. 1, lot 3, broken front, West Oxford tp.

Driller: R. Mandley and Son.
Completed June 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	38
Brown lime	102
Flint	152
Shale	280
Grey lime	522
Brown lime	709
White lime	922
Brown lime	1,014

Fresh water at 62, 158, 333, and 643 feet; sulphur water at 746 feet.

DOMINION NATURAL GAS CO., LTD.

A. and M. Robinson No. 1, lot 27, con. I, West Oxford tp.

Driller: R. Mandley and Son.
Completed August 8, 1952.
Dry hole.

Formation	Depth, feet
Surface	126
Brown lime	317
Flint	416
Lime and shale	776
Brown and grey lime	1,228
Shale	1,263
Clinton	1,280
Clinton and Red Medina	1,305

Fresh water at 131, and 316 feet; black water at 384, 818, and 1,169 feet; salt water at 915 feet.

DOMINION NATURAL GAS CO., LTD.

M. and M. Shelton No. 1, lot 4, con. II, West Oxford tp.

Driller: R. Mandley and Son.
Completed April 23, 1952.
Dry hole.

Formation	Depth, feet
Surface	190
Brown lime	245
Flint	320
Lime and shale	707
Niagara	1,110
Shale	1,156
Clinton	1,178
Clinton or shale	1,197
Red Medina	1,201

Fresh water at 193 feet; sulphur water at 723, 734, and 957 feet.

Victoria County

MARACARDEN OIL, LTD.

K. Morrison No. 1, lot 12, con. V, Eldon tp.

Driller: R. McMaster and Son.
Completed December 3, 1952.
Dry hole.

Formation	Depth, feet
Surface	11
Grey shale	45
Trenton	354
Arkose	360
Granite	378

Show of oil at 150 and 330 feet.

Welland County

KIN-MAR SYNDICATE

T. Di Martile No. 1, lot 2, fronting on Niagara River, rear of Grand Island, Bertie tp.

Driller: T. Di Martile.
Completed November 21, 1952.
Producing gas well.
Rock pressure: 150 lb.

Formation	Depth, feet
Surface	45
Lime and shale	338
Niagara	522
Shale	614
Clinton	640
Red Medina	708
Grey shale	740
White Medina	759
Red shale	776

Gas at 620 feet.
Fresh water at 47 feet; sulphur water at 69 feet.

ERIE PROSPECTING SYNDICATE

J. Gilson No. 1, lot 28, con. II, Bertie tp.

Driller: R. Sider.
Completed April 28, 1952.
Producing gas well.
Rock pressure: 350 lb.

Formation	Depth, feet
Surface	10
Flint	65
Lime, shale	400
Niagara	640
Shale	726
Clinton	752
Red Medina	831
Shale	846
White Medina	866
Red shale	896

Gas at 768, 802, and 866 feet.
Fresh water at 55 feet.

Welland County—Continued

SHERKSTON GAS SYNDICATE

R. Haggerty No. 1, lot 35, con. I, Lake Erie survey, Bertie tp.

Driller: K. Held and Son.
Completed March 5, 1952.
Dry hole.

Formation	Depth, feet
Surface	5
Flint	65
Lime and shale	437
Niagara	638
Rochester	730
Clinton	766
Red Medina	829
Grey shale	855
White Medina	871
Red shale	875

Sulphur water at 18 feet; black water at 240 feet.

DEANNA LEE GAS SYNDICATE

S. House No. 3, lot 30, con. III, Lake Erie survey, Bertie tp.

Driller: T. Di Martile.
Completed July 7, 1952.
Dry hole.

Formation	Depth, feet
Surface	22
Lime and shale	412
Niagara	628
Shale	709
Clinton	738
Red Medina	799
Grey shale	838
White Medina	850
Red shale	875

Sulphur water at 72 feet.

RALPH M. SIDER

F. Kuti No. 1, lot 28, con. II, Bertie tp.

Driller: R. Sider.
Completed July 5, 1952.
Producing gas well.
Rock pressure: 350 lb.

Formation	Depth, feet
Surface	2
Flint	67
Lime and shale	207
Brown lime	411
Niagara	651
Shale	736
Clinton	761
Red Medina	841
Shale	856
White Medina	876
Red shale	882

Gas at 802 feet.
Sulphur water at 160 feet.

ROSE LAPP

I. Lapp estate No. 1, lot 13, con. VII, Bertie tp.

Driller: E. Nagel.
Completed December 17, 1952.
Producing gas well.
Rock pressure: 65 lb.

Formation	Depth, feet
Surface	89
Lime and shale	299
Niagara	499
Grey shale	589
Clinton	619
Red Medina	684
Grey shale	704
White Medina	739
Red shale	800

Gas at 597 and 709 feet.
Sulphur water at 89 feet.

RIDGEMOUNT GAS SYNDICATE

Mrs. E. Learn No. 1, lot 1, con. IX, Bertie tp.

Driller: O. Culver.
Completed March 28, 1952.
Dry hole.

Formation	Depth, feet
Surface	8
Flint	28
Lime and shale	435
Niagara	640
Shale	717
Clinton	748
Red Medina	826
Shale	850
White Medina	857
Red shale	860

Fresh water at 18 and 24 feet.

STAR GAS SYNDICATE

M. Lobinowich No. 1, lot 30, con. III, Bertie tp.

Driller: O. Culver.
Completed June 9, 1952.
Dry hole.

Formation	Depth, feet
Surface	23
Flint	43
Lime and shale	420
Niagara	620
Grey shale	698
Clinton	729
Red Medina	811
Shale	825
White Medina	844
Red shale	850

Fresh water at 82 feet; black water at 530 feet.

MAPLE LEAF GAS SYNDICATE

E. Michael No. 1, lot 29, broken front, Lake Erie survey, Bertie tp.

Driller: R. Sider.
Completed March 8, 1952.
Dry hole.

Formation	Depth, feet
Surface	9
Flint	59
Brown lime and shale	469
Niagara	672
Shale	760
Clinton	788
Red Medina	870
Shale	882
White Medina	893
Red shale	898

Fresh water at 59 feet; black water at 112 feet.

CHARLES C. HOUSE

H. Neimanis No. 1, lot 14, con. XI, Bertie tp.

Driller: C. House.
Completed May 21, 1952.
Producing gas well.
Rock pressure: 80 lb.

Formation	Depth, feet
Surface	20
Salina	250
Niagara	465
Rochester	550
Clinton	580
Red Medina	655
Manitoulin	670
White Medina	695
Queenston	750

Gas at 565, 610, and 685 feet.
Fresh water at 20 feet; black water at 350 feet.

Welland County—Continued

RALPH M. SIDER

H. Runka No. 1, lot 31, con. II, Bertie tp.

Driller: R. Sider.
Completed January 8, 1952.
Dry hole.

Formation	Depth, feet
Surface	26
Flint	61
Brown lime and shale	441
Niagara	641
Shale	730
Clinton	761
Red Medina	844
Shale	859
White Medina	878
Red shale	880

Fresh water at 60 feet; sulphur water at 115 feet.

DONALD SHARPE

D. Sharpe No. 1, lot 14, con. II, Bertie tp.

Driller: T. A. Di Martile.
Completed January 10, 1952.
Producing gas well.
Rock pressure: 210 lb.

Formation	Depth, feet
Surface	21
Lime and shale	279
Niagara	486
Shale	551
Clinton	584
Red Medina	646
Grey shale	678
White Medina	696
Red shale	712

Gas at 652 feet.
Sulphur water at 38 feet; black water at 250 feet.

KIN-MAR SYNDICATE

R. Willson No. 2, lot 3, fronting on Niagara River, rear of Grand Island, Bertie tp.

Driller: T. Di Martile.
Completed August 12, 1952.
Producing gas well.
Rock pressure: 180 lb.

Formation	Depth, feet
Surface	45
Lime and shale	342
Niagara	523
Shale	614
Clinton	645
Red Medina	707
Grey shale	739
White Medina	760
Red shale	775

Gas at 620 feet.
Fresh water at 63 feet; black water at 348 feet.

KIN-MAR SYNDICATE

R. Willson No. 3, lot 3, fronting on Niagara River, rear of Grand Island, Bertie tp.

Driller: T. Di Martile.
Completed September 19, 1952.
Producing gas well.
Rock pressure: 150 lb.

Formation	Depth, feet
Surface	51
Lime and shale	346
Niagara	538
Shale	622
Clinton	658
Red Medina	719
Grey shale	748
White Medina	770
Red shale	865

Gas at 630–34, and 763 feet.
Fresh water at 68 and 348 feet.

DELL-BURN GAS CO., LTD.

G. Biggar No. 4, lot 6, broken front, Crowland tp.

Driller: Knight and Neale.
Completed June 28, 1952.
Dry hole.

Formation	Depth, feet
Surface	55
Shell rock and sand	72
Niagara	244
Shale	304
Clinton	340
Red Medina	398
Grey shale	418
White Medina	440
Red shale	443

Fresh water at 61, 80, and 100 feet; sulphur water at 112 and 147 feet.

DELL-BURN GAS CO., LTD.

C. Cebrynski No. 2, lot 6, broken front, Crowland tp.

Driller: Dell-Burn Gas Co., Ltd.
Completed June 5, 1952.
Dry hole.

Formation	Depth, feet
Surface	86
Niagara	259
Shale	319
Clinton	356
Red Medina	414
Grey shale	431
White Medina	455
Red shale	457

Gas at 361 and 370 feet.
Fresh water at 81 feet; sulphur water at 104 and 224 feet.

DELL-BURN GAS CO., LTD.

P. Dodrige No. 33, lot 4, con. VI, Crowland tp.

Driller: Knight and Neale.
Completed September 6, 1952.
Producing gas well.
Rock pressure: 150 lb.

Formation	Depth, feet
Surface	78
Sand and gravel	90
Lime and shale	196
Niagara	420
Shale	482
Clinton	520
Red Medina	576
Grey shale	602
White Medina	626
Red shale	649

Gas at 616 and 618 feet.
Fresh water at 84 and 91 feet; sulphur water at 110, 198, and 340 feet.

JOHN HORTON

J. Horton No. 1, lot 7, broken front, Crowland tp.

Driller: Crowland Gas Syndicate.
Completed June 28, 1952.
Producing gas well.
Rock pressure: 110 lb.

Formation	Depth, feet
Surface	64
Niagara	230
Shale	295
Clinton	330
Red Medina	390
Grey shale	420
White Medina	435
Red shale	470

Gas at 430 feet.
Fresh water at 70 feet; black water at 190 feet.

Welland County—Continued

C. R. KELLS

C. Kells No. 1, lot 24, con. VII, Crowland tp.

Driller: Crowland Gas Syndicate.
Completed April 4, 1952.
Dry hole.

Formation	Depth, feet
Surface	110
Lime and shale	230
Niagara	450
Shale	507
Clinton	540
Red Medina	590
Grey shale	622
White Medina	644
Red shale	646

Show of gas at 640 feet.
Fresh water at 45 feet; black water at 196 feet; black and sulphur water at 240 feet.

DELL-BURN GAS CO., LTD.

L. Matthews No. 3, lot 10, con. IV, Crowland tp.

Driller: Knight and Neale.
Completed August 2, 1952.
Dry hole.

Formation	Depth, feet
Surface	78
Shell rock and gravel	90
Shale	182
Niagara	380
Shale	442
Clinton	480
Red Medina	532
Grey shale	558
White Medina	583
Red shale	585

Gas at 450 feet.
Fresh water at 89 feet; sulphur water at 96 and 185 feet.

CROWLAND GAS SYNDICATE

A. Moore No. 1, lot 16, con. VI, Crowland tp.

Driller: W. Harris.
Completed September 17, 1952.
Producing gas well.
Rock pressure: 225 lb.

Formation	Depth, feet
Surface	113
Lime and shale	230
Niagara	435
Shale	490
Clinton	525
Red Medina	580
Grey shale	610
White Medina	634
Red shale	694

Gas at 525, 630, 645, and 675 feet.
Fresh water at 110 and 210 feet.

FRANK ROTH

J. Babion No. 1, lot 21, con. III, Humberstone tp.

Driller: H. Roth.
Completed June 4, 1952.
Producing gas well.
Rock pressure: 130 lb.

Formation	Depth, feet
Surface	1
Lime and shale	380
Niagara	593
Shale	660
Clinton	692
Red Medina	758
Shale	785
White Medina	795
Red shale	797

Gas at 717 feet.
Fresh water at 29 feet; sulphur water at 210 feet.

DOMINION NATURAL GAS CO., LTD.

H. and R. Bearss No. 2, lot 24, con. II, Humberstone tp.

Driller: Emerson and Rose.
Completed October 24, 1952.
Dry hole.

Formation	Depth, feet
Surface	2
Shale	397
Niagara	607
Shale	674
Clinton	710
Red Medina	768
Grey shale	807
White Medina	815
Red shale	819

Sulphur water at 22, 23, and 96 feet; sulphur and black water at 370 feet.

F. ROTH

A. Chambers No. 2, lot 21, con. II, Humberstone tp.

Driller: H. Roth.
Completed March 7, 1952.
Producing gas well.
Rock pressure: 90 lb.

Formation	Depth, feet
Surface	3
Lime and shale	380
Niagara	605
Shale	669
Clinton	699
Red Medina	759
Shale	799
White Medina	811
Red shale	862

Gas at 805 feet.
Fresh water at 135 feet; sulphur water at 155 feet.

SHERKSTON GAS SYNDICATE

Mrs. A. Chambers No. 3, lot 1, con. III, Humberstone tp.

Driller: K. Held and Son.
Completed January 21, 1952.
Producing gas well.
Rock pressure: 265 lb.

Formation	Depth, feet
Surface	44
Lime and shale	343
Niagara	540
Rochester	613
Clinton	643
Red Medina	707
Grey shale	742
White Medina	753
Red shale	756

Gas at 678 feet.
Fresh water at 57 feet; black water at 298 feet.

STERLING GAS SYNDICATE

H. Dell No. 1, lot 7, con. II, Humberstone tp.

Driller: K. Held and Son.
Completed December 9, 1952.
Producing gas well.
Rock pressure: 35 lb.

Formation	Depth, feet
Surface	41
Lime and shale	420
Niagara	614
Rochester	714
Clinton	745
Red Medina	809
Grey shale	837
White Medina	854
Red shale	875

Gas at 750 feet.
Fresh water at 50 feet; sulphur water at 360 feet.

Welland County—Continued

SHERKSTON GAS SYNDICATE

M. Durliat No. 1, lot 7, con. IV, Humberstone tp.

Driller: K. Held and Son.
Completed July 3, 1952.
Producing gas well.
Rock pressure: 60 lb.

Formation	Depth, feet
Surface	76
Lime and shale	340
Niagara	530
Rochester	588
Clinton	619
Red Medina	680
Grey shale	710
White Medina	731
Red shale	798

Gas at 614 and 720 feet.
Fresh water at 89 feet; sulphur water at 420 feet.

SHERKSTON GAS SYNDICATE

M. Durliat No. 2, lot 7, con. IV, Humberstone tp.

Driller: K. Held and Son.
Completed September 10, 1952.
Dry hole.

Formation	Depth, feet
Surface	78
Lime and shale	357
Niagara	526
Rochester	589
Clinton	620
Red Medina	682
Grey shale	711
White Medina	731
Red shale	732

Sulphur water at 93 feet; black water at 345 feet.

CROWLAND GAS SYNDICATE

F. Felhazi No. 1, lot 12, con. V, Humberstone tp.

Driller: Crowland Gas Syndicate.
Completed September 28, 1952.
Producing gas well.
Rock pressure: 110 lb.

Formation	Depth, feet
Surface	78
Shale	305
Niagara	505
Grey shale	570
Clinton	605
Red Medina	665
Grey shale	695
White Medina	705
Red shale	775

Gas at 610 feet.
Fresh water at 83 feet; black water at 200 feet; sulphur water at 310 feet.

CROWLAND GAS SYNDICATE

F. Felhouser No. 1, lot 12, con. V, Humberstone tp.

Driller: Crowland Gas Syndicate.
Completed July 10, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	70
Grey shale	300
Niagara	500
Shale	561
Clinton	600
Red Medina	656
Shale	684
White Medina	699
Red shale	760

Gas at 567 and 690–97 feet.
Fresh water at 75 feet; black water at 215 feet.

C. GEYER

C. Geyer No. 3, lot 9, con. IV, Humberstone tp.

Driller: K. Held and Son.
Completed March 26, 1952.
Producing gas well.
Rock pressure: 55 lb.

Formation	Depth, feet
Surface	70
Lime and shale	349
Niagara	540
Red shale	597
Clinton	627
Red Medina	692
Grey shale	717
White Medina	738
Red shale	762

Gas at 722 feet.
Fresh water at 74 feet; sulphur water at 235 feet.

C. GEYER

C. Geyer No. 4, lot 9, con. IV, Humberstone tp.

Driller: K. Held and Son.
Completed April 25, 1952.
Producing gas well.
Rock pressure: 80 lb.

Formation	Depth, feet
Surface	76
Lime and shale	345
Niagara	536
Rochester	593
Clinton	623
Red Medina	688
Grey shale	718
White Medina	739
Red shale	768

Gas at 630 and 734 feet.
Fresh water at 78 feet; sulphur water at 542 feet.

MCINTYRE AND HAWKINS

G. Marco No. 1, lot 6, con. IV, Humberstone tp.

Driller: C. House.
Completed March 12, 1952.
Producing gas well.
Rock pressure: 75 lb.

Formation	Depth, feet
Surface	68
Lime and shale	303
Niagara	503
Rochester	573
Clinton	603
Red Medina	671
Grey shale	691
White Medina	711
Queenston	743

Gas at 705 feet.
Black water at 70 and 175 feet.

NORMAN SIDER

H. McGaffin No. 1, lot 21, registered plan 45, Humberstone tp.

Driller: K. Held and Son.
Completed October 31, 1952.
Producing gas well.
Rock pressure: 130 lb.

Formation	Depth, feet
Surface	17
Flint	95
Lime and shale	457
Niagara	657
Rochester	750
Clinton	784
Red Medina	859
Grey shale	881
White Medina	895
Red shale	896

Gas at 793 feet.
Sulphur water at 55 and 290 feet.

Welland County—Continued

CROWLAND GAS SYNDICATE

G. Metler No. 2, lot 11, con. V, Humberstone tp.

Driller: Crowland Gas Syndicate.
Completed October 27, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	78
Shale	280
Niagara	480
Shale	545
Clinton	587
Red Medina	645
Shale	680
White Medina	696
Red shale	697

Gas at 556, 559, 589, 593, 686, and 696 feet.
Fresh water at 93 feet; black water at 207 feet; sulphur water at 290 feet.

CROWLAND GAS SYNDICATE

H. Metler No. 2, lot 11, con. V, Humberstone tp.

Driller: Crowland Gas Syndicate.
Completed December 26, 1952.
Producing gas well.
Rock pressure: 160 lb.

Formation	Depth, feet
Surface	74
Shale	270
Niagara	470
Grey shale	548
Clinton	587
Red Medina	640
Grey shale	674
White Medina	686
Red shale	745

Gas at 554, 581, 590, 678, and 682 feet.
Fresh water at 79 and 180 feet; black water at 398 feet.

CROWLAND GAS SYNDICATE

L. Myers No. 1, lot 13, con. V, Humberstone tp.

Driller: Crowland Gas Syndicate.
Completed July 15, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	67
Shale and lime	298
Niagara	485
Grey shale	551
Clinton	600
Red Medina	656
Grey shale	684
White Medina	699
Red shale	760

Gas at 567 and 688–94 feet.
Fresh water at 70 feet; black water at 210 feet.

DOMINION NATURAL GAS CO., LTD.

H. and E. Ott No. 2, lot 24, con. II, Humberstone tp.

Driller: Emerson and Rose.
Completed December 18, 1952.
Producing gas well.
Rock pressure: 40 lb.

Formation	Depth, feet
Surface	2
Shale	393
Niagara	608
Shale	666
Clinton	698
Red Medina	756
Grey shale	790
White Medina	799
Red shale	849

Gas at 674 and 796 feet.
Fresh water at 19 and 39 feet; sulphur water at 265 feet.

ROBERT RAE

R. Rae No. 1, lot 7, con. IV, Humberstone tp.

Driller: K. Held and Son.
Completed May 14, 1952.
Producing gas well.
Rock pressure: 65 lb.

Formation	Depth, feet
Surface	76
Lime and shale	339
Niagara	528
Rochester	585
Clinton	616
Red Medina	680
Grey shale	709
White Medina	730
Red shale	771

Gas at 595 and 719 feet.
Fresh water at 86 feet; sulphur water at 356 feet.

ROBERT RAE

R. Rae No. 2, lot 7, con. IV, Humberstone tp.

Driller: K. Held and Son.
Completed June 9, 1952.
Producing gas well.
Rock pressure: 65 lb.

Formation	Depth, feet
Surface	76
Lime and shale	338
Niagara	526
Rochester	587
Clinton	617
Red Medina	680
Grey shale	709
White Medina	730
Red shale	771

Gas at 594 and 718 feet.
Fresh water at 82 feet; sulphur water at 220 feet.

DELL-BURN GAS CO., LTD.

E. Salsbury No. 3, lot 31, con. III, Humberstone tp

Driller: Knight and Neale.
Completed December 8, 1952.
Producing gas well.
Rock pressure: 270 lb.

Formation	Depth, feet
Surface	139
Lime and shale	332
Niagara	561
Shale	621
Clinton	660
Red Medina	715
Grey shale	750
White Medina	762
Red shale	767

Gas at 664 and 686–89 feet.
Fresh water at 137 feet; sulphur water at 180 feet.

KRAMER AND BATES

R. Schaubel No. 1, lot 22, con. III, Humberstone tp.

Driller: Crowland Gas Syndicate.
Completed June 14, 1952.
Dry hole.

Formation	Depth, feet
Surface	7
Lime and shale	398
Niagara	585
Shale	665
Clinton	696
Red Medina	762
Shale	795
White Medina	804

Show of gas at 670 feet.
Fresh water at 30 feet; sulphur water at 160 feet.

Welland County—Continued

KRAMER AND BATES

G. Snider estate No. 2, lot 22, con. II, Humberstone tp.

Driller: Crowland Gas Syndicate.
Completed April 29, 1952.
Producing gas well.
Rock pressure: 55 lb.

Formation	Depth, feet
Surface	3
Shale	387
Niagara	600
Grey shale	667
Clinton	695
Red Medina	767
Grey shale	800
White Medina	810
Red shale	875

Gas at 731 and 802 feet.
Fresh water at 45 and 160 feet; sulphur water at 430 feet.

SHERKSTON GAS SYNDICATE

P. Turinski No. 1, lot 8, con. IV, Humberstone tp.

Driller: K. Held and Son.
Completed August 4, 1952.
Producing gas well.
Rock pressure: 60 lb.

Formation	Depth, feet
Surface	71
Lime and shale	337
Niagara	526
Rochester	594
Clinton	626
Red Medina	687
Grey shale	716
White Medina	732
Red shale	800

Gas at 725 feet.
Sulphur water at 90 feet; black water at 408 feet.

WELLAND GAS SYNDICATE

F. Zack No. 2, lot 23, con. V, Humberstone tp.

Driller: Patterson and Culver.
Completed February 23, 1952.
Dry hole.

Formation	Depth, feet
Surface	97
Lime and shale	260
Niagara	486
Shale	538
Clinton	576
Red Medina	632
Shale	662
White Medina	678
Red shale	680

Sulphur water at 110 feet.

WELLAND GAS SYNDICATE

F. Zack No. 3, lot 23, con. V, Humberstone tp.

Driller: Patterson and Culver.
Completed September 5, 1952.
Producing gas well.
Rock pressure: 45 lb.

Formation	Depth, feet
Surface	105
Lime and shale	252
Niagara	480
Shale	535
Clinton	570
Red Medina	620
Shale	660
White Medina	675
Red shale	678

Gas at 542 and 568 feet.
Fresh water at 110 feet; sulphur water at 220 feet.

E. S. FOX

H. Bradshaw No. 1, lot 14, con. XIII, Pelham tp.

Driller: Emerson and Rose.
Completed April 15, 1952.
Dry hole.

Formation	Depth, feet
Surface	145
Shale	185
Niagara	397
Shale	443
Clinton	477
Red Medina	519
Shale	565
White Medina	586
Shale	588

Show of gas at 513 feet.
Fresh water at 132 and 141 feet; black water at 254 feet.

DOMINION NATURAL GAS CO. LTD.

J. Frolick No. 1, lot 13, con. XI, Pelham tp.

Driller: Emerson and Rose.
Completed March 19, 1952.
Producing gas well.
Rock pressure: 156 lb.

Formation	Depth, feet
Surface	176
Niagara	360
Shale	411
Clinton	442
Red Medina	478
Grey shale	525
White Medina	547
Red shale	599

Gas at 528–638 feet.
Fresh water at 164, 176, and 266 feet.

E. S. FOX

J. Kendall No. 1, lot 1, con. XIII, Pelham tp.

Driller: Emerson and Rose.
Completed May 28, 1952.
Dry hole.

Formation	Depth, feet
Surface	86
Shale	186
Niagara	389
Shale	448
Clinton	483
Red Medina	527
Shale	572
White Medina	592
Shale	594

Fresh water at 79 and 88 feet; black water at 176 feet.

DOMINION NATURAL GAS CO., LTD

J. Kowalski No. 1, lot 13, con. XI, Pelham tp.

Driller: Emerson and Rose.
Completed July 11, 1952.
Dry hole.

Formation	Depth, feet
Surface	189
Niagara	350
Shale	412
Clinton	443
Red Medina	484
Shale	524
White Medina	545
Red shale	595

Gas at 535–45 feet.
Fresh water at 182 and 191 feet; sulphur water at 308 feet.

Welland County—Continued

DOMINION NATURAL GAS CO., LTD.

D. Makzyn No. 1, lot 14, con. XI, Pelham tp.

Driller: Emerson and Rose.
Completed May 8, 1952.
Producing gas well.
Rock pressure: 150 lb.

Formation	Depth, feet
Surface	179
Niagara	365
Shale	410
Clinton	442
Red Medina	482
Grey shale	530
White Medina	549
Red shale	601

Gas at 530–40 feet.
Fresh water at 176 and 190 feet.

DOMINION NATURAL GAS CO., LTD.

I. and M. Winters No. 1, lot 13, con. X, Pelham tp.

Driller: Emerson and Rose.
Completed August 29, 1952.
Dry hole.

Formation	Depth, feet
Surface	206
Niagara	366
Shale	409
Clinton	440
Red Medina	483
Shale	530
White Medina	547
Red shale	549

Fresh water at 194 and 208 feet; sulphur water at 300 feet.

E. S. FOX

P. Gorro No. 2, lot 245, town of Thorold

Driller: Emerson and Rose.
Completed December 12, 1952.
Dry hole.

Formation	Depth, feet
Surface	82
Shale	185
Niagara	402
Shale	453
Clinton	484
Red Medina	529
Grey shale	570
White Medina	589

Fresh water at 81 and 84 feet; black sulphur water at 245 feet.

THE KILLINS GAS SYNDICATE

W. and A. Gasiorek No. 1, lot 16, con. V, Wainfleet tp.

Driller: Knight and Neale.
Completed October 24, 1952.
Dry hole.

Formation	Depth, feet
Surface	136
Lime and shale	218
Niagara	462
Shale	522
Clinton	557
Red Medina	609
Grey shale	644
White Medina	661
Red shale	662

Show of gas at 557 and 661 feet.
Fresh water at 132, 160, and 200 feet; sulphur water at 238 feet.

DELL-BURN GAS, CO., LTD.

J. Medvic No. 1, lot 15, con. II, Wainfleet tp.

Driller: Patterson and Culver.
Completed June 13, 1952.
Dry hole.

Formation	Depth, feet
Surface	150
Lime and shale	350
Niagara	570
Shale	635
Clinton	675
Red Medina	715
Shale	760
White Medina	770
Red shale	773

Show of gas at 640 and 765 feet.
Fresh water at 155 feet; sulphur water at 210 feet.

DELL-BURN GAS, CO., LTD.

L. Reid No. 1, lot 15, con. II, Wainfleet tp.

Driller: Patterson and Culver.
Completed March 29, 1952.
Producing gas well.
Rock pressure: 300 lb.

Formation	Depth, feet
Surface	133
Lime and shale	340
Niagara	558
Shale	610
Clinton	652
Red Medina	700
Grey shale	747
White Medina	760
Red shale	761

Gas at 647 feet.
Fresh water at 125 feet; sulphur water at 150 feet.

THE KILLINS GAS SYNDICATE

M. and E. Saloky No. 1, lot 8, con. VI, Wainfleet tp.

Driller: Patterson and Culver.
Completed July 19, 1952.
Dry hole.

Formation	Depth, feet
Surface	121
Lime and shale	225
Niagara	435
Shale	495
Clinton	528
Red Medina	573
Shale	613
White Medina	635
Red shale	638

Gas at 540 and 633 feet.
Fresh water at 130 feet; sulphur water at 225 feet.

RALPH M. SIDER

H. N. Shafley No. 1, lot 40, con. VI, Wainfleet tp.

Driller: R. Sider.
Completed September 23, 1952.
Producing gas well.
Rock pressure: 200 lb.

Formation	Depth, feet
Surface	119
Shale and lime	215
Niagara	421
Shale	481
Clinton	509
Red Medina	548
Shale	608
White Medina	623
Red shale	661

Gas at 504 and 622 feet.
Fresh water at 121 feet; salt water at 250 feet.

Welland County—Continued

RALPH M. SIDER

N. Shafley No. 1, lot 42, con. V, Wainfleet tp.

Driller: R. Sider.
Completed December 20, 1952.
Producing gas well.
Rock pressure: 200 lb.

Formation	Depth, feet
Surface	120
Lime and shale	200
Niagara	420
Shale	480
Clinton	512
Red Medina	550
Shale	609
White Medina	627
Red shale	677

Gas at 504 and 620 feet.
Fresh water at 125 feet; salt water at 200 feet.

RALPH M. SIDER

L. Shoalts No. 1, lot 41, con. VI, Wainfleet tp.

Driller: R. Sider.
Completed October 24, 1952.
Dry hole.

Formation	Depth, feet
Surface	118
Shale and lime	215
Niagara	420
Shale	480
Clinton	508
Red Medina	547
Shale	607
White Medina	621

Fresh water at 122 feet; salt water at 250 feet.

E. S. FOX

L. Leon No. 1, lot 255, city of Welland.

Driller: Emerson and Rose.
Completed July 26, 1952.
Producing gas well.
Rock pressure: 125 lb.

Formation	Depth, feet
Surface	86
Shale	170
Niagara	384
Shale	446
Clinton	480
Red Medina	521
Shale	574
White Medina	593
Red shale	623

Gas at 579 feet.
Fresh water at 80 and 88 feet; black water at 293 feet.

KIN-MAR SYNDICATE

W. Bauer No. 3, lot 24, cross concession, Willoughby tp.

Driller: T. Di Martile.
Completed May 31, 1952.
Producing gas well.
Rock pressure: 26 lb.

Formation	Depth, feet
Surface	39
Lime and shale	259
Niagara	458
Shale	528
Clinton	557
Red Medina	620
Grey shale	657
White Medina	675
Red shale	750

Gas at 535 and 675 feet.
Fresh water at 44 feet; black water at 193 feet.

SIMON AND CHAMBERS

S. Dell No. 1, lot 2, con. I, Willoughby tp.

Driller: T. Di Martile.
Completed February 11, 1952.
Producing gas well.
Rock pressure: 175 lb.

Formation	Depth, feet
Surface	41
Lime and shale	235
Niagara	433
Shale	504
Clinton	537
Red Medina	599
Grey shale	630
White Medina	650
Red shale	700

Gas at 650 feet.
Fresh water at 44 feet; black water at 275 feet.

SIMON AND CHAMBERS

S. Dell No. 2, lot 2, con. I, Willoughby tp.

Driller: T. Di Martile.
Completed March 26, 1952.
Producing gas well.
Rock pressure: 215 lb.

Formation	Depth, feet
Surface	48
Lime and shale	237
Niagara	438
Shale	506
Clinton	538
Red Medina	598
Grey shale	625
White Medina	648
Red shale	700

Gas at 613 and 642 feet.
Fresh water at 51 feet; black water at 278 feet.

M. DI LAPO

M. Di Lapo No. 1, lot 17, cross concession, Willoughby tp.

Driller: E. Nagel.
Completed July 15, 1952.
Producing gas well.
Rock pressure: 200 lb.

Formation	Depth, feet
Surface	38
Lime and shale	258
Niagara	440
Grey shale	529
Clinton	561
Red Medina	621
Grey shale	651
White Medina	661
Red shale	665

Gas at 620 feet.
Black water at 40 feet.

BERTIE TOWNSHIP GAS AND OIL SYNDICATE

F. Schier No. 4, lot 26, con. XX, Willoughby tp.

Driller: C. House.
Completed October 16, 1952.
Dry hole.

Formation	Depth, feet
Surface	50
Salina	270
Niagara	455
Rochester	520
Clinton	550
Red Medina	620
Manitoulin	640
White Medina	662
Queenston	670

Show of gas at 528 feet.
Fresh water at 53 feet; black water at 175 and 300 feet.

Welland County—Continued

JOSEPH WILLICK

J. Willick No. 1, lot 25, fronting on Bertie township, Willoughby tp.

Driller: E. Nagel.
Completed February 27, 1952.
Producing gas well.
Rock pressure: 30 lb.

Formation	Depth, feet
Surface	58
Lime and shale	227
Niagara	447
Grey shale	537
Clinton	569
Red Medina	629
Grey shale	659
White Medina	679
Red shale	682

Sulphur water at 60 feet.

EUGENE TANKE

R. Willick No. 1, lot 13, con. V, Willoughby tp.

Driller: O. Culver.
Completed August 18, 1952.
Producing gas well.
Rock pressure: 50 lb.

Formation	Depth, feet
Surface	85
Lime and shale	160
Niagara	355
Grey shale	412
Clinton	443
Red Medina	503
Manitoulin	527
White Medina	547
Red shale	592

Gas at 534 and 544 feet.
Fresh water at 88 feet; black water at 245 feet.

EUGENE TANKE

R. Willick No. 2, lot 13, con. V, Willoughby tp.

Driller: O. Culver.
Completed October 13, 1952.
Dry hole.

Formation	Depth, feet
Surface	82
Lime and shale	155
Niagara	345
Shale	404
Clinton	427
Shale	437
Red Medina	497
Shale	516
White Medina	535
Red shale	536

Show of gas at 524 feet.
Fresh water at 109 feet; black water at 340 feet.

Wentworth County

GORDON BERRY

G. Berry No. 1, lot 17, con. VIII, Binbrook tp.

Driller: M. Culver and Son.
Completed August 12, 1952.
Producing gas well.
Rock pressure: 70 lb.

Formation	Depth, feet
Surface	42
Brown lime	137
Niagara	280
Shale	318
Clinton	353
Red Medina	388
Grey shale	433
White Medina	445
Red shale	485

Gas at 439 and 443 feet.
Fresh water at 41 feet; sulphur water at 160 feet; black water at 230 feet.

A. W. MARTIN

A. Martin, No. 1, lot 3, block 2, con. IV, Binbrook tp.

Driller: M. Culver and Son.
Completed May 14, 1952.
Producing gas well.
Rock pressure: 85 lb.

Formation	Depth, feet
Surface	53
Brown lime	135
Niagara	270
Shale	300
Clinton	320
Red Medina	360
Blue shale	418
White Medina	428
Red shale	478

Gas at 335 and 427 feet.
Fresh water at 56 and 135 feet.

J. A. PATTERSON

J. Patterson No. 1, lot 22, con. VII, Binbrook tp.

Driller: M. Culver and Son.
Completed June 24, 1952.
Producing gas well.
Rock pressure: 59 lb.

Formation	Depth, feet
Surface	40
Brown lime	100
Niagara	240
Shale	270
Clinton	295
Red Medina	340
Blue shale	390
White Medina	402
Red shale	452

Gas at 305 and 391–400 feet.
Fresh water at 44 feet; sulphur water at 100 feet.

H. W. THOMAS

H. Thomas No. 1, lot 2, con. IV, Binbrook tp.

Driller: M. Culver and Son.
Completed March 26, 1952.
Producing gas well.
Rock pressure: 48 lb.

Formation	Depth, feet
Surface	77
Brown lime	160
Niagara	265
Shale	305
Clinton	330
Red Medina	370
Blue shale	421
White Medina	431
Red shale	481

Gas at 340, 423, and 430 feet.
Fresh water at 77 and 88 feet.

Appendix A—Early Logs of Gas and Oil Wells

The following logs of wells have been obtained from various sources over a period of several years but have not been published before. They are presented here for the use of those interested in the early days of the gas and oil industry, for any value they may be to drillers and prospectors, and in order that the Department's published records may be as complete as possible.

The logs are arranged chronologically and by counties and townships.

1897
Lambton County

IMPERIAL OIL CO., LTD.[1]

T. Bulman No. 1, lot 3, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed August 25, 1897.
Producing oil well.

Formation	Depth, feet
Surface	104
Top rock	125
Upper soap	271
Middle lime	281
Lower soap	343
Lower lime	472

Oil at 435 feet.

[1]Imperial Oil Co., Ltd. is now Imperial Oil, Ltd. The name of the company was changed in 1918. [Ed.]

IMPERIAL OIL CO., LTD.

T. Bulman No. 2, lot 3, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed December 31, 1897.

Formation	Depth, feet
Surface	100
Top rock	129
Rop soap	275
Middle lime	280
Lower soap	330
Lower lime	486

Oil at 437 feet.

IMPERIAL OIL CO., LTD.

J. Griffin No. 1, lot 4, con. VII, Sarnia tp.

Driller: J. Peat.
Completed December 8, 1897.
Dry hole.

Formation	Depth, feet
Surface	100
Top rock	124
Top soap	274
Middle lime	284
Lower soap	317
Lower lime	455

Show of gas at 365 feet.
Show of oil at 434 feet.

IMPERIAL OIL CO., LTD.

E. Hillier No. 1, lot 4, con. VII, Sarnia tp.

Completed November 6, 1897.
Dry hole.

Formation	Depth, feet
Surface	100
Top rock	125
Upper soap	275
Middle lime	284
Lower soap	334
Lower lime	490

Show of oil at 435 feet.
Salt water at 480 feet.

IMPERIAL OIL CO., LTD.

E. Hillier No. 2, lot 4, con. VII, Sarnia tp.

Driller: J. Peat.
Completed December 31, 1897.

Formation	Depth, feet
Surface	96
Top rock	145
Top soap	263
Middle lime	271
Lower soap	337
Lower lime	480

Oil at 395 feet.

IMPERIAL OIL CO., LTD.

N. Jolly No. 1, lot 2, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed October 17, 1897.
Dry hole.

Formation	Depth, feet
Surface	111
Top rock	139
Upper soap	281
Middle lime	291
Lower soap	355
Lower lime	503

Show of gas at 265 and 480 feet.
Oil at 448 feet.

IMPERIAL OIL CO., LTD.

W. Kirk No. 1, lot 3, con. VI, Sarnia tp.

Completed October 29, 1897.
Dry hole.

Formation	Depth, feet
Surface	104
Top rock	129
Upper soap	276
Middle lime	284
Lower soap	341
Lower lime	480

Show of gas at 140, 383 and 472 feet.
Show of oil at 428 feet.

IMPERIAL OIL CO., LTD.

W. Kirk No. 2, lot 3, con. VI, Sarnia tp.

Completed November 23, 1897.
Dry hole.

Formation	Depth, feet
Surface	100
Top rock	128
Upper soap	276
Middle lime	284
Lower soap	338
Lower lime	481

Show of gas and oil at 430 feet.
Salt water at 481 feet.

1897—Continued

IMPERIAL OIL CO., LTD.

J. Kirk No. 3, lot 3, con. VI, Sarnia tp.

Completed December 4, 1897.
Dry hole.

Formation	Depth, feet
Surface	100
Top rock	125
Top soap	275
Middle lime	285
Lower soap	343
Lower lime	486

Show of gas at 480 feet.
Show of oil at 430 feet.

IMPERIAL OIL CO., LTD.

J. and W. Milner No. 1, lot 2, con. VI, Sarnia tp.

Driller: H. Devon.
Completed October 5, 1897.
Dry hole.

Formation	Depth, feet
Surface	102
Top rock	127
Top soap	275
Middle lime	285
Lower soap	340
Lower lime	477

Show of oil at 432 and 477 feet.

IMPERIAL OIL CO., LTD.

J. Milner No. 2, lot 2, con. VI, Sarnia tp.

Completed December 18, 1897.

Formation	Depth, feet
Surface	100
Top rock	125
Top soap	275
Middle lime	285
Lower soap	343
Lower lime	525

Show of gas at 480 feet.
Show of oil at 430 feet.

IMPERIAL OIL CO., LTD.

C. Pulse No. 1, lot 4, con. VI, Sarnia tp.

Driller: H. Bevans.
Completed December 10, 1897.
Dry hole.

Formation	Depth, feet
Surface	100
Top rock	128
Top soap	276
Middle lime	284
Lower soap	339
Lower lime	474

Show of gas at 365 feet.
Oil at 432 and 448 feet.

IMPERIAL OIL CO., LTD.

S. Switzer No. 1, lot 3, con. VI, Sarnia tp.

Completed October 28, 1897.
Dry hole.

Formation	Depth, feet
Surface	102
Top rock	127
Upper soap	267
Middle lime	275
Lower soap	330
Lower lime	495

Show of gas at 265 and 385 feet.
Show of oil at 430–32 feet.
Salt water at 465 and 475 feet.

1898
Lambton County

IMPERIAL OIL CO., LTD.

J. Beattie No. 1, lot 5, con. VI, Sarnia tp.

Driller: J. McFall.
Completed February 10, 1898.

Formation	Depth, feet
Surface	112
Top lime	142
Top soap	285
Middle lime	293
Lower soap	353
Lower lime	470

Show of oil at 412 feet.

IMPERIAL OIL CO., LTD.

J. Beattie No. 2, lot 5, con. VI, Sarnia tp.

Completed April 27, 1898.

Formation	Depth, feet
Surface	108
Top lime	158
Top soap	278
Middle lime	284
Lower soap	334
Lower lime	473

IMPERIAL OIL CO., LTD.

R. Beattie No. 1, lot 10, con. VII, Sarnia tp.

Completed January 13, 1898.
Dry hole.

Formation	Depth, feet
Surface	150
Top lime	210
Top soap	350
Middle lime	358
Lower soap	410
Lower lime	554

IMPERIAL OIL CO., LTD.

J. Brown No. 1, lot 12, con. VI, Sarnia tp.

Driller: J. Clemmie.
Completed November 12, 1898.
Dry hole.

Formation	Depth, feet
Surface	102
Black shale	137
Top rock	227
Top soap	387
Middle lime	392
Lower soap	457
Lower lime	520

Show of gas at 460 feet.

IMPERIAL OIL CO., LTD.

T. Bulman No. 3, lot 3, con. III, Sarnia tp.

Driller: H. Bevans.
Completed January 14, 1898.
Producing oil well.

Formation	Depth, feet
Surface	100
Top rock	130
Top soap	280
Middle lime	285
Lower soap	335
Lower lime	475

Show of gas at 464 feet.
Oil at 437 feet.

1898—Continued

IMPERIAL OIL CO., LTD.

T. Bulman No. 4, lot 3, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed February 26, 1898.

Formation	Depth, feet
Surface	100
Top rock	130
Top soap	283
Middle lime	290
Lower soap	340
Lower lime	472

Show of oil at 430 feet.

IMPERIAL OIL CO., LTD.

T. Bulman No. 5, lot 3, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed November 12, 1898.

Formation	Depth, feet
Surface	102
Top rock	132
Top soap	286
Middle lime	294
Lower soap	346
Lower lime	475

Show of oil at 430 feet.

IMPERIAL OIL CO., LTD.

T. Bulman No. 6, lot 3, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed May 27, 1898.
Producing oil well.

Formation	Depth, feet
Surface	100
Top lime	132
Top soap	282
Middle lime	338
Lower lime	471

Oil at 428 feet.

IMPERIAL OIL CO., LTD.

T. Bulman No. 7, lot 3, con. VII, Sarnia tp.

Completed September 8, 1898.

Formation	Depth, feet
Surface	100
Top rock	130
Top soap	282
Middle lime	288
Lower soap	336
Lower lime	472

IMPERIAL OIL CO., LTD.

T. Bulman No. 8, lot 3, con. VII, Sarnia tp.

Completed October 13, 1898.

Formation	Depth, feet
Surface	101
Top lime	131
Top soap	281
Middle lime	287
Lower soap	345
Lower lime	476

IMPERIAL OIL CO., LTD.

P. Doyle No. 1, lot 3, con. VI, Sarnia tp.

Driller: J. McCort.
Completed April 30, 1898.
Producing oil well.

Formation	Depth, feet
Surface	109
Top lime	151
Top soap	282
Middle lime	288
Lower soap	346
Lower lime	532

Oil at 430 and 445 feet.

IMPERIAL OIL CO., LTD.

P. Doyle No. 3, lot 3, con. VI, Sarnia tp.

Completed September 19, 1898.

Formation	Depth, feet
Surface	108
Top lime	138
Top soap	288
Middle lime	295
Lower soap	343
Lower lime	471

Show of oil at 428 feet.

IMPERIAL OIL CO., LTD.

P. Doyle No. 4, lot 4, con. VI, Sarnia tp.

Completed October 24, 1898.

Formation	Depth, feet
Surface	110
Top lime	140
Top soap	290
Middle lime	298
Lower soap	348
Lower lime	473

IMPERIAL OIL CO., LTD.

J. Griffin No. 2, lot 4, con. VII, Sarnia tp.

Driller: J. Peat.
Completed January 31, 1898.
Producing oil well.

Formation	Depth, feet
Surface	94
Top rock	134
Top soap	254
Middle lime	262
Lower soap	332
Lower lime	470

Oil at 430 feet.

IMPERIAL OIL CO., LTD.

J. Griffin No. 3, lot 4, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed November 30, 1898.

Formation	Depth, feet
Surface	100
Top lime	135
Top soap	285
Middle lime	292
Lower soap	337
Lower lime	473

Show of oil at 428 feet.

1898—Continued

IMPERIAL OIL CO., LTD.

J. Griffin No. 4, lot 4, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed April 18, 1898.

Formation	Depth, feet
Surface	100
Top lime	132
Top soap	282
Middle lime	292
Lower soap	342
Lower lime	475

Show of oil at 428 feet.

IMPERIAL OIL CO., LTD.

J. Griffin No. 5, lot 4, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed May 6, 1898.
Producing oil well.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	280
Middle lime	289
Lower soap	339
Lower lime	473

Oil at 427 feet.

IMPERIAL OIL CO., LTD.

J. Griffin No. 6, lot 4, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed May 13, 1898.
Producing oil well.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	282
Middle lime	289
Lower soap	339
Lower lime	478

Oil at 427 feet.

IMPERIAL OIL CO., LTD.

J. Griffin No. 7, lot 4, con. VII, Sarnia tp.

Completed May 19, 1898.
Producing oil well.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	280
Middle lime	287
Lower soap	337
Lower lime	427

Oil at 427 feet.

IMPERIAL OIL CO., LTD.

J. Griffin No. 8, lot 4, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed July 6, 1898.
Dry hole.

Formation	Depth feet
Surface	100
Top rock	130
Top soap	280
Middle lime	287
Lower soap	337
Lower lime	473

IMPERIAL OIL CO., LTD.

J. Griffin No. 9, lot 4, con. VII, Sarnia tp.

Completed July 17, 1898.

Formation	Depth, feet
Surface	100
Top rock	129
Top soap	279
Middle lime	287
Lower soap	335
Lower lime	473

IMPERIAL OIL CO., LTD.

J. Griffin No. 10, lot 4, con. VII, Sarnia tp.

Completed November 12, 1898.

Formation	Depth, feet
Surface	100
Top rock	140
Top soap	286
Middle lime	293
Lower soap	343
Lower lime	465

IMPERIAL OIL CO., LTD.

E. Hillier No. 3, lot 4, con. VII, Sarnia tp.

Driller: J. Peat.
Completed March 14, 1898.

Formation	Depth, feet
Surface	100
Top rock	140
Top soap	257
Middle lime	264
Lower soap	334
Lower lime	472

Show of oil at 430 feet.

IMPERIAL OIL CO., LTD.

E. Hillier No. 4, lot 4, con. VII, Sarnia tp.

Driller: J. Peat.
Completed May 20, 1898.

Formation	Depth, feet
Surface	104
Top lime	146
Top soap	372
Middle lime	379
Lower soap	345
Lower lime	471

Oil at 360 feet.

IMPERIAL OIL CO., LTD.

E. Hillier No. 5, lot 4, con. VII, Sarnia tp.

Driller: J. Peat.
Completed June 4, 1898.

Formation	Depth, feet
Surface	104
Top lime	146
Top soap	273
Middle lime	279
Lower soap	345
Lower lime	486

Oil at 427 feet.

IMPERIAL OIL CO., LTD.

E. Hillier No. 6, lot 4, con. VII, Sarnia tp.

Driller: H. Bevans.
Completed August 17, 1898.

Formation	Depth, feet
Surface	100
Top lime	120
Top soap	280
Middle lime	287
Lower soap	337
Lower lime	475

1898—Continued

IMPERIAL OIL CO., LTD.

E. Hillier No. 7, lot 4, con. VII, Sarnia tp.

Completed October 31, 1898.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	270
Middle lime	277
Lower soap	332
Lower lime	468

IMPERIAL OIL CO., LTD.

E. Hillier No. 8, lot 4, con. VII, Sarnia tp.

Completed December 13, 1898.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	279
Middle lime	286
Lower soap	336
Lower lime	467

IMPERIAL OIL CO., LTD.

W. Kirk No. 4, lot 3, con. VI, Sarnia tp.

Driller: J. McCort.
Completed January 26, 1898.

Formation	Depth, feet
Surface	103
Top rock	118
Top soap	269
Middle lime	277
Lower soap	334
Lower lime	475

Show of oil at 435 feet.

IMPERIAL OIL CO., LTD.

W. Kirk No. 5, lot 3, con. VI, Sarnia tp.

Driller: J. McCort.
Completed May 14, 1898.

Formation	Depth, feet
Surface	110
Top rock	251
Top soap	277
Middle lime	286
Lower soap	346
Lower lime	495

Oil at 430 feet.

IMPERIAL OIL CO., LTD.

W. Kirk No. 6, lot 3, con. VI, Sarnia tp.

Driller: H. Bevans.
Completed July 21, 1898.

Formation	Depth, feet
Surface	103
Top lime	133
Top soap	279
Middle lime	286
Lower soap	345
Lower lime	475

IMPERIAL OIL CO., LTD.

W. Kirk No. 7, lot 3, con. VI, Sarnia tp.

Completed August 1, 1898.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	148
Middle lime	154
Lower soap	335
Lower lime	472

IMPERIAL OIL CO., LTD.

H. Lucas No. 1, lot 6, con. VII, Sarnia tp.

Driller: J. McFall.
Completed April 2, 1898.
Dry hole.

Formation	Depth, feet
Surface	110
Top lime	145
Top soap	285
Middle lime	292
Lower soap	346
Lower lime	472

Show of oil at 414 and 428 feet.

IMPERIAL OIL CO., LTD

H. Lucas No. 2, lot 6, con. VII, Sarnia tp.

Driller: Bell and Knowles.
Completed June 1, 1898.
Producing oil well.

Formation	Depth, feet
Surface	113
Top lime	143
Top soap	288
Middle lime	295
Lower soap	353
Lower lime	480

Oil at 459 feet.

IMPERIAL OIL CO., LTD.

H. Lucas No. 3, lot 6, con. VII, Sarnia tp.

Completed September 8, 1898.

Formation	Depth, feet
Surface	112
Top lime	142
Top soap	287
Middle lime	294
Lower soap	351
Lower lime	480

IMPERIAL OIL CO., LTD.

T. Lucas No. 1, lot 6, con. VII, Sarnia tp.

Driller: Bell and Knowles.
Completed May 21, 1898.

Formation	Depth, feet
Surface	113
Top lime	138
Top soap	283
Middle lime	289
Lower soap	348
Lower lime	490

1898—Continued

IMPERIAL OIL CO., LTD.

J. and W. Milner No. 3, lot 2, con. VI, Sarnia tp.

Completed April 1, 1898.
Dry hole.

Formation	Depth, feet
Surface	107
Top lime	152
Top soap	279
Middle lime	286
Lower soap	344
Lower lime	478

Show of gas at 463 feet.
Show of oil at 428 feet.

IMPERIAL OIL CO., LTD.

J. and W. Milner No. 4, lot 2, con. VI, Sarnia tp.

Driller: J. McCort.
Completed May 27, 1898.

Formation	Depth, feet
Surface	104
Top lime	147
Top soap	276
Middle lime	283
Lower soap	341
Lower lime	477

IMPERIAL OIL CO., LTD.

J. and W. Milner No. 5, lot 2, con. VI, Sarnia tp.

Driller: J. McCort.
Completed June 8, 1898.

Formation	Depth, feet
Surface	102
Top rock	146
Top soap	276
Middle lime	283
Lower soap	341
Lower lime	476

Show of oil at 420 feet.

IMPERIAL OIL CO., LTD.

J. and W. Milner No. 6, lot 2, con. VI, Sarnia tp.

Completed June 25, 1898.

Formation	Depth, feet
Surface	105
Top rock	150
Top soap	277
Middle lime	283
Lower soap	341
Lower lime	477

Show of oil at 425–30 feet.

IMPERIAL OIL CO., LTD.

C. Pulse No. 1, lot 4, con. VI, Sarnia tp.

Completed in 1898.
Producing oil well.

Formation	Depth, feet
Surface	108
Top lime	143
Top soap	281
Middle lime	291
Lower soap	348
Lower lime	463

IMPERIAL OIL CO., LTD.

C. Pulse No. 2, lot 4, con. VI, Sarnia tp.

Driller: J. Peat.
Completed February 16, 1898.

Formation	Depth, feet
Surface	100
Top rock	147
Top soap	270
Middle lime	278
Lower soap	337
Lower lime	474

Show of oil at 432 feet.

IMPERIAL OIL CO., LTD.

C. Pulse No. 3, lot 4, con. VI, Sarnia tp.

Driller: J. Peat.
Completed April 1, 1898.

Formation	Depth, feet
Surface	101
Top lime	143
Top soap	265
Middle lime	271
Lower soap	337
Lower lime	470

Show of oil at 430 feet.

IMPERIAL OIL CO., LTD.

C. Pulse No. 4, lot 4, con. VI, Sarnia tp.

Driller: J. Peat.
Completed April 28, 1898.
Producing oil well.

Formation	Depth, feet
Surface	102
Top lime	144
Top soap	169
Middle lime	176
Lower soap	341
Lower lime	470

Oil at 420 feet.

IMPERIAL OIL CO., LTD.

C. Pulse No. 5, lot 4, con. VI, Sarnia tp.

Completed June 25, 1898.

Formation	Depth, feet
Surface	106
Shale	136
Soap	272
Middle lime	280
Lower soap	340
Lower lime	473

Oil at 448 feet.

IMPERIAL OIL CO., LTD.

C. Pulse No. 6, lot 4, con. VI, Sarnia tp.

Completed August 26, 1898.

Formation	Depth, feet
Surface	100
Top rock	130
Top soap	280
Middle lime	289
Lower soap	339
Lower lime	473

Oil at 425 feet

1898—Continued

IMPERIAL OIL CO., LTD.

C. Pulse No. 7, lot 4, con. VI, Sarnia tp.

Completed October 25, 1898.

Formation	Depth, feet
Surface	100
Top lime	140
Top soap	272
Middle lime	280
Lower soap	340
Lower lime	469

IMPERIAL OIL CO., LTD.

C. Pulse No. 10, lot 4, con. VI, Sarnia tp.

Completed in 1898.

Formation	Depth, feet
Surface	103
Top lime	129
Top soap	282
Middle lime	289
Lower soap	341
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Pulse No. 1, lot 5, con. VII, Sarnia tp.

Driller: J. Porter.
Completed May 21, 1898.

Formation	Depth, feet
Surface	104
Top lime	159
Top soap	281
Middle lime	286
Lower soap	336
Lower lime	476

Oil at 430 feet.

IMPERIAL OIL CO., LTD.

J. Pulse No. 2, lot 5, con. VII, Sarnia tp.

Driller: J. Porter.
Completed May 27, 1898.
Dry hole.

Formation	Depth, feet
Surface	106
Top lime	161
Top soap	283
Middle lime	288
Lower soap	338
Lower lime	480

IMPERIAL OIL CO., LTD.

J. Pulse No. 4, lot 5, con. VII, Sarnia tp.

Completed June 25, 1898.

Formation	Depth, feet
Surface	100
Top lime	160
Top soap	270
Middle lime	277
Lower soap	333
Lower lime	466

IMPERIAL OIL CO., LTD.

J. Pulse No. 5, lot 5, con. VII, Sarnia tp.

Completed August 20, 1898.
Dry hole.

Formation	Depth, feet
Surface	104
Top lime	142
Top soap	275
Middle lime	282
Lower soap	340
Lower lime	478

IMPERIAL OIL CO., LTD.

J. Pulse No. 7, lot 5, con. VII, Sarnia tp.

Completed September 24, 1898.

Formation	Depth, feet
Surface	110
Top lime	155
Top soap	277
Middle lime	284
Lower soap	343
Lower lime	465

IMPERIAL OIL CO., LTD.

J. Pulse No. 8, lot 5, con. VII, Sarnia tp.

Completed October 15, 1898.
Dry hole.

Formation	Depth, feet
Surface	112
Top lime	155
Top soap	287
Middle lime	294
Lower soap	353
Lower lime	466

IMPERIAL OIL CO., LTD.

J. Pulse No. 9, lot 5, con. VII, Sarnia tp.

Completed October 31, 1898.

Formation	Depth, feet
Surface	103
Top lime	143
Top soap	277
Middle lime	284
Lower soap	342
Lower lime	471

IMPERIAL OIL CO., LTD.

J. Purvis No. 1, lot 5, con. VII, Sarnia tp.

Driller: J. Clemmie.
Completed November 24, 1898.
Dry hole.

Formation	Depth, feet
Surface	123
Top rock	173
Top soap	295
Middle lime	300
Lower soap	370
Lower lime	500

Show of oil at 440 feet.
Salt water at 500 feet.

1898—Continued

IMPERIAL OIL CO., LTD.

J. Purvis No. 2, lot 5, con. VII, Sarnia tp.

Driller: J. Clemmie.
Completed April 7, 1898.

Formation	Depth, feet
Surface	128
Top lime	273
Top soap	293
Middle lime	300
Lower soap	370
Lower lime	500

Show of oil at 495 feet.
Salt water at 495 feet.

IMPERIAL OIL CO., LTD.

J. Purvis No. 3, lot 6, con. VII, Sarnia tp.

Completed August 5, 1898.

Formation	Depth, feet
Surface	121
Top rock	151
Top soap	291
Middle lime	299
Lower soap	356
Lower lime	485

IMPERIAL OIL CO., LTD.

J. Purvis No. 4, lot 6, con. VII, Sarnia tp.

Completed October 12, 1898.

Formation	Depth, feet
Surface	124
Top lime	164
Top soap	299
Middle lime	307
Lower soap	357
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Purvis No. 7, lot 6, con. VII, Sarnia tp.

Completed in 1898.

Formation	Depth, feet
Surface	119
Top lime	173
Top soap	293
Middle lime	300
Lower soap	363
Lower lime	471

Show of oil at 386 feet.

IMPERIAL OIL CO., LTD.

G. Rooney No. 1, lot 7, con. VII, Sarnia tp.

Driller: J. Clemmie.
Completed May 19, 1898.

Formation	Depth, feet
Surface	113
Top lime	158
Top soap	283
Middle lime	290
Lower soap	345
Lower lime	492

Oil at 375 feet.

IMPERIAL OIL CO., LTD.

G. Rooney No. 2, lot 7, con. VII, Sarnia tp.

Driller: Porter and Co.
Completed August 19, 1898.

Formation	Depth, feet
Surface	124
Top lime	175
Top soap	297
Middle lime	302
Lower soap	362
Lower lime	485

IMPERIAL OIL CO., LTD.

G. Rooney No. 3, lot 7, con. VII, Sarnia tp.

Completed September 19, 1898.
Dry hole.

Formation	Depth, feet
Surface	128
Top rock	180
Top soap	300
Middle lime	305
Lower soap	365
Lower lime	500

IMPERIAL OIL CO., LTD.

J. Schnell No. 1, lot 5, con. VII, Sarnia tp.

Completed in 1898.

Formation	Depth, feet
Surface	107
Top rock	142
Top soap	265
Middle lime	273
Lower soap	351
Lower lime	481

Oil at 430 and 469 feet.

IMPERIAL OIL CO., LTD.

J. Schnell No. 2, lot 5, con. VII, Sarnia tp.

Driller: J. McFall.
Completed April 30, 1898.

Formation	Depth, feet
Surface	106
Top lime	146
Top soap	284
Middle lime	291
Lower soap	344
Lower lime	449

Oil at 365 feet.

IMPERIAL OIL CO., LTD.

J. Schnell No, 3, lot 5, con. VII, Sarnia tp.

Completed July 21, 1898.

Formation	Depth, feet
Surface	108
Top rock	168
Top soap	278
Middle lime	283
Lower soap	343
Lower lime	428

IMPERIAL OIL CO., LTD.

J. Schnell No. 4, lot 5, con. VII, Sarnia tp.

Completed August 16, 1898.

Formation	Depth, feet
Surface	108
Top lime	133
Top soap	278
Middle lime	286
Lower soap	344
Lower lime	485

1898—Continued

IMPERIAL OIL CO., LTD.

S. Switzer No. 2, lot 3, con. VI, Sarnia tp.

Driller: J. McCort.
Completed January 11, 1898.
Producing oil well.

Formation	Depth, feet
Surface	103
Top rock	148
Top soap	270
Middle lime	277
Lower soap	335
Lower lime	472

Gas and oil at 430 feet.
Oil at 415 feet.

IMPERIAL OIL CO., LTD.

S. Switzer No. 3, lot 3, con. VI, Sarnia tp.

Driller: J. McCort.
Completed in 1898.

Formation	Depth, feet
Surface	105
Top rock	150
Top soap	272
Middle lime	279
Lower soap	337
Lower lime	475

Show of oil at 430 feet.

IMPERIAL OIL CO., LTD.

S. Switzer No. 4, lot 3, con. VI, Sarnia tp.

Driller: H. Bevans.
Completed April 28, 1898.
Producing oil well.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	280
Middle lime	287
Lower soap	337
Lower lime	472

Oil at 427 feet.

IMPERIAL OIL CO., LTD.

S. Switzer No. 5, lot 3, con. VI, Sarnia tp.

Driller: H. Bevans.
Completed June 10, 1898.
Producing oil well.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	282
Middle lime	288
Lower soap	338
Lower lime	472

Oil at 428 feet.

IMPERIAL OIL CO., LTD.

S. Switzer No. 6, lot 3, con. VI, Sarnia tp.

Driller: H. Bevans.
Completed July 30, 1898.

Formation	Depth, feet
Surface	100
Top rock	130
Top soap	280
Middle lime	287
Lower soap	337
Lower lime	472

IMPERIAL OIL CO., LTD.

S. Switzer No. 7, lot 3, con. VI, Sarnia tp.

Driller: H. Bevans.
Completed September 29, 1898.

Formation	Depth, feet
Surface	100
Top lime	130
Top soap	282
Middle lime	289
Lower soap	339
Lower lime	472

IMPERIAL OIL CO., LTD.

S. Switzer No. 8, lot 3, con. VI, Sarnia tp.

Completed November 4, 1898.
Producing oil well.

Formation	Depth, feet
Surface	100
Top lime	128
Top soap	275
Middle lime	282
Lower soap	332
Lower lime	467

IMPERIAL OIL CO., LTD.

R. Wilson No. 1, lot 6, con. VII, Sarnia tp.

Driller: J. Clemmie.
Completed June 1, 1898.
Dry hole.

Formation	Depth, feet
Surface	130
Top lime	175
Top soap	295
Middle lime	305
Lower soap	365
Lower lime	488

Show of oil at 370 feet.

IMPERIAL OIL CO., LTD.

R. Wilson No. 3, lot 6, con. VII, Sarnia tp.

Completed September 27, 1898.

Formation	Depth, feet
Surface	123
Top rock	153
Top soap	298
Middle lime	305
Lower soap	355
Lower lime	470

1899
Lambton County

IMPERIAL OIL CO., LTD.

E. Hillier No. 11, lot 4, con. VII, Sarnia tp.

Completed July 23, 1899.
Producing oil well.

Formation	Depth, feet
Surface	98
Top lime	138
Top soap	273
Middle lime	281
Lower soap	339
Lower lime	470

1899—Continued

IMPERIAL OIL CO., LTD.

P. Doyle No. 5, lot 3, con. VI, Sarnia tp.

Completed August 30, 1899.
Producing oil well.

Formation	Depth, feet
Surface	114
Top lime	149
Top soap	289
Middle lime	298
Lower soap	349
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Griffin No. 11, lot 4, con. VII, Sarnia tp.

Completed July 26, 1899.
Producing oil well.

Formation	Depth, feet
Surface	95
Top lime	130
Top soap	270
Middle lime	277
Lower soap	335
Lower lime	469

IMPERIAL OIL CO., LTD.

E. Hillier No. 9, lot 4, con. VII, Sarnia tp.

Completed July 12, 1899.
Producing oil well.

Formation	Depth, feet
Surface	98
Top lime	128
Top soap	272
Middle lime	280
Lower soap	337
Lower lime	470

IMPERIAL OIL CO., LTD.

E. Hillier No. 10, lot 4, con. VII, Sarnia tp.

Completed September 16, 1899.
Producing oil well.

Formation	Depth, feet
Surface	101
Top lime	136
Top soap	277
Middle lime	285
Lower soap	340
Lower lime	470

IMPERIAL OIL CO., LTD.

J. and M. Kirk No. 8, lot 3, Con. VI, Sarnia tp.

Completed August 15, 1899.
Producing oil well.

Formation	Depth, feet
Surface	104
Top lime	231
Top soap	285
Middle lime	292
Lower soap	344
Lower lime	470

IMPERIAL OIL CO., LTD.

H. Lucas No. 4, lot 6, con. VII, Sarnia tp.

Completed January 25, 1899.
Dry hole.

Formation	Depth, feet
Surface	110
Top lime	142
Top soap	298
Middle lime	305
Lower soap	357
Lower lime	467

IMPERIAL OIL CO., LTD.

H. Lucas No. 5, lot 6, con. VII, Sarnia tp.

Completed July 18, 1899.
Producing oil well.

Formation	Depth, feet
Surface	111
Top lime	137
Top soap	292
Middle lime	355
Lower lime	469

IMPERIAL OIL CO., LTD.

H. Lucas No. 6, lot 6, con. VII, Sarnia tp.

Completed September 11, 1899.
Producing oil well.

Formation	Depth, feet
Surface	112
Top lime	142
Top soap	292
Middle lime	300
Lower soap	358
Lower lime	470

IMPERIAL OIL CO., LTD.

T. Lucas No. 4, lot 6, con. VII, Sarnia tp.

Completed February 9, 1899.

Formation	Depth, feet
Surface	114
Top lime	142
Top soap	294
Middle lime	302
Lower soap	360
Lower lime	468

IMPERIAL OIL CO., LTD.

T. Lucas No. 5, lot 6, con. VII, Sarnia tp.

Completed July 3, 1899.
Producing oil well.

Formation	Depth, feet
Surface	114
Top lime	240
Top soap	296
Middle lime	303
Lower soap	360
Lower lime	471

IMPERIAL OIL CO., LTD.

J. and W. Milner No. 7, lot 2, con. VI, Sarnia tp.

Completed August 27, 1899.
Producing oil well.

Formation	Depth, feet
Surface	100
Top lime	126
Top soap	278
Middle lime	285
Lower soap	336
Lower lime	473

1899—Continued

IMPERIAL OIL CO., LTD.

J. and W. Milner No. 8, lot 2, con. VI, Sarnia tp.

Completed October 16, 1899.
Producing oil well.

Formation	Depth, feet
Surface	106
Top lime	131
Top soap	271
Middle lime	278
Lower soap	347
Lower lime	470

IMPERIAL OIL CO., LTD.

J. and W. Milner No. 9, lot 2, con. VI, Sarnia tp.

Completed November 3, 1899.
Producing oil well.

Formation	Depth, feet
Surface	104
Top lime	134
Top soap	274
Middle lime	282
Lower soap	340
Lower lime	470

IMPERIAL OIL CO., LTD.

C. Pulse No. 2, lot 4, con. VI, Sarnia tp.

Completed November 17, 1899.
Producing oil well.

Formation	Depth, feet
Surface	106
Top lime	133
Top soap	287
Middle lime	294
Lower soap	352
Lower lime	470

IMPERIAL OIL CO., LTD.

C. Pulse No. 8, lot 4, con. VI, Sarnia tp.

Completed January 9, 1899.
Producing oil well.

Formation	Depth, feet
Surface	103
Top lime	138
Top soap	273
Middle lime	280
Lower soap	337
Lower lime	470

IMPERIAL OIL CO., LTD.

C. Pulse No. 9, lot 4, con. VI, Sarnia tp.

Completed August 7, 1899.
Producing oil well.

Formation	Depth feet
Surface	105
Top lime	140
Top soap	280
Middle lime	288
Lower soap	341
Lower lime	470

IMPERIAL OIL CO., LTD.

C. Pulse No. 11, lot 4, con. VI, Sarnia tp.

Completed September 29, 1899.
Producing oil well.

Formation	Depth, feet
Surface	104
Top lime	139
Top soap	279
Middle lime	287
Lower soap	344
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Pulse No. 3, lot 5, con. VII, Sarnia tp.

Driller: J. Porter.
Completed June 6, 1899.

Formation	Depth, feet
Surface	106
Top lime	161
Top soap	286
Middle lime	292
Lower soap	342
Lower lime	475

Oil at 360 and 440 feet.

IMPERIAL OIL CO., LTD.

J. Pulse No. 10, lot 5, con. VII, Sarnia tp.

Completed June 26, 1899.

Formation	Depth, feet
Surface	104
Top lime	134
Top soap	269
Middle lime	277
Lower soap	335
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Pulse No. 11, lot 5, con. VII, Sarnia tp.

Completed September 12, 1899.

Formation	Depth, feet
Surface	103
Top lime	129
Top soap	279
Middle lime	286
Lower soap	336
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Pulse No. 12, lot 5, con. VII, Sarnia tp.

Completed August 6, 1899.
Producing oil well.

Formation	Depth, feet
Surface	96
Top lime	136
Top soap	271
Middle lime	278
Lower soap	338
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Pulse No. 13, lot 5, con. VII, Sarnia tp.

Completed August 25, 1899.
Producing oil well.

Formation	Depth, feet
Surface	98
Top lime	138
Top soap	273
Middle lime	280
Lower soap	340
Lower lime	470

1899—Continued

IMPERIAL OIL CO., LTD.

J. Purvis No. 5, lot 6, con. VII, Sarnia tp.

Completed May 3, 1899.
Producing oil well.

Formation	Depth, feet
Surface	120
Top lime	146
Top soap	303
Middle lime	309
Lower soap	361
Lower lime	473

IMPERIAL OIL CO., LTD.

J. Purvis No. 6, lot 6, con. VII, Sarnia tp.

Completed May 15, 1899.
Producing oil well.

Formation	Depth, feet
Surface	124
Top lime	148
Top soap	299
Middle lime	306
Lower soap	358
Lower lime	371

IMPERIAL OIL CO., LTD.

G. Rooney No. 4, lot 7, con. VII, Sarnia tp.

Completed March 17, 1899.

Formation	Depth, feet
Surface	124
Top lime	154
Top soap	306
Middle lime	313
Lower soap	365
Lower lime	470

IMPERIAL OIL CO., LTD.

G. Rooney No. 5, lot 7, con. VII, Sarnia tp.

Completed November 2, 1899.
Producing oil well.

Formation	Depth, feet
Surface	122
Top lime	162
Top soap	302
Middle lime	310
Lower soap	365
Lower lime	467

IMPERIAL OIL CO., LTD.

J. Schnell No. 5, lot 5, con. VII, Sarnia tp.

Completed June 14, 1899.
Producing oil well.

Formation	Depth, feet
Surface	110
Top lime	135
Top soap	275
Middle lime	283
Lower soap	341
Lower lime	469

IMPERIAL OIL CO., LTD.

J. Schnell No. 6, lot 5, con. VII, Sarnia tp.

Completed August 3, 1899.
Producing oil well.

Formation	Depth, feet
Surface	109
Top lime	136
Top soap	288
Middle lime	295
Lower soap	351
Lower lime	469

IMPERIAL OIL CO., LTD.

J. Schnell No. 7, lot 5, con. VII, Sarnia tp.

Completed October 2, 1899.
Producing oil well.

Formation	Depth, feet
Surface	112
Top lime	152
Top soap	292
Middle lime	299
Lower soap	349
Lower lime	471

IMPERIAL OIL CO., LTD.

S. Switzer No. 9, lot 3, con. VI, Sarnia tp.

Completed September 12, 1899.
Producing oil well.

Formation	Depth, feet
Surface	98
Top lime	124
Top soap	278
Middle lime	285
Lower soap	337
Lower lime	469

IMPERIAL OIL CO., LTD.

R. Wilson No. 4, lot 6, con. VII, Sarnia tp.

Completed April 7, 1899.
Producing oil well.

Formation	Depth, feet
Surface	118
Top lime	140
Top soap	297
Middle lime	305
Lower soap	359
Lower lime	471

IMPERIAL OIL CO., LTD.

R. Wilson No. 5, lot 6, con. VII, Sarnia tp.

Completed May 23, 1899.
Producing oil well.

Formation	Depth, feet
Surface	115
Top lime	143
Top soap	297
Middle lime	304
Lower soap	358
Lower lime	470

IMPERIAL OIL CO., LTD.

R. Wilson No. 6, lot 6, con. VII, Sarnia tp.

Completed October 14, 1899.
Producing oil well.

Formation	Depth, feet
Surface	120
Top lime	155
Top soap	295
Middle lime	303
Lower soap	353
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Wood No. 2, lot 8, con. VII, Sarnia tp.

Completed June 9, 1899.

Formation	Depth, feet
Surface	129
Top lime	157
Top soap	312
Middle lime	319
Lower soap	376
Lower lime	481

1900
Lambton County

IMPERIAL OIL CO., LTD.

J. Rooney No. 1, lot 7, con. VII, Sarnia tp.

Completed November 3, 1900.
Dry hole.

Formation	Depth, feet
Surface	110
Top lime	150
Top soap	290
Middle lime	295
Lower soap	355
Lower lime	470½

1901
Lambton County

IMPERIAL OIL CO., LTD.

E. Hillier No. 12, lot 4, con. VII, Sarnia tp.

Completed May 15, 1901.
Producing oil well.

Formation	Depth, feet
Surface	96
Top lime	136
Top soap	276
Middle lime	284
Lower soap	344
Lower lime	472

IMPERIAL OIL CO., LTD.

J. and M. Kirk No. 9, lot 3, con. VI, Sarnia tp.

Completed January 4, 1901.
Producing oil well.

Formation	Depth, feet
Surface	105
Top lime	140
Top soap	275
Middle lime	283
Lower soap	343
Lower lime	468½

IMPERIAL OIL CO., LTD.

J. Pulse No. 14, lot 5, con. VII, Sarnia tp.

Completed April 22, 1901.
Producing oil well.

Formation	Depth, feet
Surface	101
Top lime	141
Top soap	281
Middle lime	287
Lower soap	347
Lower lime	469

IMPERIAL OIL CO., LTD.

J. Pulse No. 15, lot 5, con. VII, Sarnia tp.

Completed May 2, 1901.
Producing oil well.

Formation	Depth, feet
Surface	97
Top lime	137
Top soap	277
Middle lime	283
Lower soap	343
Lower lime	470

IMPERIAL OIL CO., LTD.

J. Schnell No. 8, lot 5, con. VII, Sarnia tp.

Completed May 30, 1901.
Producing oil well.

Formation	Depth, feet
Surface	101
Top lime	141
Top soap	276
Middle lime	283
Lower soap	343
Lower lime	470½

Oil at 377, and 425–30 feet.

1903
Lambton County

IMPERIAL OIL CO., LTD.

J. Schnell No. 9, lot 5, con. VII, Sarnia tp.

Completed October 20, 1903.
Producing oil well.

Formation	Depth, feet
Surface	103
Top lime	153
Top soap	276
Middle lime	280
Lower soap	340
Lower lime	470

Oil at 360 and 420 feet.
Salt water at 460 feet.

IMPERIAL OIL CO., LTD.

J. Schnell No. 10, lot 5, con. VII, Sarnia tp.

Completed November 29, 1903.
Producing oil well.

Formation	Depth, feet
Surface	105
Top lime	158
Top soap	281
Middle lime	285
Lower soap	345
Lower lime	470

Oil at 365 and 420 feet.
Salt water at 467 feet.

1904
Lambton County

IMPERIAL OIL CO., LTD.

H. Lucas No. 7, lot 6, con. VII, Sarnia tp.

Completed April 27, 1904.

Formation	Depth, feet
Surface	109
Top lime	163
Top soap	286
Middle lime	291
Lower soap	351
Lower lime	470

IMPERIAL OIL CO., LTD.

T. Lucas No. 6, lot 6, con. VII, Sarnia tp.

Completed May 18, 1904.

Formation	Depth, feet
Surface	112
Top lime	166
Top soap	288
Middle lime	293
Lower soap	353
Lower lime	470

1904—Continued

IMPERIAL OIL CO., LTD.

J. Schnell No. 11, lot 5, con. VII, Sarnia tp.

Completed February 25, 1904.

Formation	Depth, feet
Surface	111
Top lime	169
Top soap	289
Middle lime	294
Lower soap	352
Lower lime	472

IMPERIAL OIL CO., LTD.

J. Schnell No. 12, lot 5, con. VII, Sarnia tp.

Completed March 10, 1904.

Formation	Depth, feet
Surface	111
Top lime	165
Top soap	288
Middle lime	293
Lower soap	354
Lower lime	471

IMPERIAL OIL CO., LTD.

J. Schnell No. 13, lot 5, con. VII, Sarnia tp.

Completed April 2, 1904.

Formation	Depth, feet
Surface	100
Top lime	155
Top soap	275
Middle lime	280
Lower soap	342
Lower lime	470

IMPERIAL OIL CO., LTD.

R. Wilson No. 7, lot 6, con. VII, Sarnia tp.

Completed May 31, 1904.

Formation	Depth, feet
Surface	115
Top lime	168
Top soap	288
Middle lime	293
Lower soap	358
Lower lime	470

1905
Lambton County

IMPERIAL OIL CO., LTD.

H. Lucas No. 8, lot 6, con. VII, Sarnia tp.

Completed May 22, 1905.
Dry hole.

Formation	Depth, feet
Surface	112
Top lime	160
Top soap	282
Middle lime	288
Lower soap	346
Lower lime	472

IMPERIAL OIL CO., LTD.

T. Lucas No. 7, lot 6, con. VII, Sarnia tp.

Completed December 12, 1905.

Formation	Depth, feet
Surface	111
Top lime	163
Top soap	285
Middle lime	290
Lower soap	346
Lower lime	470

IMPERIAL OIL CO., LTD.

C. Pulse No. 12, lot 4, con. VI, Sarnia tp.

Completed July 22, 1905.

Formation	Depth, feet
Surface	101
Top lime	149
Top soap	177
Middle lime	182
Lower soap	340
Lower lime	470

IMPERIAL OIL CO., LTD.

C. Pulse No. 13, lot 4, con. VI, Sarnia tp.

Completed July 8, 1905.

Formation	Depth, feet
Surface	106
Top lime	153
Top soap	276
Middle lime	286
Lower soap	338
Lower lime	470

IMPERIAL OIL CO., LTD.

C. Pulse No. 16, lot 5, con. VII, Sarnia tp.

Completed July 3, 1905.

Formation	Depth, feet
Surface	98
Top lime	150
Top soap	272
Middle lime	278
Lower soap	334
Lower lime	470

1908
Lambton County

IMPERIAL OIL CO., LTD.

G. Rooney No. 6, lot 7, con. VII, Sarnia tp.

Driller: A. Randall.
Completed June 28, 1908.
Dry hole.

Formation	Depth, feet
Surface	121
Top lime	176
Top soap	298
Middle lime	304
Lower soap	366
Lower lime	475

Show of oil at 393 feet.

1923
Middlesex County

MIDDLESEX AND DOVER GAS AND OIL CO.

J. B. Rowe, lot 21, con. X, London tp.

Driller: Berry and Anderson.
Completed September, 1923.

Formation	Depth, feet
Sand and gravel	186
Dundee(?):	
Rotten lime	601
Detroit River:	
Brown sharp lime	696
White sharp lime	774
Bass Island:	
Hard brown lime	922
Salina:	
Grey shale	937
Slate and lime shells	972
Hard brown lime	1,121
Shale and lime shells	1,180
Very hard brown lime	1,200
Anhydrite	1,210
Grey shale with anhydrite	1,230
Anhydrite	1,235
Grey shale	1,240
Pure buff dolomite	1,250
Anhydrite	1,255
Buff dolomite	1,260
Grey dolomite and anhydrite	1,265
Guelph:	
Buff dolomite (pure) with grains of selenite	1,275
Buff dolomite	1,305
Grey dolomite	1,310
Buff dolomite	1,320
Grey dolomite	1,325
Buff dolomite with few grains of selenite	1,335
Grey dolomite	1,340
Buff dolomite with selenite	1,345
Buff dolomite	1,360
Lockport:	
Grey, dark-grey, and brownish-grey dolomites	1,560
Rochester:	
Grey clay shales	1,630
Clinton:	
Grey dolomite	1,640
Medina:	
Cataract grey clay, shale	1,700

1935
Wentworth County

ROCKTON OIL AND GAS SYNDICATE

Sagar No. 2, lot 1, con. III, Beverly tp.

Completed in 1935.

Formation	Depth, feet
Surface	45
Guelph and Lockport:	
Buff and grey dolomite	160
Dark-grey shaly dolomite	220
Buff crystalline	240
White, dolomitic limestone	305
Rochester:	
Dark-grey shales	321
Clinton and Thorold:	
Light-grey dolomite with a little shale and sandstone	331
Mainly light-grey sandstone	334
Grimsby:	
Light-grey sand with green and red shale	384
Grey shale	394
Light-grey sandstone and red shale	398
Manitoulin and Whirlpool:	
Grey, sandy shale, grey dolomite, and sandstone	418
Queenston:	
Red shale	560
Greenish-grey shale	570
Red and greenish-grey shale	750

Fresh water at 55 feet; sulphur water at 140 feet; mineral water at 257 and 418 feet.

ROCKTON OIL AND GAS SYNDICATE

Lot 18, con. V, Beverly tp.

Driller: Rockton Oil and Gas Syndicate.
Completed 1935.

Formation	Depth, feet
Samples missing to	1,200
Dark-grey shale, a little grey limestone and fine-grained sandstone	1,210
Dark-grey shale, much grey or brown limestone, a little fine-grained sandstone	1,250
Dark-grey shale, a little brown limestone	1,260
Dark-grey shale, considerable brown limestone, a crinoid fragment	1,290
Dark-grey shale, a little brown limestone	1,320
Dark-grey shale, considerable brown limestone and fine-grained sandstone, a shall fragment	1,400
Gloucester or Collingwood:	
Very dark-grey shale, a very small proportion of grey limestone	1,410
Very dark-grey shale	1,440
Very dark-grey shale, a very little grey limestone	1,450
Very dark-grey shale, only a very little limestone	1,520
Very dark-grey shale, slightly darker in colour and rather better laminated than at 1,400–1,520 feet, practically free from limestone	1,600

ROCKTON OIL AND GAS SYNDICATE

F. Biggs No. 1, lot 30, con. IV, Beverly tp.

Driller: P. Jackson.
Completed 1936.
Dry hole.

Formation	Depth, feet
Surface	20
Guelph and Lockport:	
Light-grey to buff dolomite	40
Buff crystalline dolomite	65
Dark-buff to brown dolomite, green shale	135
Dark-buff to brown dolomite, little shale	140
Light-grey dolomite, little shale	160
Light-grey to white dolomitic limestone	195
Rochester:	
Light-grey to buff dolomite and a little grey shale	200
Clinton:	
Light-buff dolomite and some pyrite and green shale	230
Grimsby and Cabot Head:	
Reddish shale	265
Green shale	295
Manitoulin:	
Dolomitic limestone	305
White Medina:	
Light-grey sandstone	320
Queenston:	
Red shale	790
Red and green shale	820
Meaford-Dundas:	
Grey shales	1,420
Collingwood:	
Dark-grey bituminous	1,650
Trenton and older limestones:	
Dark-grey, fine-grained limestone	1,880
Dark-grey, fine-grained limestone with 10–40 percent grey shale	1,940
Dark-grey, fine-grained limestone with 10 percent grey shale	2,000
Grey limestone	2,126
Grey limestone with flaky kaolinite	2,185
Dense, brown limestone	2,200
Fine granular limestone with some dolomite	2,235
Dense, buff to brown limestone	2,335
Precambrian:	
Coarse crystalline dolomitic limestone or marble	2,675

Final depth reported by G. A. Babcock.... 4,175

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PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-SECOND ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXII, PART 4, 1953

Geology of the Mamainse Point Copper Area

By

JAS. E. THOMSON

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO
Printed and Published by Baptist Johnston, Printer to the Queen's Most Excellent Majesty
1954

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COLOURED GEOLOGICAL MAP

(In pocket at back of report)

Map No. 1953-1—Mamainse Point Copper Area, District of Algoma, Ontario. Scale, 1 inch to 1,000 feet.

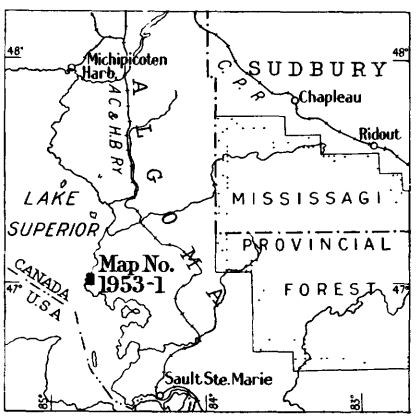
Geology of the Mamainse Point Copper Area

By Jas. E. Thomson

INTRODUCTION

The Mamainse Point copper area is located on the east shore of Lake Superior in the district of Algoma. It lies about 60 miles north of the city of Sault Ste. Marie and is reached from that centre by way of highway No. 17, which follows the shore of Lake Superior.

The occurrence of copper at Mamainse Point was probably known by the natives of this continent in very remote times. It is claimed that David Thompson, the explorer, found copper there in 1798. Attempts were made to mine the metal about a century ago when the Michigan copper district on the south side of Lake Superior was being actively developed; these efforts were unsuccessful. Except



Key map showing the location of the Mamainse Point copper area, district of Algoma. Scale, 1 inch to 60 miles.

for a little drilling by the Calumet and Hecla Mining Company from 1906 to 1908, the area remained dormant until 1948 when Macassa Mines, Limited, optioned the main copper locations. This company carried on exploration, including drilling, until the latter part of 1949 and then relinquished the option to C. C. Huston and associates, who did over 33,000 feet of drilling in 1951 and added some holes in 1952.

The following report represents the first attempt by the Ontario Department of Mines to make a detailed study of the Keweenawan rocks on the Ontario side of the Lake Superior basin. Access to recent drilling information and the resurvey of the boundaries of the old copper locations provided an excellent opportunity for detailed mapping and investigation. Accordingly, the writer spent the field season of 1952 in detailed mapping of an area, about 12 square miles in extent, surrounding the main copper showings. A reconnaissance of the remainder of the Keweenawan area showed that further detailed mapping was not advisable because of the lack of rock exposures.

Copper occurs in the Mamainse Point area in the form of chalcocite with minor amounts of chalcopyrite and native copper. The mineralization occupies zones of fracturing and faulting in the gently dipping strata of the Keweenawan series. The similarity of the regional geology to that of the Michigan copper district and the widespread occurrence of chalcocite and native copper in small fractures along the coast of Lake Superior have always provided encouragement for intensive exploration in the hope that mineable deposits might be located. The structure and mineralogy of the copper deposits at Mamainse, as revealed by drilling in the last few years, are quite different from that commonly found in the Michigan copper district. Native copper in amygdaloidal flow tops and conglomerates, which is a common type of occurrence in Michigan, has not been found in any quantity on the Canadian side of the lake; instead, the known occurrences are largely the product of fissure and fracture filling by chalcocite.

The Mamainse area is easily accessible from Sault Ste. Marie by way of a paved highway. In addition to the mineral deposits, the resources of the area consist of good hardwood forests, commercial fishing out of Mamainse Harbour, and tourist attractions during the summer months. The few permanent residents of the area are engaged in logging, fishing, or the operation of tourist camps.

Mapping Methods

Detailed mapping of a strip of ground between the Copper Creek shaft and the Mamainse mine, near mileage 62 of highway No. 17, was carried out by E. J. Bonkoff for Macassa Mines in 1949. A base line was cut from the Copper Creek shaft northward to the lake, and picket lines were turned off at 200-foot intervals and extended about 1,500 feet on either side. The geology was compiled on the scale of 1 inch to 1,500 feet. This work was continued in 1951 along the extension of the *C* zone by G. W. Goettler, and the information obtained by both geologists was made available to the writer by C. C. Huston and incorporated in the accompanying map, No. 1953-1.

Early in 1952 the boundaries of the three main mining locations, the Quebec and Lake Superior, the Sand Bay, and the Pancake Point locations of the Montreal Mining Company, were resurveyed by E. M. MacQuarrie, O.L.S., of Sault Ste. Marie. The new surveys, with those of highway No. 17, were compiled by cartographers of the Ontario Department of Mines on the scale of 1 inch to 500 feet. This was used as the base map in the preparation of map No. 1953-1. Air photographs of the Forestry Resources Inventory, Department of Lands and Forests, were enlarged to the same scale. These were particularly valuable for mapping purposes along the shore of Lake Superior where the outcrops are well exposed. However, as most of the area is thickly covered by forest growth, picket lines had to be cut for traverse control. These were turned off at right angles to the south boundary of the Quebec and Lake Superior location. They were spaced about 2,000 feet apart and carried north and south to the opposite sides of the mining locations where they were tied in to the new surveys. The picket lines were then chained, and stations established at 200-foot intervals. Pace-and-compass traverses were made at about 400-foot intervals in an east-west direction and tied to the stations on the picket lines. The geologists worked in pairs with the senior man doing the mapping while the junior man ran the compass line. In this way systematic coverage was given, and almost all the outcrops were seen.

There is little natural rock exposure in the area. In addition to the dense vegetation, the rock outcrops are covered by several inches of soil, moss, and rubble. Only on the coast of Lake Superior, in road cuts, and in areas exposed by prospecting, are good rock exposures to be seen. The steep escarpments at the

upper edge of the gently dipping strata provide good exposures when the moss is cleared away. Fortunately the area is traversed by a labyrinth of logging and skid roads recently opened by the use of a bulldozer. These helped greatly by revealing rock that would otherwise have been missed.

Outcrops are shown on the accompanying map, No. 1953-1, in as much detail as the scale of publication would permit. In using the map it must be remembered that the outcrop areas, as shown, are sometimes covered with sufficient overburden to hide geological features of interest to the prospector, such as veins, breccias, gossans, copper stain, or mineralization. Within the boundaries that have been assigned to rock outcrops, bedrock could be reached at many places by surface-trenching.

Acknowledgments

The writer received all possible assistance from residents of the area, and his indebtedness to them is hereby acknowledged. Local logging companies kindly allowed the use of their private roads. C. C. Huston, mining engineer of Toronto, turned over all surface maps, reports, and drilling data for use in the preparation of this report and assisted in many other ways. As previously mentioned, the ground in the vicinity of the main copper showings had been mapped in great detail by E. J. Bonkoff and G. W. Goettler, geologists employed by C. C. Huston, and their work is incorporated in the accompanying geological map.

Most of the mapping in 1952 was done by university students who acted as assistants on the writer's field party. The diligence and enthusiastic co-operation of these men is gratefully acknowledged. H. R. H. Cook and R. M. Ginn, senior assistants, were responsible for field mapping, and W. E. MacCormack and W. J. Elliott performed the duties of junior assistants.

Previous Geological Work

Between 1847 and 1877, Logan, Macfarlane, and Bell independently traversed the east shore of Lake Superior for the Geological Survey of Canada and briefly described the rocks and copper occurrences at Mamainse Point. The Royal Commission on the Mineral Resources of Ontario, 1890, was told about the early attempts at copper mining. In 1893, Blue summarized information from various sources on the copper deposits at Mamainse Point for the Ontario Bureau of Mines. Lane has described the section drilled inland from Coppermine Point by the Calumet and Hecla Mining Company from 1906 to 1908, and made the first geological map of the area. In 1925, Moore mapped the east shore of Lake Superior from Batchawana Bay to the Montreal River and described the copper deposits at Mamainse Point.

A list of the main references to the Mamainse area is given below.

Bibliography

Sir William E. Logan, Geol. Surv. Can., Rept. of Progress, 1863, pp. 82, 85.

Thos. Macfarlane, report on "Lake Superior," Geol. Surv. Can., Rept. of Progress, 1863–66, pp. 115–47.

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Archibald Blue, *Copper at Point Mamainse*, Ont. Bur. Mines, 1893, pp. 62–88.

Alfred C. Lane, *Record of Diamond Drilling at Point Mamainse, Province of Ontario*, Can. Dept. Mines, Bull. No. 6, Rept. No. 111, 1911, pp. 1–59.

E. S. Moore, *Batchawana Area, District of Algoma*, Ont. Dept. Mines, Vol. XXXV, 1926, pt. 2 pp. 67–85.

History and Development

The existence of copper at Mamainse Point was known in very remote times, and the so-called "Indian diggings" near Hibbard [Sand] Bay attest to the mining activities of the natives in this region. The early history of copper mining on the east shore of Lake Superior is given in the report of the Royal Commission on the mineral resources of Ontario in 1890 and in reports by Blue, Macfarlane, Lane and Moore. The similarity of the geology at Mamainse Point to that of the Michigan copper district attracted the attention of mining interests when the Michigan camp was being developed. There are sketchy records of intermittent mining activity from 1842 until 1894. During this period, shafts were put down at several places in the area; the best known developments are those at the Mamainse mine and the Copper Creek and Silver Creek shafts. According to the report of the Royal Commission of 1890, the deepest workings were on the 300-foot horizon at the Copper Creek shaft. There is no record of any copper production, but apparently a mill was installed at the Mamainse mine.

Amongst the companies engaged in early exploration were the Montreal Mining Company in 1856–57, the Ontario Mineral Lands Company in 1871, the Silver Islet Consolidated Mining and Lands Company in 1882–84, the Canada Lands Purchase Company in 1890, and the Nipigon Mining Company, probably about 1892. From 1906 to 1908, the property was optioned by the Calumet and Hecla Mining Company of Michigan. Seventeen drill holes were put down along a line of section extending inland from near Coppermine Point. The results of this work have been described by Lane.

During the construction of highway No. 17 in 1936, native copper was found in a rock cut at mileage 55, near Coppermine Point. A sample of almost pure native copper, weighing 147 pounds, was shipped to the Ontario Department of Mines from this locality[1] and was shown at the Canadian National Exhibition.

In 1948 the old copper showings were examined by C. C. Huston, mining engineer, of Macassa Mines, Limited. On his recommendation the company optioned the Kincaid No. 8,[2] the Quebec and Lake Superior, and the two locations of the Montreal Mining Company and staked a block of claims. This ground was prospected in 1948. In 1949 part of the property in the vicinity of the Copper Creek and Silver Creek shafts and the "Indian diggings" was more thoroughly prospected and mapped. Nineteen holes were drilled in the autumn of 1949. The option was relinquished by Macassa Mines, Limited, in 1950 and taken over by C. C. Huston and associates in unincorporated form. Over 33,000 feet of drilling was done in 1951, and a few additional holes were put down in 1952.

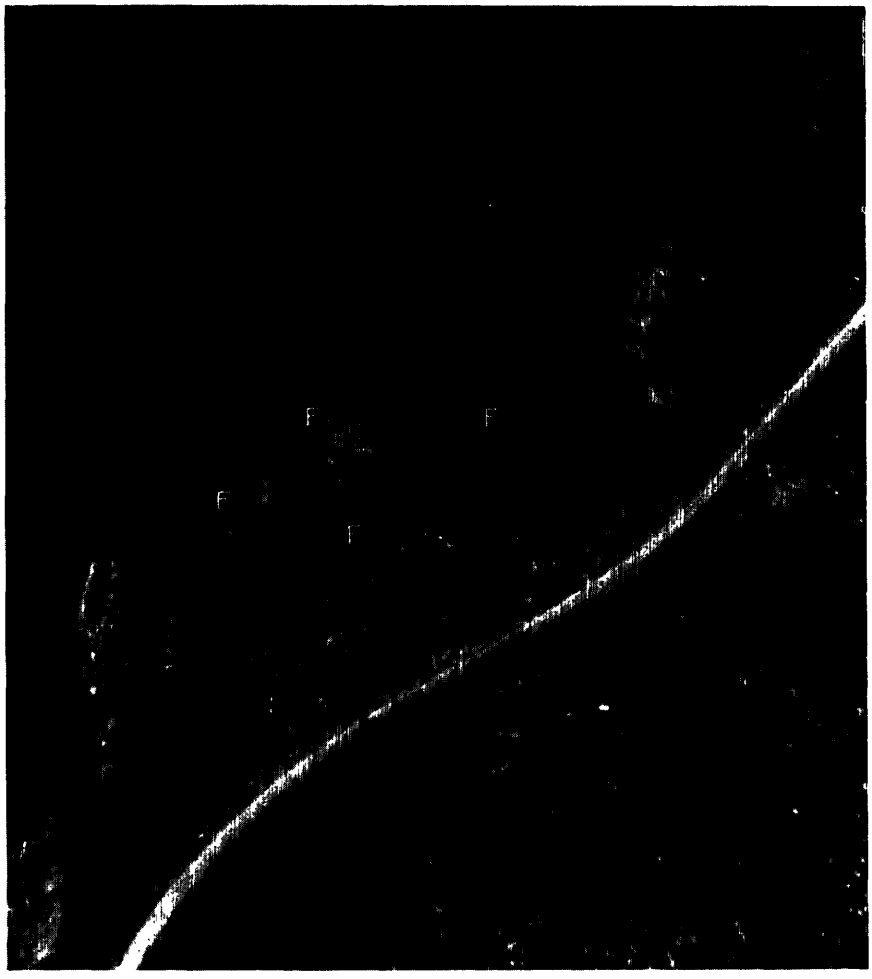
Topography

The topography of the Mamainse Point area has been produced by a combination of three factors, the nature and structure of the bedrock, glacial deposits, and the raised beaches of former glacial Lake Algonquin, the predecessor of Lake Superior. Compared with the rugged terrain, generally characteristic of the east coast of Lake Superior, the area underlain by Keweenawan rocks exhibits only mild relief. About a mile inland from Hibbard Bay, rock ridges rise about 400 feet above the level of Lake Superior, and elevations of 300 to 500 feet are fairly consistent as far eastward as the Pancake River. The Pancake Point location of the Montreal Mining Company is low, swampy, and largely devoid of rock outcrop.

[1] *The Northern Miner*, Oct. 29, 1936.
[2] Referred to locally as the "Ryan" location.

The accompanying geological map shows the amount of rock exposed and the trend of the ridges. The outcrops have a definite surface expression that is the result of the uniformity of strike and dip of the strata. The general north-south strike and the gentle slope westward, averaging about 30 degrees, is expressed topographically by a gradual ascent of an outcrop, more or less corresponding to the dip of the strata. This terminates in an abrupt escarpment at the base of which another lava flow or conglomerate bed emerges. Where outcrops are

Courtesy Ontario Dept. of Lands and Forests.



Air photograph showing lava flows exposed on the shore of Lake Superior near mileage 62 of highway No. 17. FF shows the topographic expression of faults. Scale, 1 inch to 330 feet.

abundant, as near Lake Superior north of Mamainse Point, a series of well-defined asymmetrical troughs mark the succession of strata with great accuracy. These depressions show up well from the air so that along the coast the attitude of the strata may be detected on air photographs. In contrast, the outcrops of felsite, which is a dense, hard rock, stand out in bold relief, often producing steep cliffs with a talus slope of rubble. The boulder conglomerate disintegrates more rapidly and less uniformly than the lava flows. Along the coast, the erosion of the conglomerate by wave action has produced a variety of effects, such as caves,

stacks, and arches. Also near the lake, faults and veins that trend transversely across the strata are deeply dissected, forming canyon-like structures. These were carved out when Lake Superior stood well above its present level.

Along the coast there are a succession of raised beaches that reflect the higher elevations of former glacial Lake Algonquin; these are flat terraces of sand, gravel, and boulders that rise abruptly from level to level, going inland, and are ideal for road locations.

A contour map of the Lake Superior coast from Batchawana Bay to Michipicoten Harbour, and extending inland beyond the Batchawana River, was prepared from air surveys by the Forestry Branch of the Ontario Department of Lands and Forests in 1931 and may be obtained from that department.



Gorge eroded along a fault on the shore of Lake Superior.

GENERAL GEOLOGY

Compared with the usual complexities of Precambrian geology, that of the Mamainse Point area is extremely simple. The rocks are the youngest in the Precambrian era and are only gently folded, consequently they are generally fresh and easily recognized. Within the map sheet, No. 1953-1, the consolidated strata are of Keweenawan age, but a few outcrops of Paleozoic age occur in the low-lying areas along the cost of Lake Superior to the north and south. Amygdaloidal lava flows predominate and are interbanded with boulder conglomerate; the latter makes excellent marker horizons in the succession. Acid intrusives are limited in amount and, contrary to what might be expected, are the most metamorphosed rocks in the country. These intrusives are classified as Late Keweenawan for the reason that nothing better is offered at present in Precambrian age terminology. Post-Keweenawan would be a more accurate term because there is nothing in common between these acid intrusives and the typical Keweenawan rocks. Basic intrusives occur as small unmappable dikes and are found only on rare occasions.

A table of the rock formations that have been recognized within the area

shown on the accompanying sketch map is given below. The succession is arranged in order of age with the oldest rocks at the base of the column.

Table of Formations

CENOZOIC	
PLEISTOCENE AND RECENT:	Gravel, sand, clay.
	Great unconformity
PALEOZOIC	
CAMBRIAN:	Lake Superior sandstone: sandstone, shale, and conglomerate.
	Great unconformity
PRECAMBRIAN	
LATE KEWEENAWAN:	Diabase and trap dikes; felsite and felsite breccia.
	Intrusive contact
KEWEENAWAN:	Sediments: conglomerate; small amount of sandstone, grit, and shale.
	Volcanics: amygdaloidal basalt; small amount of "ophite" and "porphyrite."

Keweenawan Series

Volcanics

Basaltic lavas make up the greater part of the Keweenawan series. Most of these are characterized by amygdaloidal phases, especially in the upper part of the flows. The amygdule filling may be calcite, chlorite, olivine, pyroxene, epidote, chalcedony, agate, or some combination of these minerals. A typical section through a flow would show abundant amygdules near the top with a gradual transition to a fine- or coarse-grained texture towards the middle, which may be devoid of amygdules or show them sparingly. A few inches at the base of the flow would probably contain plenty of amygdules, and if the flow should be thick, this amygdaloidal zone might be several feet in width. Some of the thick flows show very coarse gabbroic textures in the central area.

Lane[1] has used the Michigan terminology to describe various phases of the flows. "Trap" is the name given to the fine-grained, non-amygdaloidal phase; "ophite," a mottled, pyroxene-rich type; "porphyrite," porphyritic phases of the lava, "melaphyre," olivine basalt without any distinctive texture, and "dolerite," the unusually coarse-grained pegmatitic texture sometimes found in the thick flows. Professional Paper 144 of the United States Geological Survey follows this terminology. Some of the terms, such as "trap" have been used recently in core-logging in the area.

Some of the flows show a reddening of the upper amygdaloidal phase. In Michigan this is considered to be the result of the formation of ferric oxide by gases escaping from within the crystallizing flows.[2] The analyses listed on page 21 show that the red amygdaloidal lavas of Mamainse Point have a considerably higher content of ferric iron than the unaltered lavas. The reddening of flow tops was not widely noted in the Mamainse Point area by the writer, and apparently it is not so typical of the Keweenawan flows as it is in Michigan.

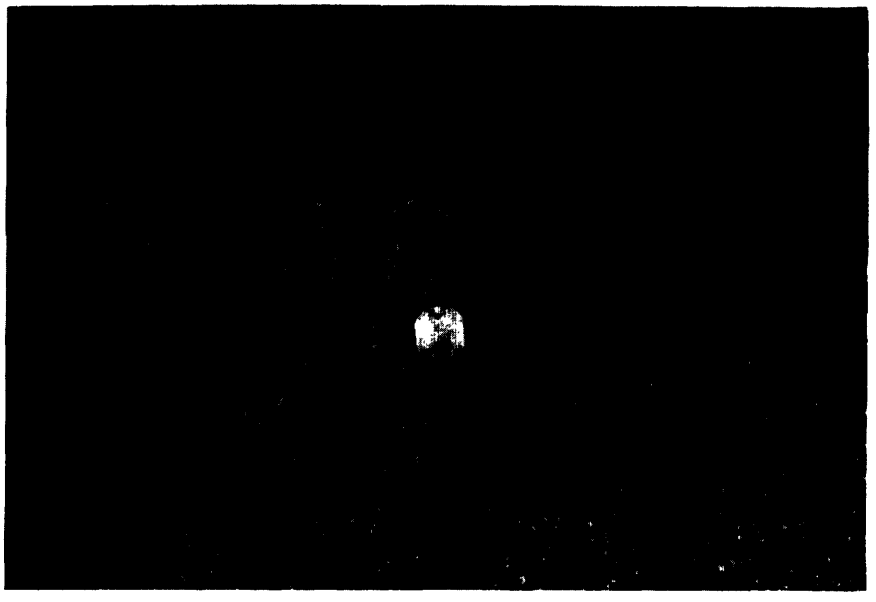
The flow tops are generally smooth and regular. Banding of the amygdaloidal zones parallel to the flow surface is sometimes seen. Fragmental and brecciated tops are not commonly found. In a few of the brecciated tops, quartz cements the fragments; these are, in reality, vein breccias because the quartz appears to have

[1]A. C. Lane, *op. cit.*

[2]B. S. Butler and W. S. Burbank, *The Copper Deposits of Michigan*, U. S. Geol. Surv., Professional Paper 144, 1929, p. 34.

been introduced after the flows were laid down. The flows range in thickness from less than 1 foot to a maximum of about 200 feet.

The lava flows generally show great uniformity in appearance so that reliable marker horizons are rarely seen and individual flows are scarcely ever traced along the strike for any distance. An occasional flow will be recognizable because of some outstanding feature such as large amygdules, coarse-grained or porphyritic texture, or fragmental top. Along the shore of Lake Superior immediately north of Hibbard Bay there is a lava with a distinct mottling. This is called the "Carlson ophite" by Lane.[1] Similar rock appears on highway No. 17 at mileage 59 and at a point (Copper Point) on the southwest side of Hibbard Bay.



Surface of an amygdaloidal basaltic flow exposed on the shore of Lake Superior.

It would appear that there are several horizons of this type of lava in the flow sequence.

Near this point, a porphyritic phase of the lava underlies a narrow band of conglomerate. This was named "porphyrite" by Lane.[2] It is 10 feet wide where exposed at the lake shore. It contains lath-shaped crystals of feldspar up to 2 inches in length and amygdules as large as 3 inches in diameter. Less spectacular porphyritic phases of the flows were noted at a few other places along the coast, but in no case were these traced inland.

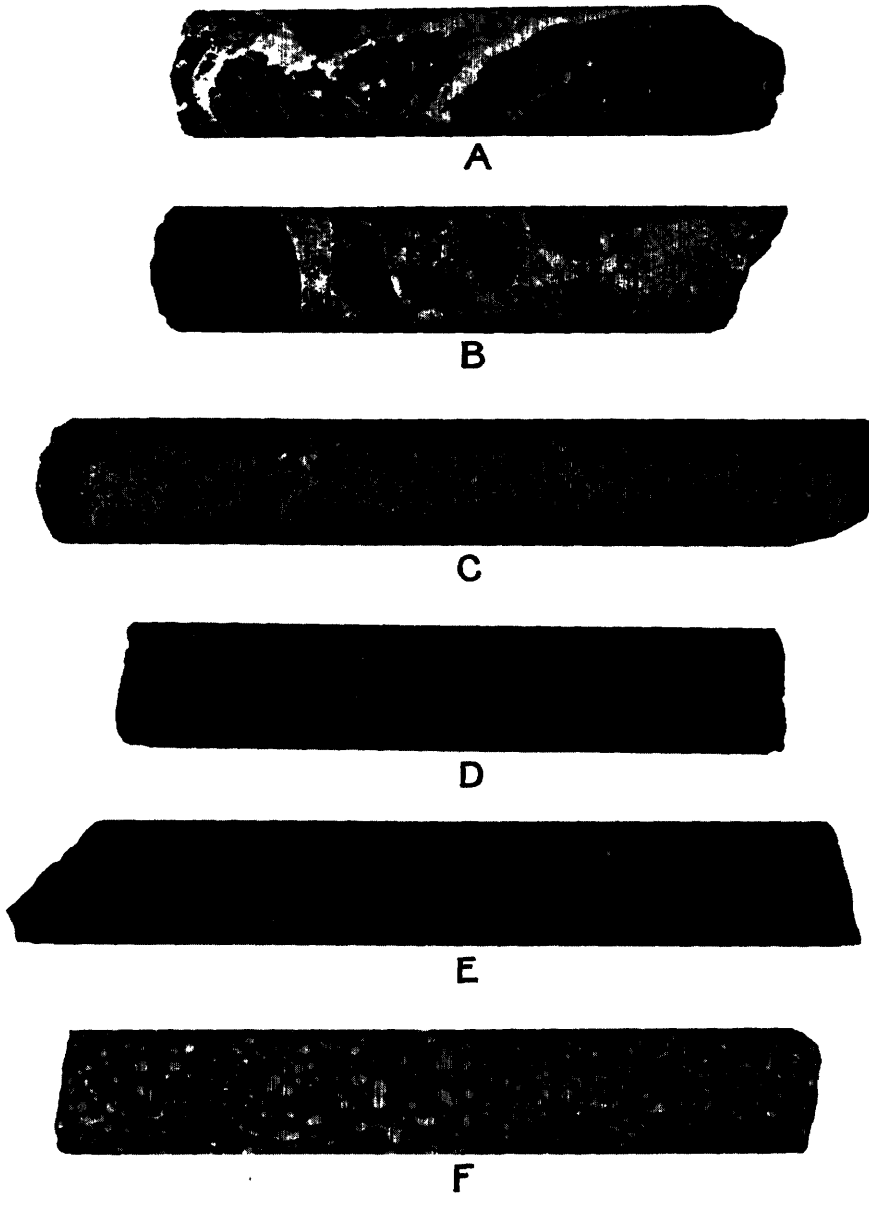
The Keweenawan lavas show little evidence of alteration. Schistosity and sheared zones are not found. Reddening or bleaching is noticeable adjacent to veins or fractures. Patches of rock may show red or green coloration due to the presence of hematite or epidote.

Sediments

The sediments consist mainly of boulder conglomerate, but narrow bands of grit, sandstone, or shale are often associated with it. Boulders up to 4 feet in longest dimension may be seen, but the bulk of them would be between 3 and 12

[1]A. C. Lane, *Record of Diamond Drilling at Point Mamainse, Province of Ontario*, Can. Dept. Mines, Bull. No. 6, Rept. No. 111, 1911, p. 50. (see accompanying map No. 112.)

[2]A. C. Lane, *Ibid.*



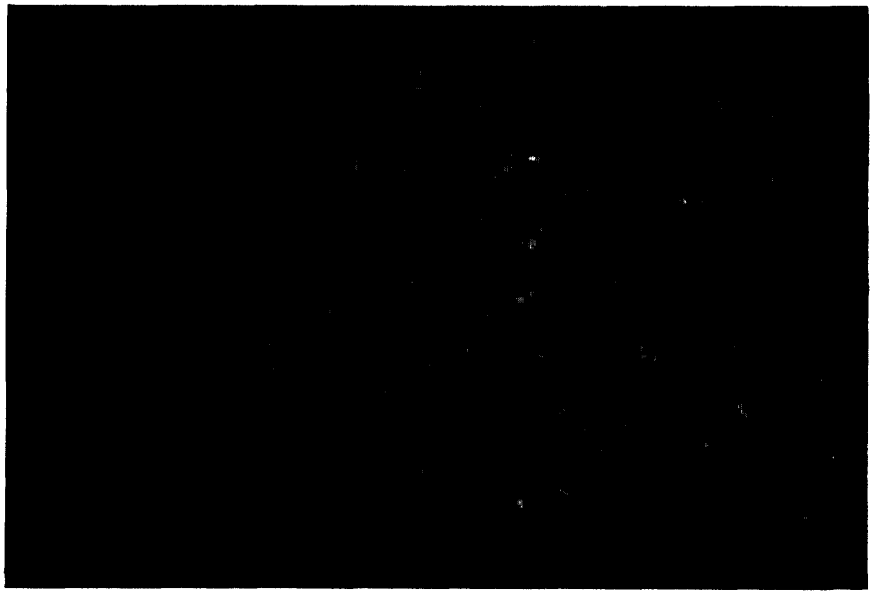
TEXTURE OF KEWEENAWAN ROCKS AS SEEN IN DIAMOND-DRILL CORES

A — fractured amygdaloidal basalt with calcite veinlets.
B — pebble conglomerate.
C — coarse-grained basalt (dolerite).
D — basalt, "ophite" type.
E — fine-grained basalt (trap).
F — amygdaloidal basalt.

One-half natural size.

inches in size. The finer-grained clastics are generally well bedded and may show cross-bedding, ripple marks, and mud cracks. There is a tendency for all the sedimentary rocks to be dark red in colour, especially where outcrops show some effects of weathering.

A great variety of boulders and pebbles are present in the conglomerate. These are subangular to rounded, but sorting is generally poor. The largest boulders consist of different varieties of granite and gneiss, but most of them consist of basic lava in the form of amygdaloid or trap. This is only natural in view of the fact that the sediments are interbedded with lavas of this type. Boulders of pegmatite, Keewatin-type greenstone and schist, diabase, vein quartz, older sediments, and other varieties are also present.



Keweenawan conglomerate exposed on the shore of Lake Superior.

The fine-grained clastics scarcely ever attain a thickness of more than a few feet and generally contain interbedded pebbly conglomerate. They are predominantly poorly bedded sandstone and grit, with occasional thin beds of shale.

Some of the sedimentary bands are quite persistent along strike and make good horizon markers. However, they can end abruptly, and so the sudden disappearance of a sedimentary horizon does not necessarily mean that it has been displaced by a fault. The largest band of sediments, named "heaviest conglomerate" by Lane,[1] outcrops over a width of almost half a mile along the coast of Lake Superior. It was traced southward to the limit of the area mapped in detail and attains a maximum width of 4,200 feet on surface. Some lava flows outcrop within the main conglomerate band, and possibly several others are drift-covered. The maximum true width of the "heaviest conglomerate" and interbedded flows would be a little under 1,800 feet. Along the shore of Lake Superior, a thickness of about 100 feet at the base of this sedimentary band is predominantly sandstone.

[1]A. C. Lane, *op. cit.*

Thickness of the Keweenawan Series

By pacing the shore of Lake Superior, Macfarlane[1] estimated the thickness of the Keweenawan series at Mamainse Point to be 16,208 feet, of which 2,138 feet consist of sediments. Using a similar method, Moore[2] estimated the total thickness to be 16,044 feet. Lane[3] stated that the area studied by him in detail is 8,510 feet thick, to which possibly 5,000 feet might be added at the base. All of these are estimates of apparent thickness and make no allowance for the effects of possible strike-faulting.

According to the writer's calculations, a section inland from near the south end of Mamainse Island and parallel to the south boundary of the Quebec and Lake Superior location would show an apparent thickness of over 12,000 feet of Keweenawan strata. This is calculated as follows:

	Average Dip	Thickness
		Feet
Interbedded lavas and sediments:		
Mamainse Island to "heaviest conglomerate"	35°–45°	5,180
"Heaviest conglomerate"	25°	1,776
"Heaviest conglomerate" to picket line *E* (see sketch map, page 13)	30°	2,000
Thickness within boundaries of map No. 1953-1		8,956
Picket line *E* to base of series as shown in sketch map	30°	3,168
Total thickness		12,124

The section inland from Coppermine Point would probably be much thicker, but the lower contact of the Keweenawan series has not been exactly located along this line of section. Based on the contact as assumed in the sketch map (facing page 6), and taking an average dip of 30 degrees, the apparent thickness would be in excess of 15,000 feet, or over 17,000 feet if a dip of 35 degrees is used. Some complex folding of the Keweenawan series is known to occur between Coppermine Point and Pancake Point, and some bodies of intrusive felsite appear. If these conditions were to extend inland, they would greatly effect these estimates of thickness.

Late Keweenawan Intrusives

Felsite and Felsite Breccia

Dikes and irregularly shaped bodies of felsite intrude the lavas and sediments of the Keweenawan series. Typical felsite is a fine-grained, reddish rock containing a few small phenocrysts of quartz. It resembles a rhyolite in texture, and some phases have been described as quartz porphyry.[4] The dikes show well-defined intrusive contacts and cut across the strata, but in places, the larger bodies could easily be mistaken for sediments or lavas and have been so interpreted in the past. The dense variety of the felsite is a hard rock that erodes into cliffs and steep scarps with talus slopes of rubble at the base. Another variety has a horizontal grain or parting, and the outcrops resemble sandstone in appearance. A dike of this type is exposed in a rock-cut on highway No. 17 at mileage 55.

[1] T. Macfarlane, report on "Lake Superior," Geol. Surv. Can., Rept. of Progress, 1936–66, pp. 132–34.

[2] E. S. Moore, *Batchawana Area, District of Algoma*, Ont. Dept. Mines, Vol. XXXV, 1926, pt. 2, pp. 67–69.

[3] A. C. Lane, *op. cit.*, p. 13.

[4] E. S. Moore, *op. cit.*, p. 74.

In places, the felsite is remarkably deformed considering that it is the youngest acid intrusive in the Precambrian Shield. This deformation is accentuated by alternating red and white colour bands, which are sometimes crenulated and drag-folded. Along the coast northwest of Pancake Point, the foliation and parting are so regular that the rock looks rather like a bedded sediment showing a great variation in attitude over short distances. Macfarlane[1] and Lane[2] classified it as sandstone. However, dikes and offshoots of the felsite and felsite breccia are observed to cut the amygdaloidal lava. The lava flows adjacent to these bodies of intrusives are folded, as shown in the sketch facing page 6, so that the intrusion of the felsite must have been accompanied by considerable deformation of the invaded rocks.

A noticeable feature of the felsite is the tendency to form a contact breccia around the periphery of the larger bodies. This breccia consists of fragments of the



Banded felsite exposed on the shore of Lake Superior northwest of Pancake Point.

invaded rock in various stages of assimilation. Blocks up to 4 feet in dimension may be seen at the contact northwest of Pancake Point, but generally the inclusions are small and well rounded. The inclusion breccia resembles a conglomerate in appearance, but all the fragments are of one rock type.

Altered and brecciated felsite are best exposed along the coast of Lake Superior between Cottrell Cove and Pancake Point. Small, red felsite dikes are often seen along the shore near Mamainse Point and sometimes look like bands of jasper.

Intrusive felsites and breccias are found in the Keweenawan series of Michigan,[3] and Tanton[4] shows bodies of quartz porphyry and related rocks, presumably intrusive, in strata of similar age on St. Ignace Island on the north shore of Lake Superior.

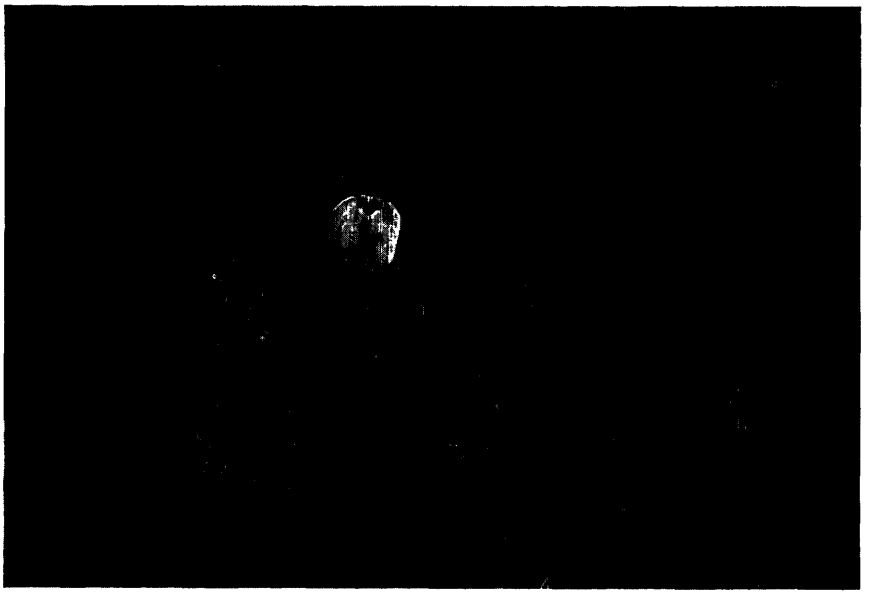
[1]T. Macfarlane, *op. cit.*, pp. 134, 135.
[2]A. C. Lane, *op. cit.*, p. 45.
[3]C. R. Van Hise and C. K. Leith, *Geology of the Lake Superior Region*, U. S. Geol. Surv. Mon. LII, 1911, p. 382.
[4]Map No. 308A—Lake Nipigon sheet, Geol. Surv. Can., 1935.

An analysis of a composite sample of felsite from the Mamainse Point area is given on page 21 of this report.

Diabase and Trap Dikes

The felsite, lava flows, and sediments are cut by narrow basic dikes. These are commonly called trap dikes, but Moore[1] has classified some as olivine diabase. The dikes seen by the writer were all under 6 feet in width and are quite fine-grained with well defined contacts.

North of Mamainse Point, at Pointe aux Mines, Nuffield[2] found numerous diabase dikes of three different ages, but only one dike appears to cut the small patch of Keweenawan lava flows. Apparently almost all the Keweenawan diabase dikes are older than the Keweenawan flows, thus accounting for their scarcity at Mamainse Point.



Felsite breccia on the shore of Lake Superior near Pancake Point.

Cambrian

Lake Superior Sandstone

The sketch map shows the location of small patches of Lake Superior sandstone, shale, and conglomerate along the shore of Mica Bay on Lake Superior. These lie with great unconformity on the Keweenawan flows and pre-Keweenawan granite.

Along the shore, at mileage 66.4 on highway No. 17, a thickness of about 15 feet of thin-bedded, flat-lying shale and sandstone is exposed; it contains ripple marks but lacks fossils. A conglomerate, 5 feet in thickness, occurs at the base and contains large angular boulders of the underlying granite embedded in a shaly matrix. The unconformity is well exposed. Farther south along the shore, at mileage 66, a great, angular unconformity between the shale and sandstone and

[1]E. S. Moore, *op. cit.*, p. 74.

[2]E. W. Nuffield, *Preliminary Report on the Geology of Part of Township 29, Range XIV, District of Algoma*, Ont. Dept. Mines, P.R.1950-5.

the underlying Keweenawan lava flows may be seen at the water's edge when the lake is calm. The flows strike N.30°W. and dip 43° SW., whereas the shales strike N.40°E. and dip 15° NW. A pebble conglomerate, 6 inches thick, lies at the base of the shale. The pebbles are predominantly quartz, but a few lava pebbles are present, and some of these are amygdaloidal. The Keweenawan flows at the contact are fractured and filled with quartz stockworks, but the quartz veinlets do not extend into the basal conglomerate. Thin, isolated patches of the basal conglomerate are cemented to the underlying flows.

Similar flat-lying sandstone, shale, and basal conglomerate, usually reddish in colour or streaked with grey, are found in low outcrops along the shore between Pancake Bay and Corbeil Point in Herrick township and on Batchawana Island in Batchawana Bay. McConnell[1] has mapped the Lake Superior sandstone at intervals from the south side of Batchawana Bay to Sault Ste. Marie; it also occurs along the south side of Lake Superior, which is only 16 miles from Coppermine Point, at Whitefish Point, and on the islands in Whitefish Bay of Lake Superior. The Lake Superior sandstone thus appears to occupy the southeastern part of the basin of Lake Superior and extend into the low-lying areas along the east coast as far north as Alona Bay.

Moore[2] has classified these sandstones as Upper Keweenawan, but other geologists[3] have regarded them as Paleozoic in age. The writer believes that the evidence is strongly in favour of the latter interpretation. The Lake Superior sandstone is placed in the Upper Cambrian at about the horizon of the Potsdam sandstone by the Michigan Geological Survey.[4]

Pleistocene and Recent

The Mamainse Point area was overridden by the continental glaciers of Pleistocene time and shows the usual glacial deposits of sand, gravel, and clay. Near Lake Superior these are overlain by lake clays, sands, silts, and gravels of Lakes Algonquin and Nipissing, which were earlier stages in the development of the present lake basin. In these stages the water stood at a considerably higher level than at present and extended inland over the bordering lowlands and up river valleys.

Gravel terraces which represent the raised beaches of former glacial lakes are found at a number of different elevations. These raised beaches are well shown on certain air photographs of the coastline. Lawson,[5] Coleman,[6] and Lane[7] have stated the levels of raised beaches at Mamainse. Lawson placed the terraces at 122, 157, and 191 feet; Coleman at 35, 58, and 184 feet; and Lane at 57, 90, and 190–230 feet. The writer made no attempt to measure the elevations of the various raised beaches.

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[1]Map No. 35a—Batchawana Area, District of Algoma, Ontario, Ont. Dept. Mines, Vol. XXXV, 1926, pt. 2.

[2]E. S. Moore, *op. cit.*, p. 73 and accompanying map No. 35b.

[3]W. E. Logan, *Geology of Canada*, Geol. Surv. Can, 1863, with accompanying map (Pub. No. 55).

A. P. Coleman, *Copper Regions of the Upper Lakes*, Ont. Bur. Mines, Vol. VIII, 1899, pt. 2, pp. 126–29.

R. G. McConnell, *Sault Ste. Marie, District of Algoma*, Ont. Dept. Mines, pp. 40–42.

[4]Pub. No. 23—Geological Map of Michigan, Geol. Surv. Mich., 1916.

[5]Andrew C. Lawson, *Sketch of the Coastal Topography of the North Side of Lake Superior*, Geol. and Natural History Surv. of Minnesota, 20th Ann. Rept., 1891, p. 182.

[6]A. P. Coleman, *op. cit.*, p. 153.

[7]A. C. Lane, *Record of Diamond Drilling at Point Mamainse, Province of Ontario*, Can. Dept. Mines, Bull. No. 6, Rept. No. 111, 1911, pp. 14, 15.

STRUCTURAL GEOLOGY

The structural information obtained during the course of the survey is plotted on map No. 1953-1. The interpretation of the structure is indicated, where possible, by the lighter tints of colour, which show the assumed extension and boundaries of formations under overburden. The cross-section is to aid in picturing the structure. The sketch map shows the relation of the area mapped in detail to the main area of Keweenawan rocks on the east shore of Lake Superior.

Folding

Amygdaloidal tops are easily recognized in the lava flows, and cross-bedding shows the tops of the sedimentary beds. However, such determinations are unnecessary because the folding is gentle, and no overturned strata are involved.



Surface of a lava flow which dips under conglomerate on left.

In the Quebec and Lake Superior location the strike of the strata is N.5°–15°W., but towards the south end of the map sheet it swings around to N.50°W. The dip ranges from 20 to 48 degrees to the west and southwest and would average around 30 degrees. There is thus a broadly arcuate fold or open anticline pitching towards Lake Superior. This structure is so broad that the anticlinal axis cannot be accurately located, but it would lie near the south boundary of the Quebec and Lake Superior location and be roughly parallel to this line.

Farther south, between Cottrell Cove and Pancake Point, the folding becomes more complex. At mileage 55 on highway No. 17, the flows dip 30°NE.; going southward along the coast they swing around as shown in the sketch map. No geological work was done northeast of the highway in this vicinity so that the significance of these unusual strikes and dips is not known. There might be some relationship to nearby felsite intrusives, but farther north, the strata near the felsite bodies are not noticeably deformed.

The dominating regional structure of the Keweenawan series around Lake Superior is the basin-shaped Lake Superior syncline, which roughly conforms to the present lake outline. The Keweenawan rocks at Mamainse Point form the east end of this elongated basin. Some geologists believe that the source of the Keweenawan lavas lies under Lake Superior, and that the space vacated by the outpouring of lava was filled by the settling of the crust.[1] The theory, as originally proposed by Hotchkiss,[2] is summarized by Butler and Burbank:[3]

> Hotchkiss . . . considers the origin of the (Lake Superior) syncline to be associated with the igneous activity. He pictures a great body of igneous material rising slowly through the earth's crust beneath the present Lake Superior basin. For a long period before Keweenawan time this rising igneous mass elevated the surface above it and tilted the rock away from the present basin. The rising surface was eroded, and the material thus derived was deposited around the margin. In Keweenawan time the magma broke through to the surface as basaltic and felsitic flows. This release of pressure and transfer of material to the surface caused the crust to settle. The process of transfer and settling continued through the Keweenawan epoch, resulting in a tilting of the beds towards the axis of the basin, the earlier beds being most affected and the later ones progressively less . . .



Lava flows on Mamainse Island. The dip is 48 degrees towards Lake Superior.

On the north shore of Lake Superior, Tanton[4] has found evidence that the Keweenawan flows (Osler series) came from a southerly source in the bed of Lake Superior.

On the south side of Lake Superior there is a steady flattening in the dip of the Keweenawan strata from the base towards the top. This is not noticeable in the Mamainse Point area. In fact, on Mamainse Island at the top of the sequence, the steepest dips in the area are found. Also, in the Mamainse Point area the boulder conglomerate of the Keweenawan series could easily have been derived by the erosion of a highland to the eastward that consisted of a large

[1] B. S. Butler and W. S. Burbank, *The Copper Deposits of Michigan*, U. S. Geol. Surv., Professional Paper 144, 1929, p. 50.

[2] W. O. Hotchkiss, *The Lake Superior Geosyncline*, Bull. Geol. Soc. Amer., Vol. 34, Dec., 1923, No. 4, pp. 669–78.

[3] B. S. Butler and W. S. Burbank, *op. cit.*, p. 50.

[4] T. L. Tanton, *Fort William and Port Arthur, and Thunder Cape Map-areas, Thunder Bay District, Ontario*, Geol. Surv. Can., Mem. 167, 1931, p. 64.

granite terrain with mingled basic volcanics and intrusives. However, no source of the volcanism has been found in this direction.

Details of the relationships at the base of the Keweenawan series of the Mamainse Point area might throw some light on the question of origin of the flows, but little information is available. The writer searched for the contact at Mica Bay and along a logging road that crosses the eastern part of the Quebec and Lake Superior location. In both localities the contact is drift-covered, but in the latter case, it was closely delimited. A small patch of Keweenawan rocks occurs north of the Mamainse Point map area at Alona Bay and has been mapped in detail by Nuffield.[1] Nuffield's map would suggest that the Keweenawan flows lie on the older granite and diabase dikes with great unconformity. The flows dip lakeward at 24–49 degrees.

It is difficult to understand how the Keweenawan flows of the Mamainse area could undergo a great reversal of dip, as would be required if their source lay in the bed of Lake Superior, without much greater deformation than is shown in the field.

Faulting

Most of the faults shown on map No. 1953-1 are postulated from the displacement of marker horizons, but a few of these structures may be actually seen on the ground. Along the coast some of the faults have been deeply eroded by wave action in glacial periods when the lake stood well above its present level. There is generally some calcite, gouge, and rock alteration along the fault planes. This has been removed rapidly by the waves so that deep narrow gorges are cut out along the faults, and they are well marked topographically. Some of the faults along the shore line are clearly marked on air photographs, and in certain cases, their extension through the shallow offshore reefs may be readily distinguished.

It should be remembered that accurate data on elevations are necessary to prove slight dislocations of gently dipping strata. As no detailed contour map of the Mamainse Point area was available, and as no levels were established in the course of the field mapping, care had to be taken that apparent offsets of marker horizons were not due to differences of elevation rather than faulting. The writer got the impression in the field that many of the faults are either weak structures with no great continuity or broad, complexly fractured zones with limited and varying local dislocations. It is possible that the interpretation of faulting as shown on map No. 1953-1 indicates a greater continuity than would be found by detailed exploration along these structures.

The faults are generally well-defined tensional structures; the fault fissure is filled with calcite and often contains fault breccia, vugs, crustification, and other evidence of an original open fissure. In drill cores, faults may be recognized by narrow mud seams, vein material, breccias, and vugs, and by lost core. The wall rock may show slight brecciation, fracturing, bleaching, or reddening. The recognizable structures are usually transverse faults or cross-faults. The apparent horizontal displacement on these would range from a few to more than 1,000 feet. They are believed to be normal faults and generally dip in the opposite direction to the dip of the strata.

The *C* zone of copper mineralization on the Sand Bay location of the Montreal Mining Company may be a strike fault dipping about normal to the dip of the flows. The *S* zone definitely follows a fault but is a transverse type of structure and dips southeasterly in the opposite direction to the dip of the adjacent strata.

[1] E. W. Nuffield, *op. cit.*

Throughout the map area there are possibilities of strike faults under the larger, drift-covered depressions and streams that lie between the rock ridges. Any such strike faults would be difficult to recognize, and no evidence for them, other than topographic suggestion, was found in the field.

The faults in the Mamainse Point area show a radial pattern with a gradual change in strike from northwest to southwest. In a general way the centre of radiation corresponds to the axis of the broad anticlinal fold described under "Folding." It is the sort of tensional fracture pattern that might be developed by gradual settling over a gentle, underlying arch that pitches westerly and broadens with depth. The area over the anticlinal arch would extend inland from Mamainse Island, and here the maximum shattering might occur. This is in accordance with field observations, as complex faulting with minor displacements were noted in this area. Along the coast for half a mile north of Mamainse Harbour, the flows are so contorted, irregular, and broken that no structure could be worked out; inland a coalescing pattern of faults presents a miniature picture of the over-all pattern.

Fracturing

Because the faulting is of the tensional variety, it largely coincides with the vein fracturing. Therefore, the main zones of fracturing have been discussed above in the section of this report that deals with faulting. Generally speaking, the vein fractures dip about normal to the dip of the adjacent flows and sediments. In some places along the coast, near the old Mamainse mine, two directions of fracturing were noted. One direction is represented by the Mamainse vein and other veins that strike more or less parallel to the flows. The other main direction of fracturing is almost at right angles to the trend of the flows. This set of fractures is later in age and consists of narrow veins often mineralized with chalcocite or a little chalcopyrite or native copper. These are very late fractures that cut all formations, even the late trap dikes.

The two ages of fracturing are shown in the exposure of the Mamainse vein at the shore of Lake Superior. The vein shows a zone of alteration about eight feet in width within which there is a vein breccia with sharply defined vuggy walls. Later narrow cross fractures show copper stain and a little native copper. Similar relationships are well shown on a ridge extending into Lake Superior northwest of the Munising Wood Products camp. A north-striking zone with reddish alteration and vein breccia is cut by a series of veinlets striking east and contain chalcocite.

A number of zones of fracturing that contain vein breccia were found in detailed mapping. These are shown on map No. 1953-1.

ECONOMIC GEOLOGY

To date, the only metal of economic interest in the area is copper. The occurrence of this metal at Mamainse Point was known in very remote times. Attempts at copper mining were made about 1842 and continued at intervals over a number of years. Between 1906 and 1908 the Calumet and Hecla Mining Company drilled a section inland from Coppermine Point. They were searching for copper deposits of the Michigan type and put down 17 holes, most of which were drilled normal to the dip of the beds or roughly parallel to the dip of the veins. The first serious attempt at exploration in recent years was begun by Macassa Mines, Limited, in 1949 and continued by C. C. Huston and associates in 1951 and 1952.

The copper deposits at Mamainse Point consist largely of chalcocite mineralization filling zones of fracturing in the Keweenawan flows and conglomerate. The typical Michigan type of deposit, in which native copper occurs in amygdaloidal and fragmental flow tops or in conglomerate, has not been found in any quantity, but on rare occasions, traces of copper mineralization may be seen in the amygdules of the lava along the coast of Lake Superior. Native copper is found at a few places; it was this metal that particularly attracted the early miners and so is found mainly around the old mine dumps. Chalcopyrite is much less common than chalcocite but is prominent in a few drill holes. The chalcopyrite generally occurs in quartz-calcite veins, whereas the chalcocite is in solid lumps in vein breccia or in veinlets. A little bornite occurs with the chalcopyrite and chalcocite and may be secondary; malachite is seen on surface exposures of veins and is one of the best indicators of copper mineralization. Specularite commonly occurs with the sulphides either in veins or in amygdules. A small amount of silver is associated with the copper and is found on analysis; silver values are highest where bornite is present.

Most of the copper mineralization occurs in a vein breccia; well defined fissure veins and veinlets in fractured zones are also found. Vein breccias up to 35 feet in width have been intersected in drilling operations; occasionally, as in hole No. C-24, several closely spaced zones of vein breccia are cut over widths as great as 150 feet. Vein breccias occur largely in the lava because it is the common host rock, but they are also found in conglomerate and along lava-conglomerate contacts. The vein breccia consists of fragments of the wall rock, quartz, calcite, chalcocite in chunks and stringers, specularite, and vuggy openings; occasionally chalcocite forms the matrix of the breccia. In parts of the *S* zone chalcopyrite is fairly common in the vein breccia, which tends to be quite siliceous and vuggy in nature. In the drill cores chalcocite may also be seen in amygdules of the lava and in the matrix of the conglomerate. However, these occurrences are always in or near fractured zones that contain chalcocite.

Fissure veins containing native copper or massive chalcocite are generally small. Large plate-like masses of native copper have been found in these veins at a few places. In 1949 a slab of native copper, half an inch in thickness and eight feet in length, was taken from a small vein. In 1936 a specimen of almost pure native copper, weighing 147 pounds, was removed from a rock cut during the construction of highway No. 17 at mileage 55.[1] At the Copper Creek shaft some fine samples of native copper in a vuggy vein breccia could be found on the dump in 1952.

Wall-rock alteration does not appear to play a very important role in the copper mineralization. Chalcocite stringers often occur in massive unaltered lava. At some places there is a reddening of the amygdaloidal lava adjacent to the vein breccia. There is also a noticeable development of epidote near some of the vein material, but this mineral occurs widely throughout the Keweenawan rocks and was largely introduced before the vein fracturing. Epidote is commonly found where the vein material occurs in conglomerate.

Most of the copper-bearing zones are associated with faulting. Those at the Copper Creek and Silver Creek shafts are definitely in faults, and there is some evidence of dislocation along the *C* zone. Some of the smaller veins along the shore of Lake Superior are located along faults where the displacement is small and may be seen in the outcrop. The *M* zone may be an exception to the general rule; the drill holes along it show no evidence of faulting.

Copper in small amounts seems to be widely distributed. Most of the holes drilled in 1949, 1951, and 1952 showed some indication of the metal. For example,

[1] *The Northern Miner*, Oct. 29, 1936.

hole No. C-19 showed specks of chalcocite in the amygdaloid at intervals over 125 feet of core adjacent to the main vein. The sludges averaged 0.5 percent copper over 205 feet of core across the vein zone.

Copper in Keweenawan Rocks

Small amounts of copper are widely disseminated throughout the Keweenawan rocks. Lane[1] has mentioned the occurrence of specks of native copper in several holes drilled by the Calumet and Hecla Mining Company and similar observations were made during the drilling in 1949–52. Lane[2] stated that systematic sampling of sludges gave 0.0149 percent copper over 530 feet of core in hole No. 1 and 0.0287 percent over 444 feet in hole No. 2. However, only sludges for certain sections of the core were analyzed, and Lane assumed that the intervening sections were devoid of copper. By averaging the sludge samples actually analyzed, Lane's averages become 0.044 percent copper over 179 feet in hole No. 1 and 0.044 percent over 288 feet in hole No. 2.

The accompanying table gives additional information on the distribution of copper in some of the holes drilled in 1949 and 1951, as supplied by C. C. Huston and associates. All analyses shown are of sludge samples from country rock devoid of veins or fractured zones and above any known vein intersections in the holes. However, a few calcite stringers are included. Opportunities for "salting" from copper-bearing veinlets are improbable. These holes intersected the strata at quite a different angle from those of the Calumet and Hecla Company and, of course, were adjacent to copper-bearing fractured zones.

AMOUNT OF COPPER IN KEWEENAWAN ROCKS[3]

Hole No.	Rock	Footage	Core length	Average copper content
			feet	percent
C-22	Lava	10–260	250	0.07
C-25	Lava	7–200	193	0.05
C-26	Conglomerate and lava	5–300	295	0.07
C-29	Conglomerate and lava	11–260	249	0.11
C-30	Conglomerate and lava	10–320	310	0.13
C-39	Lava	10–230	220	0.10
C-42	Lava	10–310	300	0.09
C-45	Lava	10–380	370	0.10
S-4	Lava	10–140	130	0.09
S-6	Conglomerate	40–100	60	0.14
S-9	Lava	20–270	250	0.08
				Weighted average, 0.092

The amount of copper contained in the country rock is about twice that obtained by Lane. The cores containing conglomerate generally showed a slightly higher copper content than those in the lava, but insufficient data are available for any general conclusions.

Chemical analyses of selected samples of drill core are listed below. The samples consisted of a few short pieces of core, and the copper content is, therefore, not as accurate a representation of the average in Keweenawan rocks as the copper analyses shown above.

[1]A. C. Lane, *Record of Diamond Drilling at Point Mamainse, Province of Ontario*, Can. Dept. Mines, Bull. No. 6, Rept. No. 111, 1911, p. 20.

[2]A. C. Lane, *op. cit.*, p. 19.

[3]Analyses by Swastika Laboratories, Limited, Swastika, Ontario.

ANALYSES OF KEWEENAWAN ROCKS

	No. 1	No. 2	No. 3	No. 4	No. 5
	percent	percent	percent	percent	percent
SiO_2	77.50	41.94	45.70	47.36	41.62
Al_2O_3	13.46	17.33	14.23	12.62	12.44
Fe_2O_3	0.58	2.87	6.99	7.89	10.82
FeO	0.82	6.28	7.54	5.78	2.51
MgO	0.01	5.40	5.77	6.51	4.55
CaO	1.05	9.76	7.31	6.45	9.74
Na_2O	0.50	3.79	3.79	3.79	4.48
K_2O	2.82	0.75	0.90	1.62	1.05
TiO_2	0.09	2.30	2.88	2.03	2.06
P_2O_5	0.04	0.23	0.30	0.23	0.23
MnO	0.06	0.48	0.40	0.40	0.24
H_2O+ [1]	2.90	4.24	2.92	3.46	2.37
H_2O- [2]	0.40	0.35	0.22	0.27	0.35
Co_2 [3]	0.70	5.21	1.93	1.39	7.25
Copper	0.015	0.02	0.065	0.035	0.01
Total	100.94	100.95	100.94	99.83	99.72

Sample No. 1—Felsite. Composite surface sample from six different locations in the area. Analysis by Provincial Assay office, 1954.

Sample No. 2—Grey amygdaloidal lava containing amygdules of chlorite and calcite. Composite sample of core from drill hole No. S-34 at depth of 100 and 150 feet and hole No. S-35 at depth of 338 feet. Analysis by Provincial Assay office, 1954.

Sample No. 3—Grey "trap" (fine-grained non-amygdaloidal basalt). Core from drill hole S-35 at depth of 328 feet. Analysis by Provincial Assay office, 1954.

Sample No. 4—Gabbroic phase of basalt containing a little epidote. Core from drill hole No. S-35 at depth of 37 feet and hole No. S-34 at depth of 141 feet. Analysis by Provincial Assay office, 1954.

Sample No. 5—Red amygdaloidal lava. Core from drill hole No. S-29 at depth of 31 feet and hole No. C-61 at depth of 632 feet. Analysis by Provincial Assay office, 1954.

The analyses listed on pages 20 and above indicate that the average copper content of the Keweenawan rocks is less than 0.1 percent. As shown on page 23 of this report, the vein zones at Mamainse Point average 1.50 to 5.13 percent copper. This represents a concentration in the vein zones of at least 15 to 50 times the amount of copper found in the host rocks. The absence of any visible leaching of the wall rocks in the vicinity of the mineralization, and the great concentration of copper in the vein zones would suggest that most of the copper has been introduced into the fractured and faulted zones by circulatory solutions emanating from some deep magmatic source. The question of whether the small amount of copper disseminated throughout the Keweenawan rocks is primary or introduced has not been investigated.

DESCRIPTION OF PROPERTIES

C. C. Huston and Associates

The property held by C. C. Huston and associates in 1952 consisted of the Kincaid No. 8 location,[4] the Quebec and Lake Superior location, the Sand Bay and Pancake Point locations of the Montreal Mining Company, and a block of unsurveyed mining claims located east of the Pancake Point location. The mining locations were originally optioned by Macassa Mines, Limited, in 1948. This company prospected the ground in 1948 and 1949 and drilled 19 holes, totalling 2,568 feet. The option was then relinquished and taken over by C. C. Huston and

[1]Combined water.
[2]Superficial water.
[3]Calculated from loss on ignition.
[4]Referred to locally as the "Ryan" Location.

associates in unincorporated form, and drilling was commenced early in 1951; 33,342 feet of drilling were done in that year. In 1952, six additional holes were drilled on the *S* zone to explore part of it at the 400-foot horizon.

The early history of the property has been described elsewhere in this report. The general geology, structure and mineralization have also been described in the preceding part of this report.

The Copper Deposits

Exploration in the period 1949–52 located four main copper-bearing zones and several smaller copper occurrences. The main bodies are known as the *C* zone, the *C*-2 zone, the *S* zone, and the *M* zone. Their location is shown on map No. 1953-1.

The *C* zone lies in the western part of the Sand Bay location of the Montreal Mining Company. It strikes N.15°W. and dips 55–68 degrees to the east. This zone does not outcrop at any place but has been traced for a strike length of 5,400 feet by 34 drill holes. It is a fractured and brecciated zone in the interbedded amygdaloidal basalt and conglomerate of the Keweenawan series. The *C* zone strikes almost parallel to the strata and dips almost normal to them. The wall rocks, to a depth of about 600 feet down the dip, are largely lava flows ranging from 20 to 100 feet in thickness. Below this horizon the *C* zone enters a thick band of conglomerate that outcrops about 1,700 feet to the east.

The *C* zone consists largely of vein breccia with chalcocite mineralization; the lava adjacent to the vein breccia may contain chalcocite in small fractures and in amygdules. In addition to chalcocite, the breccia contains fragments of wall rock, quartz, and calcite, and is quite often vuggy. Chalcocite may be in massive chunks, erratically distributed, or in stringers. The *C* zone appears to lie along a strike fault, but drilling information is not sufficient to prove this structure. The available data suggest that it is probably a normal fault with a vertical displacement of about 50 feet.

The C-2 zone lies on the hanging-wall side of the *C* zone and strikes at right angles to it. The *C*-2 zone dips to the north at an angle of about 45 degrees. According to C. C. Huston the drilling shows that it consists of two bodies; the upper body is 250 feet long, 10 feet wide, and has been traced 500 feet down the dip; the lower or main body has an assumed length of 250 feet, a true width of 30 feet, and has been traced 500 feet down the dip. These dimensions are calculated from intersections in six holes: Nos. *C-33*, *C-49*, *C-52*, *C-53*, *C-54*, and *C-55*. The *C*-2 bodies consist of fractured zones in trap and amygdaloid. Generally veinlets and thin stringers of chalcocite fill the fractures and adjacent amygdules. Occasionally, the vein material is a breccia containing chunks of chalcocite with quartz, calcite, and wall rock. Sometimes there are erratic patches of massive chalcocite in amygdaloidal lava.

The *S* zone passes through the old Silver Creek shaft. It strikes about N.10°E. and cuts transversely across the adjacent strata. The *S* zone dips about 65°E. or about normal to the dip of the flows and conglomerate. According to C. C. Huston, in 1951 it had been traced over a strike length of 3,100 feet at about the 150-foot horizon by twenty drill holes. Six holes drilled in 1952 explored part of this zone at the 400-foot horizon. The mineralized material ranges from 8 to 15 feet in width.

The *S* zone is located on a transverse fault, but the amount of displacement cannot be calculated from the available data. In some of the drill cores, a clayey mud seam and reddish vuggy breccia mark the position of the fault. A vein breccia lies close to the fault; sometimes it is well mineralized with chalcopyrite, as for example near the Silver Creek shaft, but generally the copper-bearing

mineral is chalcocite. In some holes the fault is quite apparent whereas in others evidence of it is lacking; in the latter case vein breccia may obscure or "heal" the fault plane.

The *M* zone is at the old Mamainse mine and crosses the highway at mileage 62. It has been traced 1,350 feet along the strike in nine drill holes. The zone strikes N.26°W., dips 50°E., and cuts across the strata at a slight angle. At the shore of Lake Superior the vein breccia is about eight feet wide; it occupies a fissure with well-defined walls. Native copper occurs along late cross fractures in the vein material. Farther south, the drill holes show finely disseminated chalcocite in trap and along minute fractures in the rock.

Other copper occurrences, such as at the Copper Creek shaft, the *B* zone, the *L* zone, and "Indian diggings," are shown on map No. 1953-1.

Dimensions and Grade of Deposit

The following information is taken from a report on the property by J. A. Reid, consulting mining engineer, dated September 7, 1951, and a report by C. C. Huston, dated October 25, 1951.

J. A. Reid's summary is as follows:

In respect to tonnages shown, it is emphasized that this is simply an attempt to visualize the possibilities of the property, they do not represent proven ore.

Drilling has shown four zones carrying promising quantities of copper, which in places, is associated with some silver values. The best of these are the *C* zone and the *C*-2 zone. The former has been tested to a depth of 400 feet and, for a length of 2,275 feet, averages 8.1 feet in width and 1.92 percent copper. It has a possible indicated tonnage of 182,000 per 100 feet of depth. The *C*-2 zone runs normal to the *C* zone and likely intersects it on strike. This has a length of 250 feet, an apparent true width of 27 feet, and a grade of 1.60 percent copper. It has a vertical depth of 450 feet and possibilities of 82,000 tons per 100 feet of depth. In this zone there is an enriched section, 150 feet long, 12.5 feet in true width, and 5.13 percent copper, and possibilities of 75,000 tons.

In this section also hole No. *C*-52 shows silver values of 2.09 ounces per ton.

The other two are the Silver Creek zone, which is 825 feet long, 11 feet wide, and has a grade of 1.50 percent copper with possibilities of 100,000 tons per 100 feet of depth, and the Point Mamainse zone, which shows a length of 1,150 feet, a width of 5.0 feet, and a grade of 1.57 percent copper.

It is the writer's opinion that sufficient drilling has been done on the *C* zone and *C*-2 zone to justify underground work as they are not only the most promising but, on account of their juxtaposition, could be readily explored from one shaft. It is therefore suggested that a shaft be put down to a depth of 450 feet, and the zones explored at the 200-foot and 400-foot horizons.

It is the writer's opinion that these deposits are of the lode or vein type somewhat comparable to many gold deposits, and that diamond-drilling merely gives an indication of values and tonnage, which has to be confirmed by subsequent, underground work. It is his belief that exploration on these zones would result in the discovery of enriched sections similar to that found on the *C*-2 zone. It is also his belief that there is a reasonable expectation of obtaining a mineable grade of 2.00 percent copper or better.

The Silver Creek and Point Mamainse zones are too far distant to be explored underground from the proposed shaft, and the latter is small, so that further work on these showings will have to await results in the *C* zones.

The ore is of simple character and apparently contains nothing but copper minerals, and there are no apparent deleterious ingredients to complicate treatment or cause smelter penalties, so that a 90 percent mill recovery and a 40 percent copper concentrate is probable.

C. C. Huston's report of October 25, 1951, contains some alternative figures to those of Mr. Reid. In addition to Mr. Reid's estimate for the *C* zone, stated above, Mr. Huston gives an alternative average of 1.15 percent copper across 14 feet for a length of 2,275 feet and 1.09 percent copper across 11.6 feet for a length of 2,825 feet. For the *C*-2 zone, Mr. Huston estimates 500,000 tons averaging 1.66 percent copper.

Another estimate by C. C. Huston, made in January, 1952, gave a total of 4,150 tons per vertical foot averaging 1.76 percent copper in the *C*, *C*-2, and *S* zones.[1]

[1] Jas. E. Thomson and Resident Geologists, *Preliminary Report on Copper, Nickel, Lead, and Zinc Deposits of Ontario*, (2nd ed.), Ont. Dept. Mines, P.R.1952–4.

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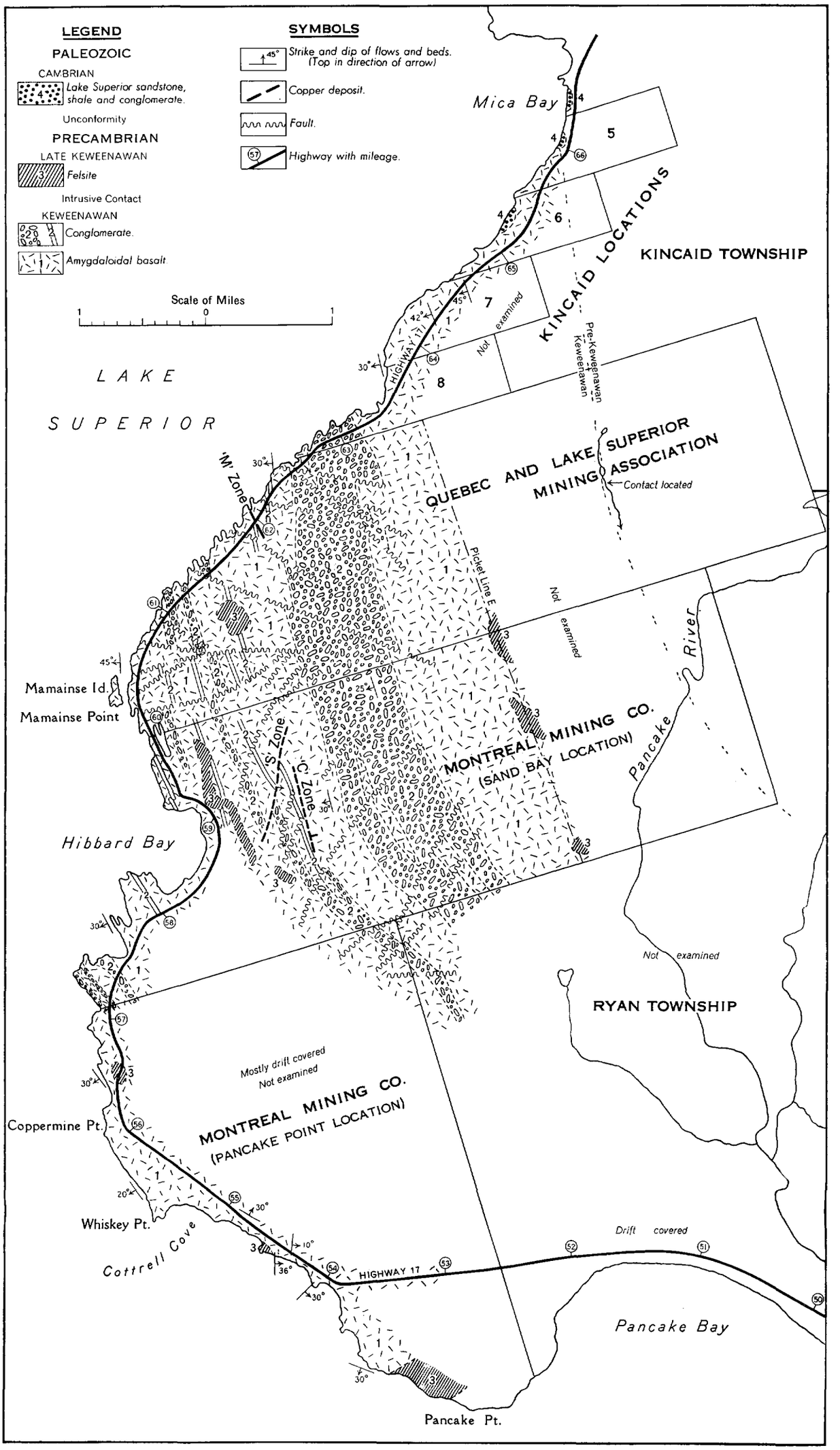
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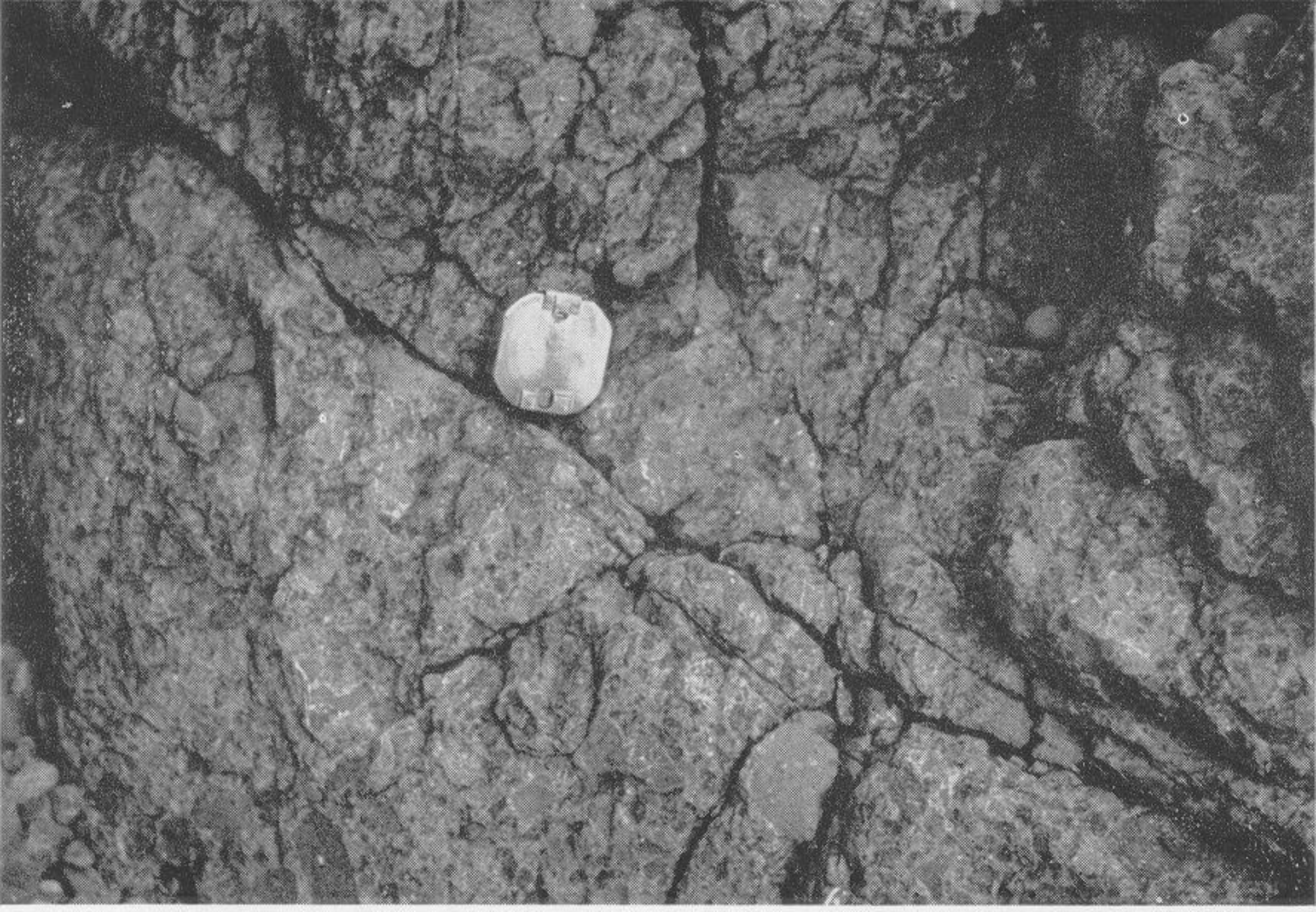
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Geological sketch map of the Mamainse Point copper area.





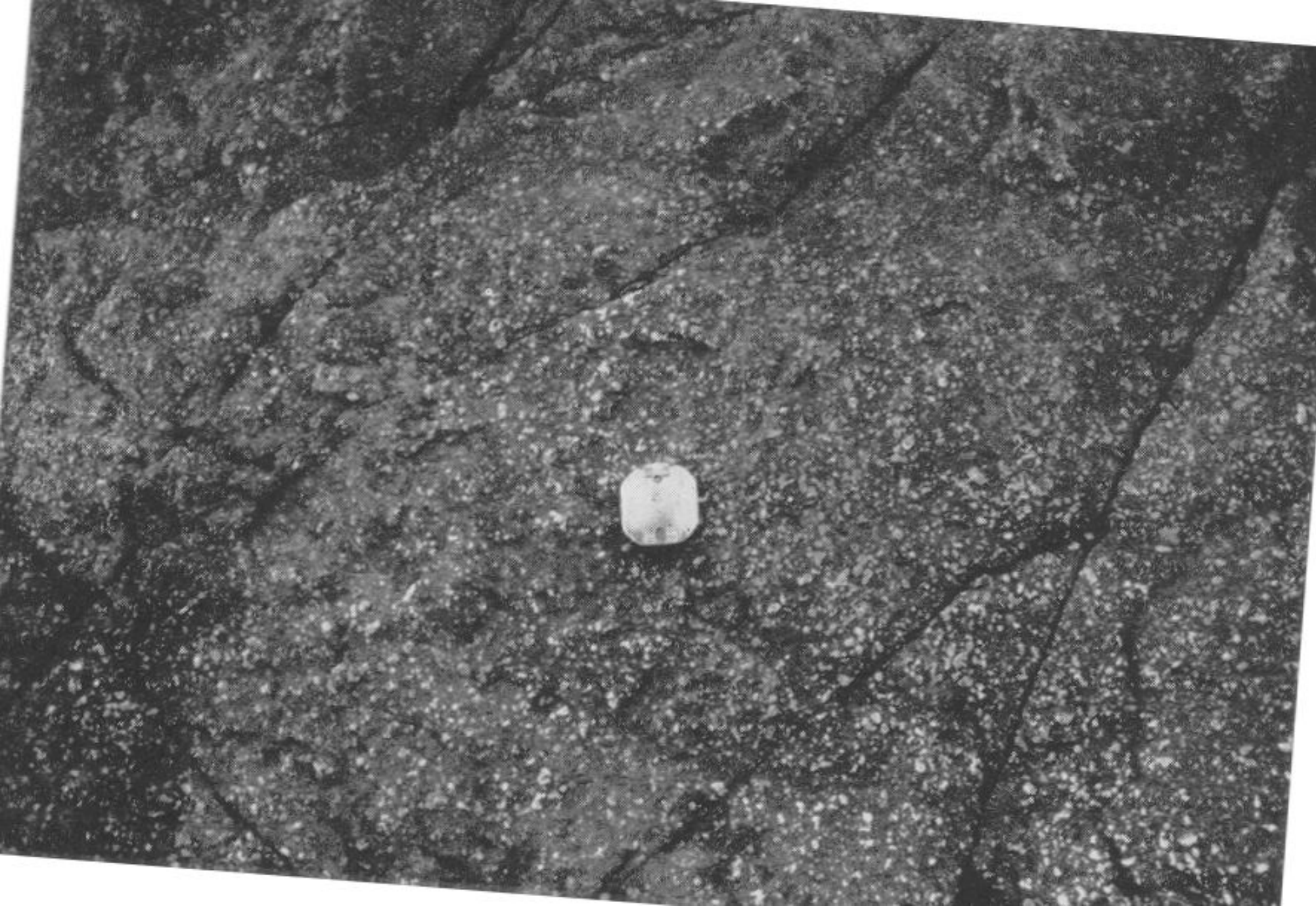


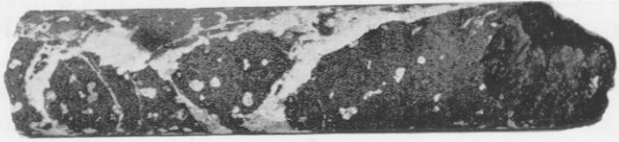




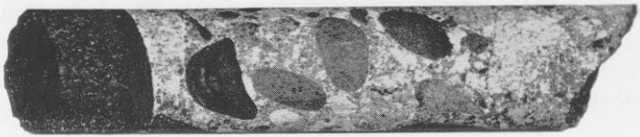

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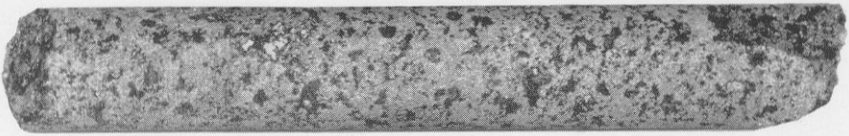




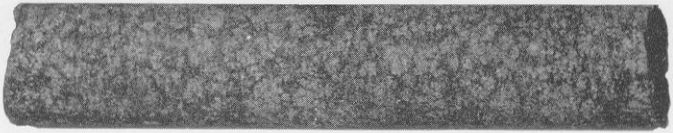
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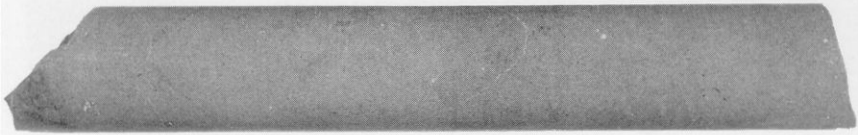
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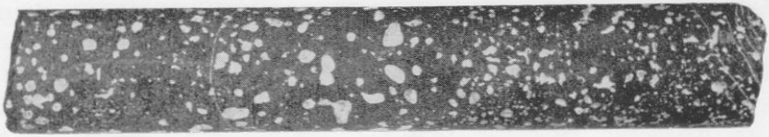
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PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-SECOND ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXII, PART 5, 1953

Geology of the Brudenell-Raglan Area

By

D. F. HEWITT

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO

Printed and Published by Baptist Johnston, Printer to the Queen's Most Excellent Majesty

1954

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Scale, 1 inch to 1 mile.

Geological Map of Craigmont Corundum Mine, Raglan Township, Renfrew County.

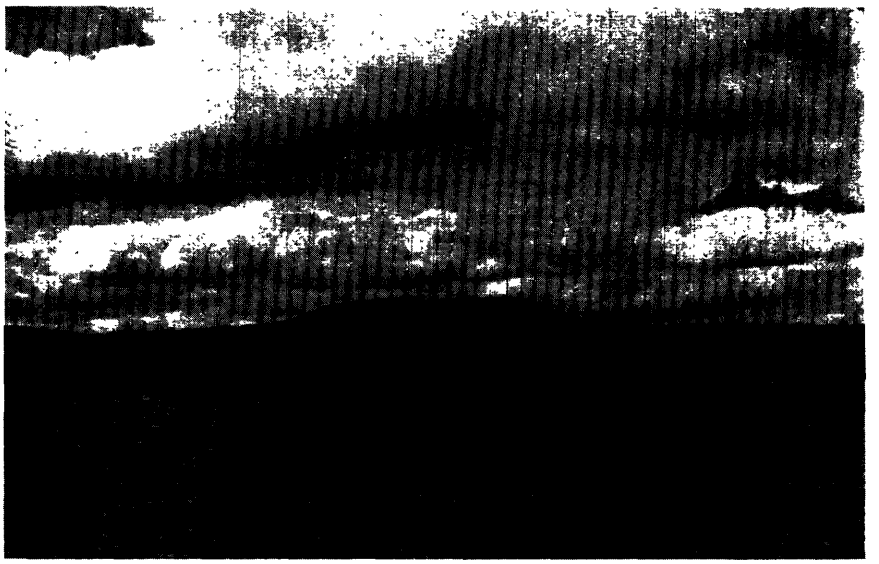
Geology of the Brudenell-Raglan Area

By D. F. Hewitt

CHAPTER I

INTRODUCTION

The Brudenell-Raglan area, described in this report, has an extent of about 350 square miles and comprises the four townships of Brudenell, Lyndoch, Radcliffe, and Raglan, which lie in the southwest corner of Renfrew county in eastern Ontario. The area is covered by the Barrys Bay, Bancroft, Brudenell, and Denbigh map sheets of the National Topographic Series.[1]



A view of Robillard Mountain (Craigmont) looking north across the York River and Conroy marsh.

There is good access by road and rail. No. 62 highway passes through the western part of Radcliffe township, and motor and lumber roads provide access to most of the area. A branch line of the C.N.R. passes just north of Radcliffe and Brudenell townships, and the towns of Killaloe and Barrys Bay on this line are about 4 miles north of the northern boundary of the area.

The villages of Combermere, Palmer Rapids, Quadeville, Brudenell, and Schutt lie within the area, as do the post offices of Rochefort, Letterkenny, Rockingham, Wolfe, Bruceton, Halfway, Jewellville, Latchford Bridge, Wingle, Hardwood Lake, Ireland, Hopefield, and Rosenthal.

Prospecting and Mining Activity

Prospecting and mining activity has been carried on in the area for over 70 years, principally for corundum, beryl, feldspar, graphite, and molybdenum.

[1]Published on the scale of 1 inch to 1 mile by the Canadian Department of National Defence and also available through the Canadian Department of Mines and Technical Surveys.

In 1880 a graphite showing on lots 1 and 2, concession II, Lyndoch township, was opened by Dan Moriarty of Eganville and was worked for a short time in 1917 by Beidelman and Lyall.

In 1900, shortly after the discovery of corundum in eastern Ontario, the Canada Corundum Company, Limited, built a mill and began mining corundum at Craigmont in Raglan township. Craigmont, Burgess Mines (3 miles to the west in Carlow township), and Jewellville were the centre of a flourishing Canadian corundum industry from 1900 to 1918. Numerous small corundum mines in Raglan, Radcliffe, and Brudenell townships supplied ore to the Craigmont and Jewellville mills.

In 1907 molybdenite was discovered, and the Jamieson molybdenite mine was opened on Mining Mountain, lot 5, concession VIII, Lyndoch township. There was a small production from this mine in 1915-16 by International Molybdenum Company, Limited. The McCoy molybdenite mine on lot 34, concession II, Lyndoch township, was worked in 1916-17 and again in 1937-38, but very little molybdenite was recovered. From 1939 to 1942 Edgemont Molybdenite Mines, Limited, explored a molybdenite deposit in lot 27, concessions IX and X, Raglan township, near the village of Schutt. A small shipment of molybdenite was made in 1942, but no further work has been done.

In recent years there has been considerable interest in the beryl-columbite pegmatites of the northern part of Lyndoch township. These occurrences were first described by Miller in 1897,[1] but no work was done until 1926 when T. B. Caldwell of Perth opened the deposit on lot 23, concession XV, Lyndoch township, and produced a small amount of beryl. Feldspar was mined from the beryl pegmatite on lot 30, concession XV, Lyndoch township, in 1935 and 1936, by Renfrew Minerals, Limited. Beryl and feldspar were produced from both these properties intermittently from 1937 to 1950 by Canadian Beryllium Mines and Alloys, Limited.

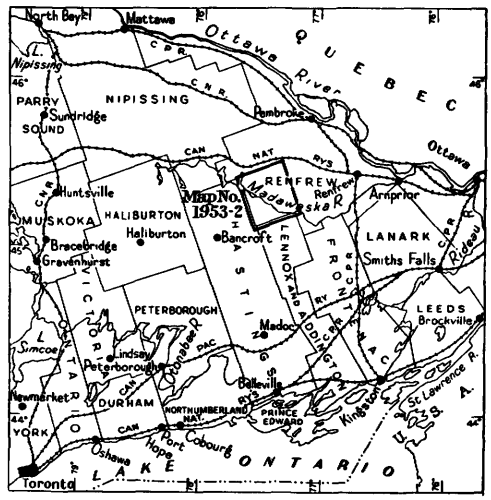
Nepheline, iron, copper, mica, zircon, and rare element mineral occurrences in the area have also been examined and explored by prospectors in recent years.

Present Survey

The present geological survey of the area was carried out in 8 months, during the summers of 1950 and 1951, by a five-man field party; three senior geologists examined outcrops, and two junior geologists ran pace-and-compass traverse lines. Plotting of geological data was done on Perfatrace fitted over aerial photographs on the scale of 1 inch to 1,320 feet. Pace-and-compass traverses were run between points easily recognizable on the aerial photographs. In this settled area there are numerous roads, farms, clearings, lakes, and streams, which provided adequate control points for tying traverses, and it was not necessary to run picketed base lines for traverse control. For the most part, traverses were spaced approximately at ¼-mile intervals. In northern Lyndoch township, where beryl pegmatites and nepheline rocks are exposed, and in the corundum belt of Raglan, Radcliffe, and Brudenell townships, traverses were spaced at approximately 10-chain intervals. Parts of the Wolfe nepheline belt were plane-tabled on the scale of 200 feet to the inch, and the beryl pegmatites were mapped on, 20 or 50 feet to the inch. As a base for the geological mapping of the Craigmont corundum deposit, Louis Moyd of Bancroft kindly provided a detailed contour outcrop map of Robillard Mountain on the scale of 1 inch to 100 feet.

[1]Willet G. Miller, *Economic Geology of Eastern Ontario: Corundum and other Minerals*, Ont. Bur. Mines, Vol. VII, 1898, pt. 3, pp. 207–38.

Geological data were transferred from the aerial photos to a base map on the scale of 1 inch to 1,320 feet, which had been prepared by the Cartography section of the Ontario Department of Mines from maps of the National Topographic Series of the Canadian Department of National Defence and the Forest Resources Inventory of the Ontario Department of Lands and Forests. The original geological outcrop map, compiled on the scale of 1 inch to 1,320 feet, was reduced to 1 inch to ½ mile, redrawn, and the geology generalized. On the generalized map, areas of numerous small outcrops now appear as single outcrops. Here, as in other parts of the Grenville subprovince, the rocks show rapid mineralogic variations over short distances and, within a small area, a number of different rock types may be found. Consequently, on this scale of mapping, the colours and symbols pertaining to an outcrop area represent only the rocks that are most prominently exposed and give only a generalized picture of the geology.



Key map showing the location of the Brudenell-Raglan area, Renfrew county. Scale, 1 inch to 80 miles.

ACKNOWLEDGMENTS

The writer was ably assisted in the field in Lyndoch township in 1950 by D. M. Shaw, A. D. Graham, H. N. Hotchkiss, and S. Roderick; and in Radcliffe, Brudenell, and Raglan townships in 1951 by A. D. Graham, H. D. Carlson, W. F. Take, and W. E. McLaughlin. A large part of the mapping was done independently by D. M. Shaw, A. D. Graham, and H. D. Carlson. The writer gratefully acknowledges the competent and efficient assistance of these men.

Special thesis studies were carried out at Queen's University on the Craigmont corundum deposits by H. D. Carlson, and on the Lyndoch beryl pegmatites by A. D. Graham.

The party received much assistance and friendly co-operation from many residents of the area. The writer is especially indebted to Louis Moyd of Bancroft, who made available the results of his detailed work on the corundum and nepheline deposits in the area, and to George Hass, Harvey Mantifel, Tom O'Brien, and Tom Smith, of the Ontario Department of Lands and Forests, for many favours.

Means of Access

The Madawaska River, a tributary of the Ottawa River, flows through the area from northwest to southeast and provided the earliest means of access. In the late 1850's two colonization roads, the Opeongo Road running westward from Renfrew, and the Addington Road running northward from Kaladar, reached the area and provided routes for settlers.

At the present time the whole area is well provided with roads and trails. Combermere village, in Radcliffe township, is on No. 62 highway between Bancroft and Barrys Bay. From Combermere it is 16 miles by a good motor road to Quadeville, in Lyndoch township, via Jewellville and Palmer Rapids. From Quadeville a motor road runs northward 22 miles through Letterkenny and Brudenell to Killaloe, a station on the C.N.R. and on No. 60 highway. From Quadeville another motor road runs northeastward through Wolfe and Foymount to Cormac and Eganville, a distance of 29 miles. From Palmer Rapids a motor road runs southward through Schutt and Hardwood Lake to the south boundary of the area and on to Denbigh, which is on No. 41 highway. This area is well-settled, and other less-travelled farm and lumber roads serve other parts of the four townships.

The Renfrew-Madawaska branch of the C.N.R. passes through Killaloe and Barrys Bay, which are the nearest rail points.

Previous Geological Work

The earliest geological reconnaissance of the area was made by Alexander Murray of the Geological Survey of Canada in 1853.[1] His canoe route took him across Kaminiskeg Lake, down the Madawaska River to its junction with the York River, and up the York River to Baptiste Lake.

In 1897 A. E. Barlow of the Geological Survey of Canada examined parts of Radcliffe, Raglan, Brudenell, and Lyndoch townships as part of a geological survey of the Haliburton-Bancroft area undertaken by Barlow and F. D. Adams.[2] Radcliffe township and portions of Raglan, Brudenell, and Lyndoch townships are shown on the Haliburton sheet (Map No. 708) accompanying Adams and Barlow's memoir on the geology of the Haliburton-Bancroft area.[3]

In 1897 Miller[4] examined and reported on the geology and economic possibilities of corundum and other mineral deposits in the corundum belt of north Hastings and Renfrew counties. This report included Radcliffe, Raglan, Brudenell, and Lyndoch townships and, in addition to describing the commercially important corundum deposits, gives the first published descriptions of the beryl-columbite pegmatite occurrence in Lyndoch township.

The Geological Survey of Canada published a memoir on mineral deposits in Renfrew county and the vicinity by B. C. Freeman[5] in 1936.

In 1939 G. Marshall Kay completed a stratigraphic and structural study of the Ottawa-Bonnechere graben and adjacent Madawaska highlands.[6] Kay's work

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[1]Alexander Murray, *Report for the Year 1853*, Geol. Surv. Can., Report of Progress, 1853-54-55-56, pp. 59–190.

[2]F. D. Adams and A. E. Barlow, Geol. Surv. Can., Vol. X, 1897, pt. A, pp. 44–56.

[3]*Idem, Geology of the Haliburton-Bancroft Areas*, Geol. Surv. Can., Mem. 6, 1910, with maps No. 708 (Haliburton sheet) and No. 770 (Bancroft sheet).

[4]W. G. Miller, *op. cit.*, pp. 207–38.

[5]B. C. Freeman, *Mineral Deposits in Renfrew County and Vicinity*, Geol. Surv. Can., Mem. 195, 1936.

[6]G. Marshall Kay, *Ottawa-Bonnechere Graben and Lake Ontario Homocline*, Bull. Geol. Soc. Amer., Vol. 53, No. 4, 1942, pp. 585–646.

has been of great assistance in the structural interpretation of the Brudenell-Raglan area that lies within the Madawaska Highlands block.

The mineral deposits in the area and its general geology are described in J. Satterly's report[1] on the Renfrew area.

Many of the mineral deposits are described in separate reports, the more important of which are listed below:

A. E. BARLOW, *Corundum*, Geol. Surv. Can., Mem. 57, 1915.
V. L. EARDLEY-WILMOT, "Corundum and Diamond," *Abrasives, Part II*, Mines Branch, Can. Dept. Mines, No. 675, 1927.
V. L. EARDLEY-WILMOT, *Molybdenum*, Mines Branch, Can. Dept. Mines, No. 592, 1925.
H. V. ELLSWORTH, *Rare-element Minerals of Canada*, Geol. Surv. Can., Econ. Geol. Ser., No. 11, 1932.
HUGH S. SPENCE, *Graphite*, Mines Branch, Can. Dept. Mines, No. 511, 1920.

Physiography

The Brudenell-Raglan area forms part of the Madawaska highlands, a major structural and topographic unit lying between the Ottawa-Bonnechere graben to the north and the Cashel peneplane to the south.[2] It is bounded on the north by the Mount St. Patrick fault, a normal fault, the north side of which is downthrown about 1,500 feet.[3]

The Mount St. Patrick fault runs northwest by west and passes across the northeast corner of Brudenell township. The Madawaska highlands are bounded on the south by the Plevna scarp, a northwest-trending normal fault that passes to the south of the Brudenell-Raglan map area.

Evidence suggests that the whole area was peneplaned in late Precambrian times and later covered by a thick mantle of early Paleozoic sediments. In post-Devonian, pre-Pleistocene times there was a period of normal faulting that is tentatively dated as early Tertiary.[4] That Paleozoic sediments still covered much of Renfrew county in early Tertiary times, is evident from the fact that down-faulted outliers of Paleozoic rocks are preserved in minor downthrown blocks within the Ottawa-Bonnechere graben.

The period of early Tertiary faulting left the Madawaska Highland horst standing as an area of fault-block mountains, dissected by numerous normal faults trending, for the most part, northwest by west, parallel to the Mount St. Patrick fault, the northern bounding fault of the horst. Within the Brudenell-Raglan area the major northwest-trending normal fault is the Madawaska fault, which runs through Bark Lake, the south end of Kaminiskeg Lake, Mekeek Lake, and then roughly parallels the course of the Madawaska River until it passes out of the area south of Mount Jamieson in the southeast corner of the area. This Madawaska fault divides the area into two major south-tilted fault blocks; the northern block, the Barrys Bay–Foymount block, is bounded by the Mount St. Patrick and Madawaska faults. The southern block, the Bangor-Denbigh block, is upthrown some 250 feet on the Madawaska and Turtle Lake faults and stands above the valley of the Madawaska River, which is incised within the southern edge of the Barrys Bay–Foymount block.

The scarp of the Bangor-Denbigh block along the Madawaska fault is best seen in Bangor and Radcliffe townships south of Kaminiskeg and Mekeek lakes. Farther southeast, in Raglan and Lyndoch townships, the main displacement is on the Turtle Lake fault, which parallels the Madawaska fault, 2 to 3 miles to the

[1] J. Satterly, *Mineral Occurrences in the Renfrew Area*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 3.
[2] G. M. Kay, *op. cit.* pp. 625–28.
[3] *Ibid.*, p. 619.
[4] *Ibid.*, p. 640.

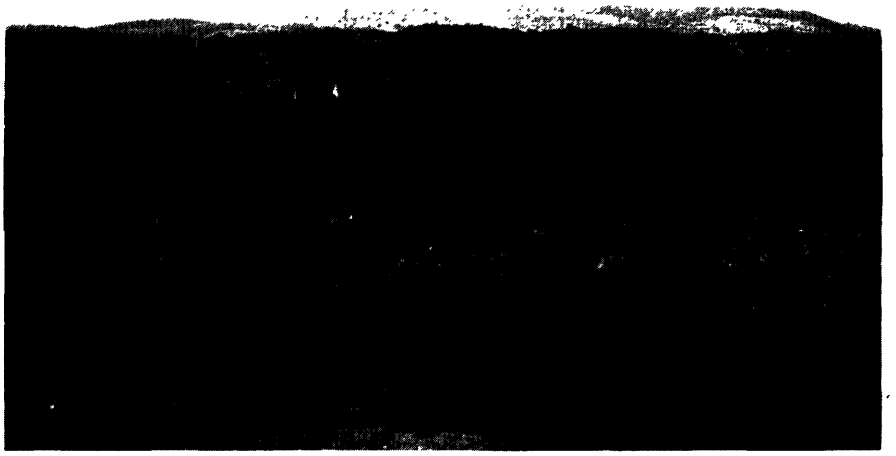
south. These two parallel faults are joined by a linkage in southern Lyndoch township.

The Barrys Bay–Foymount block itself is sliced by a number of branching normal faults that trend more westerly than the Madawaska and Mount St. Patrick faults and branch off these main faults. The chief of these are the Combermere, Reid Lake, Raft Lake, Hopefield, and Grant Lake faults. Evidence suggests that there is a second series of complementary cross-faults trending northeast by east, but few of these were recognized.

RELIEF

The maximum relief in the area is 1,000 feet. Foymount on the eastern edge of Brudenell township has an elevation of over 1,700 feet. The valley north of

Photo by J. Satterly



View looking south over the rolling farm country of the Madawaska highlands in Raglan and Radcliffe townships. Rosenthal church is seen in the left background.

Foymount, at the foot of the Mount St. Patrick scarp in northeastern Brudenell, has an elevation of 700 feet. In general the relief in the area is from 500 to 700 feet and, because of block faulting, is somewhat higher than most parts of the Laurentian paleopeneplane in eastern Ontario.

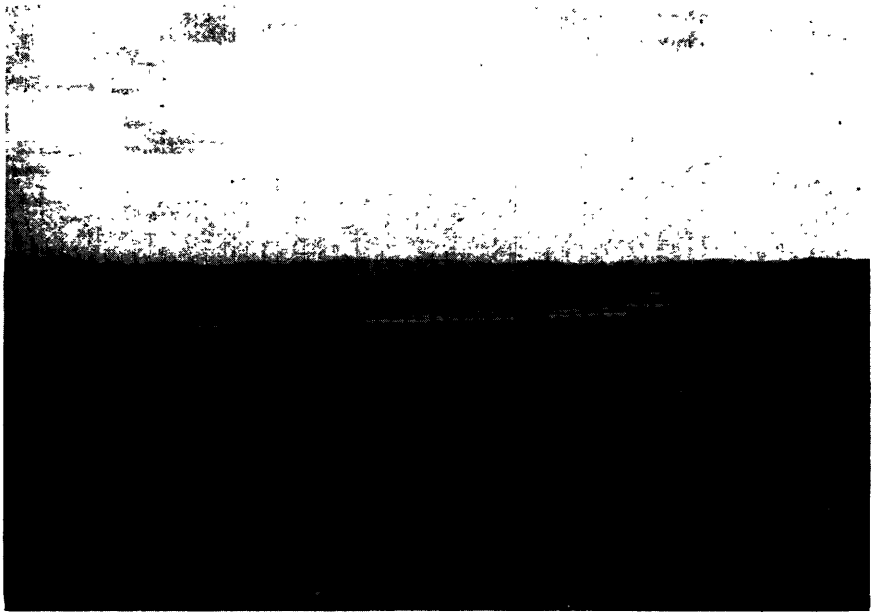
Eastern Brudenell township forms part of the Foymount syenite massif and is the highest part of the area. Elevations in the vicinity of Lorwall, Anderson (Yuke), and Britchless lakes range from 1,500 to 1,650 feet. To the south, in Lyndoch township, the general elevation of the peneplane surface falls off towards the Madawaska River and is from 1,100 to 1,200 feet. Highly resistant monadnocks of granite gneiss form Mining Mountain, the Icy Hills, and Mount Jamieson; resistant metagabbro forms the Quadeville Hills. These all have elevations of from 1,300 to 1,400 feet and stand up in relief above the general level.

In Raglan township the most prominent topographic feature is the Raglan Hills, a metagabbro range of from 1,500 to 1,650 feet in elevation, extending

north-northeastward from the southwest corner of the township. Areas of syenite and granite gneiss and diorite form hills in northern Raglan township. In Radcliffe township diorite and granite gneiss form highlands around Dam Lake. Throughout most of Radcliffe township the structure of the steeply dipping granite gneiss runs northwestward, parallel to the faulting. Parallel strike ridges of granite gneiss separated by linear valleys are a feature of the topography of this part of the area.

DRAINAGE

The area contains over 100 small lakes and ponds and is drained by the Madawaska River, its tributaries, and the tributaries of the Bonnechere River. The Madawaska River rises in Algonquin Park and flows southeastward through Bark Lake into Kaminiskeg Lake, which lies on the northwest margin of the Brudenell-Raglan area. From Kaminiskeg Lake it flows southeastward through



A view to the south from Craigmont, looking across the Conroy marsh; the Raglan hills metagabbro range is visible in the background.

Blackfish Bay and Hydes Bay, on which is located the village of Combermere, into Mekeek Lake where it is joined by the York River, which flows in from the south. From here the Madawaska flows southeastward for a distance of 25 miles through Raglan and Lyndoch townships, and leaves the map area at the southeast corner. The Madawaska River drops 90 feet in its 30-mile course through the area, and rapids are numerous. After leaving Mekeek Lake, the river is navigable as far as Palmer rapids, where there is a dam, and below this to the Horserace rapids at Palmer Rapids bridge. For 7 miles the river is again navigable as far as Little (Aumonds) rapids. Below here there is another 4-mile stretch of navigable water, followed by 4 miles of the Snake rapids in Lyndoch township. There is a trail along the north side of these rapids. Two miles below the foot of the Snake rapids is Slate falls, where there is a drop of 10 feet. Below Slate falls the river can be run by canoe, with minor rapids, as far as Wadsworth rapids on the east boundary of Lyndoch township.

Physiographically the Madawaska River is consequent and is incised within the southern margin of the Barrys Bay–Foymount fault block. For the most part the drainage is southward off the Barrys Bay–Foymount block, and Byers Creek, Eneas Creek, and Highland Creek are consequent. Parts of Rockingham Creek are subsequent along fault linears.

Leidtke and Snake creeks are shorter subsequent streams flowing northward off the Raglan scarpland. The York River appears to be subsequent or resequent.

Gorman and Brudenell lakes in north-central Brudenell township drain northward via Brudenell Creek into the Bonnechere River.

Natural Resources and History of Development

The opening and development of this area is intimately associated with lumbering on the Madawaska River and with the development of the old colonization roads, particularly the Opeongo and Addington roads. In the period from 1840 to 1890, the Madawaska Valley and its tributaries were lumbered for white pine, and the Madawaska River was one of the main arteries for the log drives. In 1847 it is reported that two and a half million cubic feet of white pine, valued at £90,000, were driven down the Madawaska. This lumber was all square-timber, white pine, and it was driven and rafted down the Ottawa and St. Lawrence rivers to Quebec City for shipment to Europe. The drive from the upper reaches of the Madawaska to Quebec City took two years.

The period from 1850 to 1865 saw the building and completion of the colonization roads and the beginning of settlement in the area. Brudenell township was originally surveyed by H. O. Wood in 1856 and 1857, while at the same time a survey party was running the line for the extension of the Ottawa and Opeongo colonization road into Brudenell township. The colonization road, the "Opeongo Trail," ran westward from Renfrew, through Dacre, south of Lake Clear, across northern Brudenell township to Barrys Bay and Madawaska. The Opeongo Trail remained for many years the chief route into the area from the Ottawa Valley. Radcliffe township was originally surveyed in 1859 and 1860 by E. H. Kirtland, and at this time the "Hastings and Opeongo Junction Road," now known as the Peterson road, was run from Brudenell, a stage stop on the Opeongo road, westward across Brudenell and Radcliffe townships, through Combermere to Maynooth on the Hastings colonization road.

Lyndoch township was originally surveyed in 1861 and 1862 by H. O. Wood; it was opened to settlement by the Addington colonization road, which ran north from the Kingston area, through Kaladar and Denbigh, to enter Lyndoch township 4½ miles from the east boundary. The Addington road crossed the Madawaska River at the foot of the Snake rapids, turned east to Strathtay at the foot of Mount Jamieson, and ran eastward to join the Opeongo road near Dacre. This road was completed about 1859. About 1867 a branch road was run north from the Madawaska crossing to Quadeville. whence north to meet the Peterson road at Harriet's Corners, 1½ miles east of Rockingham. The Opeongo and Peterson roads are still in use, but after the bridge crossing the Madawaska at Snake rapids burned, the Addington road fell into disuse, and the section north of the Madawaska River is almost entirely obliterated.

Raglan township was originally surveyed in 1865 by J. Donte. At that time there were eight farms in the area. One of the earliest clearings was the "Palmer Farm" at Palmer rapids cleared in 1846 by Dan McLaughlin of Arnprior, one of the pioneer lumbermen of the valley.

With the advent of the colonization roads, the Madawaska River became less important as a means of access to the area; finally the river drives were stopped after J. R. Booth, pioneer lumberman from the Ottawa Valley, took over the Egan estate at the headwaters of the Madawaska and was instrumental in having the railway come from Renfrew up to Barrys Bay and Madawaska in the 1890's.

Brudenell township has an area of 85 square miles of which 10 percent, chiefly in the southern part, is Crown land. Lyndoch township has an area of slightly over 85 square miles of which 59 percent is Crown land. Radcliffe township has an area of 72 square miles, with 30 percent Crown land, and Raglan township an area of 110 square miles, with 40 percent Crown land.

The present population of the area is between 2,000 and 2,500, and about 20 percent of the farm homesteads are abandoned.

AGRICULTURE

The rocky, hilly topography and poor soil of the area are not well suited for agriculture. Farm holdings range from 100 to 1,000 acres in size and generally consist of pasture and woodlot. Hay and grain are the chief cultivated crops. Sheep and cattle are raised by many farmers in the area. Near Palmer Rapids, on the sandy flood plain of the Madawaska, potatoes are an important crop.

FORESTS

The area lies within the Ottawa-Huron forest region, which is made up of 46 percent hardwood and mixed stands of hardwood and pine, 4 percent conifers, 37 percent poplar and birch, and 2 percent burned area. The remaining 11 percent is barren rock.[1]

At the present time lumbering is an important industry in the area, and the residents depend on it, to a large extent, for their living. The best white pine has long since gone, and most of the lumber is small pine, spruce, balsam, cedar hemlock, poplar, maple, and yellow birch. Some black spruce and poplar is cut for pulp. In 1950 and 1951 there were eleven small lumber mills operating in the area.

FISH AND GAME

The Madawaska River is well-known for its pickerel, bass, and pike fishing, and in the Combermere area along highway No. 62, there are many tourist resorts. Deer, fox, beaver, rabbit, skunk, and wolves are common; black bears are rare.

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[1]J. F. Sharpe and J. A. Brodie, *The Forest Resources of Ontario, 1930*, Ont. Dept. Lands and Forests, 1931, p. 30.

CHAPTER II

GENERAL GEOLOGY

The bedrock formations underlying the area are all of Precambrian age and consist largely of metasediments (crystalline limestone, paragneiss, and amphibolite) cut by basic and acidic plutonic rocks (gabbro, diorite, metagabbro, granite, syenite, nepheline "syenite," and their gneissic equivalents). Since the whole area has been highly metamorphosed, original textures and structures both in the sedimentary and plutonic rocks have been modified or entirely obliterated. Standard criteria for determining tops of strata, such as grain gradation and cross-bedding, cannot be applied with any accuracy in this part of the Grenville subprovince, and consequently the stratigraphic succession in the metasediments is unknown.

The field rock classification used in this report is based primarily on lithology with secondary emphasis on age and genesis. The age terms, Grenville, Laurentian, Algoman, and Hastings, applied by some writers, are not used in this report. The metasediments are of the Grenville type, and the granites and granite gneisses are of the Laurentian and Algoman type, but criteria on which to base definite age correlation are lacking for most of the rocks in the area.

The oldest rocks are the crystalline limestones, dolomites, paragneisses, quartzites, and amphibolites of the metasedimentary group. These were intruded by a series of plutonic rocks, the oldest of which are gabbro, diorite, and ultrabasic rocks. These older basic intrusives were later metamorphosed and now include metagabbro and hornblende gneisses and schists.

After this period of basic intrusion there were three other groups of rocks intruded: first, the nepheline and associated grey and white alkaline syenites; second, the pink and buff syenites; third, the pink and yellow-brown granites. In the case of these three groups of intrusive rocks, certain age relationships are clearly established, but others are quite obscure. For example, it is clear that pink and grey syenites cut the nepheline rocks, and that granite pegmatites cut all the other rocks. However, during the emplacement of the granite and syenite rocks, there was *lit-par-lit* injection, granitization, and syenitization. Contacts are for the most part conformable. Later metamorphism of the whole area produced strong gneissic structure in nearly all the nepheline syenite, syenite, and granitic intrusives. Small dikes of diabase and basalt of the Keweenawan type occur in two localities in eastern Brudenell and Lyndoch townships and appear to be later than the granite gneiss complex.

Nearly all the rocks of the area are highly folded and metamorphosed. That one period of folding was accompanied by granitic intrusion is indicated by the phacolithic character of certain of the granite gneiss bodies, notably the Snake Rapids phacolith in southern Lyndoch township.

Some evidence of shearing and faulting of Precambrian age was obtained; for example, a swarm of northeast-trending pegmatite dikes in northern Brudenell township occupies fractures parallel to the axes of a series of northeast-trending folds in the granite gneiss complex. A major period of normal faulting took place in early Tertiary times, and the whole area was sliced into the series of fault blocks now making up the Madawaska highlands.

During Pleistocene times the area was glaciated, and the retreating ice sheet left a thick mantle of sand, gravel, and till over the whole area. Less than 20 percent of the area is exposed rock.

The lithologic rock classification used in this report is summarized in the following table of formations:

Table of Formations

PLEISTOCENE	Boulder clay, sand, silt, gravel.
	Great Unconformity
PRECAMBRIAN — PLUTONIC ROCKS	Younger Basic Intrusives: Diabase.
	Intrusive Contact
	Granite Group: Pink and white leuco-granite, granite gneiss, alaskite. Hornblende granite, hornblende granite gneiss. Biotite granite, biotite granite gneiss. Hybrid granite gneiss (interbanded granite gneiss and amphibolite), migmatite. Granite pegmatite, pegmatitic granite.
	Syenite Group: Pink and white leuco-syenite, syenite gneiss, albitite. Hornblende syenite, hornblende syenite gneiss. Biotite syenite, biotite syenite gneiss. Hybrid syenite gneiss (interbanded syenite gneiss and amphibolite). Syenite pegmatite. Corundum syenite, corundum syenite gneiss. Corundum syenite pegmatite.
	Nepheline Gneiss Group: Nepheline-plagioclase gneiss. Nepheline-hornblende gneiss. Nepheline-hornblende-garnet gneiss. Nepheline-biotite gneiss. Nepheline-poor alkaline gneiss, oligoclase-andesine gneiss. Nepheline-scapolite gneiss, scapolite gneiss. Nepheline-corundum gneiss. Nepheline pegmatite.
	Intrusive Contact
	Older Basic Intrusive and Meta-Intrusive Group: Diorite, gabbro, hornblendite, lamprophyre, pyroxenite, olivine gabbro, olivine pyroxenite, metagabbro, amphibolite.
	Intrusive Contact
METASEDIMENTS	Crystalline Limestone Group: Crystalline limestone and dolomite. Interbedded crystalline limestone and amphibolite or paragneiss. Silicated limestone, lime silicate rock.
	Paragneiss-Amphibolite Group: Amphibolite, hornblende-plagioclase gneiss. Hornblende amphibolite, hornblende schist. Biotite amphibolite, biotite-hornblende gneiss. Garnet amphibolite, garnet-hornblende gneiss and schist. Garnet-biotite gneiss and schist. Biotite paragneiss, mica schist. Quartzite. Quartzo-feldspathic gneiss, quartz-biotite-feldspar gneiss and schist. Feldspathic paragneiss, feldspar-hornblende granulite.

Metasediments

The metasediments are the oldest rocks in the area and are of Grenville type. For the purposes of mapping they are divided lithologically into two divisions, the paragneiss-amphibolite group and the crystalline limestone group.

PARAGNEISS-AMPHIBOLITE GROUP

This group includes all the metasedimentary rocks except the limestones and associated carbonate rocks. The predominant lithologic types are the "dark gneisses," which are varieties of amphibolite, composed of varying amounts of hornblende and plagioclase (with or without quartz), biotite, garnet, scapolite, calcite, pyrite, magnetite, and pyroxene. Biotite paragneiss, quartzite, and quartzo-feldspathic and feldspathic paragneisses are also present in the area in various amounts. Generally these rocks are medium-grained, equigranular, and well-banded or bedded with marked continuity of banding or bedding. Often they are interbedded with crystalline limestone. The grade of metamorphism is high, and in most cases the textures and structures observed are not original but are of metamorphic derivation. Most of these rocks belong to the amphibolite metamorphic facies. Garnet and sillimanite have been developed in places.

The paragneiss and amphibolite are generally fresh and unaltered, but in cases where pyrite is abundant, they weather to brown "rusty paragneiss," which is often found interbedded with crystalline limestone.

Rocks of this group are widespread throughout all four townships. In Radcliffe township amphibolite occurs interbanded with granite gneiss. There, as in the southern part of Lyndoch township, there has been considerable granitization of the paragneisses and amphibolites to produce interbanded hybrid gneisses.

Within the paragneiss-amphibolite group, nine subdivisions are distinguished on the map[1] on the basis of mineral composition, colour index, texture, and structure; they are indicated by symbols as follows:

DARK GNEISSES (COLOUR INDEX OR PERCENTAGE OF MAFICS OVER 30)

2a: amphibolite, hornblende-plagioclase gneiss.
2b: hornblende amphibolite, hornblende schist (colour index over 90).
2c: biotite amphibolite, biotite-hornblende gneiss and schist.
2d: garnet amphibolite, garnet-hornblende gneiss and schist.
2e: garnet-biotite gneiss and schist.
2f: biotite paragneiss, mica schist.

LIGHT GNEISSES (COLOUR INDEX 0–30)

2g: quartzite.
2h: quartzo-feldspathic gneiss, quartz-biotite-feldspar gneiss and schist.
2j: feldspathic paragneiss, feldspar-hornblende granulite.

2a: Amphibolite, Hornblende-Plagioclase Gneiss

The amphibolites are medium-grained, equigranular gneissic rocks composed predominantly of hornblende and plagioclase. If the original sediment was limy, the amphibolite is likely to contain calcite or scapolite. Pyroxene has been developed in places. South of Lyndoch Lake, in Lyndoch township, one band of amphibolite contains hypersthene as a metamorphic mineral.

The amphibolites are usually strongly banded, with alternating light and dark bands. This banding may be due to original differences in composition in the sediments from which these rocks were formed, to differences in susceptibility to alteration by addition of material during metamorphism, or to metamorphic differentiation producing banding by segregation of mafics during metamorphism.

[1]No. 1953-2, in pocket at back of report.

2b: Hornblende Amphibolite, Hornblende Schist

When the percentage of hornblende is over 90, the amphibolite is designated as hornblende amphibolite (gneiss) or hornblende schist. Sometimes feldspar or scapolite occurs in small granular clots in this rock, giving it a spotted appearance. These rocks are strongly banded or, occasionally, finely laminated. Within the boundaries and along the borders of the Raglan metagabbro, there are fine-grained, well-banded, hornblende amphibolites that are difficult to distinguish from fine-grained facies of the metagabbro itself. In some places, in southern Raglan and southwestern Lyndoch townships, these hornblende amphibolites have structures suggesting ropy flow in basic lavas. Moyd[1] has stated that "most of the dark gneisses appear to represent highly metamorphosed equivalents of the basic intrusives and extrusives, which are common just to the south of this region, but absent within it."

2c: Biotite Amphibolite, Biotite-Hornblende Gneiss and Schist
2d: Garnet Amphibolite, Garnet-Hornblende Gneiss and Schist
2e: Garnet-Biotite Gneiss and Schist

Biotite amphibolite, garnet amphibolite, and garnet-biotite paragneiss are also found within the area, usually interbanded with amphibolite and limestone. There is an occurrence of garnet-sillimanite-hornblende gneiss on lot 34, concession XV, Lyndoch township. The sillimanite makes up as much as 20 percent of the gneiss but occurs in narrow, 6-inch to 1-foot, bands in an amphibolite gneiss. Sillimanite-garnet amphibolites were also observed in Lyndoch township just west of Wolfe post office, and in Radcliffe township, 20 chains northeast of Campbell Lake. In the latter occurrence, garnet crystals from ¼ to 1½ inches in diameter make up 5 percent of the rock over a 30-foot width. In some narrow bands the sillimanite makes up 15 percent of the rock.

2f: Biotite Paragneiss and Mica Schist

A prominent band of quartz-biotite paragneiss, in which the quartz is in narrow ⅛-inch to ¼-inch leaves and stringers, occurs in southwestern Raglan township east of Lily Lake. The band of paragneiss shown on the map just north of Schutt village is of the same lithologic type. Minor amounts of biotite paragneiss occur within the amphibolite group throughout the area.

2g: Quartzite
2h: Quartzo-Feldspathic Gneiss, Quartz-Biotite-Feldspar Gneiss
2j: Feldspathic Paragneiss, Feldspar-Hornblende Granulite

Quartzite is rare, and was observed in only three places. In all three it was identical lithologically and may be the same horizon. It is a pure white, coarsely recrystallized, glassy quartzite made up of interlocking glassy quartz grains up to ¼ inch in grain size. The quartzite is very pure and would appear to be at least 95 percent silica. This quartzite forms the footwall of the Wolfe nepheline gneisses on the Kargus, Welk, and Remus farms, in northeastern Lyndoch township. A similar quartzite forms the footwall of white alkaline gneiss on lot 23, concession X, Brudenell township. Another narrow quartzite band forms the hanging wall of an alkaline hornblende gneiss in which corundum occurs, just north of Brudenell church, lot 283, range B north, Opeongo Road lots, Brudenell township.

Quartzo-feldspathic and feldspathic paragneiss often form light-coloured

[1]Louis Moyd, *Petrology of the Nepheline and Corundum Rocks of Southeastern Ontario*, American Mineralogist, Vol. XXXIV, 1949, pp. 736–51, 738.

bands in a banded sequence of paragneiss beds. It is sometimes difficult to decide whether certain of the light-coloured gneisses are orthogneiss or paragneiss, especially where there has been syenitization or granitization.

CRYSTALLINE LIMESTONE AND DOLOMITE

Crystalline limestone and dolomite, often with bands of interbedded paragneiss, occur in a wide band extending eastward and westward through central Raglan and north-central Lyndoch townships. Minor bands of crystalline limestone occur in southeastern Raglan and southeastern Lyndoch townships, and in a belt extending northeastward across central Brudenell township. Except for a small area just west of Rockingham village, there is no crystalline limestone in Radcliffe township.

The crystalline limestone and dolomite range in colour from pure white to grey. Graphite, phlogopite, pyrite, pyrrhotite, diopside, tremolite, garnet, spinel, apatite, quartz, scapolite, vesuvianite, and feldspar occur as impurities in the limestone. Narrow lenses of pure white, fine-grained, granular diopside rock occur in the crystalline limestone near Bruceton in southwestern Lyndoch township. Silicated limestones and metamorphic pyroxenites, formed by silication of limestones, are found in some places. Such a body of green, coarsely granular lime silicate rock occurs just north of Brudenell church in north-central Brudenell township.

In many places the limestone is well banded, and the banding may represent original bedding. Flowage of the crystalline limestone under metamorphism has taken place in some areas and "dynamic breccias" or "pseudo-conglomerates," in which fragments of pegmatite, amphibolite, and gneiss float in a limestone matrix, are frequently seen. One narrow band of dark-grey, strongly sheared, mylonitic limestone in northern Lyndoch township served as a marker horizon and was traceable for over 4 miles.

Some of the crystalline limestone and dolomite is of a high purity and would be suitable for the manufacture of calcium and magnesian lime. Partial analyses of three samples of limestone and dolomite are given:

	No. 1	No. 2	No. 3
	percent	percent	percent
CaO	50.98	50.62	30.54
MgO	2.26	3.32	20.22
Insoluble	0.88	1.64	0.69

Sample No. 1 is a pure white, coarsely crystalline limestone exposed on lot 1, concession II, Lyndoch township; this is representative of a white band of pure limestone southeast of Mount Jamieson.

Sample No. 2 is a pure white crystalline limestone exposed on the Madawaska River, just east of Slate Falls, Lyndoch township.

Sample No. 3 is a pure white, medium to fine-grained, dolomite outcropping on the Hardwood Lake–McArthurs Mills road in lot 18, concession II, Raglan township.

Plutonic Rocks

OLDER BASIC INTRUSIVE AND META-INTRUSIVE GROUP

A series of basic intrusives, consisting of quartz diorite, diorite, gabbro, olivine gabbro, pyroxenite, and olivine pyroxenite, are the oldest plutonic rocks in the area. They are highly metamorphosed and commonly strongly gneissic in structure. Owing to metamorphism, the most common rock types now comprising

these basic intrusive bodies are metagabbro, hornblendite, hornblende schist, and amphibolite. The metagabbro is a coarse-grained hornblende-plagioclase flaser or granoblastic gneiss, formed by metamorphism of diorite or gabbro. It grades from a light-coloured plagioclase gneiss, with clots of black hornblende crystals, from ⅛ to ¼ inch in diameter, making up 20 to 40 percent of the rock, to a coarse-grained hornblendite, made up of shiny interlocking hornblende crystals up to ½ inch in diameter. Scapolite is a very common mineral in the metagabbro and may completely take the place of feldspar. The feldspars range from oligoclase to labradorite.

Raglan Hills Metagabbro Complex

The largest area of basic intrusive is the Raglan metagabbro, which forms a prominent range of hills in southern Raglan township. It is a lens-shaped, nearly vertically dipping, body running from the southwest corner of Raglan township, northeastward to the village of Schutt. It has a length of 9 miles and a maximum width of 3½ miles. The metagabbro and hornblende schists, which make up the major part of the intrusive, are strongly foliated with a general strike to the northeast, conforming to the shape of the intrusive, and dips ranging from 40 to 80 degrees to the southeast. The rocks exposed on the northwest or footwall side of the metagabbro, from the Little Mississippi River eastward to Lower Leidtke Lake, are crystalline limestones, with minor interbedded paragneiss. They strike and dip conformably to the contact of the metagabbro. There are inclusions of metasediments within the metagabbro, and tongues and lenses of metagabbro and hornblendite within the footwall metasediments. The rocks exposed on the southeast or hanging-wall side of the metagabbro, from Lily Lake in southwestern Raglan township to Lower Leidtke Lake, are interbedded crystalline limestone and paragneiss, which also strike and dip conformably to the contacts of the metagabbro. The lens-shaped diorite-gabbro complex appears to have been forcefully intruded, as a conformable sill, into the sedimentary series. The south contact of the Raglan metagabbro in the vicinity of Beeches Lake is a steep south-facing cliff and may be a fault-line scarp.

The predominant rock type in this complex is a coarse-grained, foliated hornblende-plagioclase gneiss, designated in this report as metagabbro. On microscopic examination, the metagabbros are observed to be composed predominantly of plagioclase, which may range from oligoclase to labradorite, and dark-green hornblende in varying proportions. Scapolite may be present. In places the light-coloured portion of the rock is entirely scapolite with no plagioclase present at all. Relic pyroxene with hornblende rims is often present in the metagabbro. Titanite, apatite, carbonate, biotite, zircon, quartz, olivine, and hypersthene are occasionally observed.

The metagabbro usually has a hypidiomorphic equigranular texture and a gneissic structure. It is a granoblastic gneiss in which the constituents are completely recrystallized to form a granular mosaic. In the less altered facies of the diorite and gabbro, where the regional dynamo-thermal metamorphism has not caused complete recrystallization, mylonitic structures are found. Mortar gneisses in which the plagioclase and hornblende crystals of the diorite show crushing along the intergrain boundaries are commonly found in the less altered parts of the basic intrusives.

The second common rock type is a fine-grained, well-banded hornblende schist or amphibolite. This facies is most common along the margin and near the east and west extremities of the Raglan metagabbro and appears to be a border facies of the body. Contact action of the basic intrusives on the adjacent sediments has produced amphibolites and hornblende schist by contact meta-

morphism of the sediments. These are sometimes indistinguishable from the amphibolites of meta-intrusive origin.

The ultrabasic pyroxenite and olivine pyroxenite portions of the complex are found chiefly in the central part of the Raglan hills east of Trolly Lake. On metamorphism, these rocks first show mortar structure and mylonitization, and then development of secondary amphiboles. The coarse-grained, massive hornblendites may represent the final stage of metamorphism of these ultrabasics.

Magnetite is a common accessory mineral in these basic intrusives. Stringers of magnetite up to 3 inches wide are occasionally observed in the metagabbro, and this rock would appear to offer some possibilities as a host rock for magnetite ore.

Quadeville Metagabbro

The second large area of metagabbro forms a range of hills in northern Lyndoch township extending eastward from the Madawaska River to MacDonald Lake in lot 12, concession XI. This body has a length of 6 miles and a maximum width at the west end of 1½ miles. It appears to be terminated at the west end by the Madawaska fault.

The predominant rock types are gabbro, pyroxenite, metagabbro, and hornblendite. The typical metagabbro is a coarse-grained hornblende-plagioclase gneiss, with 30 to 40 percent hornblende and 60 to 70 percent plagioclase. These minerals range from ⅛- to ¼-inch grain size. The mafic clots are aggregates of hornblende. The rock is foliated and in many places has a distinct lineation due to alignment of black hornblende crystals. The general trend of lineation is southeast by east with a pitch of about 20 degrees southeast. The metagabbro appears to be intruded in places by pyroxenite or pyroxene gabbro in which the foliation is less distinct. On the Quadeville Firetower hill, lot 20, concession XI, Lyndoch township, the metagabbro is extremely varied, with interbanded light and dark gneiss intruded by granite pegmatite. An inclusion of pyroxene gabbro, 3 feet in diameter, was observed in metagabbro. The inclusion has a border of coarse hornblendite.

Other Basic Intrusive Bodies

Several other smaller basic intrusive bodies occur within the area. The Stoughton (Joyces) Lake gabbro body is 2 miles long and 1 mile wide. It is located north of Stoughton Lake on lots 9, 10, and 11, concession VII, Lyndoch township. It lies within an area of paragneiss, granitized paragneiss, and granite gneiss. The body consists of bronze-coloured pyroxenite and gabbro, with purplish labradorite feldspar. The pyroxenite and gabbro are not altered to metagabbro and hornblendite but do show cataclasis.

A small body of diorite forms a prominent hill north of Green Lake, lot 1, concession IX, Lyndoch township. The diorite is cut by numerous pink perthite granite pegmatites and appears to have been altered by them.

Hybrid facies are often developed when later granite or granite pegmatite intrudes the diorite or gabbro. Most commonly, the hybrid rock is a diorite that is characterized by much biotite and some potash feldspar, and is of much lighter colour than the normal diorite or gabbro.

Gabbro makes up most of "Hardwood Mountain" on lots 7 and 8, concession IX, Raglan township. Hornblende-biotite diorite gneiss forms a mile-long ridge north of Dam Lake, lots 23 to 28, concessions IX and X, Radcliffe township. This diorite is interbanded with amphibolite and apparently intruded by granite gneiss and pegmatite.

NEPHELINE GNEISS GROUP

The nepheline rocks outcropping in the Brudenell-Raglan area form the east end of the Haliburton-Bancroft nepheline belt, described by Adams and Barlow.[1]

The nepheline rocks have always been of considerable scientific interest and their origin has been a matter of much controversy. They are important economically because of the occurrence of corundum in them and in associated pink alkaline syenites and pegmatites. Nepheline syenite has become an important ceramic raw material, and was investigated during World War II as a potential source of aluminium.

Nepheline-bearing rocks may be easily recognized by their characteristic pitted, weathered surface caused by differential weathering of nepheline and feldspar. Feldspar and ferromagnesian minerals stand up in relief above the dove-grey to blue-grey nepheline grains that have weathered out. In the Reid Lake nepheline band in Brudenell township, scapolite is a common constituent of the nepheline-bearing gneisses. Since it weathers out just as nepheline does, it is often difficult to distinguish nepheline from scapolite. In this band the scapolite is slightly lighter in colour than the nepheline and may show cleavage. An estimate of the percentage of nepheline in the rock can be made by careful examination of the weathered surface.

Occurrence

Nepheline-bearing gneisses occur in two belts in the area. The larger and more continuous of these is the Wolfe nepheline belt, a narrow band of nepheline and alkaline gneisses from 200 to 1,000 feet wide, extending for a distance of over 4 miles in northeast Lyndoch township from lot 14, concession XIV, eastward to lot 3, concession XII.

Six small occurrences of nepheline gneiss are found in the Raglan-Brudenell belt of pink syenite gneisses, which extends eastward from Craigmont, through Jewellville and Rosenthal to Rockingham in Brudenell township. The occurrences of nepheline gneiss are as follows: in Raglan township at the Klondike cuts, lot 2, concession XIX; in the Craigmont adit, lot 3, concession XVIII; on lots 12, 13, and 14, concession XV; and in a series of corundum pits at Jewellville, lots 24–26, concessions XVIII and XIX. In Brudenell township, narrow bands of nepheline gneiss occur with pink and grey syenite gneisses on the farm of Richard Gutz, lot 34, concession V, and at Reid Lake, lot 34, concession VII. The Reid Lake band extends into lot 32 of Radcliffe township. There is a very small occurrence of nepheline gneiss on the Letterkenny Road, lot 26, concession V, Brudenell township.

Lithology

The nepheline-bearing rocks are strongly gneissic in structure and varied in mineralogy both across and along their strike. Structurally the nepheline gneiss bands are conformable with the crystalline limestones, paragneiss, syenite, and granite gneiss with which they are found. Nepheline gneisses are not found cutting any other rock types. Nepheline pegmatites cut the nepheline gneisses.[2] The nepheline gneisses are intruded and replaced by white alkaline syenite, yellow-brown hornblende syenite and granite, pink syenite and granite gneiss, and granite pegmatite.

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[1]F. D. Adams and A. E. Barlow, *Geology of the Haliburton-Bancroft Areas*, Geol. Surv. Can., Mem. 6, 1910.

[2]In 1952 nepheline pegmatite was found cutting gabbro in Carlow township just west of the Brudenell-Raglan map area.

Just as the older sediments and basic intrusives have been subjected to strong regional dynamo-thermal metamorphism, which has profoundly affected their character, so too the nepheline rocks have been subjected to the same metamorphism; their original characteristics have been destroyed, and they are now metamorphic gneisses, with metamorphic structure, texture, and mineralogy. They have the structure of a metamorphic gneiss with its extremely varied banding. This variation may be due to original compositional differences in the rock before metamorphism or, more probably, due to metamorphic differentiation. Textures range from hypidiomorphic granitoid to equigranular granoblastic and poikilitic. The dark-green amphibole, nepheline, oligoclase, garnet, and scapolite are minerals stable under the high grade of metamorphism to which these rocks have been subjected. They are minerals of the amphibolite-granulite facies characteristic of this part of the Grenville subprovince.

For the purposes of mapping, the nepheline rocks have been divided, on a lithologic basis, into eight subdivisions, indicated on the map as follows:

6a: nepheline-plagioclase gneiss.
6b: nepheline-hornblende gneiss.
6c: nepheline-hornblende-garnet gneiss.
6d: nepheline-biotite gneiss.
6e: nepheline-poor alkaline gneiss, oligoclase-andesine gneiss.
6f: nepheline-scapolite gneiss, scapolite gneiss.
6k: nepheline-corundum gneiss.
6p: nepheline pegmatite.

These subdivisions are arbitrary, and one variety grades into another.

The light-coloured nepheline gneisses are made up predominantly of nepheline and plagioclase, which ranges from albite to oligoclase. Microcline and microcline perthite may be present, but are usually subordinate to plagioclase. Scapolite is often present. Dark-green amphibole, biotite, and magnetite are the most common ferromagnesians. Corundum and muscovite commonly occur in nepheline-rich or nepheline-albite gneiss, but may also occur in nepheline-poor white alkaline syenite gneiss or albitite. Fluorite, apatite, zircon, and titanite are accessories.

In the dark-coloured nepheline gneisses, amphibole is the predominant mafic constituent. Some biotite and magnetite may also be present. Garnet and scapolite are common, and occasionally grains of carbonate occur in these dark gneisses. The plagioclase ranges from oligoclase to andesine. Pyroxene may also be present and is frequently in the process of alteration to amphibole. Pyroxene, hornblende, and garnet may show poikilitic textures. Titanite is a very common accessory in the dark nepheline gneisses. Corundum is never present in the nepheline-hornblende gneisses but is often a constituent of the scapolite gneisses. In some cases grey-green scapolite makes up over 50 percent of the rock. Light-coloured nepheline-scapolite gneisses are common in the Reid Lake and Wolfe nepheline bands. The dark nepheline gneisses are largely confined to the Wolfe nepheline belt and occur interbanded with the light-coloured nepheline and alkaline gneisses.

A large number of distinctly different facies of nepheline gneisses occur in the area and are described elsewhere. Nepheline pegmatites with nepheline and albite crystals up to 1 foot in diameter occur as replacement patches in the nepheline gneisses. The boundaries of these pegmatitic patches are usually indefinite and irregular, and the term "dike" can hardly be applied to them in this area.

Nepheline is not present in all facies of these alkaline gneisses. White albitite gneiss and oligoclase-andesine gneiss (sometimes containing green amphibole, with either titanite or garnet or both) are grouped with the nepheline gneisses, as they often make up a part of the banded nepheline-rich and nepheline-poor gneiss complex. The white alkaline gneisses west of Gorman Lake and west of Brudenell post office, in Brudenell township, contain corundum, but no nepheline, and are included with the nepheline group in mapping.

Klondike-Craigmont Area

There are nepheline-rich gneisses exposed at the Klondike cuts, lot 2, concession XIX, at the west end of Robillard Mountain and in the adit at the Craigmont workings, lot 3, concession XVIII, Raglan township.

The nepheline rocks at these localities are composed chiefly of, nepheline with some oligoclase, magnetite, corundum, and muscovite. At the Klondike cuts the white to pinkish-grey, medium- to coarse-grained, nepheline rock contains less than 1 percent mafic minerals. A little muscovite, elongate barrel-shaped corundum crystals, and lineal streaks of white plagioclase give the rock a foliated appearance.

Adams and Barlow[1] described two new rock types, "Craigmontite" and "Raglanite," from the Klondike cuts as follows:

> The nepheline syenite is composed chiefly of a salmon pink to flesh red nepheline, which is generally the most abundant constituent, a light grey almost white plagioclase (oligoclase), and very occasional scales and flakes of biotite. The nepheline where exposed shows the characteristic weathering, occurring in irregular sunken areas, with all the inequalities rounded off, leaving the white plagioclase in well marked angular relief. The corundum occurs in sharp, characteristic, often barrel-shaped hexagonal crystals, the longer axis of the abundantly distributed crystals lying at right angles to the foliation.

The writer, however, did not observe this to be the case, many corundum crystals lie in the plane of foliation.

> Two specimens, each containing corundum, were selected for examination, representing approximately the extreme phases of this rock. The thin sections show a rock made up of nepheline, oligoclase, muscovite, calcite, biotite, magnetite, and corundum. Some of the nepheline is comparatively fresh, but most of it has undergone more or less decomposition, the resultant products consisting of a brilliant polarizing aggregate of minute scales, chiefly of muscovite, developed along certain irregular lines and cracks. The plagioclase is likewise somewhat turbid from incipient alteration. Only occasional very small scales of biotite were noticed, and still more rarely small grains of magnetite. The corundum in the thin sections consists of irregular-shaped, apparently corroded individuals, embedded in plates and scales of muscovite.

Chemical and modal analyses of "Craigmontite" as given by Adams and Barlow[1] are as follows:

Chemical Analysis		Mode	
SiO_2	48.38	Nepheline	63.18
TiO_2	trace	Oligoclase	29.66
Al_2O_3	30.54	Muscovite	4.39
Fe_2O_3	0.40	Calcite	1.42
FeO	0.06	Corundum	0.50
MnO	trace	Biotite	0.50
CuO	trace	Magnetite	0.10
CaO	1.87		99.75
MgO	0.19		
K_2O	3.70		
Na_2O	13.94		
P_2O_5	trace		
CO_2	0.62		
H_2O	0.50		
	100.20		

[1]F. D. Adams and A. E. Barlow, *op. cit.* pp. 311–15.

The chemical analysis and norm of "Raglanite" as given by Adams and Barlow[1] are as follows:

Chemical Analysis		Norm	
Corundum	4.45	Orthoclase	9.45
SiO_2	55.45	Albite	56.59
TiO_2	0.30	Anorthite	12.51
Al_2O_3	21.65	Nepheline	11.93
Fe_2O_3	0.81	Corundum	4.45
FeO	0.49	Calcite	1.98
MnO	0.01	Magnetite	0.70
CaO	3.65	Ilmenite	0.61
MgO	0.13	Hematite	0.30
K_2O	1.62	Forsterite	0.21
Na_2O	9.31	Water	1.64
P_2O_5	0.01		100.37
CO_2	0.88		
H_2O	1.64		
	100.40		

Adams and Barlow[2] state that:

> The mode or actual mineralogical composition of the rock is somewhat different from the norm—the difference being represented chiefly in the grouping of the feldspar molecules, and in the modal presence of micas. The rock is actually composed of oligoclase, nepheline, corundum (4.45 per cent), with small amounts of muscovite, biotite, calcite, magnetite, and apatite.

The nepheline rocks exposed in the western Klondike cuts are extremely rich in nepheline and usually carry some corundum. These nepheline rocks occur as relic patches in the pink and grey syenite gneiss complex. They are intruded by pink, grey, and buff leuco-syenites and pass into them along the strike of the bands. The relations between the pink syenite and the nepheline gneiss are well shown in the eastern Klondike cuts. Here a sequence of pink, buff, and nepheline syenite is exposed on the east wall of the cut. At the foot of the section, pink fine-grained microcline leuco-syenite forms a band underlying a band of white nepheline-albite corundum gneiss. At the contact between the two, the pink syenite has altered the nepheline rock to a pink-buff "gieseckite" syenite gneiss. Microcline and microcline perthite have been added, and the white nepheline altered to a dark-green, micaceous aggregate termed "gieseckite" in the field.[3] This zone is 6–12 inches wide. This is followed by 12–36 inches of nepheline gneiss in which the nepheline is altered to pink hydronephelite. Above this alteration zone is the fresh, relatively unaltered nepheline-albite gneiss in which nepheline makes up approximately 80 percent of the rock. The corundum and white albite in this gneiss are aligned parallel to the contact and general foliation of the gneiss complex. Some muscovite mantles the corundum crystals. In addition, there is less than 1 percent magnetite. This nepheline-rich zone is 9 feet wide and, as the upper contact is approached, the nepheline gneiss is invaded by fingers of pink syenite from the pink syenite band lying above it. As the pink syenite band and its offshoots and fingers are approached, the nepheline band again shows the typical pink hydronephelite alteration. At the contact of the pink syenite and nepheline gneiss there is a zone of 3–4 feet of pink and green hybrid gieseckite syenite gneiss containing corundum. Along its strike, the nepheline-rich band

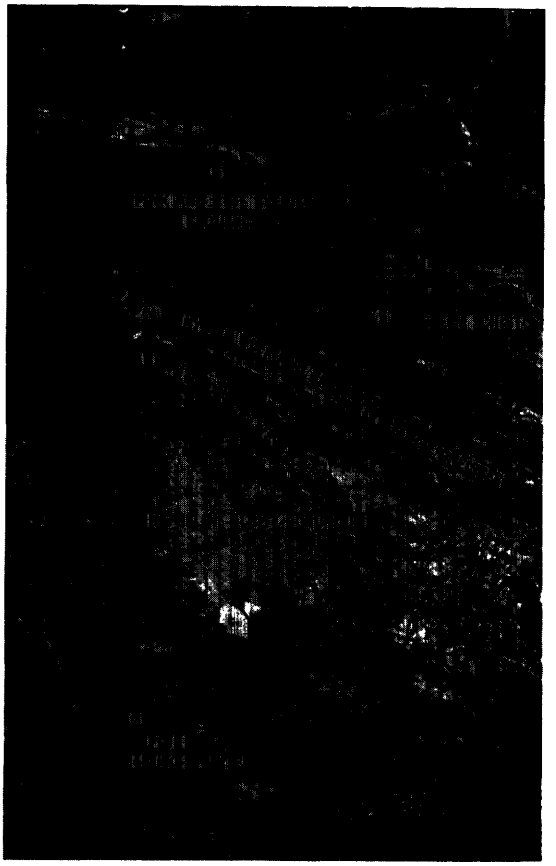
[1] F. D. Adams and A. E. Barlow, *op. cit.* pp. 313–14.

[2] *Ibid*, p. 315.

[3] The terms "gieseckite" and "hydronephelite" are used here to describe the green and pink alteration products of nepheline. Under the microscope these alteration products are seen to consist of fine-grained micaceous aggregates; the terms "gieseckite" and "hydronephelite" are not strictly correct mineralogically but serve as useful descriptive field terms and are so used in this report.

can be traced into hybrid gieseckite syenite gneiss, buff corundum-muscovite syenite gneiss, and pink leuco-syenite in that sequence, with the complete change within 20 feet. The nepheline bands have no continuity and appear to be remnants and relic patches of a once much more extensive zone of nepheline gneisses.

At Craigmont there are no nepheline rocks outcropping in the surface workings, but one band of leucocratic nepheline-rich corundum gneiss is exposed in the adit.



KLONDIKE CUT NO. 1

The photo shows a section of the east wall of the east Klondike cut (No. 1) at the extreme south end. The relations between the nepheline gneiss, the late pink leuco-syenite, and the associated hybrid facies are shown clearly.

At the foot of the section pink medium- to fine-grained leuco-syenite (1) is in contact with the footwall of the nepheline-albite gneiss band. At the contact there is a 6- to 12-inch zone of pink gieseckite syenite and a 12-to 36-inch hand of pink hydronephelite syenite.

Above this is a 9-foot zone of rather massive white to brownish nepheline-rich albite-corundum gneiss (2) showing a linear arrangement of albite and corundum. A little magnetite and muscovite are also present.

At the upper or hanging-wall contact of the nepheline gneiss (3), fingers of red leuco-syenite intrude the rock from above and there is a pronounced development of pink hydronephelite.

Between the nepheline gneiss and the pink and buff syenite (6), there is a 3-foot zone of hybrid buff, pink, and greenish gieseckite-corundum syenite gneiss (4). Green gieseckite schist is strongly developed along flat shears in the section (5).

At the top of the section (6) there is a thick zone of pink, fine-grained, sugary leuco-syenite mottled with buff and yellow-brown phases. The pink facies appears to replace the buff to yellow-brown syenite, which contains magnetite aligned to give the rock a distinct foliated appearance.

Wasmund Nepheline Gneiss Band

Nepheline gneisses outcrop irregularly in a band ¼ mile wide and ½ mile long extending eastward and westward along the crest of a ridge on lots 12, 13, and 14, concession XV, Raglan township, just east of the Wasmund homestead. The strike of the gneisses is varied, with some minor folding, but in general is east-west; dips are from 20 to 60 degrees south. The footwall of the nepheline gneiss band is crystalline limestone. The hanging wall is pink syenite gneiss, paragneiss, and crystalline limestone.

Lithology

The nepheline gneisses are interbanded with white alkaline nepheline-poor gneiss, pink leuco-syenite gneiss and hybrid syenitized paragneiss and amphibolite. Several different facies of nepheline gneiss are present:

6a: light-coloured nepheline-plagioclase gneiss.
6b: nepheline-hornblende gneiss with no feldspar.
6c: nepheline-hornblende-garnet gneiss with no feldspar.
6d: nepheline-biotite-plagioclase gneiss.
6e: nepheline-poor alkaline plagioclase gneiss with garnets ranging from ½ to 2 inches, plus titanite and scapolite.

Associated with these variable banded nepheline gneisses are small patches of nepheline pegmatite up to 8 inches wide containing zircon and radioactive minerals. The percentage of nepheline is extremely varied in this banded-gneiss zone and ranges from 0 to 50 percent.

To the east the nepheline gneisses disappear, and outcrops on strike are pink hornblende syenite gneiss, and amphibolite. To the west, along strike of the nepheline gneiss band, there is a second ridge extending from the Wasmund farm westward to the Conroy marsh. This ridge consists, for the most part, of pink syenite gneiss, pink hornblende syenite gneiss, and interbanded amphibolite. Along the crest of this ridge a band of garnet-scapolite-pyroxene rock up to 200 feet wide is exposed. This rock consists of orange-brown, fine-grained granular garnet, white scapolite, bright-green pyroxene, and titanite. In places the garnet makes up 60–80 percent of the rock. Some alkaline hornblende is often present. Garnet-scapolite-pyroxene skarn rocks are sometimes associated with the nepheline gneisses in other parts of the area, but nowhere else is there such a large body of the garnet-rich facies.

Jewellville Area

A range of hills, predominantly pink hornblende syenite gneiss, rises on the east side of the Madawaska River valley at the Palmer Rapids bridge and extends northeastward towards the highland peneplane in the vicinity of Rosenthal. The gneisses strike northeast and dip 30–70 degrees southeast. These ridges are composed of pink leuco-syenite gneiss, pink hornblende syenite gneiss, hybrid syenite gneiss, and amphibolite, with some narrow bands of pink corundum syenite gneiss, pink corundum pegmatite, and a few narrow relic bands of grey nepheline-plagioclase-corundum gneiss.

On the first ridge, ¼ mile northeast of the river, on lot 25, concession XIX, nepheline-albite-corundum gneiss occurs with pink and grey corundum-muscovite syenite gneiss in a band 100 feet wide. The discontinuous bands and lenses of nepheline-bearing rock rarely exceed 3 feet in width; the nepheline-bearing zone is exposed in shallow pits and strippings and can be traced for 300–400 feet along strike.

A second occurrence of narrow bands of nepheline-albite-corundum gneiss was observed on the crest of a ridge on lot 26, concession XIX, Raglan township, about ½ mile northeast of the Madawaska River. Here the narrow bands of nepheline-albite gneiss contain corundum, muscovite, and occasional biotite. They are surrounded and enveloped by younger pink and grey syenite gneiss.

Rosenthal Area

The next occurrence of nepheline-gneiss in the Raglan-Brudenell alkaline syenite belt is on the farm of Richard Gutz, lot 34, concession V, Brudenell township, just north of the village of Rosenthal. Here a band of nepheline-plagioclase-muscovite-corundum gneiss up to 20 feet wide occurs in a sequence of pink syenite gneiss, corundum syenite gneiss, and hybrid hornblende syenite gneiss and amphibolite. As indicated on the map, the nepheline gneiss forms a U-shaped syncline pitching to the southeast. The nepheline-plagioclase gneiss is intruded by pink alkaline syenite (gneiss) and, along strike, has been modified and replaced by the action of this later syenite. The nepheline is altered to hydronephelite, and microcline and microcline microperthite have been introduced into the rock. This alteration is particularly evident along joints.

A small body of nepheline-corundum pegmatite, in which there are long slender six-sided corundum crystals up to 8 inches in length, outcrops just south of the Gutz farmhouse.

Reid Lake Area

Two miles north of Rosenthal post office, nepheline gneisses again outcrop on lot 34, concession VII, Brudenell township, and on lot 32, concession V, Radcliffe township, to the north and south of Reid (Rockingham) Lake. South of Reid Lake the nepheline gneisses form two north-south-striking, east-dipping, bands from 100 to 200 feet wide, separated by a band of pink syenite gneiss. Tracing these bands to the south they are syenitized and pass into pink syenite gneiss. To the north these two bands outcrop up to the shore of Reid Lake. The east band is sharply drag-folded near the shore of Reid Lake. On the northwest



Reid Lake nepheline-scapolite gneiss showing the differential weathering of alternate scapolite gneiss and syenite gneiss bands.

side of the lake the nepheline gneiss outcrops as a single band, which may be the westermost of the two bands, or may represent the merging of the two bands. This nepheline band strikes north-south and dips steeply to the east. It is apparently cut off by the Reid Lake fault and displaced 1,000 feet to the northwest where it again outcrops for a short distance before it is cut off by the Rockingham Creek fault.

Lithology

The Reid Lake nepheline-gneiss bands consist mainly of interbanded nepheline-scapolite gneiss, scapolite-biotite gneiss, and nepheline-plagioclase gneiss. Zircon, muscovite, corundum, magnetite, carbonate, and apatite occur as accessories. A little microcline is present in bands adjacent to pink microcline leuco-syenite. These medium-grained, equigranular, foliated rocks are of particular interest because of the predominance of scapolite gneiss and nepheline-scapolite gneiss. The scapolite, on a fresh surface, has a greasy, yellowish-grey colour. After the freshly broken surface has been exposed to sunlight for a few days, the scapolite turns deep blue. On weathered surfaces the scapolite ranges from grey to pale blue-grey in colour, and since it weathers very much like nepheline, it is often difficult to distinguish blue-grey scapolite from dove-grey nepheline. The differential weathering of the scapolite gneisses is well shown where the bands cross the Rosenthal-Rockingham road at Reid Lake. Here the alternate scapolite bands and syenitic bands weather differentially, giving the rock a ribbed appearance.

Many of the scapolite-rich gneisses contain no plagioclase, and the scapolite may take the place of plagioclase. The nepheline-plagioclase gneisses generally have a hypidiomorphic interlocking, somewhat serrate, granitoid texture. The nepheline-scapolite gneisses generally have an equigranular, granoblastic, metamorphic texture and may represent a metamorphic facies, stable under high-grade metamorphism. Thin section examinations show strong shearing in some of the scapolite of the scapolite-bearing gneisses. On outcrop surfaces the scapolite-rich bands may show fracture cleavage that is not apparent in adjacent syenitic bands.

Wolfe Nepheline Belt

The Wolfe nepheline belt forms a prominent ridge extending eastward from the Wesley Kargus farm, lot 14, concession XIV, through the Welk and Remus farms, to Heiderman Lake, lot 5, concession XIII, Lyndoch township. In this 2½-mile section, the nepheline and associated alkaline hornblende gneisses form a well-defined band from 300 to 1,000 feet wide, dipping 30–70 degrees south. East of Heiderman Lake, outcrops are scarce, but the band is believed to extend to the east boundary of the map area. From the few outcrops available in this section, it appears that the belt narrows in width to 50 feet or less at the east end.

Throughout the length of the belt the nepheline gneiss–syenite gneiss complex has a footwall of crystalline limestone and a hanging wall of interbedded limestone and paragneiss. A narrow bed of glassy, coarsely recrystallized quartzite lies between the nepheline gneiss and the crystalline limestone footwall on the Kargus, Welk, and Remus farms.

At the west end of the belt the foliation of the nepheline gneiss swings from east-west to north-south; dips are from 30–50 degrees south and east respectively. The nepheline gneiss ridge terminates in a swamp. No nepheline gneiss outcrops west of lot 14, and the band either pinches out, as suggested by the convergence of the footwall and hanging-wall limestones, or is faulted off by

a northwesterly strike fault, which may occupy the pronounced valley south of the nepheline belt. If the latter is the case, the swing in structure may be a drag on the fault.

Throughout the nepheline gneiss belt there is a pronounced, strong lineation trending about S. 60° E. and pitching 20°–25° SE. It is possible that the nepheline band may occupy the north arm and trough of an eastward-pitching drag fold on the north arm of a major syncline.

Lithology

The nepheline gneisses consist of nepheline, plagioclase, microcline, and hastingsite as the major constituents, with biotite, magnetite, garnet, fluorite, carbonate, titanite, apatite, and zircon present in minor amounts. In places, garnet makes up as much as 10 percent of the rock. Scapolite was present as an important constituent in 4 out of 15 thin sections examined, and, in one case, makes up as much as 32 percent of the rock. Where scapolite is abundant, microcline is generally absent, and the percentage of plagioclase may be low. In 15 samples examined, nepheline ranged from 5 to 40 percent, plagioclase (from albite to andesine) from 0 to 58, microcline and microcline microperthite from 0 to 38, green amphibole from 0 to 48, and biotite from 0 to 10 percent.

Overlying, and occasionally interbanded with, the nepheline gneisses, are a series of garnet-hornblende-plagioclase-scapolite gneisses with poor foliation but pronounced lineation. In 10 samples examined, garnet ranged from 0 to 15, averaging about 10 percent, green amphibole ranged from 6 to 38, pyroxene from 0 to 40, scapolite from 3 to 65, and plagioclase from 0 to 63 percent. Microcline is absent in this rock. Plagioclase varies from oligoclase to andesine. Carbonate, titanite, apatite, and zircon are accessories. This coarse-grained hornblende-garnet-plagioclase gneiss appears to cut the nepheline gneiss and is in sharp contact with it in several places. It may be genetically related to the nepheline rocks and represent a slightly later phase of a composite intrusion.

Both these rocks are intruded by pink and white syenites and syenite gneisses and pegmatites.

Patches of nepheline pegmatite, consisting of large crystals of nepheline and albite up to 4 feet in diameter, cut the nepheline gneisses at the west end of the Wolfe belt on the Wesley Kargus farm. Fluorite, apatite, biotite, and zircon occur as accessories in these pegmatites. Contacts of the pegmatite with the gneisses are graditional through a 1-foot transition zone.

SYENITE GROUP

The syenite group includes nearly all the saturated feldspathic intrusive rocks, which are predominantly soda feldspar or potash and soda feldspar. These rocks are characterized by the lack of nepheline and quartz. Some nepheline-poor white alkaline syenites, which often occur interbanded with nepheline-rich gneiss, and which are facies of the undersaturated nepheline intrusive, are grouped in the nepheline syenite group. Quartz syenites that contain less than 10 percent quartz as an accessory mineral are grouped with the syenites.

Occurrence

The syenitic rocks are, for the most part, confined to northern Raglan and southern Brudenell townships. They occupy a belt, 3–4 miles wide, extending across northern Raglan township from Craigmont, through Palmer Rapids, to Rosenthal. In this belt, syenite gneiss and hybrid syenite gneiss are the predom-

inant rock types, but abundant granite gneiss, limestone, and amphibolite occur interbanded with the syenitic rocks. In southeastern Brudenell township, pink and brown syenite gneisses make up a large part of the Foymount massif, north and east of Anderson Lake, north of the Dent Lake fault. In southwestern Brudenell township between Rosenthal and Anderson Lake, syenite gneiss is common in the fault block slices between the Combermere and Dent Lake faults.

Lithology

For purposes of mapping, the syenitic rocks have been divided into seven lithologic groups, indicated by the map symbols as follows:

7a: pink and white leuco-syenite and syenite gneiss, albitite.
7b: hornblende syenite, hornblende syenite gneiss.
7c: biotite syenite, biotite syenite gneiss.
7h: hybrid syenite gneiss (interbanded syenite gneiss and amphibolite), migmatites.
7p: syenite pegmatite.
7k: corundum syenite, corundum syenite gneiss.
7m: corundum syenite pegmatite.

These divisions are arbitrary, and one type grades into another.

7a: Pink and White Leuco-syenite and Syenite Gneiss, Albitite
7k: Corundum Syenite and Corundum Syenite Gneiss

Mineralogically these syenites and syenite gneisses can be divided into three types, white albite syenite predominantly albite or oligoclase (albitite or oligoclasite), pink or buff syenite composed of about equal amounts of plagioclase (albite to oligoclase) and microcline, and pink syenite, predominantly microcline or microcline microperthite or both, plus minor plagioclase. These rocks may contain muscovite, magnetite, apatite, and zircon as minor accessories. The grey oligoclasites sometimes contain scapolite. When these syenites contain corundum, they are placed in group 7k.

7b: Hornblende Syenite, Hornblende Syenite Gneiss
7h: Hybrid Syenite Gneiss

When hornblende is a characterizing accessory in the syenite and syenite gneiss, it is placed in group b. These hornblende syenite gneisses are more commonly associated with the amphibolites and may, in part, be formed by "syenitization" (potash metasomatism of amphibolite gneiss) or injection of syenitic liquid into amphibolite gneiss. Where syenite and amphibolite occur interbanded or intimately intermixed, they are mapped as hybrid syenite gneiss.

7c: Biotite Syenite, Biotite Syenite Gneiss

Pink and buff medium-grained equigranular biotite syenite gneisses occur occasionally but are not so common as the types above.

7p: Syenite Pegmatite
7m: Corundum Syenite Pegmatite

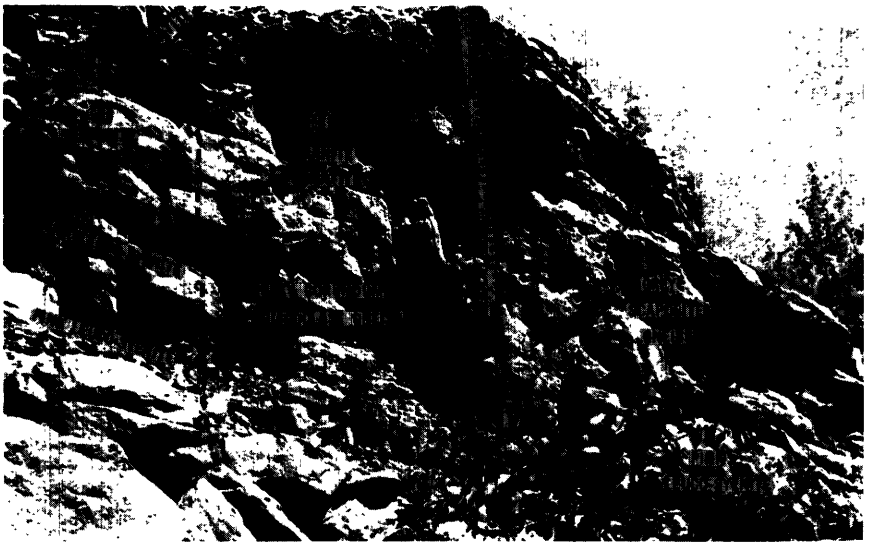
Pink, buff, and yellow-brown syenite pegmatite and pink and buff corundum syenite pegmatites commonly occur as elongate patches interbanded with, and cutting, the pink and white syenite gneiss sequence at the Klondike cuts, Craigmont, Jewellville, and Rosenthal.

Texture

Texturally the rocks of the syenite group vary considerably. Commonly the grey and pink syenite gneiss are hypidiomorphic granitoid with a closely interlocking texture and fracture like an ordinary massive granite. Some of the buff, yellow-brown, and white syenite gneisses have a sugary, equigranular texture; the feldspar crystals are not closely interlocked, and the rock pulverizes to a sugary granular aggregate on breaking. In some of the pink, buff, white, and yellow-brown syenites, the texture is porphyroblastic, with large shiny porphyroblasts of feldspar up to 3 inches in diameter in a medium-grained aplitic matrix. All facies of the syenite group grade from medium to pegmatitic grain size.

GRANITE GROUP

The commonest rock types found in the area are granite gneiss and hybrid granite gneiss. These rocks underlie the greater part of Radcliffe township, the south half of Lyndoch township, northwest and south-central Brudenell township, and part of Raglan township. In Radcliffe township the pink granite gneiss is interbanded with amphibolite, and the series includes a large amount of hybrid granite gneiss. The structure is simple, the gneisses strike southeast and dip 30°–60° SW. In southern Lyndoch township, the granite gneiss-hybrid gneiss complex has a phacolithic structure and appears to occupy the trough of a major southeast-pitching syncline. Just to the north, the Mining Mountain granite gneiss, on lots 4, 5, and 6, concessions VII and VIII, Lyndoch township, appears to occupy a drag fold on the north arm of this major syncline.



GRANITE PEGMATITE CUTTING SYENITE GNEISSES

The photo shows a section of the east wall of the lower-pond cut (No. 2) at Craigmont. Here there is exposed a section of interbanded grey, medium-grained, granular scapolite gneiss (1), and grey, medium-grained, corundum-oligoclase-andesine gneiss (grey alkaline syenite) (2). These are intruded and replaced by fine-grained, pink, equigranular leuco-syenite carrying abundant magnetite (3). This sequence of grey and pink gneisses is cut by a wide dike of pink granite pegmatite (4), which occupies the centre of the photo. The age relations between early grey corundum-scapolite-oligoclase gneisses, later pink leuco-syenite, and late pink granite pegmatite, are well shown in this exposure.

In northern Brudenell township the granite gneiss is closely folded into a series of small anticlines and synclines whose axes trend and pitch to the north-

east. A swarm of granite pegmatite dikes occupy a series of fractures trending northeast, parallel to the fold axes.

Lithology

For mapping, the granitic rocks have been divided into five lithologic groups:

8a: pink and white leuco-granite, granite gneiss, and alaskite.
8b: hornblende granite, hornblende granite gneiss.
8c: biotite granite, biotite granite gneiss.
8h: hybrid granite gneiss (interbanded granite gneiss and amphibolite), migmatite.
8p: granite pegmatite, pegmatitic granite.

The pink and white leuco-granite gneisses are composed predominantly of orthoclase or microcline feldspar and quartz, with minor plagioclase feldspar. These rocks often have a granulite fabric with the quartz oriented in lenticular plates parallel to the foliation of the rock. Zircon, apatite, muscovite, magnetite, pyrite, and molybdenite are common accessories.

The biotite and hornblende granite gneiss are composed essentially of potash feldspar, quartz, some plagioclase, and 10–30 percent biotite or hornblende. In some places both of these ferromagnesians are present. The hornblende granite gneiss on Casey Hill, lot 25, concession XV, Lyndoch township, carries allanite, zircon, and titanite as characterizing accessories.

Hybrid granite gneiss is formed by injection of granitic material into amphibolites and biotite amphibolites. In the hybrid granite gneiss group are included all the rocks commonly referred to as *lit-par-lit* gneisses, migmatites, injection gneisses, granitized sediments, etc.

The field nomenclature for granite, granite gneiss, and hybrid granite gneiss used in mapping this area is as follows:

Granite is defined objectively on the basis of minerals, textures, and structures: "Granite is a rock composed essentially of quartz and silicic feldspars, having an interlocking texture . . . and a structure not dominantly sedimentary or metamorphic."[1] Granite gneiss is a granitic rock with a metamorphic (banded) structure.

On the scale of mapping used for this area, it is not practical to map a separate band of rock if it is less than 2 chains wide. Therefore the character of an outcrop consisting of interbanded amphibolite and granite gneiss, which are recognizable the one from the other, yet are not large enough to be distinguished by separate colour bands on the map owing to difficulties of scale alone, will be indicated by the symbols "8a, 2a," if the granite gneiss predominates, and "2a, 8a," if the amphibolite predominates.

In areas where there has been much injection of granitic material into banded amphibolite and granitization of the amphibolite on such a scale that it is no longer possible to separate original material from introduced material, the migmatite or mixed rock is mapped as hybrid granite gneiss, 8h.

Pegmatites

Pods, lenses, stringers, and irregular-shaped bodies of pegmatitic granite form an important part of the hybrid granite gneiss. Granite pegmatites with well-defined borders occur as dikes cutting all the rocks of the area. The pegma-

[1]Frank F. Grout, "Origin of Granite," *Origin of Granite*, Geol. Soc. Amer., Mem. 28, 1948, p. 45.

tites are of two types, simple pegmatites composed essentially of microcline perthite, plagioclase, and quartz, in graphic intergrowth and pegmatites in which the quartz, feldspar, and accessories are coarsely crystalline with quartz and feldspar in large, pure, individual crystals over 1 foot in size. A number of the latter pegmatites are shown on the map by a red overprint. In Lyndoch township, two granite pegmatites carry beryl, and these have been worked for beryl and feldspar. Feldspar was produced from one granite pegmatite in Brudenell township. Allanite and other rare-element and radioactive minerals occur as accessories in many of the granite pegmatite dikes.

Age Relations of the Syenites and Granites

On the basis of cutting relations, there appear to be four distinct granite-syenite intrusions in the area. The earliest of these is white albite syenite, which often carries corundum. This syenite is closely associated in occurrence and origin with the nepheline gneiss. It cuts the nepheline gneiss but may be a later phase of the alkaline intrusion.

The second period of intrusion produced the pink microcline-plagioclase syenite, the closely related buff and grey syenite, and the common pink granite of the area.

The third period of intrusion produced a series of yellow-brown, titanite-rich hornblende syenite, granite, and pegmatite. Pegmatites of this period of intrusion cut both the earlier intrusions. These yellow-brown granites and syenites are particularly common in the Rockingham-Rosenthal area and in Brudenell township.

The latest intrusive is a massive, well-jointed, dark-red quartz syenite or granite often containing arfvedsonite. It is not foliated. This intrusive occurs at the Klondike and Craigmont Cuts in Raglan township.

YOUNGER DIABASE

A few small outcrops of a medium-grained, massive, fresh black diabase occur in southeastern Brudenell and northeastern Lyndoch townships. These diabase dikes cut the granite and syenite gneiss and appear to be the youngest intrusives in the area.

PLEISTOCENE AND RECENT DEPOSITS

The whole area was glaciated during Pleistocene times, and a heavy mantle of glacial drift covers much of the area. The north or stoss flanks of most of the ridges are heavily covered with boulder drift. Glacial striae indicate the direction of ice movements was S.–S.15°E. In the vicinity of Brudenell village, drumlins and rock drumlins are developed in clayey boulder drift. Elsewhere glacial drift is sandy with numerous boulders. There are extensive sand plains in the valley flats along the Madawaska River. In northeastern Brudenell township there are a series of well-developed recessional moraines. These recessional moraines are long narrow ridges of boulder drift from 15 to 40 feet high extending in an east-west direction parallel to the direction of the ice front. The lee side is steep, but the stoss side has a more gentle slope. In the Rochefort valley there are a series of four of these recessional moraines running across the valley floor. They are breached by the present stream occupying the valley. The recessional moraine ridges are best developed in lots 1–5, concessions XIII and XIV, Brudenell township, below and on the flank of the Mount St. Patrick scarp. These moraines can seldom be traced more than two miles. In a few places, kames appear to form an integral part of these recessional moraines.

CHAPTER III

STRUCTURAL GEOLOGY

Owing to the high degree of metamorphism and the destruction of the original structures of the rock, such as grain gradation, cross-bedding, etc., criteria for the determination of tops of strata are lacking in the area. Consequently, information on folding consists solely of strikes and dips of strata and foliation, and depends on tracing marker horizons where available, and on subsidiary information from drag-folding. Fracture cleavage is very rarely developed in the rocks of the area. The structure of this part of the Grenville subprovince cannot be determined by normal structural and stratigraphic methods.

Rock flowage, particularly evident in the crystalline limestones, and regional thermal, dynamic, and hydrothermal metamorphism and metasomatism, which have in many places resulted in complete reconstitution of the rocks, have so modified the original bedding in the sedimentary rocks that a simple determination of the structure is impossible.

Folding and Foliation

The rocks of the area are highly folded with dips ranging from horizontal to vertical. For the Bancroft area, Adams and Barlow[1] estimated the total thickness of the Grenville series to be over 94,000 feet. It was later recognized that there was much isoclinal folding in the steeply dipping section exposed on the Hastings road, and that the true thickness of the Grenville series is much less. Concerning the thickness of the Grenville series, Chayes[2] says:

> Some explanation of the extraordinary thickness of the Grenville is required. It has been suggested that great thicknesses of this sort are only apparent, that they have been produced by a surface crumpling rather than an intensive and extensive folding. This would imply that the present Grenville is a relatively shallow veneer on the more or less undeformed floor of the basin in which it was deposited. Arguments to be developed later in connection with the mode of intrusion of the alkaline rocks lend little support to the view that the deformation of the Grenville series is merely a surface crumpling. The present thickness of the carbonate rocks is measurable in tens of thousands of feet, and there is no direct field evidence that the original thickness was of a different order of magnitude.

The belt of predominantly metasedimentary rock crossing northern Raglan and Lyndoch townships lies between the Snake Rapids phacolith to the south and the Radcliffe township granite and hybrid gneisses to the north. This belt has a width of over 6 miles, and the true thickness of the sediments is about 10,000 feet if no isoclinal folding is present. In Lyndoch and Brudenell townships this metasedimentary band splits into two. One arm swings northward through Brudenell township forming the west flank of the Foymount granite-syenite massif; the other arm continues eastward across Lyndoch township to form the south flank of the Foymount massif.

The north arm in Brudenell township, lying between the Radcliffe hybrid gneiss and the Foymount massif, consists of nepheline and syenite gneisses, paragneiss, amphibolite, and crystalline limestone. This arm is closely folded, crumpled, and faulted.

As previously mentioned, the Snake Rapids phacolith in southern Lyndoch township occupies the trough of an eastward-pitching syncline, and the Wolfe

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[1]Frank D. Adams and Alfred E. Barlow, *Geology of the Haliburton and Bancroft Areas, Province of Ontario*, Geol. Surv. Can., Mem. 6, 1910, p. 33.

[2]Felix Chayes, *Alkaline and Carbonate Intrusives near Bancroft, Ontario*, Bull. Geol. Soc. Amer., Vol. 53, 1942, No. 3, p. 456.

nepheline belt may occupy the trough of an eastward-pitching drag fold on the north arm of this major syncline.

In central Raglan township, crystalline limestone forms the core of the eastward-pitching Moccasin Lake anticline. This anticline is overturned towards the north, and the paragneisses and amphibolites of the north arm dip to the south. The south arm of this anticline appears to be cut off against the Raglan Hills metagabbro.

Faulting

As already mentioned in the section under "Physiography," there was a major period of normal faulting in Tertiary times, which resulted in the development of the Madawaska Highland horst, bounded on the north by the northwest-by-west–trending Mount St. Patrick fault, which is the southern boundary fault of the Ottawa-Bonnechere graben, and on the south by the Plevna fault. The Brudenell-Raglan map area lies astride the Madawaska Highland horst, which itself is divided into two major south-tilted fault blocks by the Madawaska fault, another northwest-by-west–trending normal fault of considerable throw. The northern fault block, the Barrys Bay-Foymount block, is sliced by at least seven branching normal faults all trending more westerly than the Madawaska and Mount St. Patrick faults. As a consequence of their more westerly trend, these faults branch off the main Madawaska and Mount St. Patrick faults. A second set of complementary northeast-trending cross-faults may exist, but only two of these were definitely recognized in the map area.

The Tertiary faulting in the adjacent Ottawa-Bonnechere graben has been described in some detail by Kay:[1]

> There is conclusive evidence that the distribution of the Paleozoic sediments in Renfrew County area is directly related to faulting and that the beds have been preserved in downthrown blocks. Linear crystalline escarpments rise hundreds of feet above the Paleozoic outliers. The trend of the pre-Cambrian rocks consistently deviates from that of the scarps, which cannot be subsequent along more resistant rocks of the pre-Cambrian suite.

In the Brudenell-Raglan area the location of the faults is based largely on the following points of evidence:

1) *The presence of pronounced topographic scarps, not developed by differential weathering of resistant and soft rocks.* On the assumption that the whole area was peneplaned in Precambrian times, later mantled by early Paleozoic rocks, and that the present surface represents this paleopeneplane exhumed, a topographic layer map, together with the geological data, allows us to reconstruct the paleopeneplane surface and to place certain faults on the basis of displacement and tilting of this surface.

2) *The presence of pronounced linear depressions crossing the area.* When geologic evidence is in agreement, these linears are assumed to be subsequent along faults.

3) *Discordance or displacement of geological structure.*

4) *Discordance or displacement of lithology or stratigraphy.* Such evidence as the truncation of a fold, an abrupt change in lithology or stratigraphy along strike at a linear depression, or the displacement of a marker horizon or dike, etc., is assumed to indicate faulting.

5) *The presence of shearing or slickensides or other actual physical evidence of faulting in outcrop.* This type of direct evidence is rarely observed in the Brudenell-Raglan area.

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[1]G. Marshall Kay, *Ottawa-Bonnechere Graben and Lake Ontario Homoclines*, Bull. Geol. Soc. Amer., Vol. 53, 1942, No. 4, p. 622.

MOUNT ST. PATRICK FAULT

The Mount St. Patrick fault is marked by a pronounced fault scarp, which can be traced for about 85 miles in Lanark and Renfrew counties.[1] This fault trends N. 70° W. It is a high-angle, normal fault, forming the south boundary of the Ottawa-Bonnechere graben, and the throw is at least 1,300 feet. The elevation of the Precambrian surface at Foymount is 1,700 feet. The elevation of Lake Clear at the base of the scarp is 755 feet, and G. M. Kay calculates that the Precambrian basement below the Lake Clear Paleozoic rocks has an elevation of 200 or 300 feet.

GRANT LAKE FAULT

The Grant Lake fault is the northernmost of a series of normal faults, trending generally N. 82° W., which cuts the Barrys Bay–Foymount fault block into a series of fault slices between which minor adjustments within the fault block have taken place. These faults trend more westerly than the Mount St. Patrick fault and consequently meet the Mount St. Patrick fault east of the map area. Topographic evidence suggests that the Grant Lake fault joins the Mount St. Patrick fault at Lake Clear. In the case of most of these faults, marker horizons are not available to allow calculation of throw and offset. The offset on the Grant Lake fault appears to have been north side east. The calculation of offset based on apparent displacement of limestone or paragneiss bands is hardly satisfactory, since these bands are highly folded and their persistence of dip and strike at depth is unlikely.

HOPEFIELD FAULT

The Hopefield fault enters the area just east of Bath Lake on the north boundary of Radcliffe township and runs southeast by east, roughly paralleling the Grant Lake fault, through Hopefield, Brudenell Lake, north of Gorman Lake, south of Lorwall Lake, and through Britches Lake to pass out of the area into Sebastapol township. South and east of Hopefield the displacement of an anticlinal axis in the granite gneiss indicates the presence of a fault slice as shown on the map. The apparent offset on the Hopefield fault, as indicated by the displacement of a wide band of amphibolite east of Gorman Lake, is north side east.

RAFT LAKE FAULT

The Raft Lake fault enters Radcliffe township at Raft Lake and runs southeast by east to join the Rockingham Creek fault at Harriets Corners in Brudenell township.

DENT LAKE FAULT

The Dent Lake fault branches off the Rockingham Creek fault just north of Charlotte Lake in Brudenell township and runs southeast by east through Dent Lake, south of Anderson Lake, and north of Britchless Lake into Sebastapol township. The north-south–striking syenite gneisses of the Kuehl Lake–Anderson Lake area appear to terminate against this fault. It may be a continuation of the Raft Lake fault.

REID LAKE FAULT

The Reid Lake fault passes through the northwest corner of Radcliffe township and runs southeast by east, through Halfway Lake, Reid Lake, and Beardwood Lake, then southeast by east through southern Brudenell and northeastern

[1]G. M. Kay, *op. cit.*, p. 618.

Lyndoch township to pass out of the area half a mile south of Britchless Lake.

The Reid Lake nepheline band is offset 1,000 feet to the west on the north side of this fault.

JESSUP FAULT

Between Charlotte and Beardwood lakes in Brudenell township, the Jessup fault branches off the Reid Lake fault and runs southeast by east, parallel to and between the Reid Lake and Dent Lake faults, passing out of Brudenell township just south of Britchless Lake.

ROCKINGHAM CREEK FAULT

The Rockingham Creek fault trends N. 80° E. and forms a link between the Reid Lake, Raft Lake, Dent Lake, and Hopefield faults. The Rockingham Creek fault branches off the Reid Lake fault just north of Reid Lake, passes south of Rockingham village, and runs eastward to meet the Hopefield fault at the south end of Lorwall Lake. The Raft Lake fault joins the Rockingham Creek fault just west of the Letterkenny road. Three-quarters of a mile farther east, along the Rockingham Creek fault, the Dent Lake fault branches off to the southeast. Rockingham Creek is subsequent along the parts of the Rockingham Creek and Hopefield faults, and these faults are marked by a pronounced linear valley throughout part of their course.

COMBERMERE AND BROHART FAULTS

The Combermere fault enters Radcliffe township at the outlet of Kaminiskeg Lake, follows the course of the Madawaska River as far as Hydes Bay, whence southeast by east through Combermere Lake, south of Diamond Lake and terminates at the Brohart cross-fault on the northern boundary of Lyndoch township. The Jewellville corundum range appears to be offset on the Combermere fault. The folding in the syenite-paragneiss sequence to the north of the Combermere fault in the Rosenthal area is intense. The Combermere and Brohart faults appear to terminate the north-south structure in the Brudenell limestone band.

AXE LAKE AND ROSENTHAL FAULTS

The Axe Lake and Rosenthal faults are cross-faults trending northeast between the Combermere and Reid Lake faults. These faults terminate and offset small southward-pitching synclines in the syenite-paragneiss-nepheline gneiss sequence in the Rosenthal area. The Brohart, Axe Lake, and Rosenthal faults may be of Precambrian rather than Tertiary age.

MADAWASKA FAULT

The Madawaska fault is a major, normal fault, which runs parallel with the Mount St. Patrick fault and marks the south boundary of the Barrys Bay–Foymount fault block. The Bangor-Denbigh fault block to the south is upthrown some 250 feet along the Madawaska and Turtle Lake faults. The fault scarp of the Bangor-Denbigh block is best seen in Bangor and Radcliffe townships, south of Kaminiskeg and Mekeek lakes. Farther to the southeast, the major throw is on the Turtle Lake fault, which parallels the Madawaska fault 2 to 3 miles to the south.

The Madawaska fault forms the south shore of Kaminiskeg Lake in Bangor township, whence it runs southeast by east into Radcliffe township, through the west edge of Mekeek Lake, through Palmer Rapids, Latchford Bridge, and on

through Lyndoch township, roughly paralleling the course of the Madawaska River, to leave the area just south of Mount Jamieson. The Quadeville metagabbro ridge appears to be cut off at its western end by the Madawaska fault.

TURTLE LAKE FAULT

The Turtle Lake fault begins at the Conroy marsh and runs southeast by east through Raglan township, south of Raglan Lake, through Leidtke Lake, into Lyndoch township, through Turtle Lake, thence into Denbigh township. It converges slightly with the Madawaska fault toward the southeast. The Madawaska and Turtle Lake faults are apparently joined by a linkage near the foot of the Snake rapids, since the major vertical displacement in Lyndoch township appears to be transferred from the Madawaska to the Turtle Lake fault.

OTHER FAULTS

It has been considerably simpler to recognize the presence of major, northeast normal faulting in Brudenell township because the structure in the Precambrian rocks trends across the strike of the faults, giving good evidence of displacement and discordant structure.

In Radcliffe township the structure of the hybrid granite gneisses parallels the strike of normal faulting, and although there are a number of linear northeast-trending valleys, these are strike valleys and may or may not be fault lines. There are undoubtedly more northwest normal faults in Radcliffe township. There is some possibility that a cross-fault exists running from Reid Lake, southwest by south, to the Madawaska River at Jewellville. This fault would account for the marked change in structure and lithology along this line.

There is also some evidence that a normal fault may run from the Brohart fault at the northwest corner of Lyndoch township, in a southeast-by-east direction across Lyndoch township, south of Casey Hill and the Wolfe nepheline belt.

A cross-fault may run southwest by south from the mouth of the York River at Mekeek Lake, into Carlow township, passing south of Craigmont and Burgess mines.

Further comments on possible Precambrian thrust-faulting will be found in Chapter V, page 88.

CHAPTER IV

ECONOMIC GEOLOGY

There are occurrences of beryl, copper, corundum, feldspar, gold, graphite, iron, limestone and dolomite, mica, molybdenum, nepheline, rare element and radioactive minerals, sillimanite, and zircon in the Brudenell-Raglan area. Most of these occurrences are of no commercial interest and are herein described only as a matter of record. The area is best known as the centre of a profitable corundum mining industry in eastern Ontario from 1898 to 1918. Recently there has been some production of beryl and feldspar from pegmatite dikes on lots 23 and 30, concession XV, Lyndoch township.

Beryl

The mineral beryl, $Be_3Al_2Si_6O_{18}$, is the chief ore mineral of beryllium, a light metal somewhat similar to magnesium and aluminium. The most important use of beryllium is in the production of beryllium-copper alloys, which possess physical and electrical properties that make them very valuable for particular uses. J. W. Clark[1] gives the following information on beryllium-copper alloys:

> The beryllium-copper alloys are of great commercial and strategic significance, having no peer when shaped into parts that must simultaneously perform a mechanical function and conduct electric current at moderately elevated temperatures. The ease with which beryllium-copper may be formed and subsequently age-hardened is a factor of immeasurable importance in its utility; the rapidly quenched alloys are ductile (Brinell 100) and readily machinable or castable into complex shapes which then may be very substantially hardened (Brinell 350-400) and otherwise strengthened by the fabricator with a simple heat treatment. Both ductile and mill-hardened stock is available commercially, with the mill-hardened forms becoming increasingly important. Beryllium-copper alloys used in commercial practice range in beryllium content from about 0.25 to 2.85 per cent according to properties desired.

Among the common uses for beryllium-copper alloys are the following: springs, bellows, electrical contacts, aircraft engine parts, cams, bearings, resistance welding electrodes; current-carrying springs and switch parts where good electrical and thermal conductivity are desired at moderately elevated temperatures; and high-conductivity casting alloys used for switches, circuit breakers, switch gear, welding jaws, resistance welding dies, electrode holders, and other current-carrying members where strength, conductivity, and resistance to wear at moderately elevated temperatures are important.[2]

Beryllium oxide is widely used in the ceramic industry in porcelain bodies used for aircraft spark plugs and insulators. Beryllium oxide was formerly used extensively in making beryllium-zinc silicate phosphors for fluorescent lamps but, due to its toxicity, this use has been largely abandoned since 1949. Beryllium metal is used in some nuclear reactors because of its moderating effect on fast neutrons emitted by the fission of U-235 and plutonium.

Beryl is generally found in hexagonal crystals, which may be over a foot in diameter and several feet in length. It may be green, aquamarine, straw yellow, or colourless. The beryl found in eastern Ontario is yellow-green to blue-green and usually opaque. Emerald and aquamarine are gemstone varieties of beryl. Beryl has a hardness of 7.5 to 8 and a specific gravity of 2.6 to 2.8. It has imperfect basal and prismatic cleavage and conchoidal to uneven fracture. It can be distinguished from apatite by its superior hardness. Beryl commonly occurs as an accessory mineral in granite pegmatites. The United States is the chief consumer, and Brazil, Argentina, India, Australia, and the United States are the chief pro-

[1] Jack W. Clark, "Minor Metals," *Minerals Year Book 1949*, U. S. Bur. Mines, p. 1296.
[2] *Ibid.*, p. 1297.

ducers. The estimated 1949 world production of beryl amounted to 4,450 tons. In 1949 the United States imported 3,811 tons of beryl concentrates valued at $858,308. The price for beryl concentrates, as quoted in *E & MJ Metal and Mineral Markets*, November 6, 1952, was $38.50 to $40.50 per unit BeO in 10–12 percent BeO concentrates.

Two beryl-bearing granite pegmatites located on lots 23 and 30, concession XV, Lyndoch township, have produced beryl on a commercial scale. The deposit on lot 23, concession XV, was opened in 1926 by T. B. Caldwell of Perth, and in 1927, 4,456 pounds of beryl, valued at $175, were shipped to Germany.[1]

The pegmatites on lots 23 and 30, concession XV, were taken over by Renfrew Minerals, Limited, in 1935, and some development work was done in 1935 and 1936. Some 675 tons of feldspar were shipped by Renfrew Minerals, Limited, from the property on lot 30. The company was succeeded by Canadian Beryllium Mines and Alloys, Limited, which operated the two dikes for beryl and feldspar intermittently from 1939 to 1950. A considerable amount of beryl was separated by hand-cobbing, and in 1950, 57,100 pounds of beryl concentrates valued at $7,882 were sold from the stockpile.

LYNDOCH TOWNSHIP

Concession XV, Lot 23 (Canadian Beryllium Mines and Alloys, Limited)

Location and Access

The beryl-bearing pegmatite dike on lot 23, concession XV, is on the south slope of Casey Hill, a prominent northeastward-trending ridge of granite and hybrid gneiss. The property can be reached by road; from Quadeville Village corners it is 1.4 miles north on the Letterkenny road to the entrance to the mine property. The mine is ¼ mile east of the Letterkenny road.

History of Development

The dike was first described in 1897 by Miller,[2] who first reported the occurrence of beryl and columbite in this area. Miller states:

> The deposit is situated well down the face of a high hill, which faces the Quodville road on lot 23 in the fifteenth concession of Lyndoch . . . The part of the face of the hill where the outcrop occurs is covered for the most part to a considerable depth with a layer of soil and boulders. The outcrop itself as now exposed is of small size, being about 15 yards in length. The rock matter on the western end of the outcrop consists of large masses of green felspar or amazon stone and quartz. These minerals show a rather sharp contact, and the masses of them have a diameter of some feet. Associated with these minerals is some black mica and beryl which is imbedded in the quartz. The beryl crystals are of different sizes, being generally much elongated but with imperfect terminations. Some of the crystals have a diameter of six inches. One crystal was seen imbedded in the quartz which had a length of over 30 inches and a diameter of three inches. On the eastern end of the deposit the felspar has a pink or reddish colour, and was found on microscopical examination to possess a microcline base through which is set plagioclase, thus making it a microcline microperthite. The surface of this part of the deposit is much broken up, the felspar and associated quartz, which is generally smoky in appearance, being in loose fragments. It is in this part of the deposit that the mineral occurs which has been determined to belong to the rare columbite group.
>
> On making an examination of the deposit, my attention was at once attracted to this dark coloured mineral. It is black in colour, possesses a sub-metallic lustre, and occurs imbedded in the felspar. The plates conform somewhat closely to the cleavage planes of the felspar and in some cases are of considerable size. In one specimen obtained the diameter of the plate was about six inches, and its thickness one-sixteenth of an inch. The plates in some cases at points on one of their surfaces expand into nodules, which thus possess one rounded and one plane surface.

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[1] *Statistical Review of Ontario's Mineral Industry in 1931*, Ont. Dept. Mines, Vol. XLI, 1932, pt. 1, p. 29.

[2] Willet G. Miller, *Economic Geology of Eastern Ontario, Corundum and other Minerals*, Ont. Bur. Mines, Vol. VII, 1898, pt. 3, p. 235.

The deposit was later examined by H. V. Ellsworth[1] of the Geological Survey of Canada, who describes it, in part, as follows:

> The dyke was almost entirely covered by soil, brush, etc., only a few square yards being exposed, until the summer of 1926 when Mr. T. B. Caldwell of Perth opened it up in the hope of obtaining beryl in commercial quantities. It is variously estimated that from 2 to 4 tons of beryl crystals were obtained. The dyke was more or less opened up over a length of 100 feet, a width of 5 to 10 feet, and a depth of 3 to 6 feet, but it is even not yet fully exposed. The strike in a general way appears to be about north 60 degrees east magnetic.
>
> The openings show crystal masses up to 6 feet in diameter of pink microcline and beautiful green amazonstone, a moderate amount, perhaps not over 10 per cent of the whole, of white, smoky, and pale rose quartz; platy albite (variety cleavelandite), with some more or less albitized pink microcline. Accessory rare minerals that have been identified are: beryl, columbite, lyndochite, cyrtolite, monazite. A few red garnets in good crystals up to 2 inches in diameter occur and also a small amount of fluorite. Magnetite is abundant in the finer grained parts of the dyke. Triangular black tourmaline crystals up to 6 inches in diameter are not uncommon, more especially in the albite. There is reason to believe that bismuthinite was also found, as this mineral is recorded[2] as occurring in a dyke with beryl in the same township. and Mr. John Sullivan, the discoverer of the dyke, some years ago informed the writer that he had found in earlier years a mineral answering to the description of bismuthinite.

Present Workings

In 1939 Canadian Beryllium Mines and Alloys, Limited, reopened the property for beryl, and the main development of the property took place at this time. The dike was opened for a length of 245 feet along strike by a single open cut. Along the north face of the cut, the depth to the bottom of the pit is 20–25 feet; along the south face, the depth is 6–15 feet. The width of the cut from rim to rim averages 45–50 feet. The floor of the cut is relatively level; it measures 210 feet in length along the strike of the dike and averages 30 feet in width. A hundred and twenty feet from the west end of the cut, the south wall has been breached, and there is a cut 20 feet wide and 90 feet long running southward to the mine buildings. Tracks are laid in this cut, and it provides access for small ore cars. This cut is 12 feet below the floor of the main workings and is filled with water.

Stripping and trenching has been carried out on strike of the dike both to the east and west of the main cut, but the dike appears to pinch out along strike.

Geology

The country rock exposed on lot 23, concession XV, is interbanded pink hornblende granite gneiss and pink leuco-granite gneiss. These gneisses strike from N. 30° E. to N. 70° E. and dip 20°–60° SE. In the vicinity of the pit the granite gneisses strike N. 30°–50° E. and dip 20°–30° SE. Interbanded with these gneisses are flat-lying lenses of pink allanite-titanite granite pegmatite, very similar to those occurring on the Hatch property on lot 25, concession XV. These granite pegmatite stringers appear to be cut by the beryl-bearing granite pegmatite. Some layers of biotite schist occur in the granite gneiss; one such mass of biotite schist occurs in the south wall of the dike at the centre of the cut.

As shown in the accompanying sketch map of the property, the beryl-bearing granite pegmatite is exposed in the floor and north wall throughout the 245-foot length of the cut. The strike of the dike is N. 59° E., and it appears to dip vertically. The dike is irregular in shape; on the rim at the west end of the cut, it has a width of 4 feet and widens to 10 feet at the floor of the cut;[3] 50 feet eastward,

[1]H. V. Ellsworth, *Rare-element Minerals of Canada*, Geol. Surv. Can., Econ. Geol. Ser., No. 11, 1932, pp. 228–29.

[2]G. C. Hoffman, *Report of the Section of Chemistry and Mineralogy*, Geol. Surv. Can. (New Series), Vol. VIII, 1897, p. 14R.

[3]For convenience of reference, a base line was laid down along the floor of the cut, parallel to the dike strike, using the point on the floor of the cut at the west end as zero: these base line measurements are used in the following descriptions.

along strike, the dike widens to 34 feet and, at the 120-foot mark, again narrows to 10 feet; at 160 feet, it widens again to 32 feet and continues to have a width of 28–32 feet to the east end of the cut.

Thus, the dike is constricted at the centre and is divided into two pods that are quite different in structure and texture. The western pod shows pronounced zoning and coarse crystallization; the eastern pod is largely undifferentiated and relatively fine-grained, with average grain size from ½ to 1 inch. The primary zones present in the western pod are: (a) a central core of quartz; (b) an intermediate zone of microcline-perthite; and (c) a wall zone of medium to coarse-grained albite-quartz-microcline-perthite. Replacing these zones and cutting them irregularly is a later age of quartz-cleavelandite-tourmaline.

The quartz core extends from the 20-foot mark to the 100-foot mark and has a maximum width of 5 feet; it is composed of massive, milky to smoky, quartz. The microcline-perthite zone consists of massive, coarsely-crystallized, 1- to 3-

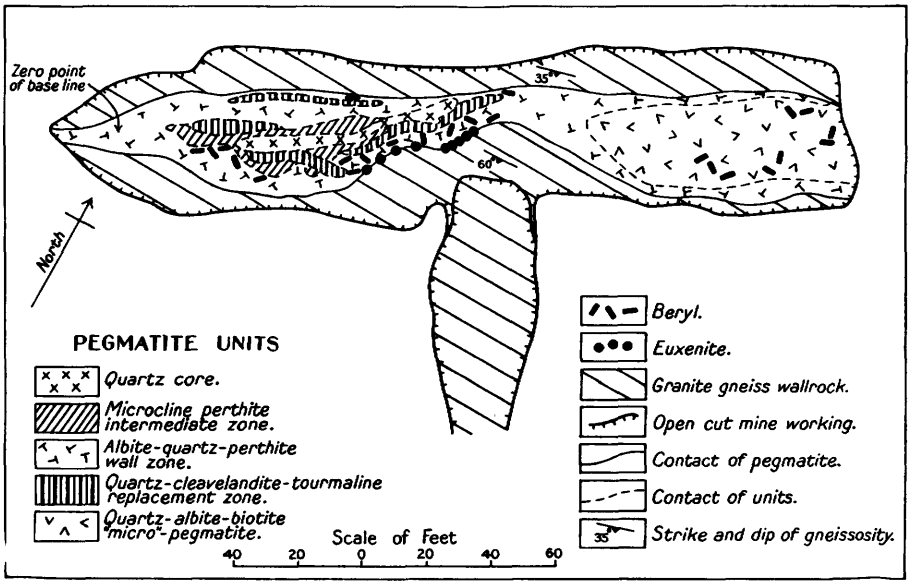


Figure 1 — Geological map of beryl pegmatite, lot 23, concession XV, Lyndoch township.

foot crystals of pink microcline-perthite and extends from the 20- to the 80-foot marks. This zone envelops the quartz core. In some places along the contact between the quartz and microcline-perthite zones, there is a narrow 1-inch band of ¼- to ½-inch tourmaline crystals in the border of the quartz zone. Stringers of quartz cut this band and penetrate the microcline-perthite zone, apparently indicating a later age for some of the quartz. The wall zone, which is most prominent in the western end of the dike, is medium-grained, being 1-inch to 1-foot grain size, and is composed predominantly of quartz, pink albite, and microcline-perthite. Beryl, biotite, muscovite, magnetite, allanite, and euxenite also occur in this zone. Cutting across, and replacing all three of these primary zones, is a secondary zone of quartz-tourmaline-cleavelandite. The cleavelandite and tourmaline occur in platy rosettes in the quartz and are up to 6 inches in diameter.

The east end of the dike, from the 120- to the 220-foot marks, is composed of only two zones. A wall zone, varying in width from 1 to 4 feet, composed of 1- to 6-inch crystals of pink albite, quartz, and microcline-perthite, with some biotite and magnetite, is usually present. The greater part of the dike is made up of a "fine-grained" or "micro"-pegmatite of 1-inch grain size, which has not differentiated into zones. Mineralogically it is composed predominantly of pink albite, microcline, quartz, biotite, beryl, muscovite, and magnetite.

Mineralogy

Beryl.—Well-formed, euhedral, six-sided, blue-green beryl crystals occur throughout the dike but are especially common in the south-wall zone adjacent to the intermediate zone of microcline-perthite. This band of beryl-rich albite-quartz rock extends from the 20- to the 120-foot mark and has a maximum width of about 10 feet. The beryl crystals are from 1 inch to 4 inches in diameter and up to 8 inches long. Beryl also occurs, as shown in the accompanying sketch map, at the east end of the dike in the "micro"-pegmatite. Here, however, instead of occurring in well-formed euhedral crystals, the small ½-inch crystals of beryl occur intergrown with quartz and feldspar interstitially and show no crystal form. This mode of occurrence lends support to the view that the east end of the dike cooled rapidly without allowing time for growth of good euhedral crystals. In his description of the property, H. V. Ellsworth[1] notes that:

> A few [beryl] crystals with well-developed terminations have been found, but they are exceptional. . . . . Some of the beryl crystals have been considerably bent without breaking, showing that the dyke has been subjected to severe stress.

The deposit was sampled by H. M. Butterfield[2] in June, 1943. He states:

> Beryl was seen pretty well throughout the floor of the quarry, but was badly scattered except in a zone 95 feet long and from 3 to 10 feet wide, which is fairly well mineralized with beryl varying from a quarter of an inch or less to 3 or 4 inches in diameter. It may be significant that this is at a constricted section of the dike. This area contains 932 square feet or 78 tons per vertical foot and is estimated to average 1.24 percent beryl or 0.130 percent BeO. At $12.00 per unit of BeO, the value in place would be $1.56 per ton, in U.S. funds, and the total beryl contained in each vertical foot would be 0.936 tons, which, estimating an average depth of 13 feet already removed from this part of the quarry, would account for 12 of the approximately 18 tons which have probably been taken out, leaving only 6 tons for the rest of the quarry. Of the total amount, probably not over 8 to 10 tons have been recovered as clean crystals, the balance being made up of beryl contained in the rock in the ore storage bin, which amounts to about 180 tons. A 250-pound sample from the bin assayed 6.82 percent beryl, but was probably slightly heavier than the average of the bin, which may be 5 to 6 percent.
>
> The area of the quarry floor is 7,040 square feet, and the average depth of rock removed is 16.3 feet, so that the total weight of rock excavated is 9,560 tons. From the above figures, it is apparent that whether the smaller richer area be taken, or the entire area of the quarry, the operation could not be carried on at a cost within the value of the contained beryl at the present price

As noted earlier, the current price for beryl is $38.50 to $40.50 per unit BeO, or over three times the 1943 price. This would give a value, in place, of $5.20 per ton for the beryl-rich zone.

An analysis of beryl from this property and partial analyses of beryl from this property and from lot 30, concession XV, are given on page 40.

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[1]H. V. Ellsworth, *op. cit.* p. 229.

[2]From a memorandum by H. M. Butterfield, *Beryl Deposits–Lyndoch Township*, published with the permission of the Metals Controller, Dept. of Munitions and Supply, Ottawa.

	Sample No. 1	Sample No. 2	Sample No. 3
	percent	percent	percent
BeO	14.38	13.41	12.51
SiO_2	64.40	64.34	62.94
Al_2O_3	18.08	16.82	17.18
Fe_2O_3	0.97	1.16	0.94
CaO	0.18		
MgO	0.33		
MnO	0.04		
K_2O	0.18		
Li_2O	0.18		
Na_2O	0.35		
H_2O	1.08		
Total	100.17		
Specific gravity	2.726		

Sample No. 1—Blue-green beryl from lot 23, concession XV, Lyndoch township, analyzed by H. C. Rickaby.[1]

Sample No. 2—Blue-green, glassy beryl from lot 23, concession XV, Lyndoch township; partial analysis by the Provincial Assayer, Ontario Department of Mines, 1951.

Sample No. 3—Asparagus-green, opaque, altered beryl from lot 30, concession XV, Lyndoch township; partial analysis by Provincial Assayer, Ontario Department of Mines, 1951.

Euxenite, var. lyndochite.—The rare element minerals lyndochite, columbite, monazite, cyrtolite, and allanite are recorded as occurring in this pegmatite. Lyndochite is the low-uranium end member of the euxenite group and was described from this locality by Ellsworth.[2] It is a titano-tantalo-columbite of rare earths, uranium, thorium, iron, and calcium. An analysis of this mineral is given on page 42. Ellsworth[3] described lyndochite as follows:

> The mineral is brilliant black *en masse*, reddish brown and translucent by strong illumination of thin edges or splinters or in a powder under the microscope. Powder, pale yellow; lustre, vitreous; perfect conchoidal fracture; cleavage, none; hardness, 6,5; sp.gr., 4.909 at 17.88 degrees; infusible.

Ellsworth's microscopic examination discloses that the lyndochite contains inclusions of columbite, and that the columbite has apparently been replaced by lyndochite.

Lyndochite and magnetite, intergrown, form a narrow border zone between the wall zone and the wall rock on the south side of the dike between the 80- and 110-foot marks.

Columbite.—No columbite in place was seen by the writer and must have been more common in the upper parts of the dike which have been mined out. Ellsworth[4] describes its occurrence as follows:

> Columbite occurs as thin, flat, disk-shaped masses, with concentric markings on cleavages or partings of feldspar. The masses may vary in size from less than an inch in diameter to as much as a foot or more across. The large ones are comparatively thin, seldom more than ½ inch thick, whereas the smaller ones less than an inch in diameter may be almost hemispherical.

[1] T. L. Walker and A. L. Parsons, *Beryl and Associated Minerals from Lyndoch Township*, Univ. Tor. Studies, 1927, p. 13.

[2] H. V. Ellsworth, *op. cit.*, p. 49.

[3] *Ibid.*, p. 229.

[4] *Ibid.*, p. 230.

Monazite.—Ellsworth[1] also reports that

> One rough wedge-shaped crystal [of monazite] about 2 inches square by ½ inch thick, and a few much smaller ones were found by the writer embedded in red microcline near a lyndochite crystal and a small cyrtolite mass. The monazite is a dull brown colour and has lost its transparency by alteration.

Cyrtolite.—Cyrtolite, a variety of zircon, is reported by Ellsworth to occur in masses up to the size of a man's fist. The writer noted numerous small zircons up to ¼ inch in size in albite feldspar along the north wall of the cut.

Columbian anatase.—A. D. Graham[2] has identified columbian anatase from this property by X-ray study.

Allanite.—Allanite occurs in vitreous, black, platy crystals with lyndochite in the border zone and in the north wall of the dike.

Microcline and microcline-perthite.—The intermediate zone is composed of coarsely crystalline pink microcline and microcline-perthite. Green amazonstone also occurs in the dike, and appears to be replaced by pink microcline microperthite.

Albite.—Pink, and mottled pink and white albite feldspar makes up a large part of the wall zone of the dike. In the "micro"-pegmatite of the eastern end of the dike, albite is the predominant feldspar. Platy curved sheaves of cleavelandite make up an important part of the late quartz-cleavelandite-tourmaline zone.

Quartz.—Both smoky and clear glassy quartz are present. There appear to be two ages of quartz, as indicated earlier.

Tourmaline.—Tourmaline in shiny black triangular prismatic crystals up to 1 inch in diameter and 6 inches in length occur with cleavelandite and quartz in the latest zones of the dike.

Biotite and muscovite.—Both biotite and muscovite occur, particularly in the east end of the dike, where books up to 2 inches in diameter occur. Some of the biotite is rimmed with muscovite.

Magnetite.—Magnetite is a common accessory in the dike and often occurs with euxenite.

Garnet.—Occasional crystals of reddish-brown garnet up to ½ inch were observed in feldspar.

Fluorite and apatite.—Massive purple fluorite and green glassy apatite up to ¼ inch occur with biotite and albite in the north wall of the dike at the east end. One occurrence noted by the writer was along the border of the dike adjacent to schlieren of mica schist.

The following table gives analyses of lyndochite and columbite from lot 23, concession XV, Lyndoch township:

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[1]H. V. Ellsworth, *op. cit.*, p. 230.

[2]A. D. Graham, by permission from his unpublished thesis for Master of Science Degree, *Mineralogy, Genesis, and Structure of Beryl Pegmatites, Lyndoch Township*, Queen's University, 1952.

	Sample No. 1	Sample No. 2	Sample No. 3
	percent	percent	percent
SiO_2	0.07	.....	1.28
TiO_2	16.39	.....	5.19
BeO	0.13	.....	.....
Al_2O_3			
Fe_2O_3	1.32	.....	.....
FeO	0.77	11.14	10.90
CuO	.....	0.03	.....
CaO	4.86	.....	0.15
MgO	0.13	.....	.....
MnO	0.59	10.22	10.24
ZrO_2	0.04	.....	.....
SnO_2	0.12	0.92	0.56
Cb_2O_5	41.43	75.75	55.79
Ta_2O_5	3.84		15.21
PbO	0.37	.....	.....
UO_2	0.67	.....	.....
UO_3	0.04	.....	.....
ThO_2	4.95	.....	.....
$(Ce,La,Di)_2O_3$	4.34	.....	.....
$(Yt,Er)_2O_3$	18.22	.....	.....
Rare earths	.....	2.00	9.82
H_2O (—110°)	0.06	.....	.....
H_2O (+110°)	1.90	.....	.....
Ignition loss	(1.76)	.....	.....
Total	100.24	100.06	100.14
Specific gravity	4.909	.....	5.431

Sample No. 1—Lyndochite, lot 23, concession XV, Lyndoch township. Analyst, H. V. Ellsworth[1]; analysis No. XXVIII.

Sample No. 2—Columbite, lot 23, concession XV, Lyndoch township. H. V. Ellsworth,[2] Analyst, W. L. Goodwin, analysis XII.

Sample No. 3—Columbite, lot 23, concession XV, Lyndoch township. H. V. Ellsworth,[3] analysis No. XIII. Analyst, E. W. Todd. Specific gravity, T. L. Walker and A. L. Parsons.[4]

Concession XV, Lots 30 and 31 (Canadian Beryllium Mines and Alloys, Limited)

Location and Access

A second beryl-bearing, granite pegmatite worked by Canadian Beryllium Mines and Alloys, Limited, for beryl and feldspar is located on lots 30 and 31, concession XV. This property can be reached by road from Quadeville by driving west 1½ miles on the Quadeville-Palmer Rapids road, turning north off the road at the west end of Eneas (Cameron) Lake, and proceeding 1¼ miles by gravel road to the mine property.

History and Development

The occurrence of beryl and radioactive minerals in this granite pegmatite dike is described by Ellsworth.[5] The dike was opened up in 1935 and 1936 by Renfrew Minerals, Limited, and 675 tons of feldspar were produced. During this period of development the east and central workings, shown on the accompanying

[1]H. V. Ellsworth, *Rare-element Minerals of Canada*, Geol. Surv. Can., Econ. Geol. Ser., No. 11, 1932, p. 264.
[2]*Ibid.*, p. 260.
[3]*Ibid.*, p. 260.
[4]T. L. Walker and A. L. Parsons, *Contributions to Canadian Mineralogy*, Univ. Toronto Press, Geol. Ser. No. 16. 1934, p. 34.
[5]H. V. Ellsworth, *op. cit.*, p. 230.

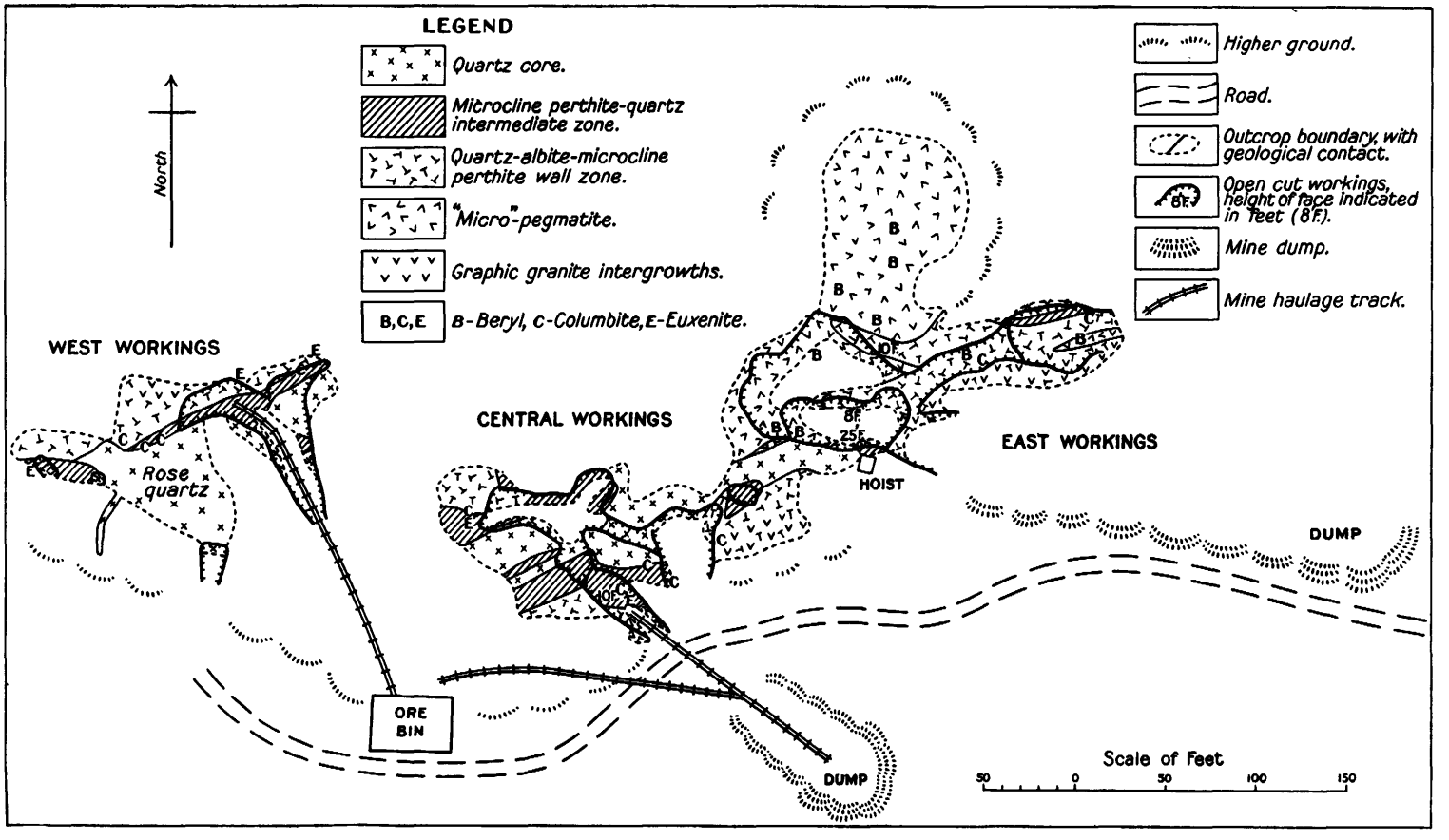


Figure 2 — Geological Map of Beryl Pegmatite, Lot 30, Concession XV, Lyndoch Township.

sketch map of the property, were opened. In 1950, 57,100 pounds of beryl concentrates, valued at $7,882, were sold from the ore stockpile from this property. In 1948 and 1949 Canadian Beryllium Mines and Alloys, Limited, opened the west workings and produced approximately 300 tons of feldspar, which is stockpiled at the property.

Present Workings

The west workings consists of a T-shaped cut, 8 feet deep, extending 75 feet in a north-south direction and 80 feet in an east-west direction. No beryl occurs in this workings.

The central workings, 100 feet to the east, is irregular in shape, as shown in the accompanying sketch, and extends for 130 feet in an east-west direction and 80 feet in a north-south direction.

The east workings, which lies 50 feet to the northeast of the central workings has a length of 200 feet in an east-west direction and 75 feet in a north-south direction. The main pit, at the western end of this workings, has a face of 25 feet. The main deposit of beryl occurred in this cut. A small boom derrick used for hoisting is mounted on the south side of this workings.

Geology

The beryl-bearing granite pegmatite is exposed on a low hill surrounded by spruce-tamarack-cedar swamp. The pegmatite is exposed for a length of 600 feet in an east-west direction and has an exposed width of 100 to 150 feet. The walls of the pegmatite are not exposed, so its size and attitude are not known. At the eastern end of the workings, a coarse-grained granite or "micro"-pegmatite is exposed on a knoll just north of the workings. This may be the footwall country rock of the dike; if so, it appears to be closely associated in age and genesis with the pegmatite, as it is similar mineralogically and contains interstitial anhedral beryl in portions of it. Patches of this rock are pegmatitic. It is very similar to the "micro"-pegmatite occurring at the east end of the dike on lot 23 and may represent an undifferentiated facies of the pegmatite. The contact between this "micro"-pegmatite and the mineralogically similar coarser facies of the pegmatite is indefinite.

The pegmatite appears to strike approximately N. 70° E. and to form a flat sheet, dipping gently to the south. Since the wall rock contacts are not exposed, it is difficult to determine the true structural picture, and this estimate of its attitude is based on the trend of zones in the pegmatite, as shown in Figure 2.

There are three recognizable zones in the pegmatite: (a) an inner zone or core of massive glassy white, smoky, or rose quartz; (b) an intermediate zone of pink microcline-perthite feldspar with some quartz; and (c) an outer zone of albite and microcline-perthite, with quartz. At the western end of the property the pegmatite is very coarsely crystalline. One area of massive, white to rose quartz measures 75 by 30 feet. Before mining began at the west workings, the writer noted a single crystal of pink microcline-perthite measuring approximately 20 by 8 by 6 feet, containing perhaps 80 tons of feldspar. In the outer zone there is some graphic intergrowth of feldspar and quartz. In the west workings, quartz and feldspar are the main constituents, and impurities are rare. A little sericite, kaolin, columbite, and magnetite were observed.

In the central workings, the quartz, albite, and microcline-perthite do not show such coarse crystallization. Some graphic granite occurs on the south side of this workings. Euxenite and magnetite are common.

In the east workings, beryl crystals are exposed in the feldspar on the south

wall of the main pit, in the floor of this pit, and at the other places indicated on the sketch map. One beryl crystal from this pit was reported by the foreman to have measured 8 feet in length with a diameter of 18 inches. Radiating plates of columbite-tantalite occur in pink microcline-perthite along the south face of these cuts, adjacent to a zone of graphic granite pegmatite, which forms the outer or hanging-wall zone of the pegmatite in this section. On the north side of the east workings, graphic granite and "micro"-pegmatite consisting of quartz, albite, and microcline in ½- to 2-inch crystals are exposed. Hornblende and magnetite are common in the east workings.

Mineralogy

The following minerals were found in this pegmatite: white and pink albite; pink microcline-perthite; rose, smoky, and white quartz; hornblende; biotite; muscovite; magnetite; columbite-tantalite; euxenite; beryl; fluorite; cyrtolite; molybdenite; specularite; pyrite; and calcite.

Beryl.—Occurrences of beryl, in place, are confined to the east workings. Some beryl crystals up to 8 inches in diameter were seen, but most of the crystals now exposed are about 2 inches in diameter. An analysis of the opaque, asparagus-green beryl from this locality is given in a previous section. Beryl occurring in the "micro"-pegmatite is anhedral and apparently interstitial to quartz and feldspar.

Columbite.—Plates of columbite up to 3 inches in diameter and ¼ inch in width occur in radiating clusters in pink microcline-perthite in the west, central, and east workings. Columbite sometimes occurs with magnetite.

Euxenite.—Dark-brown to black euxenite with a waxy resinous lustre occurs with magnetite in pink microcline-perthite.

Biotite, muscovite, hornblende.—Hornblende and biotite occur in the more sodic zone of the central and east workings. Biotite is common in the "micro"-pegmatite. Sericite occurs on slickensided slip faces of feldspar in the east workings.

Fluorite.—Fluorite occurs in the central workings, in vugs in potash and soda spar associated with euxenite and bladed columbite.

Other Deposits

In addition to the occurrences of beryl on lots 23 and 30, concession XV, Lyndoch township, other occurrences have been reported in the area, particularly on Casey Hill, lots 19–22, and lot 25, concession XV; on the farm of T. O'Brien, lot 31, concession XIV; and south of Eneas (Cameron) Lake. Careful examination of these areas was made, but no beryl occurrences were discovered. A considerable amount of exploration work was done on granite pegmatites on Casey Hill, east of the occurrence on lot 23. Six pits were examined in pegmatite on lots 19, 20, and 21, concession XV, but no beryl was seen. No beryl occurs in the workings on the crest of Casey Hill on lot 25, concession XV. These workings are described under the section on rare element and radioactive minerals on page 83.

Summary

The occurrence of beryl in granite pegmatites on lots 23 and 30, concession XV, Lyndoch township, should encourage further prospecting for beryl-bearing granite pegmatites in the area, particularly along the south margin of the Foy-

mount massif. Overburden is deep, and outcrop in the area between lots 23 and 30 is very scarce, making surface prospecting difficult. In the two dikes in which beryl occurs, there has been strong zoning, coarse crystallization, and segregation of the mineral constituents. None of the graphic granite or undifferentiated pegmatite examined in the area contained beryl. However, beryl did occur in the medium-grained "micro"-pegmatite facies of the zoned dikes, and careful examination of outcrops of any fresh albite granite should be made for indications of beryl as a possible clue to the occurrence of other beryl-bearing dikes.

Copper

LYNDOCH TOWNSHIP

Concession IV, Lot 30

A small showing of chalcopyrite was examined by the writer on the farm of E. Washinta, lot 30, concession IV. A shallow pit 3 by 3 by 2 feet deep was excavated in quartz-mica paragneiss. A few irregular ¼-inch wide stringers of chalcopyrite occur in the paragneiss.

Corundum

The mineral corundum ranks second only to diamond in hardness and was widely used as an abrasive until it was gradually supplanted by the artificial abrasives, silicon carbide, and alumina. During World War II when there was a pressing demand for grain corundum for snagging wheels, used in the production of forgings and castings, and for corundum flour, used in grinding optical lenses, this mineral became strategically important. The United States, the largest consumer of corundum, has used from 3,000 to 5,000 tons annually for optical flour and for the manufacture of snagging wheels. This corundum is largely imported from South Africa. During the period from 1900 to 1920, there was a large production of corundum in Ontario, from the Craigmont, Jewellville, and Burgess mines.

CHARACTERISTICS AND PROPERTIES

Corundum has the formula Al_2O_3 and consists of 52.9 percent aluminium and 47.1 percent oxygen, together with small amounts of such impurities as silica, iron, lime, magnesia, and water. Analyses of corundum from Craigmont, given by A. E. Barlow[1], are as follows:

	B	F	G
SiO_2	none	.....	0.07 (av.)
Al_2O_3 (diff.)	95.58	96.26	97.27
$FeO+Fe_2O_3$	2.10	0.36	0.32
CaO	0.48	.....	.....
MgO	1.00	.....	.....
H_2O	0.84	1.93	.....
	100.00		

B—Brown corundum from corundum pegmatite, Craigmont. Analysis by M. F. Connor.
F—Corundum from Craigmont. Analysis by W. L. Goodwin.
G—Corundum from Craigmont. Analysis by J. W. Wells.

[1]A. E. Barlow, *Corundum*, Geol. Surv. Can., Mem. 57, 1915, pp. 110–11.

Corundum occurs in barrel-shaped, hexagonal crystals, sometimes tapered at the ends, and in massive subhedral crystalline masses. Corundum found in the Brudenell-Raglan area may be brown, bronze, greenish-bronze, blue, blue-grey, grey, or white in colour, and often shows zonal structure. Lustre is vitreous to adamantine. Corundum has an uneven conchoidal fracture and breaks to form sharp angular fragments. It has excellent basal parting, which resembles good basal cleavage. On these parting planes a cross-hatch pattern of striations is often seen. The hardness of corundum is 9, and its specific gravity ranges from 3.95 to 4.10. Emery is granular corundum that is intimately intermixed with magnetite. Some emery occurs in Brudenell township.

USES AND SPECIFICATIONS

Corundum was formerly widely used for many types of abrasive, but, as noted above, the present use of corundum is restricted to specialized uses, such as snagging wheels and optical flour in which it surpasses artificial corundum. In snagging wheels the natural corundum gives a higher rate of production than artificial abrasive because of the way in which natural corundum grains break down to expose new sharp, angular, cutting edges as the wheels wear. Artificial abrasive grains, although tougher, wear down to smooth, rounded edges and lose their bite. For optical grinding, corundum flour is superior for the same reason.

The following information on uses for corundum is reprinted from U. S. Bureau of Mines Information Circular:[1]

> The coarse grade products are made into grinding wheels, especially snagging wheels for malleable iron and steel. These wheels are employed in grinding and processing hard steels, in the grinding and manufacture of shells, in the manufacture of lathe tools and high speed tools, and in making boring tools and cutters, gear differentials, carburetors, surgical instruments, and similar high grade products usable in or applicable to industrial and war activity. Snagging wheels are particularly useful at the present time in the production of forgings and castings for tanks and other military equipment. Substitution of manufactured abrasive wheels in this use, it is claimed, would reduce efficiency as much as 30 percent. Snagging wheels require a comparatively coarse-grain corundum—about 12- to 24-mesh. Before the war, a considerable quantity of corundum was manufactured into so-called intermediate and fine wheels employed in finishing various machine parts largely non-military in character. The grain sizes in intermediate wheels ranged from about 36- to 60-mesh and in the fine wheels from 60-mesh up to around 150-mesh.
>
> During the war period, however, the use of corundum has been restricted to its most essential applications in the conduct of war activities, that is, snagging wheels and optical uses. As indicated above, the coarse-grain products are made into snagging wheels. The finer-grain material (powder or flour) is consumed by grinders of optical precision instruments for military, naval or industrial use and for ophthalmic lenses. Applications include range finders, gun sights, searchlight mirrors, field glasses, periscopes, torpedo-tube sights, camera lenses, and other products requiring a high degree of precision and refinement . . . Corundum is admirably adapted for abrasive use, particularly because of its hardness, angular to conchoidal fracture, and sharp edges which break down readily, continually exposing fresh cutting surfaces.
>
> Competition from artificial abrasives, such as silicon carbide (carborundum) and aluminium oxide, is severe. Except for certain rather specialized uses, the industry has tended to employ the artificial product because of its more uniform and readily controlled composition. For these specialized purposes, however, technical methods of operations and procedure have been developed to a remarkable degree. Complete change-over to the artificial abrasive has not been feasible. Such an eventuality would involve considerable change in shop routine, a long period of necessary technical investigation, and probably a high loss in unsatisfactory products.

There are no definite specifications for corundum. The buyers evaluate corundum by sample, according to its purity, size of crystal, hardness, and toughness. To be of maximum value concentrates should contain no material finer than about 10 mesh and should test better than 90 percent clean, free, corundum. Magnetic contamination is objectionable, as is any material which will fuse at temperatures below 2,700° F.

[1]Robert W. Metcalf, *Corundum*, U. S. Bur. Mines, 1944, I.C. 7295, p. 10.

The South African government grades their crystal corundum production as follows:

A—not less than 92 percent Al_2O_3.
B—90 to 92 percent Al_2O_3.
C—85 to 90 percent Al_2O_3.
1—½ inch in diameter and over.
2—¼ to ½ inch in diameter.
3—⅛ to ¼ inch in diameter.

Most of the imports to the United States from Africa are A1, A2, and B3 grades.

GEOLOGICAL MODE OF OCCURRENCE

In the Brudenell-Raglan area, corundum occurs in the nepheline and scapolite gneisses, and in the pink and grey alkaline syenites and their pegmatitic equivalents. The main production of corundum from Craigmont, Burgess, and Jewellville mines came from corundum syenite and corundum syenite-pegmatite. At the Klondike workings there is a considerable amount of corundum in the nepheline-rich rocks, and there was some production from this source.

The mode of occurrence of corundum at the Craigmont workings is typical of its occurrence throughout the area. Here there is a sequence of gneissic rocks; predominantly pink and buff leuco-syenite and hornblende syenite, with some interbanded oligoclase-andesine gneiss; red granite (gneiss); yellow-brown hornblende-titanite syenite; and grey scapolite gneiss. There are also some bands of amphibolite and biotite-rich gneiss. All these are intruded by syenite and granite pegmatite. Corundum syenite, in which the corundum occurs in crystals ranging from microscopic size up to 1 inch in diameter, forms narrow bands up to 10 feet wide in the syenitic gneiss sequence. These bands thin out and generally do not persist along strike. The richest corundum deposits are in syenite-pegmatite pods and lenses which often lie parallel to the gneissosity of the country rock. These corundum-rich pegmatite lenses range from 1 to 15 feet in width, and some of the more persistent zones can be traced for a 100 feet or more. The corundum crystals range in size from 1 inch to over 8 inches in diameter. One corundum crystal weighing 60 pounds is reported by H. E. T. Haultain[1] to have been taken from the Craigmont workings.

GRADE AND MINING

The corundum deposits at Craigmont, Jewellville, and elsewhere in the area, were mined by a series of open cuts. At Craigmont and Klondike there are over 30 open cuts, the largest of which has a length of 500 feet, a width of 100 feet, and a maximum face of 50 feet. V. L. Eardley-Wilmot[2] gives the following description of mining methods at Craigmont:

> The ore was extracted by driving in a number of large open cuts in the hillside. A series of about 20 holes, 14 or 15 feet deep, were electrically fired and the blocks so obtained were further broken down by dynamite to suitable sizes for crushing. As the ore was not rich enough for straight milling, rough hand sorting was resorted to in order to eliminate the waste and lowest grade, which resulted in about a 20 per cent mill feed. The ore was taken from the various quarry faces by teams to the nearest tramway and then conveyed to the top of the mill building in 4-ton ore cars, each car being weighed before dumping into the storage bins.

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[1]H. E. T. Haultain, *Corundum at Craigmont*, Can. Min. Jour., Vol. I (new series), 1907, No. 10, pp. 291–96.

[2]V. L. Eardley-Wilmot, "Corundum and Diamond," *Abrasives Part II*, Mines Branch, Can. Dept. Mines, No. 675, 1927, p. 16.

During the operation of the Craig mine, 321,252 tons of corundum ore milled yielded 17,791 tons of grain corundum, a recovery of 5.55 percent. About 3 percent corundum remained in the tailing, so the grade of ore milled apparently averaged 8.5 percent.

MILLING

Because of its high specific gravity, 3.95–4.1, the corundum is readily separated from its feldspathic gangue by gravity concentration. In the early mills, concentration was accomplished by jigs and tables. The flow sheet for the 200-ton-per-day Craigmont mill, which operated from 1904 to 1913, is given by Eardley-Wilmot.[1] Primary crushing was done by Blake jaw crushers, and secondary crushing by rolls. The crushed ore was sized by trommel screens, the coarser sizes being jigged in Hartz jigs and the finer sizes concentrated on Wilfley and Overstrom tables. The concentrates from this primary concentration mill, averaging 55 percent corundum, were sent to the grading and finishing mill, where it was dried and magnetite removed by magnetic separation. The product was sized into seven sizes and passed over air jigs; final concentration was completed on Wilfley tables.

In 1944, Wartime Metals Corporation, a government agency, built a tailings re-treatment plant at Craigmont. The tailings were screened through a 20-mesh screen, and the oversize reground in a rod mill. The products were classified in a 5-foot Dorr classifier, sized in a 6-pocket Fahrenwold sizer, and concentrated on 13 Wilfley tables. Middlings from the tables were reclassified and reconcentrated on 3 Wilfley tables. The corundum concentrates were run through a magnetic separator, dewatered, dried, dry-screened, and bagged.[2]

BRUDENELL TOWNSHIP

Concession IV, Lot 34 (Rosenthal Pit)

The Rosenthal corundum pit is located at the northeast corner of lot 34, concession IV, Brudenell township, 1,000 feet east of the Brudenell township boundary, just south of the road between concessions IV and V. The main part of the pit is 50 feet long in a north-south direction, 25 feet wide, with a 12-foot face on the east side and a 5-foot face on the south side. A shallow bench extends a farther 30 feet to the south with an east face of 4–6 feet and a south face 3 feet in height.

The pit is of interest geologically in that it exposes the following rock types: grey corundum leuco-syenite gneiss and pegmatite; pink corundum leuco-syenite gneiss and pegmatite; pink and white leuco-syenite gneiss; pink leuco-syenite, with large pink albite porphyroblasts up to 2 inches; hornblende-biotite gneiss and amphibolite; pink allanite granite-pegmatite; and yellow-brown hornblende syenite and granite-pegmatite.

The pink and white leuco-syenite gneisses and corundum syenite gneisses strike north-south and dip gently 10° E. The pink leuco-syenites appear to replace the white leuco-syenites, which occur as relic patches and bands in the east face of the cut. Pink allanite granite-pegmatite cuts these earlier pink and white syenite gneisses and is in turn cut by yellow-brown hornblende syenite and granite-pegmatite, which carries abundant titanite. The lenses and schlieren of biotite amphibolite occur interbanded with the layered leuco-syenite gneisses. On the east wall of the cut near the bottom of the main pit is a 2-foot wide zone of

[1] V. L. Eardley-Wilmot, *op. cit.* pp. 28, 29.

[2] For a more detailed description see: A. C. Roach. *Re-Treatment of Corundum-Bearing Tailings at Craigmont*, Trans. Can. Inst. Min. Met., Vol. XLIX, 1946, pp. 636–64.

grey and pink corundum syenite gneiss traceable for a length of 25 feet. A second layer of grey corundum syenite gneiss occurs in the east wall to the south and above the previous one. It is 12–18 inches wide and traceable for 20 feet. The corundum crystals range from ⅛ to 1 inch in size and constitute 3–5 percent of these bands.

Just to the southwest of the main pit a very rich patch of corundum pegmatite, 6 by 3 feet, is exposed on the outcrop. It runs 50–75 percent corundum and is a typical example of the small erratic-rich corundum pegmatite patches that occur in places in the corundum-bearing series.

Concession V, Lot 24

L. M. Moyd[1] has reported a small occurrence of corundum in a sheared, altered zone in hybrid syenitic gneisses in the extreme northwest corner of lot 24, concession V, Brudenell township. The writer searched for this occurrence but was unable to find it. There is an occurrence of corundum just north of the concession line in lot 24, concession VI.

Concession V, Lot 34 (Gutz Farm)

A small corundum pit, 40 by 40 by 10 feet deep, was opened in the southwest corner of lot 34, concession V, on the farm of Richard Gutz just north of Rosenthal. The pit is 200 feet east of the Rosenthal-Rockingham road and 800 feet north of the south boundary of the lot. Corundum from this pit was shipped to the mill at Jewellville.

In the pit, pink and white mottled leuco-syenite gneisses, amphibolite, and corundum syenite-pegmatite are exposed. The gneisses strike N. 15° W. and dip 25° E. The syenitic zone exposed in this pit has a thickness of approximately 10 feet. Corundum crystals from ½ to 5 inches in diameter occur in the white syenite pegmatite in irregular patches and zones. Corundum-bearing pegmatite lenses up to 5 feet long and 2 feet wide occur in the west end of the pit, and one band, 12 feet long and 1 foot thick, occurs on the south side of the pit. To the south the ground is covered with overburden, but this corundum-bearing zone may extend through to the Rosenthal corundum pit in lot 34, concession IV, a distance of 1,000 feet to the southeast.

Two chains to the north of the Gutz corundum pit there is an exposure of nepheline-albite-corundum pegmatite. The corundum crystals are grey-brown in colour and occur in long, slender, tapered crystals, 3–6 inches in length and up to 1 inch in diameter. Sodalite, cancrinite, and muscovite mica occur as accessories.

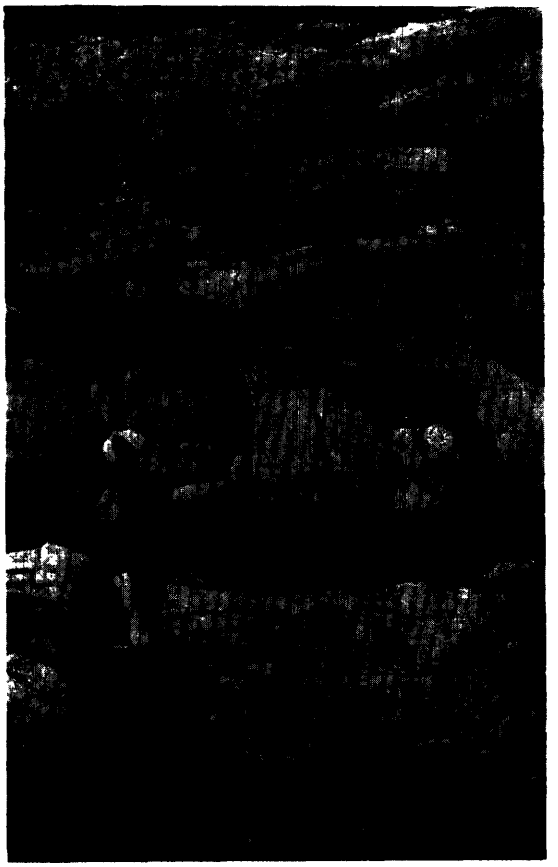
One hundred feet to the north, and separated from the nepheline-corundum pegmatite by a covered interval, is an outcropping ledge of pink muscovite-corundum syenite that grades along strike into grey nepheline-albite syenite within a distance of 20–40 feet. This nepheline-bearing band has a thickness of 15 feet and can be traced in a northwesterly direction for 150 feet. Analyses of the pink muscovite-corundum syenite, the white nepheline-albite gneiss, and the intermediate, hybrid hydronephelite, syenite gneiss are given in the table on page 98.

On the north half of this lot another narrow band of pink corundum syenite occurs interbanded with white nepheline-albite gneiss and amphibolite. Some corundum occurs in the nepheline gneiss, but the corundum content is too low, and the occurrences too small and scattered, to be of economic interest.

[1]L. M. Moyd, Private report on nepheline and corundum occurrences in eastern Ontario for the Frobisher Exploration Company, Limited.

Concession VI, Lot 7

There is an occurrence of corundum at the west end of a small lake in lot 7, concession VI, southeastern Brudenell township. A band of grey biotite-corundum syenite gneiss, 3–5 feet in width, occurs interbanded with crystalline limestone. Bluish corundum crystals up to 1½ inches long and irregular grains of corundum make up about 5 percent of the rock. The band is exposed for a length of 10 feet.



ROSENTHAL CORUNDUM PIT

A view of the east wall of Rosenthal corundum pit showing massive pink leuco-syenite replacing pink and grey corundum syenite gneiss. Immediately above and below the 2-foot band of pink leuco-syenite, indicated by A. D. Graham, there are narrow zones of corundum-rich material, in mottled pink and buff syenite gneiss.

Concession VI, Lot 24

A small occurrence of corundum in crystals of ¼-inch diameter occurs in a field a few chains north of the concession road in lot 24, concession VI. The corundum is in mottled pink and white syenite gneiss. The corundum-syenite gneiss is interbanded with amphibolite and crystalline limestone. This occurrence of corundum is of no economic significance.

Concession VII, Lot 20

An occurrence of corundum southeast of the east end of Charlotte Lake is described by Moyd[1] as follows:

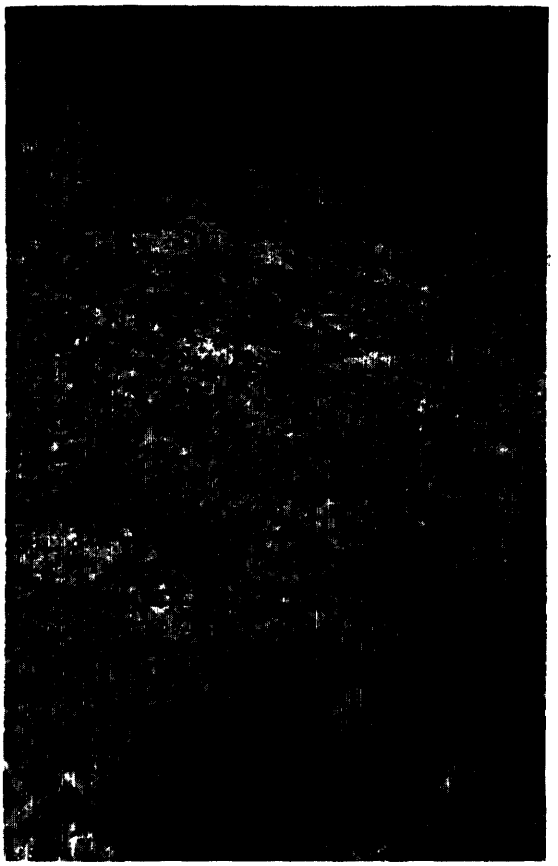
[1]L. M. Moyd, *op. cit.*

Corundum is found in several small outcrops of syenitized and distorted dark rocks, probably highly altered limestones. The corundum is seen as high-weathering knobs up to 2 inches in diameter, but is very patchy in distribution.

Concession VII, Lot 34 (Reid Lake)

The occurrence of corundum south of Reid Lake on lot 34, concession VII, was first noted by Miller.[1]

At the south end of Reid Lake two bands of nepheline-scapolite gneiss, trending north-south, cross the Rosenthal-Rockingham road. In the east band there is a small occurrence of corundum about 100 feet north of the road. Corundum



Corundum crystals standing up above nepheline and albite in the nepheline-albite-corundum gneiss at Reid Lake.

grains, intimately intergrown with magnetite, occur in masses ½–2 inches in diameter in a nepheline-albite gneiss. The corundum-magnetite aggregates are mantled by nepheline. The corundum crystals make up 10 percent of a small outcrop of 6 by 10 feet. A small amount of corundum occurs in grey nepheline-albite gneiss on the road 100 feet to the south of the outcrop described above. A third small occurrence was found south of the road, 300 feet west of the latter exposure.

[1]W. G. Miller, *Economic Geology of Eastern Ontario: Corundum and other Minerals*, Ont. Bur. Mines, Vol. VII, 1898, pt. 3, pp. 221–22.

Concession X, Lot 20

A small occurrence of grey corundum crystals, up to ¼ inch in diameter, was noted in a grey muscovite-biotite syenite gneiss, which outcrops on a small island in Gorman Lake; it is not of commercial significance. This corundum-bearing alkaline syenite appears to be an extension of the white alkaline syenite that outcrops west of Gorman Lake.

Range B, North, Lot 279

A small outcrop, 12 by 6 feet in size, exposed ⅜ mile north of Brudenell church in northern Brudenell township, is composed of rusty corundum syenite-pegmatite. Corundum crystals up to ½ inch in diameter occur, sparsely distributed, across the outcrop, which is interbanded with white alkaline syenite gneiss. The occurrence is too small to be of economic importance.

LYNDOCH TOWNSHIP

Concession XV, Lots 13 and 14

A small band of pink corundum syenite and syenite-pegmatite extends in an east-west direction just north of a small lake that lies a few chains northwest of the house, on the farm of Wesley Kargus. Over a length of 700 feet the writer noted a few small occurrences of pink corundum syenite-pegmatite and pink corundum syenite associated with pink and white leuco-syenite gneiss and granite pegmatite. Corundum is rare, and the occurrences are of mineralogic interest only. The largest corundum crystals noted were 1 inch in size and occurred in patches of pink syenite-pegmatite in the usual irregular spotty distribution characteristic of the corundum pegmatite showings. The pink and white syenite gneisses contain bands of amphibolite.

RADCLIFFE TOWNSHIP

Concession I, Lot 21

W. G. Miller[1] noted an occurrence of corundum on lot 21, concession I, Radcliffe township. The outcrops are said to strike north-northeast and parallel the strike of the main corundum belt to the southeast. The narrow syenite band lies between two large areas of granite gneiss. The corundum-bearing rock is pink muscovite leuco-syenite.

Concession I, Lot 29

In a field at the north end of lot 29, concession I, near the lot 28 boundary, there are open cuts that expose corundum-bearing syenite and pegmatite. The workings trend N. 75° W. and have a total length of 400 feet. The main cut has a maximum width of 25 feet, and its depth ranges from 6 to 15 feet; it consists of three pits separated by rock pillars. The country rock is a complex of interbanded pink and grey syenite gneisses, syenite-pegmatite, yellow-brown scapolite gneiss, and hornblende amphibolite.

In the most easterly of the three pits, the gneissic rocks strike N. 70° W. and dip 40° S. Pink aplitic leuco-syenite and pink aplitic hornblende syenite gneiss with pink feldspar porphyroblasts, are interbanded with leucocratic pink and white variegated (mottled) syenite, typical of the corundum-bearing facies in the area. Relic patches of grey and white albitite occur surrounded by pink leuco-

[1]Willet G. Miller, *Corundum and Other Minerals*, Ont. Bur. Mines, Vol. VIII, 1899, pt. 2, pp. 223–24.

syenite. The white syenite facies contain yellowish-bronze corundum crystals and rare sulphides. Grey and yellowish scapolite gneisses are also present and are cut by pink leuco-syenite and hornblende syenite pegmatite. Corundum occurs both in the pink and grey syenite facies.

The two westerly pits show the same syenitic sequence. Seams of yellow scapolite-rich gneiss, containing aggregates of white sericite, possibly after corundum, occur in the variegated syenite sequence. Relic patches of altered corundum closely associated with 3 to 4-inch clots of hornblende occur in the west wall of these cuts. Veinlets of hornblende and calcite, with biotite up to 3 inches in size, were also observed.

The west pit measures 120 by 15 by 15 feet deep; the central pit, separated from the west pit by a 10-foot pillar, measures 100 by 15 feet and has a depth of 4–12 feet; the east pit is 30 feet from the central pit and measures 80 feet by 15 feet by 15 feet deep.

The maximum width of the corundum-bearing zone is 5 feet, as exposed in the east walls of the east and central pits. The distribution of corundum is somewhat irregular but may average 2–5 percent. The adjacent area is strongly folded, and the corundum zone cannot be traced beyond the pits.

Concession I, Lot 31

There is a corundum cut on the farm of August Michaelis, lot 31, concession I, Radcliffe township. The cut is 50 feet east of the lot 30 boundary, 1,800 feet north of the concession road. The cut is 60 feet long, 15 feet wide, 6 to 10 feet deep, and is water-filled.

The rocks exposed in the pit consist of interbanded pink and white variegated leuco-syenite with abundant accessory magnetite, pink leuco-syenite, and white corundum syenite. These syenite gneisses strike from east to northwest by west and dip steeply to the south. Corundum occurs widely scattered in the pink and white syenite gneisses and is often mantled by muscovite. Most of the corundum crystals average ¼ to ⅜ inch in size with very few over 1 inch. The corundum bands are from 1 to 2 feet in width and can be traced throughout the pit. The grade is low, probably not running over 2 or 3 percent. The corundum syenite band passes into granite gneiss and pegmatite on strike. The occurrence is small and of little commercial interest.

Concession II, Lot 31

A small occurrence of corundum was noted on the farm of Julius Schroeder, lot 31, concession II, Radcliffe township, 1,200 feet south of the farm buildings.

Bronze corundum crystals, ⅛ to ½ inch in diameter, occur in pink leuco-syenite gneiss with pink and white mottling. The pink syenite is interbanded with hornblende syenite and hornblende-biotite granite gneiss and is cut by pink granite and syenite-pegmatites. The occurrence is on the northwest slope of a hill at the south edge of cleared fields. Outcrop is abundant on the hill but only one small patch of corundum-bearing rock was observed. The corundum facies grades into syenite gneiss with no corundum along strike. The gneisses strike N. 45° E. and dip 25° S. J. Satterly[1] states that:

> The [corundum] zone is from 10 to 15 feet thick and was traced for 150 feet along its strike. In it the corundum occurs as grains or crystals from an eighth of an inch to half an inch across in several bands from 1 to 12 inches wide, forming 1 per cent in these bands.
>
> The occurrence is of no economic interest.

[1] J. Satterly, *Mineral Occurrences in the Renfrew Area*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 3, p. 31.

RAGLAN TOWNSHIP

Concession XIV, Lot 15

A small outcrop of corundum syenite-pegmatite, consisting of coarse-grained albite feldspar, corundum, and tourmaline, is exposed on the side of a hill on the farm of John Buderick, lot 15, concession XIV, Raglan township. The outcrop measures 10 by 15 feet and trends N. 60° W. The pegmatite is completely surrounded by crystalline limestone. The occurrence is of mineralogic interest only. Trenching along strike has exposed limestone, and there does not appear to be any continuation of the band.

Concessions XIV and XV, Lots 20, 21, and 22

Three small occurrences of corundum are found on the south dip slope of a ridge of syenitic gneisses running across lots 20, 21, and 22, concessions XIV and XV, Raglan township.,

The westerly occurrence is an outcrop measuring 20 by 15 feet, in which ½-inch corundum crystals occur in pink muscovite-biotite syenite gneiss interbanded with amphibolite and granite gneiss. The gneisses strike N. 15°–20° E. The percentage of corundum is small, and the occurrence is not of commercial size or grade. Some pink magnetite-muscovite-corundum leuco-syenite also occurs interbanded with the corundum-biotite syenite facies.

The easterly band of corundum syenite gneisses can be traced discontinuously for 450 feet along the dip slope of the hill. The band has a true thickness of about 20 feet. Corundum crystals occur locally concentrated in grey muscovite-biotite syenite gneiss and in pink muscovite-magnetite syenite gneiss similar in character to the rocks in the westerly exposure. Associated rocks are biotite granite gneiss, hybrid granite gneiss, quartz biotite paragneiss, and amphibolite.

These occurrences are not of commercial interest.

Concession XV, Lot 20

A small occurrence of corundum was noted in a field 100 feet north of the road on the farm of Harvey Mantifel, lot 20, concession XV, Raglan township. Large crystals of bronze corundum up to 3 inches in diameter make up 30 percent of a small 2-foot-square outcrop. The corundum pegmatite occurs in a fine-grained pink leuco-syenite gneiss and is a local pegmatite-rich patch of small dimensions and extent. The surrounding area is drift-covered.

Concession XVII, Lot 9

A small 15-foot outcrop of grey corundum syenite gneiss occurs on the fence line 300 feet west of the barn on the abandoned farm formerly belonging to Gottlieb Lentz, lot 9, concession XVII, Raglan township. A small patch, 6 feet long and 3 feet wide, runs 1 percent in corundum, with elongated, 2- to 4-inch, grey corundum crystals in grey syenite gneiss.

Concession XVII, Lot 10

Corundum was found by J. Satterly[1] on lot 10, concession XVII, Raglan township, on the farm of Gottlieb Lentz, and is described as follows:

> A low northwest-facing rock ridge lies 175 feet at N. 75° E. from the old farm-house. It consists of banded grey, pink, and white hybrid syenitic gneisses, which strike N. 45° E. and dip 35° S. E. The bands range from a quarter of an inch to 6 inches in width. A few grains of brown

[1] J. Satterly, *op. cit.*, p. 32.

corundum from an eighth to a quarter of an inch in diameter were seen in two grey biotite syenitic gneiss bands, 2 and 6 inches thick. This hybrid syenitic gneiss was examined for a length of 200 feet on the strike to the northeast, but corundum was only seen in one other place, a single crystal being found in a pink syenitic band. The hybrid gneiss, which has an exposed thickness of from 15 to 25 feet, is overlain by an exposed thickness of 10 feet of crystalline limestone.

An examination of numerous outcrops of syenitic gneiss, granite-pegmatite and crystalline limestone in fields in the southern parts of lots 9 and 10 did not reveal any additional occurrences of corundum.

The occurrence is of no commercial interest.

Concession XVII, Lot 13

A small occurrence of corundum has been found on the farm of Charles Boehme, lot 13, concession XVII, Raglan township. The corundum rock is exposed northwest of the farmhouse on a low ridge at the north edge of a field. Corundum crystals up to 3 inches long occur in pink and grey variegated leuco-syenite gneisses in a zone 2 feet wide and 30 feet long on the dip slope of the outcrop. Corundum is exposed in a second outcrop 100 feet to the east. On the east outcrop corundum is irregularly distributed in the syenite gneiss over a length of 60 feet and a width of 20 feet on the dip slope of the hill. The dip of the gneisses is 30° S.

This occurrence was first noted by Miller[1] and is also described by Satterly.[2]

Concession XVII, Lot 17

An occurrence of corundum is described on lot 17, concession XVII, Raglan township, by Moyd[3] as follows:

> A very narrow corundum-bearing zone occurs in a ledge of syenite rocks cut by granite pegmatites. The zone is about a foot wide and pinches out within a few feet.

The occurrence is of no economic interest.

Craigmont Corundum Mine
Concessions XVIII and XIX, Lots 3 and 4 (Craigmont Workings)
Concession XIX, Lot 2 (Klondike Workings)

Location and Access

The Craigmont corundum mine consists of two groups of open cuts on the west and south faces of Robillard Mountain in the northwestern corner of Raglan township. The property is easily accessible by road from the village of Combermere, which lies 6 miles to the north. The nearest rail point is Barrys Bay, 10 miles north of Combermere.

Robillard Mountain is on the west side of the York River, 3 miles above the junction of the York and Madawaska rivers; the hill, which has an elevation of 1,500 feet, rises 600 feet in relief above the Conroy marsh through which the York River flows.

History and Development

The corundum deposits on Robillard Mountain were acquired in 1899 by J. H. Shenstone and B. A. C. Craig on behalf of the Canada Corundum Company. In 1900 this company erected a 20-ton mill, began mining, and produced the first corundum from Ontario deposits. The village of Craigmont, named after the vice-president of the company, came into being at the foot of Robillard Mountain.

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[1]Willet G. Miller, *Economic Geology of Eastern Ontario, Corundum and other Minerals*, Ont. Bur. Mines, Vol. VII, 1898, pt. 3, p. 221.

[2]J. Satterly, *op. cit.*, p. 32.

[3]Louis Moyd, Private report on Nepheline and Corundum in eastern Ontario.

In 1903 a new 200-ton mill was erected. This company operated the Craigmont deposits from 1900 to 1908, when the mine closed because of overproduction. In 1909 the property was taken over by the Manufacturers Corundum Company, which continued production at Craigmont until the mill burned down in 1913. No further mining was done at Craigmont.

In 1919 Corundum, Limited, leased the Craigmont property and built a new 100-ton mill to treat the tailings. There was a small production in 1920 and 1921. In 1944 the Dominion government Wartime Metals Corporation established the Craigmont Corundum Project to erect a 200-ton plant for the re-treatment of tailings at the Craigmont property. Corundum was produced from this source from 1944 to 1946.

The production record of the Craigmont mine is given in the accompanying table. Eighty-four percent of the total Canadian corundum production of 24,800 tons has come from the Craigmont mine.

PRODUCTION OF CORUNDUM AT CRAIGMONT[1]

Year	Ore treated	Graded grain produced	Recovery	Value of recovery	Graded grain shipped[2]	Value of shipments[2]
	tons	tons	percent		tons	
1900	.....	60	....	$ 6,000	3	$ 300
1901	4,133	503	12.2	52,115	....	.....
1902	7,997	806	10.1	80,561	....	.....
1903	8,877	839	9.5	83,942	....	.....
1904	26,822	1,580	5.9	142,200	....	.....
1905	20,566	1,563	7.6	140,654	....	.....
1906	44,559	2,900	6.5	260,972	....	.....
1907	59,908	2,643	4.4	237,916	....	.....
1908	1,887	65	3.4	6,460	1,046	95,989
1909	27,539	1,377	5.0	123,948	1,337	120,303
1910	28,290	1,411	5.0	136,981	1,779	160,119
1911	41,405	1,641	4.0	164,088	1,472	147,158
1912	36,754	1,620	4.4	194,408	1,960	233,212
1913[3]	12,515	763	6.1	91,602	1,177	137,036
1919[4]	1,300[5]	26	2.0	.....	....	.....
1920[4]	13,025[5]	322	2.5	.....	196	24,547
1921[4]	11,256[5]	407	3.6	.....	403	55,965
1944[4]	.....	173	....	17,111	173	17,111
1945[4]	.....	1,317	....	130,393	1,317	130,393
1946[4]	.....	742	....	102,340	742	102,340
TOTAL	321,252[5]	20,758	5.8	$1,971,691	11,605	$1,224,473

Workings

Corundum was mined from more than 20 open-cut workings on the south slope of the hill and from 11 cuts on the west side of the hill. The cuts vary in size and depth from short ledges, 15 to 20 feet long and 2 to 3 feet deep, up to large quarries such as the upper-pond cut at Craigmont, which is 500 feet long, with a maximum width of 100 feet and a maximum depth of 50 feet. The farthest east cut at the Klondike workings is 320 feet long with a maximum width of 100

[1]Figures from files of the Statistical Branch, Ontario Department of Mines.
[2]The amount and value of shipments for the years 1901–7 are not reported.
[3]During the years 1914–16 some Craigmont ore is reported to have been milled at Burgess mines, Carlow township.
[4]Tailings re-treatment.
[5]Tailings not included in total.

feet and a maximum depth of 60 feet. The majority of the cuts do not have depths greater than 20 feet, and in many the depth does not exceed 10 feet.

At the Craigmont workings, an adit 220 feet long was driven northward into the side of the hill at an elevation of 990 feet; an irregular drift trends westward from the end of the adit for 150 feet, south for 70 feet, then curves northwestward for 50 feet. A number of slashes extend into the walls of the drift. The locations of the cuts and the portal of the adit may be seen on the accompanying geological map of the workings.

General Geology

A detailed description of the general geology, petrography, and structural geology is given by H. D. Carlson in Appendix A of this report. While engaged as senior assistant on the geological field party in the Brudenell-Raglan area in 1951, and in the Monteagle-Carlow area in 1952, Mr. Carlson carried out a detailed study of the geology and petrology of the Craigmont corundum deposit as part of research work leading to the degree of Doctor of Philosophy at Queen's University, Kingston.

The writer is indebted to Louis Moyd of Bancroft who made available his plane table map, on the scale of 1 inch to 100 feet, of the Craigmont mine. This map was used in the preparation of the accompanying geological map of the Craigmont corundum mine (see map in back pocket) and was of invaluable assistance.

Economic Geology

Although the Craigmont and Klondike workings have produced substantial amounts of corundum, it is difficult to find ore zones of workable size in the cuts as exposed at present. There are few places available where mining of corundum ore could be immediately begun in these workings. The corundum is rather erratic and patchy in its distribution and much lean or barren material must be removed during the mining of the adjacent lenses of corundum-rich rock.

These deposits, however, are extensive, outcropping over a length of more than a mile on the south face of Robillard Mountain. There appears to be a thick zone of syenites, between the granite gneiss hanging wall and the barren syenite footwall, which contains numerous, rather narrow, bands of corundum syenite and pegmatite. This thick zone of favourable host rock warrants further exploration. Good thicknesses of corundum rock are present in the exploration adit on the Craigmont side of the hill.

On the accompanying geological map of the Craigmont area, occurrences of corundum are indicated by the letter C in red.

Craigmont Cuts

Cut No. 1.—A 3-foot zone of grey scapolite corundum gneiss, 35 feet long, runs about 2 percent corundum. Some corundum also occurs in pink syenite.

Cut No. 2.—Some corundum-rich lenses are exposed; one, 4 feet wide and 30 feet long, runs 30 percent corundum. Many of the zones are apparently worked out. Overhang is a serious problem.

Cut No. 3.—Banded pink and grey corundum syenite: one band 4 feet wide has a length of 30 feet. It runs 15–20 percent corundum. Just north of cut No. 3 a patch of corundum pegmatite, 18 by 6 feet, runs 10–15 percent corundum.

Cut No. 4.—A corundum-rich grey plagioclase gneiss on the northeast face has a width of 10 feet, a length of 25 feet, and runs 30 percent corundum.

Cut No. 5.—On the west face a 3-foot zone of pink and buff corundum syenite, exposed over a length of 12 feet, runs 3 percent corundum. Near the foot of the east face north of the pond a 4-foot band of corundum syenite 40 feet long runs 10–15 percent corundum. This would probably make ore. Other corundum-bearing zones of smaller size also occur in the face. Some rich patches occur at the north end of the cut, but the corundum distribution is extremely erratic.

Cut No. 8.—A few narrow bands of corundum rock are present. In the cut just north of No. 8, a 2-foot zone of corundum syenite 30 feet long runs 10 percent corundum.

Cut No. 9.—On the west wall of the cut an 8-foot zone of grey corundum syenite runs 3–5 percent corundum. It is cut by corundum syenite pegmatite which runs 20 percent corundum. A zone of material running 6 to 8 percent corundum is probably available. There is 8–10 feet of barren cap rock on the cut.

Cut No. 11.—Two narrow zones of corundum in syenite; the upper cuts of the west group are not rich in corundum.



KLONDIKE CUT NO. 1

The photo shows a sequence from nepheline gneiss, through gieseckite-muscovite-corundum gneiss, to pink leuco-syenite, as exposed in the east wall near the south end of the main east Klondike workings (Cut No. 1). A grey-white, corundum-poor nepheline gneiss, exposed at the foot of the cut (1), grades into a 12-inch zone of pink hydronephelite gneiss with muscovite and corundum (2), and then into a buff to yellow-brown gieseckite-muscovite-corundum gneiss (3). This member of the sequence is in turn superseded by pink and buff, mottled leuco-syenite (4), containing some greenish, sheared gieseckite and finally by massive, well-jointed, equigranular pink leuco-syenite (5).

Klondike Cuts

Cut No. 1.—Some bands, 4–10 feet wide, carry up to 10 percent corundum. The face is high and contains much barren cap rock.

Cut No. 4.—A 12-foot zone of nepheline-albite gneiss runs 3–5 percent corundum. Corundum is also present in buff syenite gneiss on the dip face just west of the cut. Up to 10 percent corundum was noted in irregular patches.

Cut No. 5.—A small but rich pod of corundum syenite pegmatite, 5 feet long and 2 feet wide, runs 20 percent corundum in crystals up to 2 inches in size.

Cut No. 7.—A small pod of corundum syenite pegmatite 4 feet long occurs in the east wall. The cut offers no ore possibilities.

Cut No. 9.—Some small lenses of corundum syenite gneiss are present.

Concession XVIII, Lot 10

There are two small occurrences of corundum on the syenite ridges on the east side of the Conroy marsh on the farm of George Wishman, lot 10, concession XVIII, Raglan township. The exact location of these two occurrences is shown on the accompanying map.

The west occurrence is on the flat dip surface of the outcrop on the south side of the hill. Small bronze corundum crystals up to ½ inch in diameter occur in pink leuco-syenite. The patch is 100 feet long and 1 foot wide. It is of no commercial interest.

The east occurrence is a small relic patch of corundum syenite on the top of the hill. Yellowish-green grains of ⅛-inch corundum stand up on the weathered surface of white magnetite leuco-syenite. The corundum-bearing syenite patch measures 20 by 5 feet and averages 5 percent corundum. The white corundum-bearing syenite is intruded and replaced by pink syenite, syenite-pegmatite, granite, and granite pegmatite.

Concession XVIII, Lot 18

A corundum showing is described by Miller[1] on Indian Hill, lot 19, concession XVIII, Raglan township. The occurrence found by the writer at the crest of this hill is on lot 18, concession XVIII, and may be the same locality.

Small tapering elongate crystals of corundum up to 1 inch in length occur in grey syenite and syenite pegmatite. A patch, 50 feet east of the crest of the hill, measures 8 by 15 feet and has a corundum content of 10 percent. The grey syenite and syenite-pegmatite is intruded and replaced by allanite-bearing granite-pegmatite, and cannot be traced in either direction on the bare outcrop along strike.

A second very small patch of ¼-inch, corundum crystals occurs 260 feet east of the above-mentioned occurrence in a host rock of mottled pink and white magnetite syenite gneiss.

Jewellville Corundum Pits
Concession XVIII, Lots 24, 25
and Concession XIX, Lots 24, 26 and 27

The Jewellville corundum pits are located on a range of syenite ridges rising from the Madawaska River and extending northeastward for a mile from the Palmer rapids bridge toward the uplands in the vicinity of Rosenthal post office. These deposits were discovered and prospected between 1901 and 1906 by

[1]W. G. Miller, *Economic Geology of Eastern Ontario; Corundum and other Minerals*, Ont. Bur. Mines, Vol. VII, 1898, pt. 3, p. 221.

Corundum Refiners, Limited, and in 1907 some access roads and further prospecting was done by the Canada Corundum Company. The main development of these deposits began in 1915 with detailed prospecting and diamond-drilling carried out by the Manufacturers Corundum Company. In 1916 this company dismantled their mill at Burgess Mines and removed the machinery to a new 100-ton mill on lot 24, concession XVIII, Raglan township, near Palmer rapids. Production of corundum from these workings was reported in 1917 and 1918. The property closed in August 1918 and has been inactive since.

There are nine groups of pits located on these ridges, and these are all connected to the mill site by roads, which are now largely overgrown. Mining operations were confined to the winter months.

The corundum deposits consist of two main types; (1) pink and grey corundum syenite-pegmatites occurring as irregular patches and pods cutting pink and white leuco-syenite; the corundum in these pegmatites occurs as bronze crystals ¼–3 inches in size; and (2) pink and grey corundum syenite in which corundum occurs as a medium-grained constituent of the syenite in grains ranging 1/32–¼ inch in diameter. These corundum syenite bands and corundum syenite-pegmatites occur within a gneissic sequence of pink and grey leuco-syenite, pink hornblende-magnetite syenite, amphibolite, and granite gneiss. In a few places on these hills there are narrow relic bands of nepheline-albite gneiss that are replaced along strike by pink and grey syenite gneisses. Corundum is sometimes a constituent of these nepheline gneisses.

Concession XVIII, Lot 24

Locality 1.—Small showings of corundum can be seen in narrow bands of pink and grey corundum syenite in a series of syenitic gneisses just east of the road on lot 24, concession XVIII, Raglan township. Two occurrences were noted by the writer; one is adjacent to the road, 500 feet north of Palmer rapids bridge; the other is adjacent to the road, 250 feet south of the bridge. These occurrences are of no commercial interest.

Locality 2.—At the north end of lot 24 there are two small corundum pits on the west face of a hill about 350 feet northeast of the bridge at Palmer rapids crossing. The west pit has a length of 40 feet along the strike of the syenite gneisses, a width of 18 feet, and a depth of 5 feet. The rocks exposed in the pit are pink corundum-magnetite leuco-syenite interbanded with pink and grey to buff, mottled, corundum syenite gneiss. Muscovite rims the small corundum cystals, which average 1/16 inch in diameter. Overlying the pink corundum syenite gneiss is a band of grey magnetite syenite gneiss. The main body of country rock is pink syenite gneiss interbanded with hornblende syenite gneiss and amphibolite. The rocks strike N. 30° E. and dip 35° SE. There is some pink corundum syenite-pegmatite containing corundum crystals up to ½ inch in size. Patches of this corundum pegmatite, up to 3 feet in length, run 10 percent corundum. In general the corundum shows its usual patchy, erratic, distribution, and the occurrence does not appear to be of commercial grade.

A second small pit, 30 by 30 by 12 feet deep, is located 50 feet northeast of the pit described above. This pit is filled with water. The rocks are pink and grey magnetite leuco-syenite; very little corundum is showing. A few 1-foot-long patches of pink corundum syenite-pegmatite run 5 percent corundum. Two narrow 6-inch zones of pink corundum syenite, running 5 to 8 percent corundum, are exposed in the east wall of the pit. Corundum was also noted by the writer on outcrop surfaces of syenite 20 feet northeast of the pit.

Locality 3.—On the road down the northeast bank of the Madawaska River,

1,000 feet southwest of the Palmer rapids bridge, there is a lumber road branching off to the east. At the edge of the cleared area, 200 feet north of this road junction, there are outcrops of corundum syenite and corundum pegmatite and a small cut on the outcrop face. This locality provides a good exposure of interbanded pink and grey syenite gneiss, together with grey magnetite corundum syenite gneiss over an exposed length of 80 feet. Interbanded with the pink and grey syenite gneisses and their corundum-bearing facies, are bands of amphibolite that appear to be cut by grey syenite. Some grey scapolite-rich gneiss is also present. The best corundum zone is a 5-foot zone, 20 feet long, running 2 percent corundum, ¼ to 1 inch in grain size. The syenite gneisses are cut by a later pink hornblende granite-pegmatite. The corundum occurrence does not appear to be of commercial grade.

Concession XVIII, Lot 35

Miller[1] has reported an occurrence of corundum on the north end of lot 35, concession XVIII; the writer was unable to locate this showing.

Concession XIX, Lot 25

Locality 1.—A series of four small pits are located near the southwest corner of this lot close to the boundary lines, the most southerly and westerly being in lot 25, concession XVIII and lot 24, concession XIX, respectively. These pits are on the top of a syenite ridge 1,200 feet northeast of Palmer rapids bridge and are reached by an overgrown wagon road leading from the old mill site on the flat in lot 24, concession XVIII.

The most westerly pit measures 20 by 20 by 6 feet deep and is water-filled. The rock is fine-grained, pink leuco-syenite. Very little corundum is evident in the pit walls. The second pit, located 25 feet southeast of the first pit, measures 20 by 20 by 8 feet deep and exposes pink and buff-coloured leuco-syenite, intruded and replaced by irregular lenses of buff to grey corundum syenite-pegmatite measuring 4 feet in length and 1 foot in thickness. No commercial grade corundum was seen. The gneisses strike N. 30° E. and dip 30°–40° SE. There is pronounced lineation of corundum-magnetite biotite schlieren trending S. 65° E. on the dip slope of these exposures.

A third pit, 100 feet to the northeast along strike of the formation, measures 5 by 6 by 3 feet deep. Here there is a narrow 3-foot band of nepheline-albite gneiss interbanded with pink and grey leuco-syenite gneiss. The nepheline-albite gneiss contains minor amounts of biotite and muscovite and, in places, up to 10 percent corundum. This gneiss is in discontinuous narrow pods and lenses enveloped by syenite gneisses.

To the northeast, along strike of the formations, a few shots have been put in the north-facing ledge of interbanded nepheline-albite-corundum and syenite gneisses.

Locality 2.—From locality 1, a trail leads northeast for a distance of 700 feet to locality 2 on the south end of lot 25. Here there is an open cut, 130 feet long, running northeast on the north face of a syenite ridge. The cut has a face of 20 feet and a maximum width of 25 feet. The strike of the country rock syenite gneisses is N. 20° E., their dip 20°–30° SE. The rocks exposed in the cut are fine-grained pink, grey and buff leuco-syenite gneiss, grey and buff corundum-biotite syenite gneiss (sometimes with abundant magnetite), amphibolite, green and

[1]Willet G. Miller, *Corundum and other Minerals*, Ont. Bur. Mines, Vol. VIII, 1899, pt. 2, p. 223.

grey scapolite gneiss, grey and pink corundum syenite-pegmatite, and granite-pegmatite.

At the northeast end of the cut there is a 3-foot zone of grey corundum syenite grading 5–8 percent corundum which can be traced for 20 feet. Above this 3-foot zone there is a 5-foot zone of grey corundum syenite running 5 percent corundum, up to ¼ inch in grain size. These corundum bands are irregular in character and can be traced discontinuously through the length of the cut. At the southwest end of the cut the 3-foot band is on the floor of the cut. Some sulphides occur in the corundum syenite-pegmatite. At the northeast end of the cut, in the pegmatitic facies of the rock, there is a large vug measuring 3 feet in diameter. It is lined with crystals of calcite, apatite, pyroxene, feldspar, and quartz.

This occurrence is the most promising looking of the Jewellville cuts and may justify further examination to determine the continuity of the corundum-bearing syenite bands exposed in the cut. There would appear to be a 15-foot width of low to medium grade corundum rock.

Locality 3.—On the top of the syenite ridge 500 feet southeast of locality 2, there are bands of nepheline and corundum-bearing syenite which have been exposed by considerable trenching and by two pits. The overburden is light, the outcrops are abundant on the crest of the ridge, and the relations between the nepheline-corundum and corundum syenites and the pink and grey syenites are well shown.

Nepheline-rich albite gneiss is exposed in narrow bands within pink and grey syenite gneiss over a width of 50 feet. Two small cuts, one measuring 30 by 2 by 3 feet, and the other, about 15 feet long with a 3-foot face, have been made along a ledge of outcropping nepheline-albite and corundum gneiss. Corundum is present in the nepheline-albite and grey and pink syenitic facies, but nowhere appears to exceed 10 percent. It occurs as euhedral crystals from ¼ to 3 inches in size. Corundum also occurs irregularly distributed in pink and buff syenite-pegmatite facies of the complex, and in these pegmatitic facies the corundum crystals may occur in small but rich patches running 10–25 percent corundum. Unfortunately these rich patches are small and erratic and do not appear to be of sufficient concentration to make ore grade material. Minor amounts of biotite, muscovite, and magnetite are present in nearly all these rocks.

Concession XIX, Lot 26

Two small pits are located on the south half of lot 26, concession XIX. One open cut measures 30 by 15 by 10 feet deep, the other 20 by 10 by 6 feet deep. Pink and grey corundum syenite gneisses occur as narrow lenses, bands, and pods in pink to grey hornblende and biotite syenite gneisses. These syenite gneisses are interbanded with biotite amphibolite and hornblende-plagioclase gneiss (amphibolite). All of these rocks are cut by pink aplite. The corundum-bearing bands are less than 3 feet wide, irregular in occurrence, and do not appear to be of commercial interest.

Concession XIX, Lot 27

Locality 1.—At the lower end of lot 27, concession XIX, near the lot 26 boundary line, there are a number of pits and trenches in a clearing on top of the hill. These pits are most easily reached by a trail running ¼ mile south from the southwest corner of the farm fields on lot 27. There are five small cuts ranging in size from 40 by 15 by 20 feet deep to 20 by 10 by 5 feet deep. The largest pit in the northwestern part of the clearing is 40 feet long, 10–15 feet wide, and 20 feet deep. It exposes pink and grey syenite gneiss containing a lean zone of pink

SUMMARY OF CORUNDUM OCCURRENCES

Location	Name of property or owner	Production	Remarks
Brudenell tp.:			
Con. IV, lot 34	Rosenthal	Small	Warrants further exploration. Exposures of corundum-bearing rock in possible mineable widths are present. Further exploration is necessary to indicate the potentialities of the deposit. A 2-foot zone, 25 feet long, grades 3–5 percent.
Con. V, lot 24			Corundum occurrence only, of no commercial interest.
Con. V, lot 34	R. Gutz	Small	Warrants further exploration. Exposures of corundum-bearing rock in possible mineable widths are present. Further exploration is necessary to indicate the potentialities of the deposit. A 1-foot zone, 30 feet long, grades 2–5 percent, patchy and erratic.
Con. VI, lot 7			Corundum occurrence only, of no commercial interest. A 3–5-foot zone, 10 feet long grades 5 percent.
Con. VI, lot 24	Charlotte Lake		Corundum syenite, of no commercial interest.
Con. VII, lot 20	Charlotte Lake		Corundum occurrence only, of no commercial interest.
Con. VII, lot 34	Reid Lake		Small rich scattered patches of corundum are present and could be readily quarried on a minor scale. Only a few hundred tons of corundum rock are in sight. A 10- by 8-foot patch grades 10 percent.
Con. X, lot 20	Gorman Lake		Corundum syenite, of no commercial interest.
Range B, North, lot 279			Corundum pegmatite, of no commercial interest.
Lyndoch tp.:			
Con. XV, lots 13 and 14	Kargus farm		Patchy corundum in syenite pegmatite, of no commercial interest.
Radcliffe tp.:			
Con. I, lot 21			Corundum occurrence only, of no commercial interest.
Con. I, lot 29	Michaelis Lake	Small	Warrants further exploration. Exposures of corundum-bearing rock in possible mineable widths are present. Further exploration is necessary to indicate the potentialities of the deposit. A 5-foot zone, 100 feet long, grades 2–5 percent.
Con. I, lot 31	A. Michaelis	Small	Warrants further exploration. Exposures of corundum-bearing rock in possible mineable widths are present. Further exploration is necessary to indicate the potentialities of the deposit. Not well exposed. 2-foot band, 60 feet long, grades 2–5 percent.
Con. II, lot 31	J. Schroeder	Small	Corundum occurrence only, of no commercial interest. A 10-foot zone, 150 feet long, grades 1 percent.

SUMMARY OF CORUNDUM OCCURRENCES

Location	Name of property or owner	Production	Remarks
Raglan tp.:			
Con. XIV, lot 15	J. Buderick		Corundum occurrence only, of no commercial interest.
Cons. XIV and XV, lots 20, 21, and 22	G. Mantifel		Scattered small occurrences in syenite, of no commercial interest.
Con. XV, lot 20	H. Mantifel		Corundum occurrence only, of no commercial interest.
Con. XVII, lots 9 and 10	G. Lentz		Corundum occurrence only, of no commercial interest.
Con. XVII, lot 13	C. Boehme		Corundum occurrence only, of no commercial interest.
Con. XVII, lot 17			Corundum occurrence only, of no commercial interest.
Cons. XVIII and XIX, lots 3 and 4	Craigmont	Large	Warrants further exploration. Corundum is present in numerous zones over widths of over 100 feet and these zones extend over a considerable area. Some mineable zones are present in outcrop. The deposit has been a substantial producer and offers potentialities for further exploration over a wide area.
Con. XIX, lot 2	Klondike	Large	Warrants further exploration. Corundum is present in numerous zones over widths of over 100 feet and these zones extend over a considerable area. Some mineable zones are present in outcrop. The deposit has been a substantial producer and offers potentialities for further exploration over a wide area.
Con. XVIII, lot 10	G. Wishman		Scattered erratic distribution in syenite, of no commercial interest.
Con. XVIII, lot 18	Indian Hill		Corundum occurrence only, of no commercial interest. An 8- by 15-foot patch, grades 10 percent, erratic.
Con. XVIII, lots 24, and 25 and con. XIX, lots 24, 26, and 27	Jewellville Pits	Small	Warrants further exploration. The main cut at locality 2 on lot 25, concession XIX, Raglan township, exposes a corundum-bearing zone about 15 feet wide throughout its length of 130 feet. Some further exploration of this zone would possibly be warranted.
Con. XVIII, lot 35			Corundum occurrence only, of no commercial interest.

and grey corundum syenite 4–5 feet wide. The corundum content is about 1 percent. The rocks strike N. 20° E. and dip 50° SE. The pink and grey corundum syenites occur in bands and lenses enclosed in pink and grey leuco- and biotite-syenite gneisses. Some calcite is developed in vuggy openings along the planes of gneissosity.

Locality 2.—In the east-central part of the south half of lot 27, concession XIX, there are other workings consisting of an open cut 50 feet long, 25 feet wide, and 10 feet deep, water-filled; a stripping, 300 feet in length extending northwest from the open cut; a pit, measuring 25 by 10 by 6 feet deep, located 15 feet east of the end of the open cut; and a shallow pit 10 by 10 by 2 feet deep, located 50 feet east of the north end of the stripping.

In the exposures, lenses and bands of pink and grey corundum syenite gneiss are comformably intercalated with pink and grey hornblende and biotite syenite gneisses and dark-grey, rusty-weathering paragneiss. The gneisses strike nearly east-west and dip vertically. In the north pit the strike is N. 80° E., and the dip 50° S. Corundum also occurs in replacement pods of syenite-pegmatite. The east pit exposes pink granite gneiss. No commercial-grade corundum ore is present.

Feldspar

Potash and soda feldspar, used in the manufacture of glass, pottery, enamels, and other ceramic products, have been widely mined from Precambrian granite-pegmatite dikes in many parts of eastern Ontario. The potash feldspar, (orthoclase or microcline) has the formula $KAlSi_3O_8$. It ranges from dark brick-red to pink, grey, or white in colour. Feldspar has excellent cleavage, it splits well in two directions and rather poorly in a third, all nearly at right angles to one another. Its lustre is vitreous to pearly on cleavage surfaces. The hardness is 6.0 to 6.5.

Feldspar deposits in Ontario are operated chiefly by independent jobbers selling crude lump feldspar, hand-cobbed and sorted in the pit, in carload lots to custom grinding mills. No. 1 potash spar, for which there is usually a good demand, consists of carefully sorted pure feldspar containing less than 10 percent quartz, and free from impurities such as pyrite, hornblende, mica, chlorite, iron staining, tourmaline, and garnet. In 1952 the price for crude No. 1 potash spar was about $10 per ton f.o.b. cars, eastern Ontario.

Production of feldspar in Ontario in 1951 amounted to 13,690 tons, valued at $133,583.[1]

The production of feldspar from deposits in the Brudenell-Raglan area has been small. In 1942 T. H. Craig reported a production of 30 tons of feldspar from a pegmatite dike on lots 22 and 23, concession II, Brudenell township. In 1935 and 1936 Renfrew Minerals, Limited, reported a production of 675 tons of feldspar from the beryl-bearing granite-pegmatite on lot 30, concession XV, Lyndoch township. In 1949 Canadian Beryllium Mines and Alloys, Limited, produced approximately 300 tons of pink potash microcline-perthite feldspar from this same property.

BRUDENELL TOWNSHIP

Concession II, Lots 22 and 23

A granite pegmatite dike located on lots 22 and 23, concession II, Brudenell township, was opened up by T. H. Craig in 1942, and 30 tons of feldspar was shipped. The granite pegmatite dike forms a low ridge trending N. 60° E. The

[1] D. F. Hewitt, *Feldspar in Ontario*, Ont. Dept. Mines, Industrial Mineral Circular No. 3, 1952.

workings are on the northwest face of the ridge. The pegmatite is exposed for 500 feet at the main workings and again for 300 and 500 feet to the northeast along strike of the ridge.

At the main workings the pegmatite dike has been opened up for a length of about 150 feet on the northwest face of the ridge. The bulk of the pink microcline feldspar is in 6- to 8-inch crystals in a close intergrowth of medium-grained quartz and feldspar. Much graphic granite is present. Pink albite, biotite, and hornblende are also present. The largest pure crystal of potash feldspar seen in the workings measured 2 feet in length, whereas crystals of potash feldspar are rarely over 8 inches.

Three hundred feet to the northeast, on strike, there is a stripping measuring 30 by 15 feet, with a pit 5 by 5 by 3 feet deep, which exposes graphic granite-pegmatite containing biotite and hornblende.

Five hundred feet to the northeast of the main workings, there is a stripping 30 by 50 feet, and a pit 10 by 10 feet in which are exposed crystals of microcline-perthite-feldspar and quartz up to 6 by 4 feet in size in a groundmass of fine-grained granite-pegmatite.

The main workings do not offer good prospects of developing a commercial feldspar deposit owing to the small size of the feldspar crystals and the high percentage of quartz and graphic granite. Further exploration at the northeast end may be warranted as the feldspar crystals are much larger at the northeastern stripping.

LYNDOCH TOWNSHIP

Concession XV, Lot 23

The beryl-bearing granite pegmatite on this lot has already been described in detail under "Beryl" (pages 36–42). A small tonnage of pink microcline perthite and light green amazonstone has been stock-piled at this property as a by-product during the mining of beryl.

Concession XV, Lot 30

This granite pegmatite dike has also been described under "Beryl" (pages 42–46). During the operation of the east workings by Renfrew Minerals, Limited, in 1935 and 1936, a total of 675 tons of feldspar was shipped from this property. Stripping at the west end of the dike uncovered a large area of very coarse-grained, "giant" pegmatite consisting of a core of rose quartz and intermediate zones of coarse-grained, pink microcline perthite and quartz. As previously noted, one microcline perthite crystal seen by the writer measured 20 by 8 by 6 feet and contained at least 80 tons of first-grade feldspar. There is no beryl exposed at the west end of the dike and, in 1949, Canadian Beryllium Mines and Alloys, Limited, opened this portion of the dike as a feldspar operation. The present size of the pit is shown on the map of the property (Figure 2, page 43). About 300 tons of pink microcline perthite was produced and was stock-piled in a bin on the property. This portion of the pegmatite contains commercial-grade potash feldspar and further exploration is warranted to determine the size of the pegmatite body present.

RADCLIFFE TOWNSHIP

Range B, North, Lot 240

A small feldspar prospect is located just north of the Hopefield road on this lot. The 20-foot trench, the only workings, is now completely overgrown. Pink perthitic microcline and grey albite in crystals up to 1 foot in diameter occur on

the dump. Biotite, quartz, and a rare element mineral which may be allanite, were also noted on the dump by A. D. Graham. The occurrence appears to be of no commercial interest.

OTHER GRANITE PEGMATITES

In addition to the granite pegmatites described above, there are numerous other occurrences that have not been commercially exploited. Unfortunately, although granite pegmatite dikes and pegmatitic granite are abundant in the township, there appear to be very few pegmatites that contain large crystals of clean feldspar in sufficient concentration to warrant exploration and development. Most of the granite pegmatites are medium-grained or fine-grained, with crystals rarely exceeding 1 foot in diameter. In other cases, large-size crystals do occur, but quartz is intimately intergrown with the feldspar to form a "graphic granite" pegmatite. The larger pegmatite dikes mapped in the Brudenell-Raglan area are shown on the map in red. In Brudenell township a swarm of granite pegmatite dikes trending northeast occur in the folded granite gneiss complex in the Lake Printy area. These granite pegmatites range from 5 to 25 feet wide and consist of pink microcline feldspar, albite, and quartz, with minor amounts of biotite, hornblende, magnetite, and allanite often present. Graphic intergrowths of quartz and feldspar are common, and the pure feldspar crystals rarely exceed 12 inches in diameter.

A dike of granite pegmatite is exposed on the south face of a bluff on lot 25, concession VI, Brudenell township. The dike is almost flat-lying and is exposed for a length of over 600 feet along the brow of the hill. Mineralogically this pegmatite is composed predominantly of microcline and quartz with a small amount of soda spar and scarce hornblende. Like most of the pegmatites of the area, it is too fine-grained to be of commercial value; the largest potash feldspar crystal measures 3 by 4 feet and is imbedded in an aggregate of quartz and feldspar 6–12 inches in size.

On Casey Hill in northern Lyndoch township, east of the beryl-bearing granite pegmatite on lot 23, concession XV, there are three small pits that have been opened in granite pegmatite. The writer was informed by P. Madigan, owner of an adjacent farm, that these pegmatites had been prospected and opened for beryl, but careful examination of the pegmatites disclosed no beryl present in these rocks. One of these pits is located on lot 21, concession XV, and measures 12 by 12 by 4 feet deep. The granite pegmatite consists of pink microcline microperthite and white to smoky quartz up to 5 inches in crystal size. Biotite, sericite, pyrite, and epidote are also present. Farther east, just north of the beaver pond on the southeast side of Casey Hill, there are two small pits in graphic granite pegmatite. The dike is from 10 to 30 feet wide and is exposed over a length of 200 feet. It consists predominantly of graphic granite, with some microcline up to 6 inches in crystal size. Soda spar, biotite, and magnetite were also noted. No beryl is present.

Another granite pegmatite typical of the occurrences in the map area is exposed on the west face of a hill on lot 15, concession III, Radcliffe township, north of the Combermere-Quadeville road. The medium-grained pink granite-pegmatite is exposed over an area of 50 by 100 feet and consists of pink potash spar and quartz in crystals of 6- to 8-inch size in a matrix of corduroy spar. No other minerals occur as impurities, and if separation methods are applied to recover feldspar from such a quartz-feldspar mixture, deposits of this type might be of commercial interest.

Gold

Satterly in his report[1] on the mineral occurrences in Renfrew county states that:

> Negligible gold values in calcite or quartz veins in pegmatite or limestone have been reported from widely separated areas in Renfrew county, and a number of occurrences have been opened up. None of these showings are of any commercial interest. Many of them have been described by Freeman,[2] and two areas noted by him, but not described in detail, are in lots 18 and 19, concession XV, Brudenell township, and lots 16 to 30, concession IX, Radcliffe township. These occurrences are in pegmatites cutting gneissic granite and consist of quartz and feldspar with an occasional speck of pyrite or arsenopyrite. In no place were large values obtained and none of the prospects is at all promising.

The pits on these lots were re-examined by the writer and assistants, but no mineralization of economic significance was noted.

Graphite

The mineral graphite is a soft, black, naturally crystallizing form of carbon that occurs in rocks as disseminated, tabular flakes or scales, as massive amorphous lumps or as foliated mixtures of the flake and lump varieties of graphite. Graphite often occurs as streaks or veins in the host rock. Flake graphite has perfect basal cleavage, a metallic lustre, and a grey to black streak. It is extremely soft, its hardness being from 1 to 2, depending on impurities present. It is resistant to acid and heat but a good conductor of heat and electricity.

Graphite is used in lubricants, paints, lead pencils, foundry facings, dynamo brushes, electrodes, dry batteries, crucibles, and numerous other articles. The carbon content of the graphite, the percentage and character of associated impurities, and the size and toughness of the flake are important qualities to test in examining a graphite ore.

In the Brudenell-Raglan area graphite occurs as disseminated flakes in crystalline limestones, feldspathic paragneisses, and pegmatite. Flakes range in size from 1/16 to 1/4 inch. Graphite of ore grade should run from about 7 to 10 percent recoverable graphite with a high percentage of recoverable flake.

LYNDOCH TOWNSHIP

Concession II, Lots 1 and 2

The graphite deposit on lots 1 and 2, concession II, Lyndoch township, is reported to have been discovered about 1880 by D. Moriarty of Eganville. Most of the development work was done by Messrs. Beidelman and Lyall in 1917. The workings are located 700 feet north of the Madawaska River just east of Mount Jamieson. They can be reached by wagon road running west from the road just west of the Highland Creek crossing.

These workings have been described in detail by J. Satterly,[3] and the writer's examination can add nothing to his description, which is as follows:

> In 1943 some of the workings were partly caved, overgrown, or filled with debris so that complete rock exposures were not available for examination. Six workings, in a general northeast-southwest direction, at intervals over a length of 1,900 feet, were seen. [see Figure 3.] In these workings the graphite occurs as disseminated flakes in narrow bands in white crystalline limestone. Phlogopite is usually present along with the graphite.
>
> At the southwest end at "A," an open cut and pit expose several bands of graphite. The open cut is 15 by 20 feet with a 6-foot face. It exposes a zone of graphite-bearing limestone, which is

[1] J. Satterly, *Mineral Occurrences in the Renfrew Area*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 3, p. 40.

[2] B. C. Freeman, *Mineral Deposits in Renfrew County and Vicinity*, Geol. Surv. Can., Mem. 195, 1936, pp. 7, 8.

[3] J. Satterly, *op. cit.*, pp. 49–51.

5 feet in width, strikes N. 20° E., and dips 80° W. The graphite flakes are mainly from a twentieth to a tenth of an inch in diameter, but are occasionally as wide as a quarter of an inch. The graphite content across the 5 feet is estimated at 20 per cent. A small pit, 25 feet to the southeast of the open cut, exposes a number of narrow graphite-bearing bands alternating with barren bands across a total width of 5 feet. The graphite content across the 5 feet is estimated at less than 10 per cent.

Trench "B" is now largely caved in, and little can be seen. A little graphite was observed at one place.

Shaft "C," which is 10 by 10 feet and 35 feet deep, is surrounded by broken rock except at its northwest side. The banding in the limestone strikes N. 45° E., and the dip is vertical. Material on the dump shows that the graphite-bearing bands in the crystalline limestone range from a mere row of flakes to bands 2 inches in width, and larger blocks indicate that some bands may be 4 inches wide. Phlogopite is nearly always present with the graphite. The barren limestone between the bands consists of a coarsely crystalline calcite. The amount of graphite ranges from less than 1 up to 20 per cent., and may average 5 per cent. The width of the graphite zone in the shaft could not be observed.

Trench "D" is irregular in shape. There is water in its southern part, and much debris or

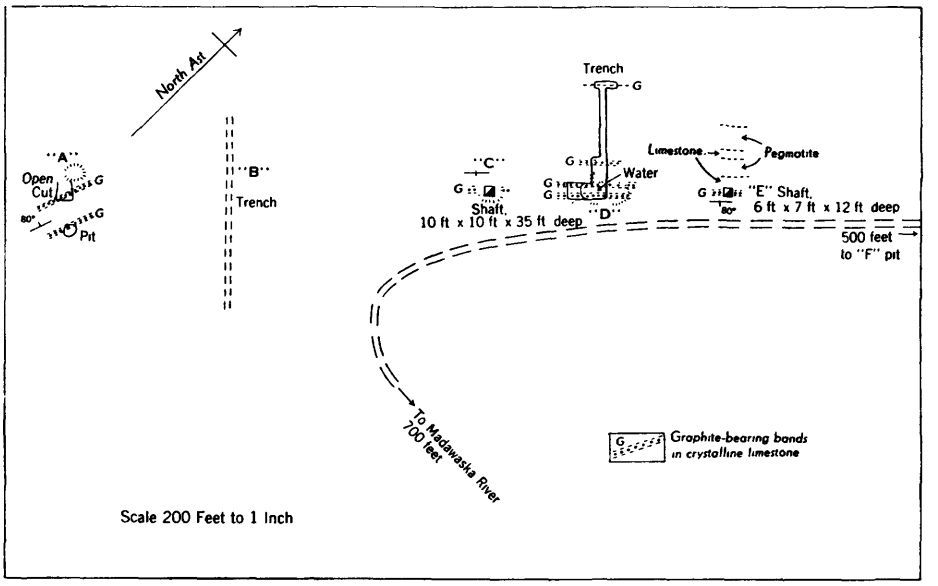


Figure 3 — Sketch map of the graphite showings on lot 1, concession II, Lyndoch township. (After J. Satterly.)

waste rock in other places. Four graphite-bearing zones were seen here. In the southeastern part, two zones are 3 and 4 feet wide. At the extreme northwest end there is very little graphite. The zones may average 10 per cent. graphite. As before, the graphite occurs disseminated in bands as much as an inch or more in width with barren coarse calcite between. Some much higher grade material (50 per cent.) was found on the dump, but none could be seen in place. Freeman reports that near the centre of the zone bands from 1½ to 2 feet wide contain over 50 per cent. flake graphite.[1]

A shallow shaft, "E," 6 by 7 by 12 feet deep, exposes a 6-foot zone of disseminated graphite containing a 1-foot barren zone in the middle. On the northwest wall of the shaft a shear zone accounts for a rich band of graphite, from 3 to 4 inches wide. To the northwest of the shaft two pegmatite sills (?), 18 and 25 feet wide, intrude crystalline limestone containing less than 1 per cent. graphite.

A pit, "F," 8 by 10 feet and from 3 to 6 feet deep at 1,225 feet northeast of shaft "E" exposes a low-grade 1-foot graphite zone in crystalline limestone.

The work to date, consisting of pits, trenches, and shafts at intervals over a length of 1,900 feet, has indicated the presence of a number of graphite-bearing zones in and parallel to the bedding of a crystalline limestone trending northeast and southwest. It is not certain that these zones are continuous. The grade of the zones and type of occurrence are such that further exploration may be warranted in order to prove the size and grade of the deposit as a whole.

[1]B. C. Freeman, *op. cit.*, p. 21.

Concession XV, Lot 24

At the south end of lot 24, concession XV, ¼ mile south of the Letterkenny road, a small prospect pit, measuring 6 by 8 feet, has been driven into the north face of a small knoll. The pit was opened as a graphite prospect and is in graphite-bearing crystalline limestone. Flakes of graphite up to ⅛ inch in size make up 5–10 percent of the rock in the richer bands. The graphite-bearing silicated limestone is interbedded with paragneiss. The graphite-rich bands range from a few inches to 2 feet in width. The occurrence is small and does not appear to be of commercial interest due to the narrow width of the graphite-bearing bands and their lack of continuity.

OTHER OCCURRENCES

There is a small occurrence of graphite-bearing crystalline limestone and rusty paragneiss on lot 9, concession XIII, Brudenell township. The graphite-bearing zone, a few feet in width, outcrops along a west-facing cliff face, ¼ mile east of the Killaloe-Brudenell road.

Another small occurrence of graphitic paragneiss was noted by the writer on lot 15, concession II, Radcliffe township. The graphitic zone is exposed over a 10-foot width on the north face of a hill, just south of the Quadeville-Combermere road.

Iron

No iron prospects have been opened up in the Brudenell-Raglan area. There are, however, large bodies of gabbro and metagabbro, that contain appreciable amounts of accessory magnetite, and magnetite veinlets and stringers are sometimes found in the gneissic metagabbro and associated hornblende schists. The association of magnetite deposits with these types of rock, as for example at Calabogie, suggests that the Brudenell-Raglan area, in particular the gabbro and metagabbro areas, is favourable prospecting ground for iron ore.

LYNDOCH TOWNSHIP

Range B, Lot 1

There is a small pit measuring 7 by 7 by 6 feet deep on this lot, just west of the road to Wilson's lumber camp. The pit is in sheared hornblendite, which is cut by granite pegmatite. A zone 6 feet wide is well mineralized with magnetite and hematite, forming a strong local compass anomaly. Pyrite, chalcopyrite, specularite, garnet, and biotite are also present in the mineralized zone. The country rock strikes N. 15° E. and dips 30° E.

RAGLAN TOWNSHIP

Concession VII, Lot 26

Stringers of magnetite, up to 4 inches in width, occur in metagabbro on the top of a ridge on lot 26, concession VII, Raglan township, on the farm of E. Keller.

Limestone and Dolomite

Crystalline limestone and dolomite of the Grenville type are widespread in the Brudenell-Raglan area. For the most part, these crystalline limestones and dolomites are impure, sometimes containing considerable phlogopite, diopside, graphite, tremolite, feldspar, scapolite, chondrodite, garnet, vesuvianite, and spinel, as well as interbedded paragneiss. In some localities, however, pure white

bands of crystalline limestone or dolomite, suitable for the manufacture of lime, for stucco dash, terrazzo chips, poultry grit, or artificial whiting, do occur. The band of white crystalline limestone southeast of Mount Jamieson in Lyndoch township is very pure. Analyses of samples from this band are given earlier on page 14; lime in two samples was 50.98 and 50.62 percent; magnesia, 2.26 and 3.32 percent; and insolubles, 0.88 and 1.64 percent, respectively. A band of white crystalline dolomite of high purity outcrops on the Hardwood Lake–McArthur's Mills road in Raglan township. A small sample from this band analyzed: lime, 30.54 percent; magnesia, 20.22 percent; and insolubles, 0.69 percent.

A small lime kiln was operated for some time at Craigmont, using local crystalline limestone.

Mica

No production of mica has been reported from the Brudenell-Raglan area, but several small occurrences have been opened up by local residents and a few pounds of phlogopite mica obtained. The phlogopite mica commonly occurs in books from 2 to 8 inches or larger in "basic" pegmatites composed predominantly of pyroxene, scapolite, calcite, and phlogopite. Apatite, titanite, hornblende, and sulphides are often also present.

No deposits of muscovite mica were seen in the map area.

To be of commercial interest the books of phlogopite mica should be clear of staining and free from flaws, reeves, herringbone structures, inclusions, cracks, and wedging. A large percentage of mica books over 5 inches in diameter is necessary in a commercial mica operation. The mica should be free-splitting.

BRUDENELL TOWNSHIP

Concession I, Lot 29

An occurrence of phlogopite mica in basic pegmatite or mica pyroxenite has been reported on the farm of E. Brohart, lot 29, concession I, Brudenell township. Mica from this locality seen by the writer was of small size and doubtful commercial value.

LYNDOCH TOWNSHIP

Concession XVI, Lot 12

A small pit and some trenches have been opened on a showing of phlogopite mica on lot 12, concession XVI, Lyndoch township. The workings are located on the southeast face of a ridge overlooking Eneas Creek, ⅛ of a mile east of the farm road. Here amphibolite country rock, striking N. 50° E. and dipping 45° SE., is underlain by coarsely crystalline, white Grenville limestone. At the contact of these rocks, a small pit, measuring 10 by 10 by 3 feet deep, exposes a 4-inch seam of phlogopite mica in a diopside-scapolite-pyroxene-tremolite rock. The phlogopite is dark brown to black in colour and occurs in books up to 6 inches in diameter. The mica is not of commercial grade. There are three parallel trenches, 30 to 40 feet long, running in a northerly direction from the mica pit.

Half a mile east, along strike of this band of marble, there is a second small showing of phlogopite mica in a phlogopite-actinolite-scapolite pegmatite cutting interbanded marble and paragneiss. The mica-bearing pegmatite is itself cut by a later pink, titanite-rich granite pegmatite.

Concession XV, Lot 34

Two small 3- by 3-foot prospect pits expose a few books of dark brown to black phlogopite mica in a mica pyroxenite cutting hornblende paragneiss on this

lot. The mica books are up to 5 inches in diameter but are of no commercial value due to high iron content and presence of flaws, breaks, crenulations, and cracks.

OTHER OCCURRENCES

Small books of phlogopite mica occur in a phlogopite-scapolite-pyroxene pegmatite on the south half of lot 24, concession XVI, Lyndoch township.

A small prospect pit was sunk on an occurrence of phlogopite in a basic pegmatite on the hillside just west of Moccasin Lake, Raglan township.

These occurrences are of no commercial interest.

Molybdenum

Molybdenite, the molybdenum sulphide, MoS_2, is the chief ore mineral of molybdenum. Molybdenite occurs in granite gneiss, granite pegmatite, and in metamorphic pyroxenite.

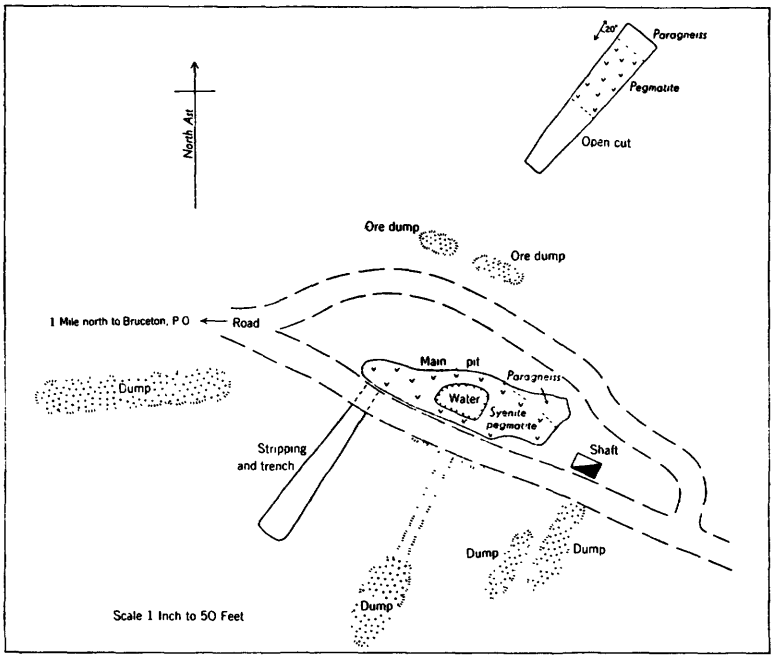


Figure 4 — Geological sketch map of the workings of the McCoy molybdenite property, lot 34, concession II, Lyndoch township, August, 1943. (After J. Satterly.)

LYNDOCH TOWNSHIP

Concession II, Lot 34, South Half (McCoy Mine)

The McCoy molybdenite property has been thoroughly described by J. Satterly[1] in 1943, and no new work has been done since his examination. His description is as follows:

The old McCoy molybdenite property is situated in the south half of lot 34, concession II, Lyndoch township, about a mile south by wagon road from Bruceton. Eardley-Wilmot[2] has described the early operations as follows:

[1] J. Satterly, *Mineral Occurrences in the Renfrew Area*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 3, pp. 84, 85.

[2] V. L. Eardley-Wilmot, *Molybdenum*, Mines Branch, Can. Dept. Mines, No. 592, 1925, p. 103.

"During 1916, a 4-foot pit was sunk, and further prospecting work and trenching in 1917 resulted in the following shipments: In the first year, one ton of 0.4 per cent. ore and 8 tons of 93 per cent. picked flake were sent to Ottawa, and in 1917, one ton of 0.89 per cent. ore was sent to Renfrew."

The property was acquired by McCoy Molybdenite, Limited, in 1937, and early in 1938 a 2-compartment shaft was sunk to a depth of 40 feet and some 260 feet of surface trenching carried out. Workings seen in August, 1943 [see Figure 4] were as follows: The main pit is 10 by 50 feet and 6 feet deep, with an oval pit in the centre 10 by 15 feet and 6 feet deep and filled with water. Just beyond the east end of the pit is a vertical shaft 4 by 7 feet and 40 feet deep. To the northeast of the west end of the main pit in the side of a hill is an open cut 45 feet long, from 5 to 8 feet wide, and 5 feet deep at the face. To the southwest is an overgrown stripping and trench 40 feet long, from 4 to 8 feet wide, and 5 feet deep at its southwest end. These workings are in the northwestern part of the south half of lot 34.

The main pit exposes a sheet of pink hornblende and pyroxene syenite-pegmatite. It contains accessory tourmaline and quartz as intergrowths. Very little molybdenite was seen in place. The ore dumps north of the pit consist of pegmatite containing 1 per cent. molybdenite in flakes from half an inch to 1½ inches across. A little coarse pyrite was seen at one place on the north wall of the pit. At the northeast corner of the main pit the pegmatite is overlain by almost flat-lying, grey biotite paragneiss. The pegmatite appears to be thinning to the east. G. A. MacMillan[1] reports that shaft-sinking revealed the pegmatite to be a sheet about 35 feet thick, which is underlain by white crystalline limestone. Fragments of the latter can be seen on the dumps.

Concession V, Lot 33

A small pit and some trenches have been sunk on a molybdenite-bearing pyroxenite and crystalline limestone on lot 33, concession V. The pit measures 10 by 12 by 8 feet deep. The country rock is crystalline limestone, which is cut by medium-grained, pale-green pyroxenite containing stringers of calcite that carry molybdenite and pyrrhotite. The mineralization is sparse and erratic. A quarter of a mile to the north there is a wide band of biotite paragneiss that contains sparse pyrrhotite and molybdenite. The paragneiss is cut by abundant quartz stringers. Some small pits and trenches have been sunk on this occurrence, which is on lot 33, concession VI.

Concession VIII, Lot 4

At the base of the southeast face of Mining Mountain, there is another small molybdenite prospect on lot 4, concession VIII, Lyndoch township. Here there is a pyroxenite pegmatite consisting of pyroxene, hornblende, smoky quartz, black mica, and calcite. The pegmatite strikes N. 70° E. and cuts pink granite gneiss and crystalline limestone. Flakes of molybdenite up to 1 inch in size occur sparsely in the quartz of the pegmatite. There are three small pits on this dike; the largest of them measures 20 by 6 by 4 feet deep. The dike has a length of 110 feet and pinches out at both ends.

Concession VIII, Lot 5 (Jamieson Mine)

The Jamieson molybdenite mine on lot 5, concession VIII, Lyndoch township, is located on the top of Mining Mountain, 32 chains (2,100 feet) west of D. Madigan's farm house, which can be reached by road from the village of Griffith on No. 41 highway. There is a path from the farmhouse to the mine workings.

The main workings, located in a clearing on the hilltop, is an open cut 215 feet long and 12–20 feet wide, trending N. 50° E. The north end of the cut is water filled. It is 20 feet to water level. This water-filled portion of the cut is 60 feet long. The centre 50 feet of the cut is 10 feet deep. The southwest 105 feet of the cut is also water filled, and 15 feet of wall is exposed above water level. D. Madigan reports that an inclined shaft, 65 feet deep, exists here. A second pit, measuring 20 by 10 by 5 feet deep, is located 30 feet south of the main cut.

[1] Personal Communication.

The accompanying sketch map shows the size and shape of the pits and a cross-section through the south end of the main cut. The country rock consists of pink granite gneiss, interbanded with hornblende amphibolite, amphibolite, and rusty paragneiss, sparse crystalline limestone and mica pyroxenite are also present. The country rock strikes N. 40° E. and dips 15° SE.

The molybdenite occurs in a calcite-mica pyroxenite-pegmatite, which strikes roughly N. 50° E. and appears to dip steeply east, cutting the flatly dipping, country rock gneisses. The central part of the "vein-dike" consists of coarse grained, pink to salmon, calcite containing lepidomelane. A 5- to 6-foot width of

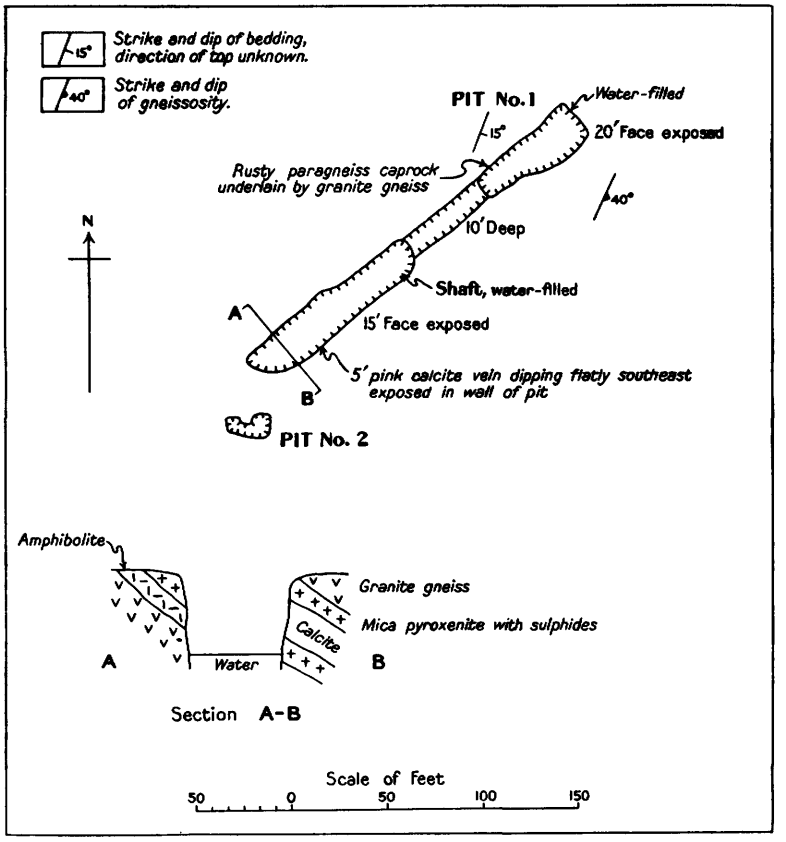


Figure 5 — Jamieson molybdenite mine.

this pink calcite is exposed in the southeast wall of the main cut (south end). Bordering this massive calcite is the mica pyroxenite, carrying pyrite, pyrrhotite, and molybdenite. Flakes of molybdenite up to 2 inches in size were noted erratically distributed in massive pyrrhotite and pyrite. Apatite, galena, sphalerite, and chalcopyrite occur on the dump. J. Satterly[1] reports samples of a late breccia and vug-filling mineralization on the dump:

> The breccia consists of fragments of calcite, and pink pegmatite from an eighth to a quarter of an inch across in a fine-grained greenish-brown groundmass. In this occur crystals of bright, translucent, green apatite[2] from a quarter of an inch to 1 inch in diameter.

[1] J. Satterly, *op. cit.*, p. 86.
[2] Determination by E. W. Nuffield, Department of Mineralogy, University of Toronto.

Eardley-Wilmot[1] describes the property as follows:

Work was first done on the property, in 1907, by the late Mr. R. A. Jamieson, of Renfrew, and later on, in 1915-16, was worked on lease by the International Molybdenum Company, Limited. Two 20-foot pits, which have been connected by an open trench, were sunk in the gneiss-limestone contact. Between these pits there is an inclined shaft.

* * * * * * * *

The country rocks are various kinds of gneisses, interbanded with crystalline limestone. The gneisses are cut in many places by intrusive granites and pegmatites, the molybdenite deposits occurring near their contacts with the limestones. The ore-body, which has been exposed for a length of 220 feet along its strike and consists of pyroxene and pegmatite, outcrops on a ridge of gneiss. Molybdenite in large flakes is intimately associated with pyrite and pyrrhotite, of which there is a considerable quantity. The three minerals rarely occur in the gneiss or limestone, but are found on the contacts of these rocks or distributed throughout the pegmatite dikes.

* * * * * * * *

During the latter part of 1915 about 80 tons of hand-cobbed ore was sent direct to Orillia. The greatest part of this was cobbed to 20 or 30 per cent. MoS_2, and 1½ tons was pure flake. In 1916 recorded shipments to Renfrew and Orillia amounted to 73 tons of 3 per cent. ore, and 12.5 tons of hand-cobbed ore assaying 18 per cent. MoS_2. It is stated that in all, 285 tons of ore, containing approximately 12,760 pounds of pure molybdenite was taken from this mine, but by whom and when the balance of this ore was shipped is not recorded.

Concession VIII, Lot 7

The Legree prospect located on lot 7, concession VIII, Lyndoch township, consists of three pits and strippings from which 150 pounds of cobbed ore was shipped. The main outcrop on the property is pink leuco-granite gneiss, cut by granite pegmatite, which is cut by a strong shear zone trending S. 80° E. To the northwest there is a second outcrop consisting of pink leuco-granite gneiss, granite pegmatite, limestone, and paragneiss. The rocks strike N. 80° E. and dip 25° S. Molybdenite and pyrrhotite occur erratically distributed in patches along the contacts of the granite gneiss and sediments. A small L-shaped pit, 10 by 10 by 6 feet deep, was sunk on the west outcrop. The prospect does not look promising due to the low grade and erratic distribution of the molybdenite.

Elsewhere on Mining Mountain, and on Wadsworth Mountain which lies just to the west, there are scattered flakes of molybdenite in pink leuco-granite gneiss.

Concession XIV, Lot 4

On lot 4, concession XIV, east of the Wolfe fire tower, there is a low ridge of pink leuco-granite gneiss interlayered with pink biotite granite gneiss and granitized amphibolite. Molybdenite flakes up to ⅛ inch in size were noted in the pink leuco-granite in small irregular patches, which might run 2 percent.

RAGLAN TOWNSHIP

Concessions IX and X, Lot 27 (Edgemont Molybdenite Mines, Limited)

A molybdenite-bearing pink graphic granite-pegmatite on lot 27, concessions IX and X, Raglan township, has been opened by a shallow shaft, pits, and trenches. The workings are on a low hill just west of the Denbigh–Palmer Rapids road about ¾ mile north of Schutt post office.

This property, originally known as the Wingle-Leidtke prospect, was acquired in 1939 by Edgemont Molybdenite Mines, Limited. Satterly[2] reports that this company did considerable trenching and test-pitting, sunk a vertical 10- by 15-foot shaft to a depth of 40 feet, and did 1,000 feet of diamond-drilling.

The granite pegmatite dike, which lies at the contact of paragneiss on the

[1] V. L. Eardley-Wilmot, *op. cit.*, pp. 103–5.

[2] J. Satterly, *Mineral Occurrences in the Renfrew Area*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 3, p. 87.

west and crystalline limestone on the east, strikes N. 20° E. and has a width of 5–35 feet. It can be traced for a length of 800 feet from the shaft to the north workings. The country rocks strike N. 30° E. and dip 20°–50° E. The granite pegmatite consists of pink graphic granite, albite, and biotite. Fractures in the dike carry molybdenite, calcite, hornblende, magnetite, pyrite, and pyrrhotite.

The north workings consists of a trench 10 by 10 by 100 feet long, trending N. 60° W. The trench exposes a hanging wall of silicated crystalline limestone and a pegmatite dike. The footwall paragneisses are exposed farther to the south, on the west side of the dike. Other trenches and pits have been opened along the dike. In the dike there is a fracture striking N. 25° E., dipping vertically, and from 1 to 20 inches in width. This fracture is filled with calcite, pyrrhotite, molybdenite, smoky quartz, magnetite, and apatite. A little molybdenite was noted in the silicated limestone wall rock.

Three hundred feet south of the north trench there is a second trench, 70 feet long, along the pegmatite dike. The shaft is 800 feet south of the north cross trench. Very little can be seen in the vicinity of the shaft, and the amount and character of mineralization is unknown.

A shipment of 27 tons of low-grade ore, containing 243 pounds of molybdenum, was sent to the United States in 1942. Satterly[1] states that "there are no indications that any body of a commercial size is present in the above workings."

The occurrence of molybdenite is also reported at the Craigmont and Klondike corundum workings in northwestern Raglan township.

Nepheline

The mineral nepheline, $NaAlSiO_4$, is the characterizing feldspathoid of the rocks of the nepheline syenite group. Nepheline syenite is being mined in Methuen township, Peterborough county, by American Nepheline, Limited, as a ceramic raw material for the glass and ceramic industries. In the glass batch it is used as a source of alumina and alkalis. It replaces feldspar in some ceramic bodies, glazes, and enamels. It has also been used with success in floor and wall tile. Commercial grade nepheline syenite deposits should be low in ferromagnesian minerals. The rock is crushed, and a separation of the ferromagnesian minerals such as biotite, hornblende, and garnet, together with magnetite, is made. The marketed product consists of nepheline, albite, and microcline. For use in the glass and ceramic industries the iron content must be low, usually less than 0.07 percent. Commercial nepheline syenite now being produced in Ontario averages 24 percent alumina.

The nepheline syenites are also of commercial interest because of the presence of corundum in them and in the associated pink and grey corundum syenites, which appear to be genetically related to the nepheline syenites.

The nepheline rocks have already been described in a previous section (pages 17–25), and a detailed description will not be repeated here. For the most part, the occurrences of nepheline gneiss in the Brudenell-Raglan area are small, the distribution of nepheline is erratic within the bands themselves, and none of the occurrences approach the Blue Mountain body in size, grade, or freedom from ferromagnesian impurities. The richest nepheline rocks in the area are those exposed in the Klondike cuts, Raglan township. There are large relic patches of nepheline-rich rock in these workings, which consist of about 80 percent nepheline, 15 percent albite, and 5 percent corundum. The largest band of nepheline-bearing rocks is the Wolfe nepheline belt in Lyndoch township. It has a length of over

[1]Satterly, *op. cit.*, p. 87.

4 miles and a width of 100–1,000 feet. However, within the belt the distribution of nepheline is irregular, and there are many interbanded nepheline-poor alkaline syenite gneisses.

BRUDENELL TOWNSHIP

Concession V, Lot 26

There is a small, 3-foot band of nepheline gneiss interbanded with amphibolite, crystalline limestone, and brown and pink syenite gneiss on the west side of the Letterkenny road, just south of Beardwood lake. It is of no commercial interest.

Concession V, Lot 34 (Gutz Farm)

On the farm of Richard Gutz, lot 34, concession V, Brudenell township, there is a 15-foot-wide band of nepheline-muscovite-albite-biotite gneiss exposed for a length of 150 feet just south of the farmhouse. The nepheline syenite gneiss is intruded and replaced along strike by pink corundum leuco-syenite; the transition from nepheline-albite gneiss, through white alkaline gneiss, in which the nepheline is completely altered, to pink corundum syenite gneiss can be well seen on the outcrop.

One hundred feet to the southeast there is an outcrop of nepheline-albite-corundum pegmatite with long tapered crystals of grey corundum. This occurrence has been previously described (page 50).

The nepheline band strikes north-south and dips 20° E. One-quarter mile to the north, on the north half of this same lot, a band of nepheline-albite gneiss again outcrops, interbanded with pink leuco-syenite gneiss and pink corundum-muscovite syenite gneiss. This band strikes N. 40° W. and dips 20° SW. It may represent the northeast arm of a flatly south-pitching syncline. The nepheline band south of the Gutz farmhouse would form the northwest arm of this syncline.

The nepheline content of these bands is varied and rarely exceeds 20–25 percent; the bands are narrow and discontinuous, being replaced along strike by pink syenite; they are, therefore, of no commercial interest as a source of nepheline.

Concession VII, Lot 34

Nepheline gneisses outcrop to the north and south of Reid Lake. South of the lake there are two bands of nepheline-scapolite-plagioclase gneiss striking north-south and dipping to the east. They are 100–200 feet wide and are separated by a pink syenite gneiss band. These nepheline-scapolite gneisses are described on pages 23 and 24. The nepheline content is extremely variable from band to band, and the presence of abundant scapolite ensures a high lime content. For these reasons, although in places the nepheline content reaches over 50 percent, the occurrence is of doubtful commercial value as a source of nepheline.

LYNDOCH TOWNSHIP

Wolfe Nepheline Belt

The Wolfe nepheline belt is the largest band of nepheline rocks in the Brudenell-Raglan map area. It consists of a band of nepheline and associated alkaline syenites 200–1,000 feet wide, extending from the Kargus farm, lot 14, concession XIV, Lyndoch township, eastward through Heiderman Lake, lot 5, concession XIII, to the township boundary. East of Heiderman Lake, outcrops are scarce, and the band is extremely narrow. A general description of the band is given in a previous section (pages 24–25). There are three areas where the nepheline rocks are best developed and well exposed. These are: (1) the Heiderman Lake

ridge, lot 6, concession XIII; (2) the Welk-Remus ridge, lots 10, 11, and 12, concession XIV; and (3) the Wesley Kargus ridge, lots 13 and 14, concession XIV.

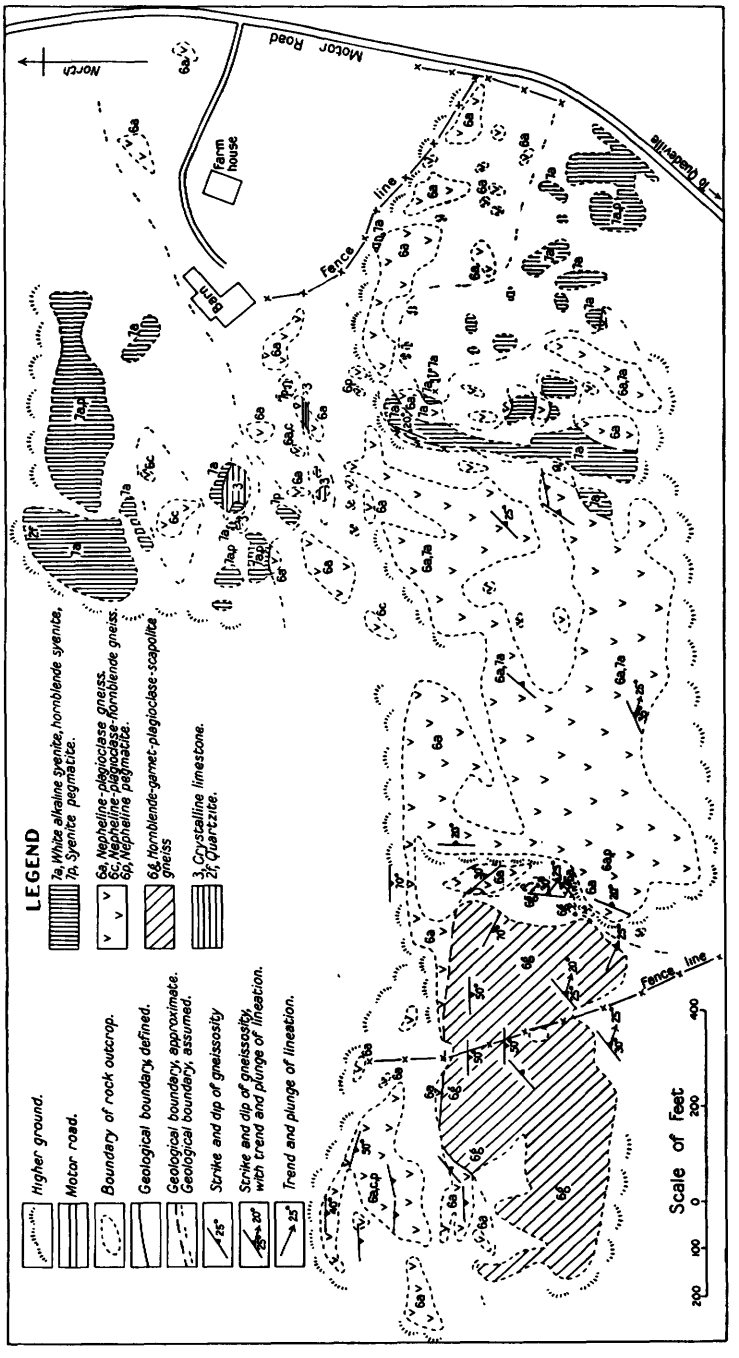


Figure 6 — Geological map of Welk-Remus ridge, Wolfe nepheline belt.

Concession XIII, Lot 6 (Heiderman Lake)

Just west of Heiderman Lake, in open fields on lot 6, concession XIII, Lyndoch township, a 500-foot band of nepheline-bearing gneisses is exposed in

scattered outcrops over a length of ⅜ mile. The gneisses strike east-west and dip 40°–80° S. The gneisses in the Heiderman Lake section of the Wolfe nepheline belt are intimately interbanded, and all of the following lithologic types are present: nepheline-plagioclase gneiss; nepheline-hornblende-plagioclase gneiss; nepheline-hornblende gneiss; nepheline-scapolite-hornblende gneiss; scapolite-hornblende gneiss; white alkaline syenite gneiss; pink alkaline syenite gneiss; pink and white syenite-pegmatite; yellow-brown biotite-scapolite syenite gneiss. Nepheline content is low and erratic, and the occurrence is of no present commercial interest.

Concession XIV, Lots 10, 11, and 12 (Welk-Remus Ridge)

The accompanying map (Figure 6) shows the general geology and structure of the rocks on an east-west–trending ridge, which crosses the Welk and Remus farms on lots 10, 11, and 12, concession XIV, Lyndoch township. The ridge has a length of ½ mile and for the most part is sheep pasture with good rock exposures. The rocks strike in a general east-west direction and dip from 40°–70° S. As shown on the map, the nepheline-bearing gneisses occupy the north side of the ridge and form a distinct unit at the west end of the ridge, with an overlying unit of hornblende-garnet-plagioclase-scapolite gneiss to the south. To the east the nepheline gneisses are intruded by white alkaline, pink, and yellow-brown, syenite and syenite pegmatites; the nepheline content is low and erratic.

On the north or footwall side of the band, there is a narrow band of coarsely crystalline glassy quartzite again present. The hornblende-plagioclase-garnet-scapolite rock is coarse-grained and shows a very strong lineation trending southeast and pitching 20°–25° SW. A mafic hornblende-nepheline-garnet rock occurs in one or two small outcrops at the base of the ridge on the south side near the fence line between lots 11 and 12.

The nepheline content of the gneisses exposed on this ridge is too low and erratic to be of commercial interest.

Concession XIV, Lots 13 and 14 (Wesley Kargus Farm)

The accompanying map (Figure 7) shows the general geology and structure of the nepheline-plagioclase and associated white alkaline syenite gneisses, which form an 80-foot ridge, trending in an east-west direction, just south of the farmhouse on lots 13 and 14, concession XIV, Lyndoch township. The ridge is ½ mile long; throughout its length, the gneisses strike in a general east-west direction and dip 30–50 degrees south. At the west end of the ridge, the structure of the nepheline gneisses swings from east-west to northeast-southwest, and the ridge falls off into low ground. No outcrops of nepheline gneiss occur to the west, and the band either pinches out, possibly in the trough of an east-plunging synclinal drag fold or is faulted off by a northwest-trending strike fault, which may occupy the valley south of the ridge.

On the north side of the ridge, the footwall rocks of the nepheline gneiss consist of a series of coarsely crystalline white limestone and siliceous paragneisses. At the base of the ridge there is a narrow band of glassy quartzite. In some places pink alkaline syenite forms the footwall of the nepheline gneiss band. The nepheline gneiss band consists of interbanded white nepheline-plagioclase gneiss, white plagioclase gneiss, hornblende-nepheline-plagioclase gneiss, hornblende-garnet-plagioclase gneiss, and nepheline pegmatite. The nepheline content is extremely variable and erratic. As shown on the accompanying map, the nepheline-bearing gneisses occupy the west end and the north side of the ridge. To the south and east, the hanging wall gneisses consist of hornblende-plagioclase gneiss, hornblende-garnet-scapolite plagioclase gneiss and mafic garnet-horn-

blende-scapolite gneiss. Garnet porphyroblasts up to 1¼ inches in diameter occur in the nepheline-free gneiss on the southeast side of the ridge.

At the west end of the ridge some shallow trenches and pits have been

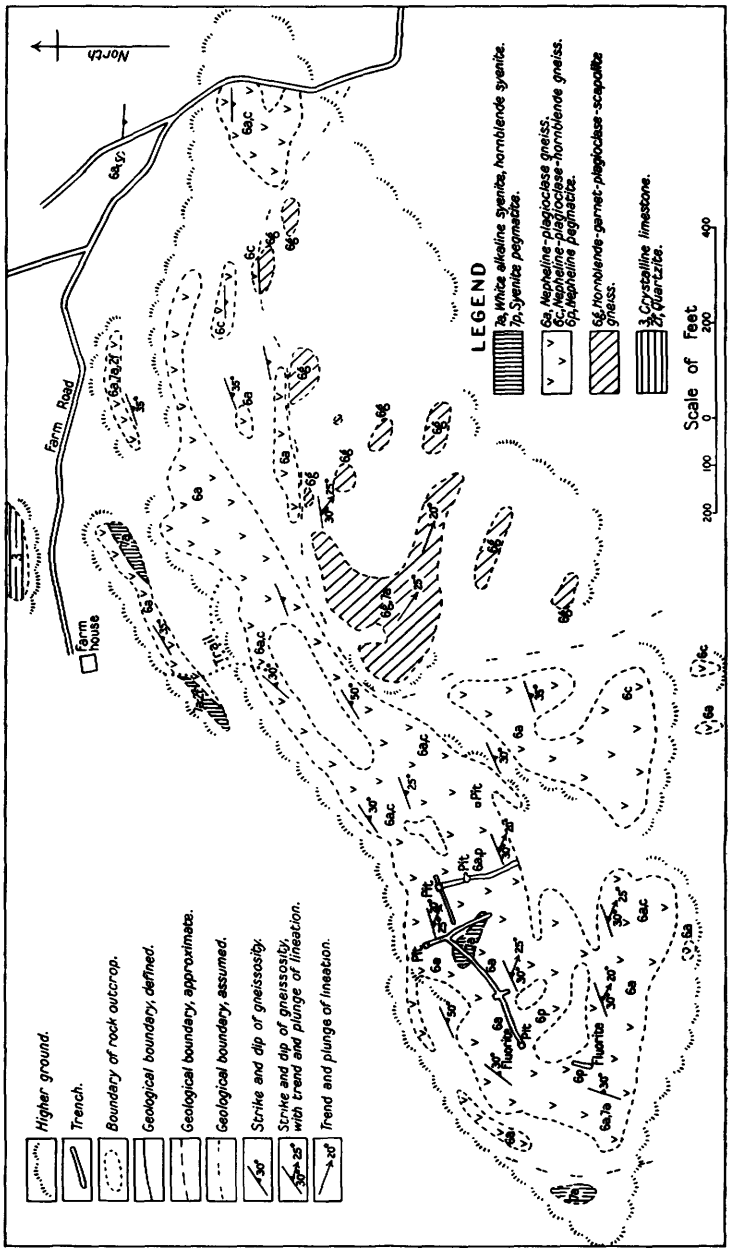


Figure 7 — Geological Map of Wesley Kargus ridge, Wolfe nepheline belt.

excavated in the nepheline-bearing gneisses. Small patches of nepheline pegmatite of the replacement type are common on this part of the ridge. Good evidence of the progressive replacement of medium-grained hypidiomorphic granitoid nepheline-albite syenite by large 4- to 12-inch pegmatitic patches of pure grey

nepheline can be seen in the trenches at the west end of the ridge. The patches of grey nepheline grade into medium-grained nepheline albite gneiss, often with a border zone of nepheline with relic inclusions of unabsorbed medium-grained albite scattered throughout.

Pale-violet fluorite up to ⅛ inch in grain size is a common accessory in the nepheline gneiss. On the south side of the ridge at the western end there is a small pit which exposes nepheline-albite pegmatite over a length of 25 feet. Coarse-grained green apatite and purple fluorite are present with biotite and nephelite crystals in the pegmatite.

The nepheline content at the western end of this ridge varies from 0 to 40 percent and probably does not average over 15 percent over an average 100-foot width of the banded gneiss. Hornblende is the chief mafic mineral present, and varies from 0 to 25 percent. This portion of the Wolfe nepheline belt is the best from the viewpoint of nepheline content, low percentage of mafic impurities, and constancy of composition, but even this part of the belt is of questionable economic interest.

RAGLAN TOWNSHIP

Concession XIX, Lot 2

Very rich patches of nepheline-corundum rock, which run as high as 80 percent nepheline, occur in the western Klondike cuts. The nepheline has a pink to grey colour and a glassy to vitreous lustre on fresh surfaces. The corundum crystals generally have a long-tapered, crystal habit and are often mantled with muscovite. Magnetite is a common accessory. The main patches of nepheline-corundum and nepheline-plagioclase-corundum rock are 15–20 feet in thickness and have exposed lengths of nearly 100 feet. They are replaced along strike by pink and grey leuco-syenites.

Satterly[1] states:

> In 1938, N. B. Davis[2] tried to sort out some of the rock of high nepheline content but free of corundum, without, however, much success. No shipments were made.

Nepheline-plagioclase-magnetite gneiss also occurs at Craigmont workings in the adit.

Concession XV, Lots 12, 13, and 14

A new occurrence of nepheline-albite gneiss was reported by A. D. Graham on lots 12, 13, and 14, concession XV, Raglan township. Here the nepheline-bearing gneisses outcrop in a band ¼ mile wide and ½ mile long in an east-west direction. The nepheline-albite gneiss is interbanded with white and pink alkaline syenite gneiss and amphibolite. The nepheline content varies from 0 to about 50 percent. The average nepheline content is extremely low, and the occurrence is of no commercial interest at the present time.

Concession XIX, Lot 25 (Jewellville Corundum Pits)

A narrow band of nepheline-corundum-plagioclase gneiss occurs in the corundum pits at Locality 1 (see page 62), on lot 25, concession XIX, Raglan township.

As already described in the previous section on corundum (page 63),

[1] J. Satterly, *Mineral Occurrences in the Renfrew Area*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 3, p. 91.

[2] N. B. Davis, written communication.

nepheline-albite gneisses occur in the corundum pits at Locality 3 on lot 25, concession XIX. The nepheline gneiss bands are small and discontinuous.

Rare Element and Radioactive Minerals

As is the case with many of the pegmatites in eastern Ontario, some pegmatites of the Brudenell-Raglan area contain small amounts of rare element and radioactive minerals, such as columbite-tantalite, euxenite, lyndochite, allanite, and monazite. The content of rare element and radioactive minerals in the pegmatites is extremely small, and it is doubtful whether economic concentrations of any of these minerals exist in these pegmatites.

BRUDENELL TOWNSHIP

Concession IV, Lot 34

In the corundum pit near Rosenthal village on lot 34, concession IV, patches of massive black allanite up to 6 square inches in size occur in red granite and syenite pegmatites which cut the corundum-bearing rocks.

Printy Lake Area, Concessions XIV and XV, Lots 10–20

The granite pegmatites of the Printy Lake area in north-central Brudenell township contain allanite as a common accessory mineral.

Concession X, Lot 21

On a small island in Gorman Lake there is a granite pegmatite containing large clusters of a black resinous radioactive mineral tentatively identified as allanite.

LYNDOCH TOWNSHIP

Concession XV, Lot 23

The beryl granite pegmatite on lot 23, concession XV, Lyndoch township, has already been described (pages 36–42). The pegmatite carries small amounts of lyndochite, columbite, columbian anatase,[1] cyrtolite, monazite, and euxenite.

Concession XV, Lot 25 (Universal Light Metals Company)

The Universal Light Metals Company opened a series of pits on lot 25, concession XV, Lyndoch township, on the crest of Casey Hill, ¼ mile east of the Quadeville-Letterkenny road. The size and distribution of the pits on the property are shown in the accompanying sketch (Figure 8). The pits expose pink granite pegmatite cutting pink granite and hornblende granite gneiss. Allanite, zircon, and titanite are common accessories in the pegmatite and granite.

At pit B, which measures 10 by 10 by 1 foot deep, allanite occurs in a pink, medium-grained leucocratic granite made up of pink feldspar and quartz with about 5 percent of small crystals of allanite with red rims and shatter patterns around them. Magnetite, hornblende, and garnet are also present.

In the main pit there is an allanite-rich zone exposed in the south wall of the cut. The zone has an exposed length of 12 feet and a maximum thickness of about 4 feet. The zone is irregular and passes into allanite-poor granite gneiss at either

[1]A. D. Graham, by permission from his unpublished thesis for Master of Science degree, *Mineralogy, Internal Structure, and Genesis of Beryl Pegmatites, Renfrew County, Ontario*, Queen's University, 1952.

end. Lath-shaped allanite crystals, up to 1 inch in length, make up 10–15 percent of the rock.

No beryl, columbite, or monazite were observed on the property.

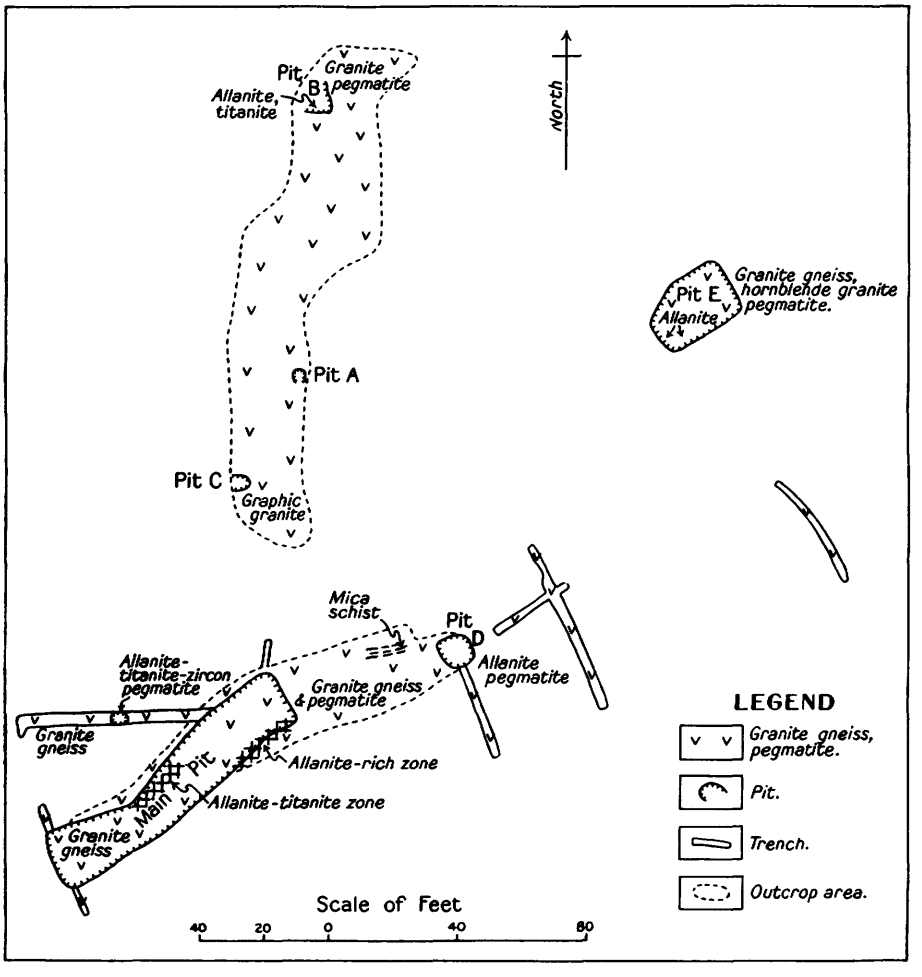


Figure 8 — Hatch property, (Universal Light Metals Company), lot 25, concession XV, Lyndoch township.

Concession XV, Lot 30

The beryl-bearing granite pegmatite dike on lots 30 and 31, concession XV, Lyndoch township, has also been previously described (pages 42–46). This dike carries columbite-tantalite in the pink microcline microperthite throughout east, west, and central portions of the workings. The crystals of columbite-tantalite are platy, averaging 1/16–1/8 inch in thickness and 1–2 inches in length. Zircon, cyrtolite, lyndochite, and euxenite also occur in this pegmatite. Graham[1] states that:

> The radioactive element minerals identified in these pegmatites (lots 23 and 30, concession XV) belong to the euxenite-polycrase series. The minerals in this series are essentially niobates and titanates of the rare-earth metals yttrium, erbium, cerium, and of uranium. Euxenite is the niobate end-member and polycrase the titanate end-member. The intermediate member is euxenite-polycrase and a low uranium, high calcium and thorium member has been named lyndochite by Ellsworth.

[1]A. D. Graham, *op. cit.*

RAGLAN TOWNSHIP

Concession XVIII, Lots 3 and 4

Ellsworth[1] has reported the occurrence of euxenite and allanite at Craigmont. Uraninite is also reported to have been present in concentrates.

Allanite is also present in the Jewellville corundum cuts on lot 25, concession XIX, Raglan township.

Sillimanite

The mineral sillimanite has the formula $Al_2O_3SiO_2$ and occurs commonly as fine, fibrous needle-like aggregates or white fibrous sheaves in gneisses and schists. It is vitreous to silky in lustre and has a hardness of 7 to 7.5. It ranges in colour from white or grey to straw yellow or brown. Sillimanite is used in the manufacture of sillimanite refractories.[2]

Sillimanite-garnet-hornblende gneiss forms narrow bands in amphibolite on lot 34, concession XV, Lyndoch township. The sillimanite consists of fine-grained, fibrous, radiating aggregates which make up 20 to 30 percent of the rock. Sillimanite also occurs as a constituent of a sillimanite-garnet augen gneiss associated with hornblendite just west of Wolfe post office in the eastern part of Lyndoch township. Narrow bands of garnet-sillimanite amphibolite occur at the contact of granite gneiss and amphibolite just east of Wadsworth Lake, Radcliffe township. Clots of radiating needle-like crystals of sillimanite up to ¾ inch in diameter make up as much as 15 percent of the rock. All these bands are narrow and of no commercial interest.

Zircon

Zircon is a common microscopic mineral in nearly all granites and syenites. In the Brudenell-Raglan area zircons, 1/16–⅛ inch in size, are often found in syenite and granite gneisses and associated pegmatites. In southeastern Brudenell township, zircon, apatite, and calcite are characteristic accessories of the yellow-brown hornblende syenites and syenite pegmatites that are prevalent in the Anderson Lake area.

Zircon is the chief source of the zirconium oxides used in refractories and ceramics.

BRUDENELL TOWNSHIP

Concession V, Lot 1 (Kuehl Lake)

At the eastern end of Kuehl Lake on lot 1, concession V, a zircon prospect was opened up in 1930 by Professor A. L. Parsons of the Royal Ontario Museum for specimen material.[3] In 1943 the occurrence was reopened by the Universal Light Metals Company under the direction of J. E. Hatch.

The main workings consist of an open cut, trending N. 20° E., measuring 40 by 10 by 5 feet deep. The country rock consists of a band of yellow-brown to pink porphyroblastic syenite gneiss striking N. 20° E., dipping 40° E., underlain by hybrid syenite gneiss, and overlain by interbanded silicated crystalline limestone and coarse amphibolite. Syenite pegmatite, as flat sheets or sills, cuts the syenite gneisses. Lenses and pods of hornblende, zircon, apatite, titanite, calcite vein material occur in the yellow-brown hornblende syenite. The hornblende within

[1] H. V. Ellsworth, *Rare-element Minerals of Canada*, Geol. Surv. Can., Econ. Geol. Ser., No. 11, 1932, p. 231.

[2] D. F. Hewitt, *Kyanite and Sillimanite in Ontario*, Ont. Dept. Mines, Ind. Min. Circ. No. 4, 1952.

[3] J. Satterly, *op. cit.*, p. 118.

the hornblende syenite gneiss is spottily distributed in lenses, stringers, and individual crystals up to 4 inches in size. This recrystallization or reconstitution of hornblende within the pink and yellow-brown syenite, as this syenitic material replaces amphibolite bands, is a characteristic feature of the process of syenitization apparent throughout the area.

The zircon crystals occur in the yellow-brown syenite and in lenses of calcite, apatite, biotite, and hornblende in the syenite. Very little zircon is now visible in the workings. Titanite occurs in wedge-shaped crystals up to ½ inch in size.

Some of the zircon crystals are of good hyacinth colour, and parts of the crystals are sometimes suitable for gem-cutting. C. C. Waite has cut a $^4/_5$-carat marquis brilliant of fine orange and red colour from a fragment of a large crystal from this occurrence. J. Satterly has a ½-carat brilliant from similar material found at this locality.

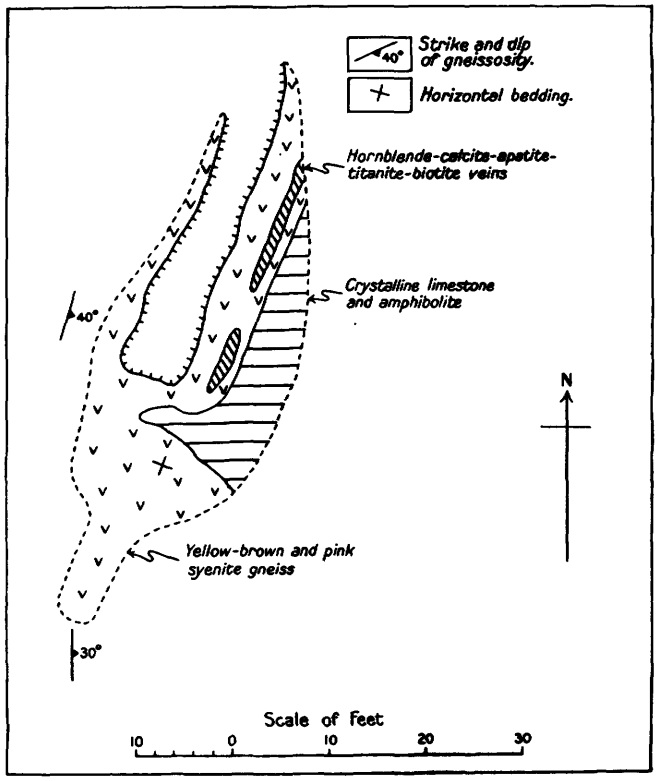


Figure 9 — Kuehl Lake zircon property, Brudenell township.

CHAPTER V

GEOLOGICAL PROBLEMS OF THE AREA

Theoretical Considerations

The foregoing chapters have given a factual description of the general geology and economic mineral occurrences of the area with as little discussion of theoretical considerations and interpretations as possible. Mapping has been carried out primarily on a lithological basis, with only secondary emphasis on genetic interpretations.

In this part of the Grenville subprovince the grade of metamorphism is high, the rocks have been profoundly altered since their original deposition or emplacement, and original structures and textures in sediments, volcanics, and intrusives have often been completely obliterated. In addition to dynamo-thermal metamorphism, there are many changes effected by metasomatism, granitization, and kindred processes. The rocks as we now find them are a heterogeneous metamorphic assemblage of great structural complexity, differing vastly from their original character. There are plutonic rocks that are not intrusive, nor even igneous, in the sense that they have consolidated from a magma. There is sedimentary material, notably marble, that is definitely intrusive in the sense that it was mobile, flowed, and was injected into other rocks. Some of the hybrid granite, syenite, and nepheline gneisses contain material of both sedimentary and igneous origin.

The genesis of many of the rock types, as for example the amphibolites, is controversial and uncertain. Unfortunately, therefore, it is often obscure as to what is being represented on geological maps of this part of the Grenville subprovince, particularly when the geologist has mapped on an interpretative, rather than on a simple lithologic classification. This contest between different genetic interpretations by different geologists has been well illustrated in the adjacent Bancroft area. For example, the nepheline-hornblende gneiss, represented by the symbol "6b" on the accompanying map sheet, has been variously mapped in an interpretative way as monmouthite, melanocratic hornblende ijolite, nepheline paragneiss, and nephelinized dark gneiss of extrusive or intrusive origin.

Where such interpretative mapping is controversial, speculative, or dependent on special insight, it is often difficult to infer lithology from the resulting map, which is often based on a subjective interpretation of what the rocks once were, rather than what they are. Conversely, it is relatively simple to use a lithologic map as a basis for genetic interpretation. Therefore, the present mapping was carried out on the basis of a simple lithologic classification with the thought that it will be useful to the prospector as well as the geologist who may wish to make further study of the area in an interpretative way.

The purpose of this section of the report is to point out some of these geologic problems of the area that are difficult of interpretation and to suggest some possible, but not necessarily correct, solutions.

1—Metamorphism

The Grenville-type sediments and nearly all the plutonic rocks, including gabbro, syenite, granite, and nepheline rock, have been subjected to intense metamorphism, and show a metamorphic fabric. Some of the late granite and pegmatite are the only rocks in the area that do not show evidence of a long metamorphic history.

The metamorphic history is complex and is made up of a number of components. There has been an intrusion of gabbro and granite, with concomitant contact metamorphic effects; there has been metasomatism of three types: (a) scapolitization of paragneiss, gabbro, and nepheline gneiss, (b) limited nephelinization, and (c) granitization; there has also been an important period of regional metamorphism during which the rocks have been folded and faulted, and a regional gneissosity developed. The metasediments now belong to the amphibolite metamorphic facies; a granulite fabric has been developed in many of the granite gneisses.

REGIONAL LINEATION

A period of Precambrian thrust-faulting during which there were strong forces acting from the southeast is suggested by a strongly developed and widespread regional lineation in the metagabbro, the nepheline gneisses, and some of the granite gneisses. This persistent lineation strikes S. 45° E. and pitches 20°-25° SE. Owing to metamorphism, later intrusion and Tertiary faulting, it is difficult to get evidence of this early age of Precambrian faulting, but the evidence in northern Lyndoch township suggests that overthrusting from the southeast may have overturned the Grenville series and produced a series of flatly south-dipping fault slices. A strong zone of grey, sheared limestone mylonite extending across concessions XIII and XIV in northern Lyndoch township may represent one of these south-dipping thrust zones.

Many of these various metamorphic components are related; the scapolization and granitization are probably associated with one of the periods of granitic intrusion. The intrusion of granite, granitization, and regional metamorphism may all be part of the same epoch in the metamorphic history of the area.

Owing to the complexity of the metamorphic history, it has not been possible to determine any zoning of metamorphic facies or progressive regional metamorphism in the area. The grade of metamorphism is high, as indicated by the development of amphibolites; garnet and sillimanite frequently appear.

THE LIMESTONES

The limestones of the Grenville type found in this area are completely recrystallized to white and grey marbles. In most cases there is a rude banding, which may be relic bedding. This banding is generally developed parallel to the paragneiss interbeds, where such occur.

Flowage

During recrystallization some of the marbles have certainly flowed, and there is some evidence of forceful intrusion of marble into other rocks. Frequently fault zones up to 10 feet wide are sealed with a marble breccia, and it is apparent that the marble had a certain degree of mobility. Marble breccias containing fragments of paragneiss, amphibolite, granite gneiss, pegmatite, nepheline gneiss and gabbro are of common occurrence.

Grade

The marbles are, for the most part, composed of recrystallized calcite or sometimes dolomite. In general the magnesia content is low. Quartz is not uncommon in the marbles, and silica and calcite were apparently in equilibrium in many cases. However, some diopside and tremolite rocks do occur and tremolite, diopside, and scapolite are frequently found in the marbles. No wollastonite is

known, and the degree of metamorphism is, therefore, considered to be medium. In the cases where tremolite skarn rocks and meta-pyroxenites have been formed from Grenville marble, the process usually appears to have been metasomatic.

Adams and Barlow[1] considered that many of the amphibolites were derived from the limestones. This problem is discussed briefly in the later section on, "Origin of Amphibolite."

THE METAGABBRO

The early Precambrian diorite and gabbro intrusives, of which the "Raglan Hills" metagabbro and "Quadeville" metagabbro are the best examples, have been strongly metamorphosed and usually show a pronounced gneissic structure.

Progressive Metamorphism

This metamorphism of the gabbro to form metagabbro can be seen in several stages of progression. The initial step is cataclasis, with the formation of mortar structure. The plagioclase and hornblende crystals show crushing along intergrain boundaries. As dynamic metamorphism proceeds, this effect is increased with strong mylonitization of the diorite or gabbro and development of secondary amphiboles.

In the higher grades of metamorphism, metagabbro is produced by the complete recrystallization of the mylonitized rock. The recrystallized amphibole and plagioclase of the metagabbro form a granular mosaic with the original interlocking texture of the intrusive completely destroyed. The typical metagabbro is a granoblastic gneiss in which the hornblende often occurs as clotted aggregates.

Scapolitization

A noteworthy feature of the metagabbro bodies is the common development of scapolite replacing plagioclase in the granoblastic gneisses. This scapolitization is thought to be due to metasomatic introduction of carbon dioxide and chlorine-bearing solutions, perhaps from late granitic intrusives such as the Boulter granite. In his study of the Adirondack gabbros, Buddington[2] attributes a similar scapolitization to chlorine-bearing solutions from a granite magma.

A somewhat puzzling feature of the gabbro-metagabbro group is the apparent intrusive relations between gabbro and metagabbro, or between pyroxenite (or olivine gabbro) and metagabbro. Both in the Raglan Hills complex and in the Quadeville metagabbro complex, there are instances where relatively fresh-looking, but often somewhat gneissic, gabbro cuts strongly gneissic granoblastic metagabbro and is, therefore, apparently younger in age than the metagabbro. However, there are also inclusions of gabbro, surrounded by mantles of coarse hornblendite, in metagabbro. In the initial mapping, gabbro and metagabbro were separated into two groups, and the latter was thought to be possibly partly extrusive in origin. Further mapping and the lack of any evidence of extrusive origin for the metagabbro indicated that this division was not practical, and these rocks were grouped together as facies of a multiple intrusion.

It is also interesting to note that, in general, the gabbros give a strong anomaly on the aeromagnetic sheets due to accessory magnetite, while the metagabbros do not usually give a strong anomaly.

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[1]F. D. Adams and A. E. Barlow, *Haliburton and Bancroft Areas*, Geol. Surv. Can., Mem. 6, 1910.

[2]A. F. Buddington, *Adirondack Igneous Rocks and Their Metamorphism*, Geol. Soc. Amer., Mem. 7, 1939, pp. 260–67.

THE NEPHELINE ROCKS

Almost without exception the nepheline rocks of the area are strongly gneissic, indicating that they have been through the same metamorphic cycle as the sediments, gabbros, and early granites. The result of this metamorphism has been the development of strong gneissic banding in the nepheline rocks; the writer believes that this gneissosity is a metamorphic fabric imposed on the nepheline rocks during regional metamorphism, a perfectly natural metamorphic process. There is no undisputed evidence in this area that the gneissic structure in inherited from any sedimentary rock that may have been later nephelinized.

Metamorphic Differentiation

During the regional metamorphism the nepheline rocks, consisting of nepheline, plagioclase, biotite or hornblende, and calcite, developed this strong metamorphic banding, and the process of metamorphic differentiation may explain the variable character of the nepheline gneisses. This variability in nepheline and mafic content across the nepheline gneiss bands is most evident in the Wolfe nepheline belt where this feature may be ascribed, in part at least, to metamorphic differentiation due to chemical mobility of the constituents, influenced by the presence of volatiles.

Concept of Mobility

The writer believes that a limited movement of material is part of every metamorphic process, and that, under metamorphism, a homogeneous igneous rock may develop a heterogeneous metamorphic character to a greater or lesser degree depending on the intensity of metamorphism and the volatility and natural mobility of the mineral constituents under high pressures and temperatures. This process of metamorphic differentiation has been effective in this area in the case of alteration of gabbro to metagabbro, and would seem to explain equally well the banded character of some of the nepheline rocks. Heterogeneity is a common result of metamorphism; the question of whether the change from a relatively massive, "igneous-looking" rock, such as the Blue Mountain nepheline body in Methuen township, or the Otter Creek sill in Monmouth township, to a nepheline gneiss is due to heterogeneity developed during increasing intensity of metamorphism, or, as some other recent workers have suggested, the change is rather one from a heterogeneous sedimentary gneiss to a homogeneous "igneous-looking" rock, this homogenization being effected by a process of nephelinization, is certainly a major problem of the area.

This is discussed further in the later section on "Character and Origin of the Nepheline Rocks."

2—The Origin of Amphibolite

The common "dark gneisses" of the area are chiefly varieties of amphibolite, composed of varying amounts of hornblende and plagioclase, ranging from oligoclase to andesine, with or without quartz, biotite, garnet, scapolite, and pyroxene. As a metamorphic facies, "amphibolite" is widespread throughout the area and certainly includes both metasediments and meta-intrusives, as well as a small amount of amphibolite derived by the action of granite on limestone, as described by Adams and Barlow. On the map most of the amphibolite is placed in the "paragneiss-amphibolite" group, largely on field relations, as, for example, when amphibolites occur interbanded with limestones. Some of the amphibolites, however, are grouped with the meta-intrusives.

AMPHIBOLITE OF META-INTRUSIVE ORIGIN

In Lyndoch and Raglan townships the large metagabbro complexes, which form the Raglan and Quadeville hills, consist of diorite, gabbro, hornblendite, pyroxenite, peridotite, metagabbro, metadiorite, amphibolite, and hornblende schist. Metasediments occur around the margins of these complexes and as large pendants and inclusions within them. Fine-grained, well-banded amphibolite and hornblende schist make up the marginal border facies of the metagabbro and are part of the intrusive mass. The contact action of these basic intrusives on the adjacent enclosing sediments has produced contact metamorphic amphibolite and hornblende schist, which are sometimes indistinguishable from the amphibolites of meta-intrusive origin. Therefore, in some cases, amphibolites of metasedimentary origin, lying along the margins of, or within, the metagabbro complex, have unavoidably been grouped with those of meta-intrusive origin under the symbol "4e."

AMPHIBOLITE OF METASEDIMENTARY ORIGIN

The bulk of the amphibolite in this area is of sedimentary origin and has probably been produced by thermal metamorphism of pelitic or calcareous pelitic sediments. These pelitic sediments or greywackes grade into limestones, and all gradations from amphibolite to marble are found. Scapolite is frequently developed in the calcareous amphibolites and probably indicates the thermal metamorphism of a calcareous greywacke rather than metasomatism.

There is good evidence of the development of metapyroxenite, consisting predominantly of green diopside and tremolite, through the metasomatic alteration of limestone, and it appears to the writer that this limestone-metapyroxenite transformation was the most common type of change that occurred in the area when the Grenville limestones were subjected to metasomatism.

Some of the amphibolites may have been formed from limestone by the extreme process that Adams and Barlow have suggested, namely, a complete replacement of calcite by plagioclase and hornblende, with major introduction and removal of material, and a complete remaking of the rock.

Under the conditions of dynamo-thermal metamorphism, which apparently existed in the area, the Grenville limestones recrystallized and flowed while the calcareous greywackes became amphibolite. We now find amphibolite and marble intimately interbanded. Gradation from marble, through calcareous amphibolite into amphibolite, is a field fact. However, whether this fact is to be interpreted as progressive metasomatism rather than gradational change due to the original lithology, is a matter of controversy. Similarly the fact of interbanded amphibolite and marble can be explained by original lithology, but it is more difficult to explain why certain bands of a limestone should be changed to amphibolite while adjacent bands were recrystallized without any metasomatic alteration. The writer believes that the Grenville series was probably recrystallized by regional metamorphism prior to the stage of metasomatism attendant on granite intrusion, and, therefore, that such original physical differences such as porosity and permeability in the limestone itself can hardly explain a selective metasomatic replacement of some of the bands of the marble. Chayes[1] has explained this rather anomalous condition of sharp contact between amphibolite and marble by large scale intrusion or injection of marble into amphibolite.

The writer interprets amphibolite rather as a regional metamorphic effect than as an effect of metasomatism. In the major areas of granite gneiss and

[1]Felix Chayes, *Alkaline and Carbonate Intrusives near Bancroft, Ontario*, Bull. Geol. Soc. Amer., Vol. 53, 1942, No. 3.

hybrid granite gneiss on the accompanying map, amphibolite is much more common than limestone, although pendants of limestone and interbanded limestone and amphibolite do occur. It is a fact that in the major areas of granite gneiss, limestone is scarce. Whether this fact can be better explained on the basis of alteration or assimilation of limestone to produce amphibolite, or on the basis of original distribution, is questionable.

In the Monteagle-Carlow Townships area immediately to the west, where the degree of metasomatic activity appears to be higher, lime metapyroxenite bands, which must represent altered limestone, are much more common than in this area. Another noteworthy feature apparent in the Hybla pegmatite subprovince of Monteagle township, as pointed out by P. A. Peach of the University of Toronto, is the prevalence of large, well-defined granite pegmatite dikes in the limestone and metapyroxenite bands and their relative scarcity in the amphibolite bands. Much pegmatitic material is present in the amphibolite bands, but it is in the form of *lit-par-lit* injections. In other words, the amphibolite is easily "granitized" by injection of pegmatitic material, to produce a "hybrid gneiss," but limestone does not "granitize" easily, and the introduced pegmatitic material is in well-defined dikes.

AMPHIBOLITE OF METAVOLCANIC ORIGIN

Moyd[1] has suggested that some of the "dark gneiss" is of volcanic origin, possibly representing metamorphosed tuff or thin greenstone flows. This origin is certainly possible for some of the amphibolite, but in the absence of any direct evidence of volcanic structures such as pillows, bombs, pyroclastic fragmentals, ropy flow, etc., the writer found it necessary to group all the amphibolites either as metasedimentary or meta-intrusive, depending on field associations.

3—Granites and Granitization

In the Brudenell-Raglan map area the granitic rocks do not commonly occur in large, transgressive, discordant masses of uniform composition. For the most part the granitic rocks are gneissic in structure, and granite gneiss, pegmatite, and amphibolite are intimately mixed to produce a "hybrid granite gneiss." On the map the pink granitic areas are composed predominantly of leuco-granite gneiss (8a), usually with little or no mafic material, granite pegmatite (8p), and hybrid or mixed granite gneiss and amphibolite (8h). A noteworthy feature of much of the area is the prevalence of pegmatitic granite and the lack of well-defined granite-pegmatite dikes.

BOULTER GRANITE

In southwestern Raglan township and extending into adjacent Carlow township, there is a mass of grey biotite soda granite of slightly gneissic structure, which differs markedly in appearance from the typical hybrid pink and grey granite gneisses of the rest of the area. The Boulter granite appears to be the best example of a transgressive granite body of fairly uniform character to be found within the area, and is thought to be a truly igneous granite stock.

CONCORDANCE

The structure of most of the granite gneisses is concordant with the structure of the enclosing metasediments. In the case of the Snake Creek granite gneiss

[1]Louis Moyd, *Petrology of the Nepheline and Corundum Rocks of Southeastern Ontario*, American Mineralogist, Vol. XXXIV, 1949, p. 738.

body in Lyndoch township, the structure appears to be phacolithic. The large body of hybrid granite gneiss occupies the trough of a syncline. Similarly, the nearby Mining Mountain granite gneiss also appears to be a concordant phacolith occurring on a drag fold. The Mount Jamieson hybrid granite gneiss body in southeastern Lyndoch township is also a concordant, pod-like intrusive body, and the structure of the enclosing limestone and amphibolite country rock sweeps around the body of hybrid gneiss. In these cases, although there is evidence of many mafic metasedimentary schlieren in the bodies, the main addition of granitic material appears to be due to injection, with room being made for the additional material by displacement of the enclosing rocks. The mechanism here appears to have been injection rather than any process of metasomatic volume-for-volume replacement of metasediment.

GRANITIZATION

In the cases cited above the evidence appears to favour the production of hybrid granite gneiss by injection of granitic material into certain structurally favourable zones, with limited digestion and assimilation or granitization of the country rock.

In Radcliffe township the main rock types found are interbanded granite gneiss, hybrid granite gneiss, and amphibolite, and there is little to suggest to what extent these gneisses are the product of granitic intrusion, injection, or granitization. These rocks are clearly of hybrid origin, but it is difficult to determine what percentage of the rock is sedimentary, what part is transfused or granitized sediment, and what part is truly igneous in that it solidified from an injected magma of granitic composition.

POTASH METASOMATISM

Apparently intrusion, injection, and replacement were all part of the history of the granitic and syenitic rocks in this area. The fact that replacement did play a very important part in the production of "igneous-looking" syenites from nepheline gneisses at the Klondike, Craigmont, Jewellville, and other corundum deposits has already been stressed. The main process in this alteration was potash metasomatism. Many of the hybrid syenite gneisses (7h), particularly in Brudenell township, have probably been developed by potash metasomatism of amphibolite. In many cases in this replacement process the iron of the amphibole has been fixed in the rock as magnetite, accounting for the high magnetic anomalies in the syenitic areas, as contrasted to most of the granitic areas on the aeromagnetic map sheets.

This process of potash metasomatism has produced a massive, relatively uniform, "igneous-looking" rock from a variable gneiss: the process has effected homogenization by metasomatism. This potash metasomatism is intimately tied up with the granite gneiss and pegmatite, spatially and genetically, and can be regarded as an important agent of the granitization process.

HETEROGENEITY *vs.* HOMOGENEITY

In an earlier section the writer pointed out that metamorphism of these Archean rocks had apparently been accompanied by a development of heterogeneity in the resulting gneisses, and that some migration of material had apparently occurred, at least on a restricted scale. It has also been noted, however, that metasomatism has apparently produced homogenization of a variable gneiss. These two opposite processes both seem to have been operative at different times and under quite different conditions. The "granitization" school of petrologists

have appealed strongly to this idea of granitization producing homogeneity. Niggli has discussed this and concludes that the chemical and mineralogic heterogeneity of the Finnish country rocks that he has examined is so extreme that by no system of anatexis and homogenization could salic granite bodies be produced. He has concluded that it is not a case of heterogeneous migmatites being transformed into homogeneous granite, but rather the reverse process.

As far as interpretation of evidence in the present area is concerned, it appears that both homogeneity and heterogeneity have been locally produced by different processes on a relatively small scale, but whether these processes could modify rock on a batholithic scale is problematic.

H. H. Read[1] has pointed out that rocks of extreme composition, "such as quartzite, limestone and amphibolite," persist untransformed in the midst of granitized semi-pelitic and pelitic rocks. These quartzites, limestones, and amphibolites are the characteristic rocks of the Grenville series, and amphibolites in particular form an important part of the hybrid gneiss terrane of the Grenville subprovince. How much of these hybrids is caused by injection and how much by transformation of metasediments is, therefore, quite controversial.

GRANITIZATION OF THE NEPHELINE ROCKS

That there has been an important period of granitization, which has affected this area, towards the end of the Precambrian history, is certain. This granitization has been in part produced by injection, but extensive potash metasomatism, which has resulted in extensive development of microcline and microcline microperthite in the effected rocks, has been a closely associated part of the granitization and perhaps the forerunner of injection. This injection probably preceded batholithic intrusion, but, in this area, the granitization is in no way marginal to any observable batholithic intrusive.

One of the most noteworthy effects of granitization in this area is the destruction of the nepheline rocks by a process of replacement. The stages and results of this "granitization" process have been described in an earlier section of this report (pages 20–21). The nepheline rocks pass into syenite, often carrying corundum, and subsequently, if the process is completed, into granite gneiss.

These hybrid rocks nearly all carry abundant microcline and microcline microperthite. Microperthites are absent in the early intrusives, apparently having been destroyed during metamorphism.

4.—Character and Origin of the Nepheline and Corundum Rocks

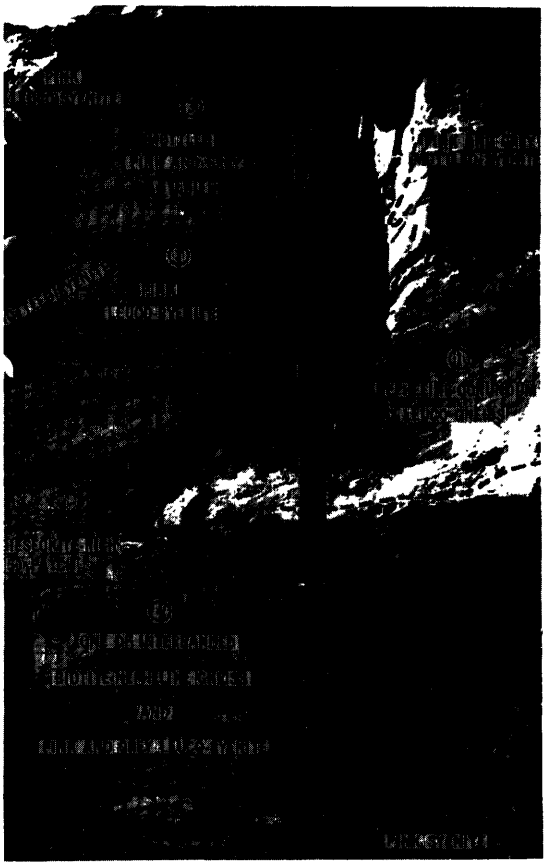
The nepheline rocks of the Brudenell-Raglan area have several features in common with the nepheline rocks of the Bancroft area, but good evidence of replacement, or interbanding of nepheline rocks with paragneiss and limestone, such as is seen in the York River section, is lacking.[2]

The strong gneissosity of the nepheline rocks, and their great variability across their strike, with interbanding of nepheline-rich, albite-rich, and hornblende-rich facies, is interpreted as a result of metamorphic differentiation. The Wolfe nepheline belt, for example, consists of two or possibly three distinct lithologic units which are variable within themselves, but in sharp contact and distinct from one another. A careful study was made to determine whether these units

[1]H. H. Read, *A Commentary on Place in Plutonism*, Quart. Jour. Geol. Soc., London, Vol. CIV, Mar., 1948, pp. 155–204.

[2]This replacement will be discussed in a later report on the Monteagle-Carlow and Dungannon-Mayo map areas now in preparation. The non-intrusive origin of parts of the Bancroft band is reasonably clear from field evidence.

could possibly represent the original disposition of stratigraphic units in a replaced sedimentary sequence. At the east end of the Wolfe belt the nepheline gneisses narrow from 1,000 feet to less than 200 feet, with convergence of the footwall and hanging-wall limestones. As the nepheline gneiss bands converge, various ones disappear, a feature difficult to explain if the rock is a replaced sediment. The bands do not grade into nepheline-poor paragneiss but disappear by convergence of adjacent gneiss bands within the intrusive, and finally the nepheline band disappears as though it were the end of a sill. The Wolfe belt is interpreted as a composite intrusive, consisting of two or three distinct units, intruded as a conformable sill into a sedimentary sequence.



REPLACEMENT OF THE NEPHELINE GNEISS BY PINK LEUCO-SYENITE

The photo shows a section of the west wall of Cut No. 6, the main upper cut, of the west Klondike workings. Here again the relations between the leucocratic nepheline-albite corundum gneiss, the pink leuco-syenite, and the hybrid, mottled pink and grey syenite gneiss is well shown in good exposure.

Through the centre of the section is a zone of leucocratic, medium-grained, grey-buff, nepheline-albite-corundum gneiss (1) with a pronounced foliated appearance due to elongate segregations of albite (or oligoclase) and corundum.

Massive, pink, medium-grained, equigranular leuco-syenite (2) intrudes and cuts the nepheline gneiss with a zone of mottled hybrid pink and grey leuco-syenite gneiss (3) commonly occurring as an intermediate stage in the replacement process.

In some cases there is a zone of interbanded biotite-nepheline gneiss and pink and grey mottled leuco-syenite gneiss (4) where the process of syenitization is incomplete.

Grey-green, gieseckite-rich nepheline gneiss (5) also occurs in places. The alteration of nepheline to a dull grey-green "gieseckite" aggregate is apparently one of the first steps in the alteration of the nepheline-rich gneiss. Corundum often appears in this facies.

MOBILITY OF NEPHELINE, RECRYSTALLIZATION AND REGENERATION

As pointed out in the section on metamorphism, some movement of material is part of every metamorphic process and will depend on the intensity of metamorphism and the volatility and natural mobility of the mineral constituents under high temperature and pressure. In the Wolfe belt, particularly at the west end, the leucocratic nepheline-albite gneisses carry up to 5 percent fine-grained purple fluorite, indicating a high content of volatile material. Nepheline pegmatites, usually of a replacement character, are common. With the high content of calcite and fluorite the rock is self-fluxing, and the nepheline may have become mobile and recrystallized in place into the large characteristic "blows" or replacement patches of nepheline pegmatite. Conceivably some of the nepheline may have even migrated to form replacement pods of pegmatite, or even to "nephelinize" some adjacent metasediments.

In the Wolfe belt examples can be seen of patches of massive grey nepheline, 6–10 inches in diameter, in medium-grained nepheline-albite gneiss. Around the edges of the nepheline patch, vestiges of the medium-grained albite often exist within the nepheline for a width of 2 inches or so from its margins. This suggests a replacement origin for this type of nepheline occurrence, and the possibility suggests itself that the nepheline has been formed by a recrystallization and regeneration in place under metamorphism. Some addition of material or metasomatic introduction may have also played a part in the process.

Gummer and Burr[1] have noted evidence for this type of replacement in the Bancroft area:

> A shear zone crosses the foliation of nepheline gneiss roughly at right angles. Two crystals of nepheline, about 8 inches in longest dimension, and euhedral in form, have been developed across the crack, and also across several albite-rich bands. Remnants of albite-rich bands remain in the nepheline crystals and show distortion. This seems to be a clear case of recrystallization of the nepheline, with concomitant replacement of the host-rock.

SCAPOLITIZATION, ASSIMILATION OF LIMESTONE, AND THE PLAGIOCLASE EFFECT

The presence of scapolite in many of the nepheline rocks, particularly at Heiderman and Reid lakes, is thought to indicate some contamination of the intrusive by assimilation of limestone. Since the intrusive is alkaline and therefore has a high concentration of volatiles, great liquidity, and strong pressure, it is able to assimilate some limestone during its emplacement. The result of this contamination of the nepheline rocks with limestone has been: (1) the presence of calcite in these rocks; or (2) under thermal metamorphism, the formation of scapolite and displacement of any remaining plagioclase toward the calcic end of the plagioclase series. The scapolite is found to be much less sodic than the plagioclase in the rocks in which they both occur. The scapolite probably indicates thermal metamorphism of a nepheline rock containing calcite, rather than metasomatic introduction of carbon dioxide and chlorine.

GRANITIZATION AND DESTRUCTION OF THE NEPHELINE ROCKS BY REPLACEMENT

A noteworthy feature of the area is the destruction of the nepheline rocks by potash metasomatism and replacement. In the Brudenell-Raglan area, although no transition from nepheline gneiss to paragneiss was observed, there are numerous examples of the transition from nepheline gneiss to syenite gneiss and ultimately to granite gneiss. In examining the occurrence and distribution of the

[1]W. K. Gummer and S. V. Burr, *Nephelinized Paragneisses in the Bancroft Area*, Jour. Geol. Vol. LIV, 1946, No. 3, p. 149.

nepheline rocks, particularly in Raglan and Brudenell townships, it becomes apparent that the nepheline rocks, enclosed as they are within belts of hybrid syenite and granite gneiss, represent the remnants of a once much more extensive belt of rock.

In the Klondike and Craigmont cuts, in the Jewellville pits, and at Rosenthal, this replacement of the nepheline rocks is well shown. The steps are: first, a hydration and silication, which destroys the nepheline and produces an albite syenite; second, the introduction of potash to form potash feldspar, usually in the form of microcline and microcline microperthite, with the conversion of the rock to a pink syenite. As the process of granitization proceeds, quartz is introduced, and a granite gneiss is the final product. This progressive alteration can be traced in outcrop in a few places. The two sets of analyses on page 98 illustrate two steps in the change.



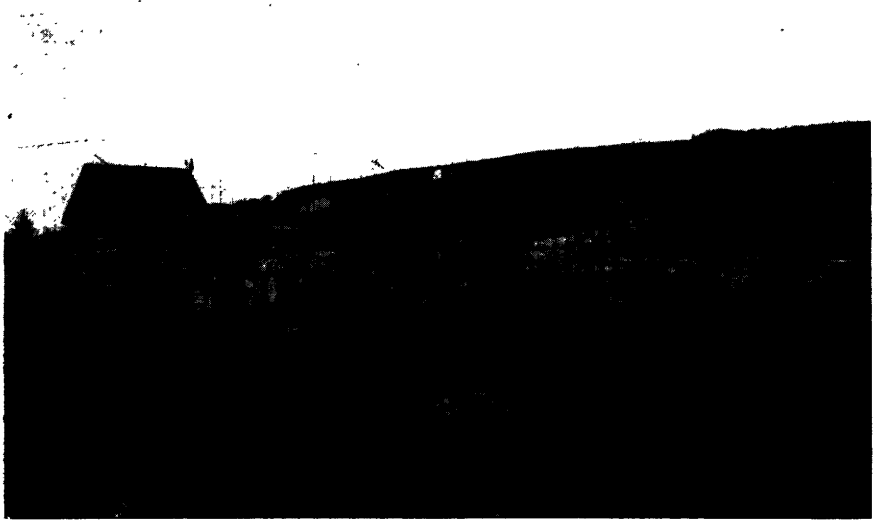
RELIC PATCHES OF NEPHELINE-ALBITE GNEISS IN PINK AND BUFF SYENITE.

This shows the west wall of the lower part of cut No. 6, the main upper cut of the West Klondike workings. Leucocratic blue-grey to white nepheline-rich albite gneiss (1) consisting of over 80 percent nepheline, makes up the upper part of the section. The lower part of the section consists of pink and buff leuco-syenite. Relic patches of unreplaced leucocratic nepheline gneiss up to 2 feet long, surrounded by irregular 2- to 4-inch rims of snow-white albite, occur in buff leuco-syenite. The buff syenite in turn is replaced by pink-syenite. Some gieseckite-rich zones occur in the hybrid buff zones near the nepheline gneiss.

A prominent feature of this section is the relic patches of unreplaced nepheline rock in the pink and buff mottled leuco-syenite.

ANALYSES ILLUSTRATING THE ALTERATION OF NEPHELINE ROCKS[1]

	From R. Gutz farm			From Klondike workings		
	Sample GU-4	Sample GU-2	Sample GU-1	Sample KC-2	Sample KC-3	Sample KC-1
SiO_2	52.29	54.18	57.00	45.90	62.22	64.37
Al_2O_3	25.67	24.21	24.91	29.79	19.78	19.41
Fe_2O_3	2.35	3.59	3.47	1.82	1.07	1.10
FeO	1.87	2.00	1.26	1.44	0.68	0.80
MgO	trace	trace	trace	0.71	0.60	0.06
CaO	1.28	2.65	0.50	3.16	1.50	0.31
Na_2O	11.26	7.97	7.90	8.26	7.52	5.73
K_2O	3.49	3.57	3.00	3.26	4.66	6.77
H_2O+	0.74	1.83	1.12	3.50	0.67	0.30
H_2O-	0.09	0.22	0.09	0.28	0.05	0.10
CO_2	0.69	0.52	0.00	1.62	1.07	0.11
TiO_2	0.21	0.13	0.14	0.07	0.08	0.15
P_2O_5	trace	trace	trace	trace	0.00	trace
Cr_2O_3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MnO	0.03	0.03	0.02	0.04	0.02	0.01
NiO	....	....	....	....	....	trace
V_2O_5	<0.01	<0.01	<0.01	0.01	0.01	0.02
Total	99.97	100.91	99.41	99.86	99.93	99.24



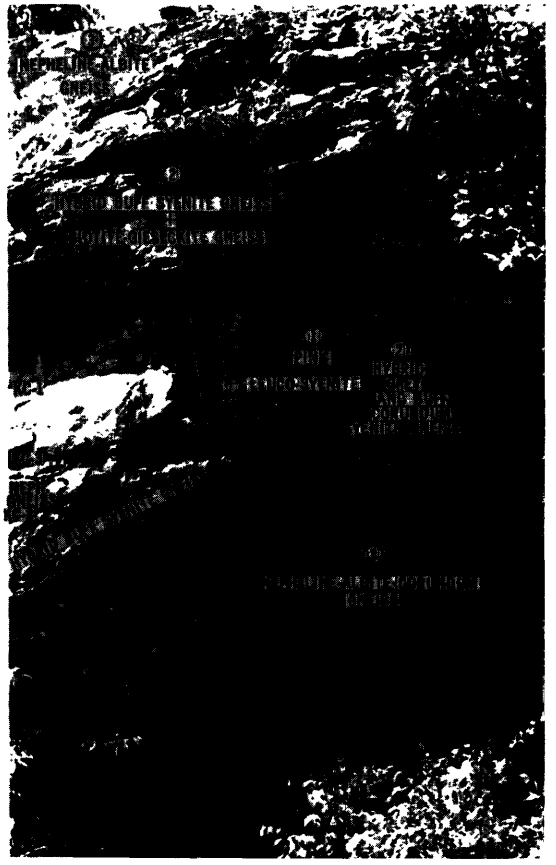
An exposure of gneiss on the farm of Richard Gutz, Rosenthal, from which samples GU-1, GU-2, and GU-4 were taken for chemical analysis.

The first set of three samples is taken from a nepheline gneiss band just south of the farmhouse of Richard Gutz on lot 34, concession V, Brudenell township. The samples are taken along strike over a length of 20 feet and represent: (1) nepheline-rich gneiss (GU-4); (2) an altered nepheline gneiss in which the nepheline has been hydrated to form a fibrous zeolite alteration matte (GU-2); and (3) an albite syenite produced by alteration of GU-2 with the disappearance of the hydrated zeolitic phase and further silication (GU-1). As will be noted in the following analyses, this first stage of alteration consists of silication with a

[1]Analyses by Provincial Assay Office, Ontario Department of Mines, 1952.

noticeable increase in SiO_2, hydration, and an increase in lime when the zeolitic aggregate is formed, followed by dehydration and a decrease in lime when the altered nepheline is replaced by sodic feldspar.

The second set of three samples is from Cut No. 6 at the Klondike workings and represents the potash metasomatism of the nepheline gneiss. The samples are taken over a width of 6 feet. Sample KC-2 is a nepheline-rich-albite gneiss; KC-1 is a pink microcline syenite; and KC-3 is the intermediate hybrid phase. The main chemical and mineralogic features of the alteration are an increase in silica, a decrease in alumina and a decrease in soda (representing the replacement



REPLACEMENT OF NEPHELINE GNEISS BY PINK LEUCO-SYENITE

The photo shows a section on the west wall of Cut No. 6, the main upper cut at the west Klondike workings. This section is just south of sections shown in photos on pages 95 and 109. Here the intrusive character of the pink leuco-syenite into the nepheline-albite-corundum gneiss is particularly well shown. The tongue of pink leuco-syenite (1) appears to intrude the nepheline-albite-corundum gneiss (3). Grey and buff corundum syenite gneiss (2) are apparently intermediate or hybrid facies. The stages of alteration appear to be: (a) the appearance of corundum, gieseckite, and muscovite; (b) an increase in buff coloration in the rock and the development of abundant biotite and muscovite; (c) more buff coloration, some pink coloration probably due to introduction of microline perthite, and a less gneissic structure in the rock; (d) alteration of the rock to a mottled, pink and buff syenite gneiss; the mottling still gives the rock a foliated appearance; (e) complete alteration to a massive, pink leuco-syenite. There is a distinct segregation of biotite into mafic bands in the buff and grey hybrid gneisses, and a granoblastic flaser structure is apparent.

Samples KC-1, KC-2, and KC-3 were taken from this section for chemical analysis to show the transition from KC-1, pink leuco-syenite to KC-2, nepheline-albite-corundum gneiss.

of nepheline by feldspar), and an increase in potash (representing the formation of potash feldspar). In some cases the excess alumina goes to form corundum.

CORUNDUM

The nepheline intrusive was high in alumina, and in some cases corundum crystallized as a primary mineral in the nepheline rocks. The close spatial association between the band of nepheline rocks and the corundum syenites strongly suggests a genetic relation between the nepheline rocks and the corundum-bearing syenites.

In many of the corundum occurrences in the Brudenell-Raglan area, the banded complex of corundum syenite and corundum pegmatite contains vestiges of nepheline gneiss or grey alkaline syenite gneiss as well as the invariably present,



KLONDIKE CUT NO. 3

The photo is taken at Cut No. 3, at the foot of the main western Klondike cuts, looking north up the hill. This section is one of the best places to see typical, pink and buff, mottled leuco-syenite. Here, as shown on the right-hand side of the photo, there are good exposures of medium-grained equigranular pink leuco-syenite with small, 2- to 10-inch, blotches of buff leuco-syenite scattered throughout the outcrop in gneissic alignment. Bronze corundum occurs in many of the buff patches. The relations suggest that the pink leuco-syenite is replacing the buff syenite. In the upper left-hand part of the photograph, leucocratic nepheline-rich albite gneiss outcrops on the hillside. This band is continuous down to the foot of the cut, as shown. Between this nepheline gneiss and the pink mottled leuco-syenite, there is a narrow zone of hybrid gieseckite syenite gneiss, with corundum.

mottled pink and buff hybrid syenite. In the "syenitization" or replacement of the nepheline rocks, alumina is released and may crystallize as corundum. When the replacement of nepheline gneiss by pink leuco-syenite takes place *in situ*, small-grain corundum may grow in the syenite. In other cases the solutions effecting replacement may migrate some distance and produce patches of replacement corundum syenite pegmatite. Owing to their small size, irregularity, isolation from any visible connection to an intrusive body, and lack of disturbance to the gneissic structure of the rocks in which they occur, these corundum pegmatite "patches" are interpreted as being of a non-intrusive origin.

The abundance of microcline perthite in these hybrid corundum syenites indicates that they are later than the main period of dynamo-thermal metamorphism.

EMPLACEMENT OF THE NEPHELINE ROCKS

The question of mode of emplacement of the nepheline rocks is an interesting problem. The alkaline magma, if one existed, would be an extremely reactive one, being undersaturated in silica and high in volatiles. Because it is silica deficient there will be a strong tendency to react with and assimilate any siliceous rocks encountered during intrusion.

If the magma was intruded by a stoping mechanism it would probably soon lose its undersaturated characteristics by reaction with granites or siliceous sediments. As Chayes[1] points out, "a small quantity of undersaturated liquid introduced into such a vast volume of granite would have little chance of survival." In the same vein Wegmann[2] gives the opinion that alkali magmas appear as rocks only under particular conditions, specifically, if in their paths they cut no rocks which can draw from them a great portion of their alkaline content. By the very chemical character of the magmatic solutions associated with the undersaturated magma, we would not expect much "nephelinization" to precede emplacement of the magma, because the solutions would soon be modified: silicated and saturated. The relation between nepheline rocks and limestone may be one of structural rather than genetic significance, in that the limestone terrane offers little possibility for silication of the alkaline magma by assimilation and reaction. The alkaline magma must have a ready path of access to its final position in the earth's crust, with as little chance of reaction and contamination as possible.

[1]Felix Chayes, *Alkaline and Carbonate Intrusives near Bancroft, Ontario,* Bull. Geol. Soc. Amer., Vol. 53, 1942, No. 3.

[2]C. E. Wegmann, *Zur Deutung der Migmatite,* Geol. Rundschau, Vol. 26, 1935.

APPENDIX A

Craigmont Corundum Deposits

By H. D. Carlson[1]

GENERAL GEOLOGY

The rocks exposed in the Klondike and Craigmont cuts may be divided into the following groups:

1) Granite and syenite pegmatites.
2) Granite gneiss.
3) Syenite gneisses:
    a) Quartz-albite syenite with arfvedsonite.
    b) Hybrid, pink-buff alkaline syenites.
4) Leucocratic nepheline gneiss.
5) Scapolite gneiss.
6) Oligoclase-andesine gneiss (grey alkaline syenite).
7) Amphibolites.

Corundum is found in the nepheline gneiss, the scapolite gneiss, the oligoclase-andesine gneiss, and in hybrid altered facies of these rocks, which occur along their contacts with the hybrid pink-buff alkaline syenites.

All these rocks, except the pegmatites and the arfvedsonite syenite, have, for the most part, gneissic fabrics and occur in irregular bands conformably intercalated with one another. The attitude of the banded structure of the sequence is roughly parallel to the southern slope of Robillard Mountain; in general it strikes a little north of west and dips from 20°–40° S., the average dip being about 30°, with minor, local open folding evident in some places.

The amphibolites occur as minor bands, clots, and schlieren enclosed by all the other rock types. They are quantitatively unimportant, and none of the exposures are of mappable size.

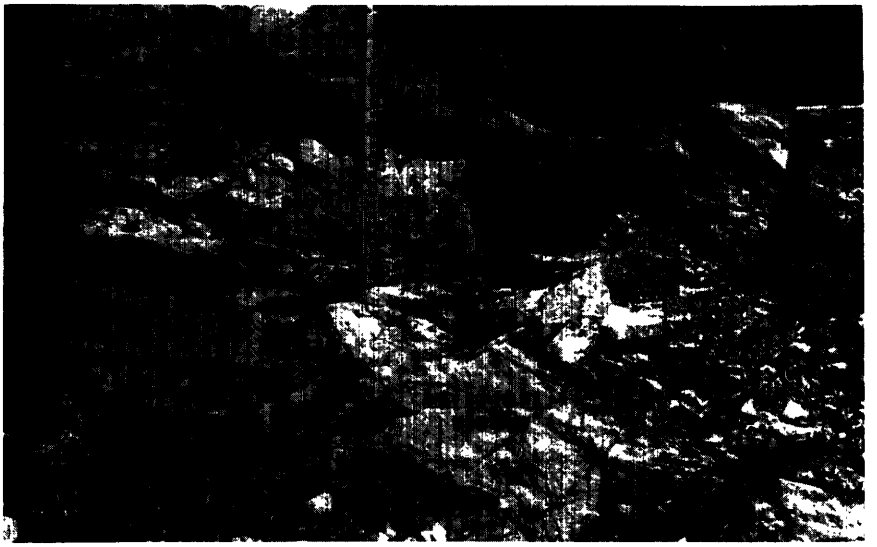
The oligoclase-andesine gneisses are generally closely associated, and often intimately interbanded, with scapolite gneiss. These two rock types occur in bands conformably intercalated with nepheline gneiss bands in the Klondike cuts and in the underground workings at Craigmont. Relations between the oligoclase-andesine gneiss–scapolite gneiss complex and the nepheline gneiss bands are obscured generally by an extensive potash metasomatism of both, as will be demonstrated elsewhere, resulting in the development by replacement of the hybrid pink-buff alkaline syenites. The oligoclase-andesine gneiss–scapolite gneiss complex occurs in the Craigmont cuts as relic bands, lenses, and irregular elongate masses, which grade into, and are enclosed by, the hybrid pink-buff alkaline syenite complex. Excellent exposures of these rocks are located in cuts No. 1, 2, 6, 10, 12, 13, and 14 at the Craigmont workings and in the far-west cuts at the Klondike workings (see map of Craigmont mine in back pocket).

Nepheline gneisses can be seen in nine of the eleven cuts at the Klondike workings and in the adit at the Craigmont workings. Hybrid relics of nepheline gneisses are present in two of the Craigmont cuts. The nepheline rocks occur in three main bands at the Klondike workings. The first band is exposed at the bottom of the far-west cut along the west face of the hill. This band of nepheline gneiss and its associated hybrid alteration products has a length of about 75 feet and a maximum width of 6 feet where exposed. The second band can be seen in the central cuts and is separated from the first by a banded sequence of the oligo-

[1]See page 58.

clase-andesine gneiss and scapolite gneiss, approximately 30 feet thick. This nepheline syenite band has a maximum exposed thickness of about 25 feet, and is overlain by the hybrid pink-buff alkaline syenite complex. The third band is exposed along the steep east wall of the far-east cut, and has a maximum exposed thickness of 25–30 feet. It is underlain and overlain by hybrid pink-buff alkaline syenites. A nepheline gneiss band is exposed in the drift, which extends westward from the north end of the adit at the Craigmont workings. This band has a maximum exposed thickness of 8 feet and is overlain by hybrid pink-buff alkaline syenites. Hybrid relics of nepheline gneisses occur on the east wall of the west section of cut No. 9 and in the southeast corner of cut No. 11 at the Craigmont workings.

The hybrid pink-buff alkaline syenite complex is the most abundant and widespread member of the banded sequence. It is present, in various amounts, in every cut in the workings at both ends of the hill but is best exposed in cuts No.



SCAPOLITE GNEISS, CRAIGMONT CUT NO. 1

The photo shows the east wall of Cut No. 1, the lowest cut at Craigmont. Here the massive, mottled, pink and buff magnetite leuco-syenite (1) cuts and replaces a medium-grained granular, grey, scapolite-plagioclase gneiss. The grey scapolite gneiss contains about 2 percent corundum. Scattered corundum crystals from ¼ to 1 inch in size also occur in the pink syenite.

2, 5, 9, 11, and 15 at the Craigmont workings and in the main-central and far-east cuts at the Klondike workings. A small zone of quartz-albite syenite, containing acmite and arfvedsonite, cuts the hybrid pink-buff alkaline syenite complex in the main central cut at the Klondike workings.

The banded corundum-bearing and syenitic sequence exposed on the south and southwest slopes of Robillard Mountain is underlain to the north by granite gneisses and migmatites, which are exposed on the top and on the east slopes of the hill. In Craigmont cut No. 7 at the bottom of the south slope of the hill, leuco-granite gneisses overlie the syenitic gneisses.

This whole banded sequence of rocks is cut by numerous dikes, stringers, and irregular masses of pink to yellow-brown, granitic to syenitic pegmatites, none of which are of mappable size.

PETROGRAPHY

Amphibolites

The amphibolites are dark-grey to black rocks consisting of variable proportions of hornblende, biotite, and plagioclase, which ranges in composition from An_{20} to An_{35}. Titanite, apatite, zircon, and magnetite are accessory constituents present in minor amounts. Rarely, microcline and microcline perthite may make up as much as 10 percent of the rock. Generally, the mafic minerals predominate quantitatively over the feldspars, and of these, hornblende predominates. The amphibolites have a rather schistose structure, the mica flakes and hornblende prisms being in parallel alignment. These rocks are usually medium-grained and equigranular.

The nature of the contacts between the amphibolite lenses and bands, and the enclosing rocks, is various. In places, the contact between the amphibolites and the hybrid pink-buff syenite complex is quite sharp, though generally the pink syenites contain considerable biotite and hornblende in zones from 2 to 6 inches wide, adjacent to the contact. Examination of such sharp contacts in thin section reveals no definite contact of any kind: each rock type appears to grade into the other over a narrow range. At other places, the contacts between the amphibolites and the enclosing complexes are seen in the field to be of a gradational nature.

A number of narrow lenses and bands of highly schistose biotite-rich rock are present in the sequence enclosed in the other rock types. These rocks range in composition from over 85 percent biotite with no feldspar and over 10 percent apatite, to less than 50 percent biotite with predominant plagioclase (oligoclase-andesine); with the plagioclase, or instead of it, there may be microcline and microcline-perthite. Contacts of these biotite-rich rocks with the enclosing rocks are gradational over various distances.

Oligoclase-Andesine Gneiss–Scapolite Gneiss Complex

The oligoclase-andesine rock consists predominantly of plagioclase, ranging in composition from An_{20} to An_{40}, and various quantities of the following minerals: biotite, magnetite, hornblende, pyroxene, muscovite, titanite, apatite, zircon, carbonate, sericite, chlorite, epidote, and corundum. Feldspars always make up at least 60 percent, by volume, of the rock and seldom less than 80 percent unless corundum is present in excess of 5 percent. In most exposures, the mafic, accessory, and secondary minerals constitute less than 20 percent of the rock by volume.

The fabric of the oligoclase-andesine rock varies both along and across the strike of the bands in which the rock occurs. In general those portions containing the least amounts of mafic and accessory minerals have a rather massive granitoid texture, which may be medium- to coarse-grained, and equigranular. However, coarse porphyroblasts of feldspar and corundum, up to 2 inches in diameter, are sometimes developed in the rock. Those portions of the oligoclase-andesine rock containing considerable quantities of dark minerals tend to have a gneissic fabric, owing to the parallel alignment of mica flakes and hornblende and pyroxene prisms, and to the tendency of the mafics, particularly magnetite, to segregate into more or less distinct bands (and lenses) relatively rich in one or more of these minerals. These bands and lenses range from less than $\frac{1}{16}$ to 3 or 4 inches in width, and individually are generally discontinuous beyond a few feet in length. Texturally, the gneissic phases may be equigranular to inequigranular, porphyroblastic and medium- to coarse-grained. There are all gradations visible in the field between the massive, non-gneissic, granitoid phases of the oligoclase-andesine rock and the well-banded gneissic phases.

Corundum is erratically distributed in the oligoclase-andesine rock, in some places making up as much as 25 percent of the rock by volume, in others being totally absent. It occurs as bronze or green, stubby, euhedral, hexagonal, barrel-shaped crystals to rounded, anhedral, porphyroblastic grains in all sizes from less than $^1/_{25}$ to 2 inches in diameter. Most of the grains and crystals of corundum have mantles of muscovite of various thicknesses surrounding them. These appear to have formed at the expense of the corundum and, in some cases, seem to have almost completely replaced that mineral, since large euhedral, hexagonal psuedomorphs of muscovite after corundum occur in a few places in the rock. A complete range in the thickness of the selvages from thin films to thick shells around a corundum core may be seen in the field. Corundum is not present in those sections of the rock containing pyroxene or hornblende.



EAST WALL OF CRAIGMONT CUT NO. 5

The photo, taken at the east wall of cut No. 5, just north of the upper pond at Craigmont, shows a sequence of scapolite gneiss, grey and pink corundum syenite, and pink leuco-syenite. The grey, medium-grained, greenish-grey scapolite gneiss at the base of the section is cut by pink leuco-syenite, and is overlain by pink leuco-syenite. Between the main section of pink leuco-syenite gneiss at the top of the cut and the scapolite gneiss at the base of the cut, there is a 2-foot zone of pink and grey, corundum-rich syenite gneiss.

The scapolite gneisses consist predominantly of a light- to medium-greenish scapolite and subordinate amounts of one or more of the following minerals: magnetite, hornblende, epidote, garnet, biotite, muscovite, pyroxene, pyrite, apatite, titanite, zircon, chlorite, carbonate, sericite, and corundum. Scapolite

always constitutes at least 65 percent of the rock by volume and seldom less than 80 percent, unless more than a small percentage of corundum is present. Generally the mafic, accessory, and secondary minerals make up less than 15 percent of the rock by volume. The scapolite ranges in composition from $Ma_{60}Me_{40}$ to $Ma_{40}Me_{60}$.

The fabric of the scapolite rock varies, both along and across the strike of the bands in which the rock occurs, from massive and structureless where few or no mafic minerals are present, to gneissic in those portions of the rock where there are sufficient mafics, segregated into rather irregular, discontinuous bands, to give it a gneissic structure. These bands vary from less than $^1/_{25}$ to 3 or 4 inches in width. Magnetite shows some tendency to gather into rather irregular, clotty segregations in the scapolite gneiss and, in places, magnetite lenses up to 1 foot long and 3 inches wide are present. Generally the rock is medium-grained and equigranular, though in places coarse-grained phases are well developed, particularly along the borders of some of the intrusive pegmatite masses. The texture, in contrast to the closely interlocking mosaic of minerals in the oligoclase-andesine rock, is "sugary," the constituent scapolite grains being rather rounded and not intergrown with their neighbors.

Corundum has an erratic distribution in the scapolite gneiss, tending to occur in irregular patches which are relatively rich in this mineral, while other parts of the rock will carry none at all. The bronze and green grains range from less than $^1/_{25}$ to over 1 inch in diameter and range from stubby, euhedral crystals to rounded anhedral porphyroblasts. Many of the corundum grains have thin mantles of muscovite surrounding them, but these are not generally so well developed as they are in the oligoclase-andesine gneiss. Where pyrite is present in more than very minor amounts, the scapolite gneiss is rusty-weathering.

In places the bands of scapolite gneiss are cut by fractures, up to 2 inches wide usually at about right angles to their strike. Many of these contain crystals and masses of pyrite, calcite, diopside, muscovite, magnetite, chalcopyrite, molybdenite, and tourmaline. These openings generally do not extend beyond the boundaries of the scapolite gneiss bands into the enclosing rocks.

The gneissic phases of both the oligoclase-andesine and scapolite rock are, in many places, rather intimately interbanded with one another, the individual bands varying from less than $^1/_8$ inch to 4 inches in thickness. The contacts between the bands are not sharp, rather there is a complete variation in the relative proportions of feldspar and scapolite across their strikes from plagioclase-rich to scapolite-rich layers. Individual bands are not continuous along their strike but pass gradually from one rock type into another. Where the massive, nongneissic phases of both rock types are in contact, that contact is generally quite sharp and well defined. In places, massive coarse-grained oligoclase-andesine rock contains lens-like inclusions, up to 6 inches wide and 2 or 3 feet long, of scapolite rock, with sharp boundaries between the included and the enclosing rock.

The east wall of the lower-pond cut at the Craigmont workings is an excellent exposure of the oligoclase-andesine gneiss–scapolite gneiss complex and illustrates the nature of the relation between the two end members. At the lower end of the cut, immediately above the pond, rather massive oligoclase-andesine rock is exposed; proceeding up the cut, this rock, becomes progressively more gneissic in fabric, and thin bands of scapolite gneiss appear intercalated between the oligoclase-andesine layers and grading off into them along and across their strike; these scapolite-rich bands become wider and more numerous farther up the cut, and the oligoclase-andesine bands become correspondingly narrower and less numerous.

Finally, towards the top of the cut, the oligoclase-andesine bands have faded out completely, and the scapolite rock becomes massive and relatively non-gneissic in character.

Chemical analyses and modes of the massive non-gneissic phases of both the oligoclase-andesine and scapolite rock are given in the accompanying table.

CHEMICAL ANALYSIS[1]

	Scapolite rock, specimen CR-168	Oligoclase-andesine rock, specimen KL-5
SiO_2	47.37	51.54
Al_2O_3	24.83	24.13
FeO	3.16	3.82
Fe_2O_3	2.60	1.61
TiO_2	trace	0.18
MnO	0.27	0.15
CaO	11.88	8.96
MgO	0.33	0.43
K_2O	0.83	0.72
Na_2O	5.26	5.70
H_2O(—105°C.)	0.12	0.18
H_2O(+105°C.)	2.56	1.65
CO_2	0.63	0.64
P_2O_5	trace	0.13
F	0.00	.....
Cl	0.12	.....
SO_3	0.23	.....
Total	100.19	99.84

MODES

Scapolite rock, specimen CR-168	Percent	Oligoclase-andesine rock, specimen KL-5	Percent
Scapolite	96	Plagioclase (An_{32})	98
Black opaques	3	Microcline	1
Biotite, Muscovite, Chlorite, Sericite, Carbonate	1	Microcline perthite, Sericite, Black opaques, Muscovite, Carbonate	1

Nepheline Gneiss

The leucocratic-nepheline gneiss consists predominantly of nepheline with subordinate amounts of plagioclase, ranging in composition from sodic oligoclase to andesine and minor amounts of one or more of biotite, magnetite, muscovite, calcite, zircon, apatite, zeolites, sericite, and corundum. Nepheline is always present in excess of 60 percent by volume and may make up as much as 80 percent of the rock. The feldspar constitutes 15–25 percent by volume, and the remaining minerals are more or less accessory constituents.

The rock has a rough gneissic fabric owing to the tendency of the feldspar and nepheline to be segregated into nepheline-rich and nepheline-poor bands, and to

[1]Analyses by W. H. Herdsman, Glasgow, Scotland.

the parallel alignment of the mica flakes. The feldspar-rich bands range in thickness from less than ¼ to 2 inches in width, and appear to be lenticular and discontinuous ranging from 2 or 3 inches to 3 or 4 feet long. They are enclosed by nepheline-rich rock. The nepheline gneiss is medium- to coarse-grained and equigranular, the consituent mineral grains forming an interlocking mosaic closely resembling a granitoid texture.



WEST WALL OF KLONDIKE CUT NO. 6

The photo shows a portion of the west wall in the central part of Cut No. 6, the main upper cut of the west Klondike workings. This is a typical sequence of interbanded nepheline-corundum gneiss, pink and grey hybrid gieseckite-corundum syenite gneiss, and pink leuco-syenite (gneiss).

In the lower portion of the photo there is a wide zone of banded, medium-grained, hybrid pink and grey gieseckite-corundum syenite gneiss (1). Corundum, mantled with muscovite, is common in this facies.

A narrow zone of massive, medium-grained, pink leuco-syenite (2) replaces the gneissic sequence.

Between the pink syenite zone and the overlying zone of grey-white leucocratic nepheline-corundum gneiss (4), there is a series of interbanded nepheline-biotite (corundum) gneiss and pink leuco-syenite gneiss (3).

This photo shows the extremely complex character of the interbanded alkaline syenite facies in this cut.

Corundum appears to have an erratic distribution in the rock; where it is found there is usually plenty of it—up to 15 percent by volume; while in other places it is totally absent. The mineral occurs in long, slender, euhedral, hexagonal, barrel-shaped, bronze to grey crystals in all sizes, from those scarcely visible in the hand specimens to 3 inches long. These may have any orientation

from parallel to perpendicular to the gneissic planes of the rock, but where large crystals are abundant and well developed, these tend to have the same orientation in any one section of the nepheline gneiss. Many of the corundum crystals have



FAULTING AT THE KLONDIKE WORKINGS

The photo shows part of the west face at the top of Cut No. 6, the main upper cut, at the west Klondike workings; it shows the relations between pink leuco-syenite, nepheline-rich gneiss, and the hybrid corundum gieseckite syenite gneiss.

At the left-hand side of the photograph is nepheline-rich, grey-white, medium- to coarse-grained leucocratic gneiss (1) containing less than one percent mafics. A little muscovite and lineal streaks of albite give the rock a foliated appearance. Little corundum occurs at this exposure.

The nepheline rock passes on strike into a 12- to 15-inch irregular zone of buff to grey, mottled muscovite-gieseckite hybrid gneiss (2), which lies between the nepheline gneiss and pink syenite.

In the central, lower and upper right-hand part of the photo there is pink to red, mottled, medium-grained, sugary, leuco-syenite (3). Some biotite and patches of green gieseckite alteration occur in the pink and buff, mottled syenite. The pink syenite grades into pink and grey-buff muscovite-corundum syenite gneiss. Near the 2-foot mark on the stadia rod, a patch of grey corundum-biotite syenite gneiss is cut by red leuco-syenite. The contacts are sharply defined.

At (4) there is a sharp contact between intruding red leuco-syenite and grey-buff corundum-biotite syenite gneiss.

White nepheline gneiss also outcrops just to the right of the photo.

Fractures and shears cut the outcrop as shown in the photo.

The main feature to be seen in this exposure is the gradation from early nepheline-albite gneiss, through a hybrid alteration zone of grey-buff, muscovite-biotite-corundum-gieseckite syenite gneiss, into relatively massive red and pink leuco-syenite. A massive, equigranular, pink leuco-syenite of igneous appearance replaces the gneissic alkaline syenite with the destruction of the gneissic fabric of the rock. The change appears to be accomplished without disturbance, discordance, or forceful intrusion of any kind by a process of replacement without significant change of volume in the rock.

mantles of muscovite of varying thicknesses surrounding them; in places, long slender, barrel-shaped crystals of muscovite appear to be pseudomorphs after corundum. At one place, an area of about 6 square feet of nepheline gneiss contains a number of small, vuggy openings filled partially with radiating clusters and bladed intergrowths of zeolites. A few tiny grains of sodalite are developed in the nepheline gneiss at one place.

Chemical analyses of two specimens of the nepheline gneiss are given in the accompanying table.

ANALYSES OF NEPHELINE GNEISS[1]

	Specimen KC-2	Specimen KL-99
SiO_2	45.90	47.72
Al_2O_3	29.79	31.25
FeO	1.44	2.62
Fe_2O_3	1.82	0.73
TiO_2	0.07	trace
MnO	0.04	0.14
CaO	3.16	1.06
MgO	0.71	0.18
K_2O	3.26	3.09
Na_2O	8.26	11.64
H_2O(—105°C.)	0.28	0.00
H_2O(+105°C.)	3.50	0.72
CO_2	1.62	0.96
P_2O_5	trace	trace
Total	99.86	100.11

The Hybrid Pink-Buff Alkaline Syenite Complex

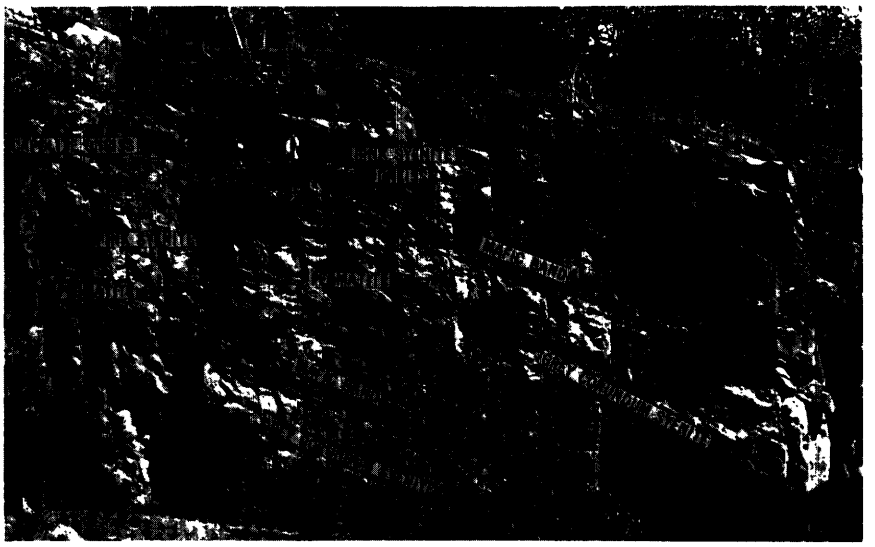
The hybrid pink-buff alkaline syenites occur as bands of various thicknesses, and as dikelets, and irregular patches that cut and alter the foregoing rock types in a most irregular fashion. The crosscutting dikelets are non-dilational types, that is, where they cut across the gneissic structures of the earlier rocks at acute angles, there is no apparent off-setting of the gneissic bands in these rocks. In most exposures, the larger bands and masses of the hybrid pink-buff syenites contain lenticular bands of the earlier rock types and of hybrid phases of these.

The hybrid pink-buff alkaline syenites are extremely diverse in both mineral composition and fabric. They consist predominantly of various proportions of microcline, microcline-perthite, and plagioclase with or without one or more of the following minerals: pyroxene, biotite, muscovite, hornblende, magnetite, ilmenite, zircon, apatite, titanite, allanite, corundum, carbonate, chlorite, epidote, sericite, leucoxene, and reddish iron hydroxides. The relative proportions of plagioclase and potash feldspar in the syenites may range from nearly 90 percent microcline and microcline-perthite, with less than 10 percent plagioclase, to over 90 percent plagioclase with only traces of perthite. The plagioclase ranges in composition from An_7 to An_{37}. The microcline-perthite is the replacement type, with microcline replacing plagioclase. Generally those portions of the complex having a more pronounced pinkish colour are richer in potash feldspar than the lighter-buff-coloured parts. Pyroxene, magnetite, and biotite are the most common of the mafic minerals, but only rarely do they make up as much as 25 percent of the rock by volume. The accessory and secondary minerals are usually present in only very

[1]Analyses: KC-2, Provincial Assay Office, Ontario Department of Mines; KL-99, W. H. Herdsman, Glasgow, Scotland.

minor amounts. Corundum is very rarely a constituent of the hybrid pink-buff alkaline syenites and then only in those parts of the complex which are immediately adjacent to corundum-bearing facies of the other rock types. The mafic minerals have an erratic distribution in these rocks; in some bands, one or more of them may be relatively abundant, but throughout most of the complex, the mafics are present only in minor quantities or not at all.

The fabric of the hybrid pink-buff alkaline syenite complex is as various as its mineral composition. Textures range from equigranular medium-grained aplitic, to inequigranular coarse-grained porphyroblastic, with porphyroblasts of feldspar and mafic minerals up to 1 inch in diameter enclosed in a medium- to coarse-grained groundmass of feldspar. In places, very coarse-grained, almost pegmatitic, phases are developed with abundant coarse porphyroblasts of feldspar up to 3 and



SYENITE GNEISS SEQUENCE AT THE UPPER-POND CUT, CRAIGMONT WORKINGS

The photo shows a good section of the syenite gneisses on the east wall of the upper-pond cut (No. 5) at Craigmont. The main part of the section consists of pink syenite and leuco-syenite gneiss. Two narrow bands of mafic biotite amphibolite are shown in the section. In the upper part of the section on the left-hand side, two relic masses of unreplaced, grey-green scapolite gneiss can be seen. Two large pods of syenite pegmatite intruding the pink syenite gneiss can be seen in the left and central part of the photo. In the lower and lower-right part of the section, two narrow bands of corundum-rich grey alkaline syenite occur interbanded with the pink syenite gneiss. These may represent relics of a formerly more extensive band of grey alkaline (oligoclase-andesine) gneiss.

4 inches in diameter in a subordinate groundmass of medium-grained feldspar. Where mafics are present, they tend to be segregated into bands relatively rich in these minerals, imparting a gneissic fabric to those sections of the complex in which they occur. All gradations may be seen in the field from one textural and mineralogical phase of the complex to all the others.

The hybrid pink-buff syenite complex as a whole has a definite banded structure owing to such factors as: (1) the parallel alignment of the mafic minerals, (2) the tendency of the mafics to segregate into rude layers, (3) the alignment of the bands, lenses, and elongate patches of the earlier rock types enclosed in the complex roughly parallel to the foliation planes of its gneissose phases, and (4) the variations in colour of the hybrid pink-buff syenite complex itself through shades of red and pink to buff and buff-grey tones; these various shades, the changes of

which seem to reflect variations in the relative proportions of potash feldspar and plagioclase in the rock, tend to occur in thin bands, and irregular elongate patches which are parallel to the gneissic structure. The complex in many places is extremely variable in colour and consists of an intimately mottled mixture of pink and buff syenites. The pink appears to invade and replace the buff, discontinuous, rather irregular bands, and elongated patches of the light sandy-buff syenite are enclosed by the pink syenite. Contacts between these two types are difficult to define closely, partly because the difference in colour between them is not pronounced, but mostly because the contacts are somewhat gradational in the great majority of places.

Chemical analyses and modes of two specimens of the hybrid, pink-buff alkaline syenite complex are given in the accompanying table.

CHEMICAL ANALYSES[1]

	Pinkish leuco-syenite with magnetite, specimen CR-24	Light-pinkish leuco-syenite, specimen CR-54
SiO_2	58.12	64.82
Al_2O_3	19.43	19.73
FeO	3.99	1.38
Fe_2O_3	4.98	1.44
TiO_2	0.26	trace
MnO	0.06	0.07
CaO	1.58	0.78
MgO	0.22	trace
K_2O	4.31	6.52
Na_2O	6.09	5.16
H_2O(—105°C.)	0.18	0.17
H_2O(+105°C.)	0.49	0.09
CO_2	trace	trace
P_2O_5	0.07	0.00
Total	99.78	100.16

MODES

Pinkish leuco-syenite with magnetite, specimen CR-24	Percent	Light-pinkish leuco-syenite, specimen CR-54	Percent
Plagioclase (An_{29})	54	Plagioclase (An_{30})	63
Microcline	17	Microcline	35
Microcline perthite	22	Microcline-perthite	2
Magnetite	4	Magnetite	<1
Muscovite, Carbonate, Sericite, Reddish iron hydroxides	3	Ilmenite and leucoxene, Reddish iron hydroxides, Sericite	<1
Zircon, Apatite, Chlorite, Fine, dark inclusions in feldspar	trace	Zircon, Fine, dark inclusions in feldspar	trace

[1]Analyses by W. H. Herdsman.

Contacts of the hybrid pink-buff alkaline syenites with the earlier rock types are almost invariably gradational in character. Few sharp contacts and no chilled contacts were seen in the field. The nature of the pink syenite-amphibolite contacts has already been indicated. Contacts between the pink syenite and the oligoclase-andesine–scapolite gneiss complex are characterized by the development of transition zones of buff syenites between them. These transition zones range in width from less than 1 inch to 3 feet, depending upon the size of the adjacent pink syenite members. They appear to have developed by a process of feldspathization[1] of the scapolite rock or oligoclase-andesine rock or both. Going across a contact from scapolite gneiss to pink syenite, for example, one passes imperceptibly, from scapolite-rich rock with no feldspar, into a zone in which a few isolated grains of buff-coloured feldspar are developed; gradually the scapolite grains decrease in abundance, and the buff feldspar increases in amount until, finally, no scapolite remains; by degrees, the buff feldspar takes on a more pinkish colour across the contact zone and finally merges into the pink syenite. Similar transition zones occur along contacts between the oligoclase-andesine rock and pink syenites. Almost without exception the lenticular bands of oligoclase-andesine gneiss and scapolite gneiss, which are enclosed in the hybrid pink-buff alkaline syenite complex, have been considerably altered by the introduction of buff feldspar and have been, in places, almost completely transformed into hybrid buff syenites. The relative proportions and amounts of mafic and accessory minerals in the original rocks do not seem to be particularly affected by the feldspathization process. Every gradation may be seen in the field from pure scapolite gneiss and pure oligoclase-andesine gneiss to pink syenites through the development of intermediate hybrid, buff syenite zones. In many, if not most places, the transitional zones have coarser-grained textures than the original rock, though generally the over-all fabric is more or less preserved. Commonly, porphyroblasts of feldspar over 1 inch in diameter are developed in them.

Corundum occurs more abundantly in the "buff-feldspathized" parts of the earlier rock types than anywhere else in the sequence. The mineral is present as more or less equidimensional subhedral grains and rounded anhedral porphyroblasts in all sizes, from those scarcely visible to those over 1 inch in diameter. Most of the corundum grains have thin mantles or selvages of muscovite surrounding them.

Contacts between the nepheline gneiss and the hybrid pink-buff alkaline syenite complex are also completely gradational in character over widths ranging from less than 2 inches to more than 4 feet. The nature of the gradational change from fresh unaltered nepheline gneiss to pink syenite follows. The nepheline gneiss grades into a zone in which the nepheline is altered to dull chalky-white or pinkish hydronephelite, which is an aggregate of very fine-grained zeolites and secondary white mica; this zone ranges in width from less than ½ inch to 2 feet. The hydronephelite zone passes gradually into a hybrid zone consisting of variable proportions of buff-coloured feldspar, greenish gieseckite, silvery-white muscovite, some hydronephelite, and minor pinkish feldspar. Gieseckite is a fine-grained aggregate of secondary white mica, chlorite, and carbonate; this mineral aggregate (gieseckite) is usually quite abundant in the altered zones particularly in the neighborhood of minor shears and joints, but may be entirely absent. The hybrid, buff gieseckite-muscovite zones grade into the hybrid pink-buff syenite complex by an increase in the content of pink and buff feldspar and a decrease in the amounts of gieseckite and muscovite. In many places in the vicinity of these gradational

[1]This feldspathization is actually accomplished by the introduction of potash and replacement of scapolite and plagioclase or both by microcline and microcline microperthite.

contacts, the pink and buff syenites enclose relic patches of nepheline gneiss and its hybrid, altered phases.

Corundum is generally developed more abundantly in these hybrid, altered contact zones than in the nepheline gneiss itself. The mineral occurs in these zones as large to small euhedral crystals up to 2 inches long, many of which have selvages of muscovite, and as blocky subhedral to anhedral grains up to 3 inches long, few of which have the muscovite mantles.

The pronounced gneissic fabric of the nepheline gneiss is not well preserved in the transition zones and tends to disappear gradually as the alteration proceeds.

Quartz-Albite-Arfvedsonite Syenite

This rock type occurs at only one place in the workings on Robillard Mountain. A lenticular, eye-shaped mass of this dark red alkaline syenite, some 40 feet in length with a maximum thickness of about 12 feet, is exposed near the centre of the east wall of the main central cut at the Klondike workings. This mass is enclosed on all sides by the hybrid pink-buff syenite complex.

The rock consists predominately of albite with about 15 percent of mocrocline and subordinate amounts of arfvedsonite and a dark greenish pyroxene. Quartz is present in rather minor quantities; accessory minerals in the rock include magnetite, zircon, apatite, and titanite; and a few small flakes of chlorite and grains of carbonate were seen in thin section, as well as minor quantities of reddish, iron hydroxides developed along cleavage cracks in the feldspar. The arfvedsonite appears to have developed as an alteration product of the pyroxene. No corundum was found in this rock.

The quartz-albite-arfvedsonite syenite is a massive, well-jointed, dark reddish, medium-grained, hypidiomorphic, equigranular aggregate of the component minerals and has no schistose or gneissic structure.

A chemical analysis of a specimen of this rock is given in the accompanying table.

Analysis of Quartz-Albite-Arfvedsonite Syenite, Specimen KC-4[1]

SiO_2	65.31
Al_2O_3	16.02
Fe_2O_3	2.20
FeO	1.26
MgO	0.63
CaO	1.50
Na_2O	5.50
K_2O	5.64
H_2O+	0.48
H_2O-	0.12
CO_2	1.07
TiO_2	0.29
P_2O_5	0.00
Cr_2O_3	0.01
MnO	0.03
NiO	.....
V_2O_5	0.01
S	.....
Total	100.15

Contacts between the quartz-albite-arfvedsonite syenite and the enclosing hybrid pink-buff alkaline syenite complex are rather variable in character, in

[1]Analysis by Provincial Assay Office, Ontario Department of Mines.

places being knife-sharp, in other places being gradational over widths up to 1 foot. The rough, banded structure of the enclosing complex does not sweep around the eye-shaped mass but abuts against it. In places, the gradational contact zones have a rude gneissic structure and, on its northwest side, a few narrow bands, stringers, and irregular zones project from the mass of arfvedsonite syenite into the hybrid pink-buff syenites. The quartz-albite-arfvedsonite syenite itself contains a number of small, irregular lenticular inclusions of pink and buff syenites, and these usually have gradational contacts with the enclosing mass.

Granite Gneiss

Granite gneisses underlie the corundum-bearing and syenitic sequence exposed on the south flank of Robillard Mountain. That granitic rocks may also overlie this sequence at depth is suggested by the occurrence of pink and grey granite gneisses overlying the syenitic sequence in Craigmont Cut No. 7 at the bottom of the south slope of the hill. The petrography of the granite gneisses of the area has been dealt with elsewhere and will not be reviewed here.

Intrusive Pegmatites

All of the foregoing rock types are cut by dikes and irregular masses of granitic and syenitic pegmatites, few of which are more than 10, and most less than 5 feet wide. These pegmatites consist predominantly of large, pink, buff, and grey-green rounded grains of feldspar up to 8 inches in diameter, set in a subordinate fine-grained granular matrix of pink and buff feldspar that forms thin films around and between the larger grains. The grey-green feldspar seems to be segregated into masses and zones by itself, though there are all gradations between these zones and those sections of the pegmatites rich in pink and buff feldspars. Hornblende is present as black, rather elongate, anhedral grains, in all sizes from about ½ to 4 inches long, which may consititute as much as 15 percent of the rock by volume. These are scattered erratically through the rock but have a tendency to form irregular patches in the pegmatitic masses that are relatively rich in this mineral. The grey-green pegmatitic phases appear to be richer in hornblende than the pink phases. In some exposures, segregations of granular quartz occur irregularly in the rock in patches up to 1 foot long and 6 inches wide and as small as the individual quartz grains themselves. Vuggy openings in the pegmatite masses contain euhedral crystals of pink feldspar, coarse books of black biotite, and silvery white muscovite, masses of greyish white carbonate, and granular pyrite.

Contacts between the pegmatitic masses and the rocks that they cut may be knife sharp in some places, but in other places the same mass will show gradational contacts with the enclosing rocks over a narrow range.

STRUCTURAL GEOLOGY

Folds

The banded structure of the rock sequence exposed on the south slope of Robillard Mountain strikes roughly N. 80° W. and dips about 30° S. Locally the strike of the formations deviates from the average by as much as 20 degrees, and the dip by as much as 10 degrees, where minor, low, open folds and rolls are superimposed upon the general structure. These appear to have no significance with respect to the distribution of the various rock types nor the distribution of corundum in the sequence.

Joints

In the main, central cut at the Klondike workings, joint planes in the nepheline gneisses strike N. 60° W. and dip vertically. In a cut immediately below and slightly to the east of the main, central cut, two sets of joints are present in the nepheline gneiss. One set strikes N. 30° E., the other N. 35° W., and both dip vertically. Joint surfaces in the nepheline gneisses are invariably coated with a thin layer of hydronephelite overlain by a layer of gieseckite, the whole zone of alteration ranging in thickness from less than ¼ to 1 inch, being generally thickest on the northeast-trending set. In the upper-pond cut at the Craigmont workings, two sets of joints are present in the hybrid pink-buff alkaline syenite complex. One set strikes N. 75° W., the other N. 40° E., and both dip vertically.

Shears and Faults

A number of roughly parallel, minor faults and sheared zones traverse the gneissic structure of the nepheline gneiss exposed on the west face of the main central cut at the Klondike workings. They range from ⅛ to 2 inches wide and are spaced from 1 to 4 feet apart. They strike N. 35° W. and dip 65° SW. The narrowest cracks are characterized by a zone of alteration up to 1 inch wide on either side of the crack, consisting of from 1/16 to ⅛ inch of greenish gieseckite, the remainder being dull-whitish hydronephelite grading into the nepheline gneiss. The wider shears have gouge and alteration zones, which may have a total width of 1 foot. The shear itself is filled with a soft, crumbly, highly schistose mass of black biotite and pinkish feldspar, the schistosity of which is roughly parallel to the walls of the shear. Between this material and the hydronephelite zone developed adjacent to the nepheline gneiss, there is commonly a band, up to 2 inches wide, in which bluish scapolite is developed.

SUMMARY

Corundum occurs in the Craigmont and Klondike workings as a constituent of several different rock types, as follows:

Oligoclase-Andesine Gneiss

Corundum occurs erratically in this rock in irregular patchy zones that locally may contain as much as 25 percent of this mineral by volume. These patches may vary in size from a few cubic inches to perhaps a couple of hundred cubic feet or even larger. The distribution of corundum in these zones is uneven and irregular. The corundum grains range in size from sub-microscopic to 2 inches in diameter.

Scapolite Gneiss

The occurrence and distribution of corundum in the scapolite gneiss are essentially very similar to those in the oligoclase-andesine gneiss.

Nepheline Gneiss

Corundum occurs in the nepheline gneiss in a very similar manner to its occurrence in the oligoclase-andesine gneiss and in the scapolite gneiss.

Hybrid Rocks

Corundum appears to be most abundantly developed in hybrid altered phases of the above three rock types which represent gradational contact zones between them and the hybrid pink-buff alkaline syenite complex. Many lenticular hybrid inclusions, partially-altered relics of the earlier rock types, which are enclosed in the hybrid pink-buff alkaline syenite complex, are rich in corundum.

APPENDIX B

Mineral Occurrences in the Brudenell-Raglan Area Arranged by Townships

Mineral	Location	Name of property or owner	For description see page
BRUDENELL TOWNSHIP:			
Corundum	Con. IV, lot 34	Rosenthal	49
	Con. V, lot 24	.....	50
	Con. V, lot 34	R. Gutz	50
	Con. VI, lot 7	.....	51
	Con. VI, lot 24	.....	51
	Con. VII, lot 20	Charlotte Lake	51
	Con. VII, lot 34	Reid Lake	52
	Con. X, lot 20	Gorman Lake	53
	Range B, North, lot 279	Brudenell	53
Feldspar	Con. II, lots 22 and 23	Craig mine	66
	Con. VI, lot 25	.....	68
Gold	Con. XV, lots 18 and 19	.....	69
Graphite	Con. XIII, lot 9	.....	71
Mica	Con. I, lot 29	.....	72
Nepheline	Con. V, lot 26	.....	78
	Con. V, lot 34	R. Gutz	78
	Con. VII, lot 34	Reid Lake	78
Rare element minerals	Con. IV, lot 34	Rosenthal	83
	Con. X, lot 21	Gorman Lake	83
	Cons. XIV and XV, lots 10–20	Printy Lake	83
Zircon	Con. V, lot 1	Kuehl Lake	85
LYNDOCH TOWNSHIP:			
Beryl	Con. XV, lot 23	Can. Beryllium Mines and Alloys, Ltd.	36
	Con. XV, lots 30 and 31	Can. Beryllium Mines and Alloys, Ltd.	42
Copper	Con. IV, lot 30	E. Washinta	46
Corundum	Con. XV, lots 13 and 14	W. Kargus	53
Feldspar	Con. XV, lot 23	Can. Beryllium Mines and Alloys, Ltd.	67
	Con. XV, lot 30	Can. Beryllium Mines and Alloys, Ltd.	67
Graphite	Con. II, lots 1 and 2	Beidelman and Lyall	69
	Con. XV, lot 24	.....	71
Iron	Range B, lot 1	.....	71
Mica	Con. XV, lot 34	.....	72
	Con. XVI, lot 12	.....	72
	Con. XVI, lot 24	.....	73
Molybdenum	Con. II, lot 34, S.½	McCoy	73
	Con. V, lot 33	.....	74
	Con. VIII, lot 4	Mining Mountain	74
	Con. VIII, lot 5	Jamieson mine	74
	Con. VIII, lot 7	Legree	76
	Con. XIV, lot 4	Wolfe	76
Nepheline	Con. XIII, lot 6	Heiderman Lake	79
	Con. XIV, lots 10–12	Welk-Remus ridge	80
	Con. XIV, lots 13 and 14	W. Kargus	80
Rare element minerals	Con. XV, lot 23	Can. Beryllium Mines and Alloys, Ltd.	36
	Con. XV, lot 25	Universal Light Metals Co.	83
	Con. XV, lot 30	Can. Beryllium Mines and Alloys, Ltd.	84
Sillimanite	Con. XV, lot 34	.....	85

Mineral	Location	Name of property or owner	For description see page
RADCLIFFE TOWNSHIP:			
Corundum	Con. I, lot 21	.....	53
	Con. I, lot 29	.....	53
	Con. I, lot 31	A. Michaelis	54
	Con. II, lot 31	J. Schroeder	54
Feldspar	Con. III, lot 15	.....	68
	Range B, North, lot 240	....	67
Gold	Con. IX, lots 16–30	.....	69
Graphite	Con. II, lot 15	.....	71
RAGLAN TOWNSHIP:			
Corundum	Con. XIV, lot 15	J. Buderick	55
	Cons. XIV and XV, lots 20–22	G. Mantifel	55
	Con. XV, lot 20	H. Mantifel	55
	Con. XVII, lot 9	G. Lentz	55
	Con. XVII, lot 10	G. Lentz	55
	Con. XVII, lot 13	C. Boehme	56
	Con. XVII, lot 17	.....	56
	Cons. XVIII and XIX, lots 3 and 4	Craigmont workings	56 and 102
	Con. XVIII, lot 10	G. Wishman	60
	Con. XVIII, lot 18	Indian Hill	60
	Con. XVIII, lot 24	Jewellville pits	61
	Con. XVIII, lot 25 and con. XIX, lots 24 and 25	Jewellville pits	62
	Con. XIX, lot 26	Jewellville pits	63
	Con. XIX, lot 27	Jewellville pits	63
Iron	Con. VII, lot 26	.....	71
Molybdenum	Cons. IX and X, lot 27	Edgemount Molybdenum Mines, Ltd.	76
Nepheline	Con. XV, lots 12–14	Wasmund nepheline gneiss band	82
	Con. XIX, lot 2	Klondike workings	82
	Con. XIX, lot 25	Jewellville pits	82
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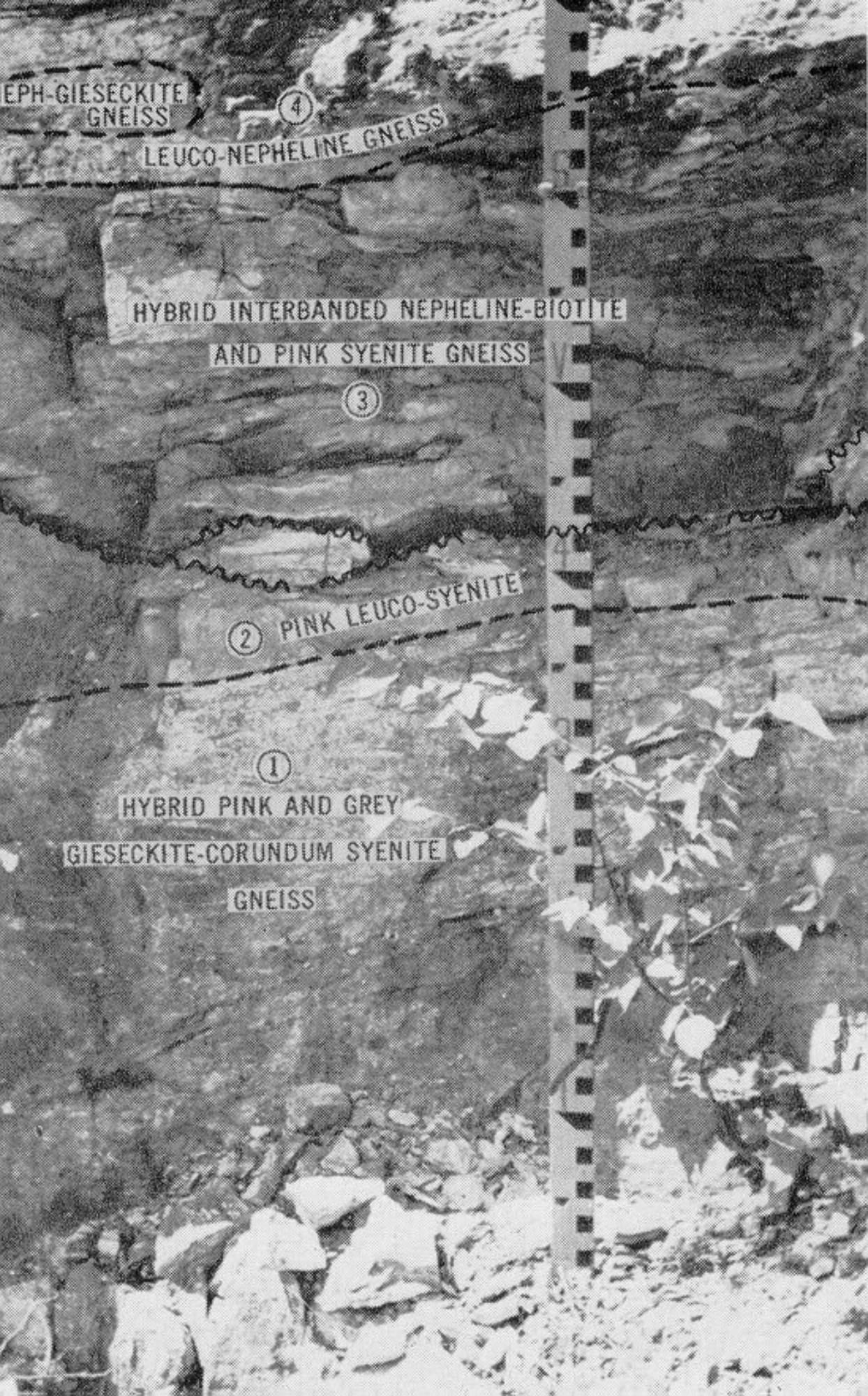
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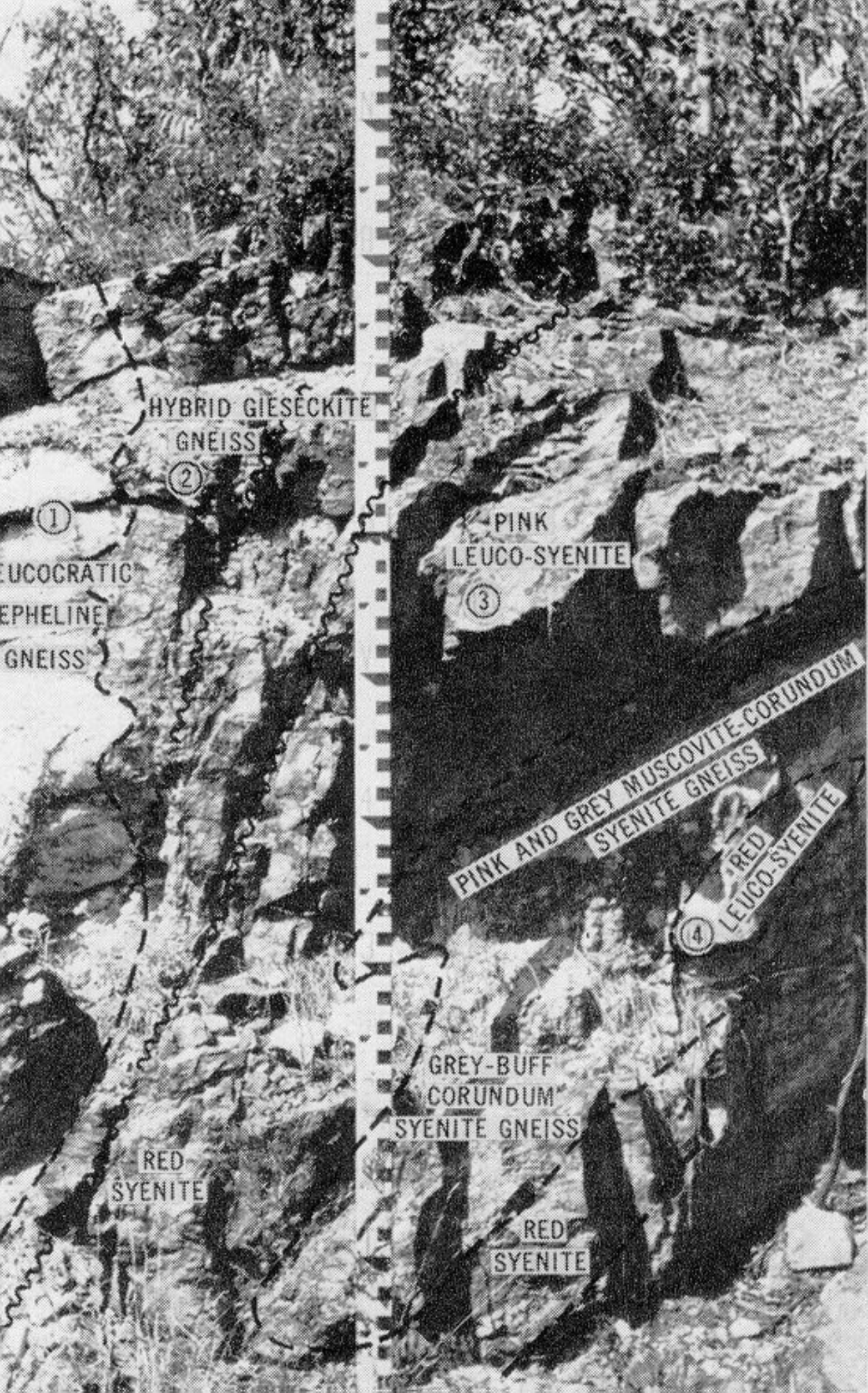



NEPHELINE
GNEISS
PINK AND BUFF MOTTLED
LEUCO-SYENITE WITH CORUNDUM
PINK
EUCO-SYENITE
NEPHELINE GNEISS
HYBRID
GIESECKITE
GNEISS
PINK AND BUFF MOTTLED
LEUCO-SYENITE

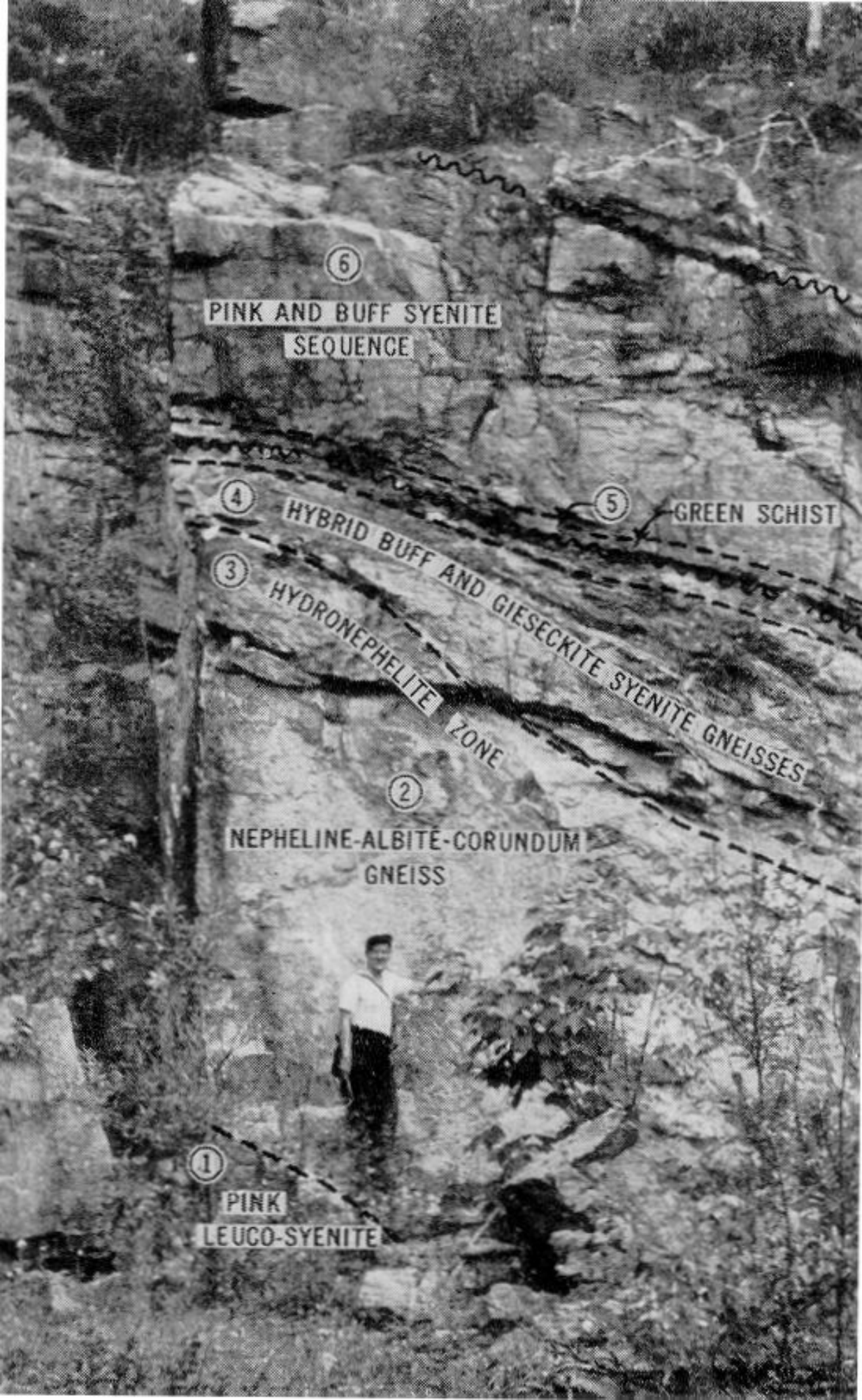

①
PINK MAGNETITE LEUCO-SYENITE
②
SCAPOLITE GNEISS
①
PINK MAGNETITE
LEUCO-SYENITE
GREY SCAPOLITE
GNEISS


PINK LEUCO-SYENITE
AMPHIBOLITE
PINK
LEUCO-SYENITE
PINK AND GREY CORUNDUM SYENITE
REACTION ZONE
SCAPOLITE GNEISS
PINK LEUCO-SYENITE
SCAPOLITE
GNEISS

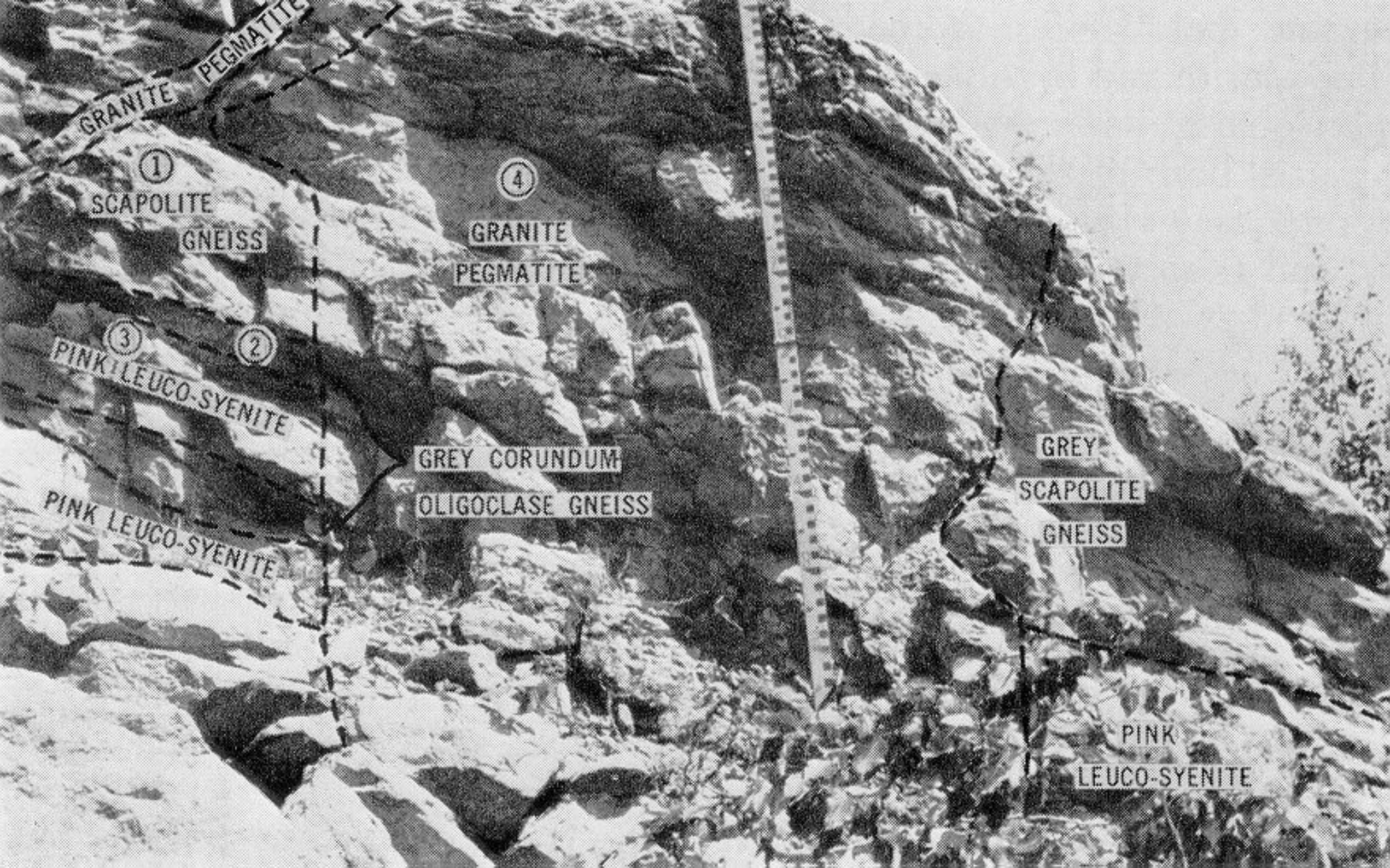

EPH-GIESECKITE GNEISS
4
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AND PINK SYENITE GNEISS
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GIESECKITE-CORUNDUM SYENITE
GNEISS

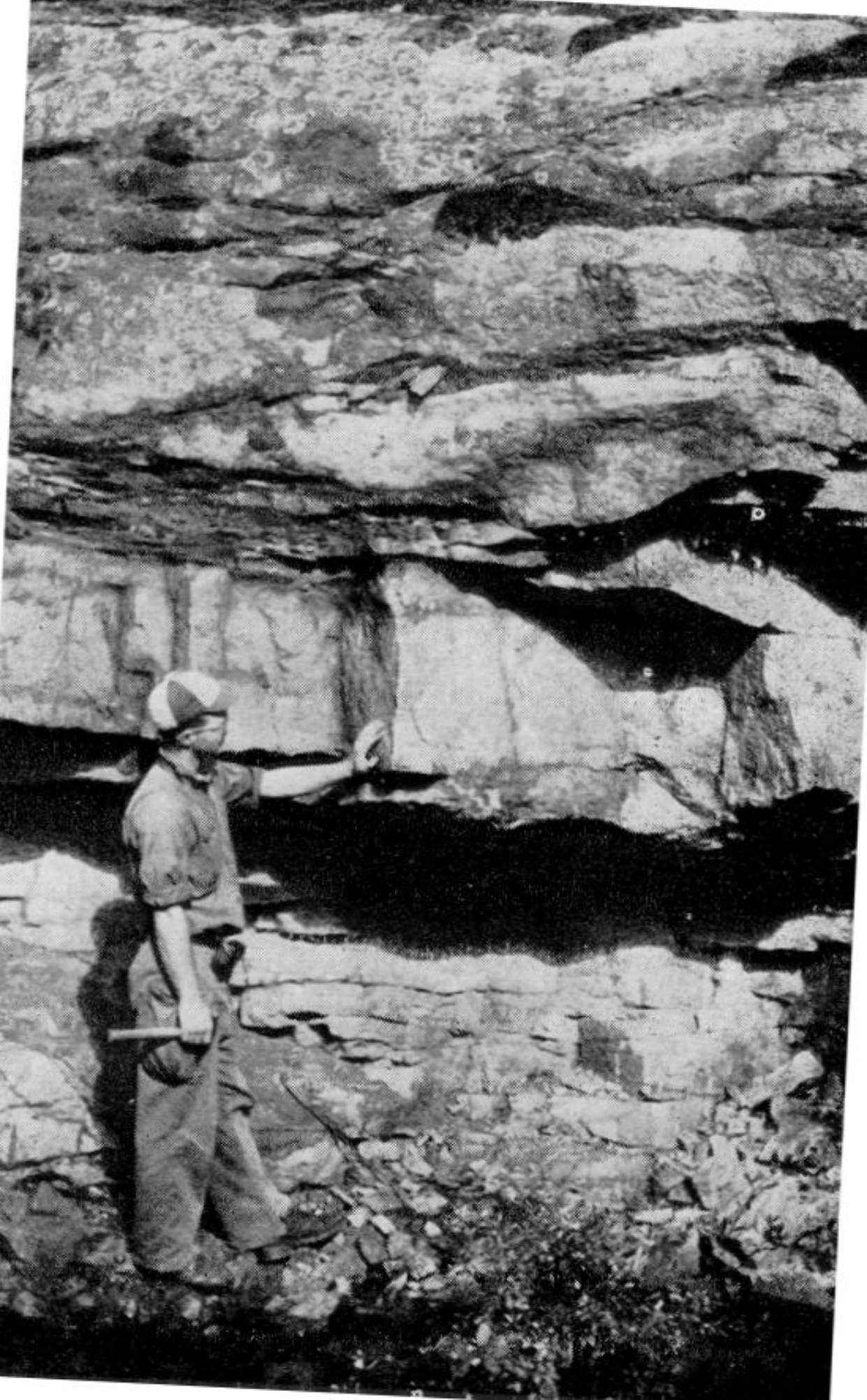

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PINK AND GREY MUSCOVITE-CORUNDUM
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GREY-BUFF
CORUNDUM
SYENITE GNEISS
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SYENITE
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SYENITE


SCAPOLITE GNEISS
PINK SYENITE
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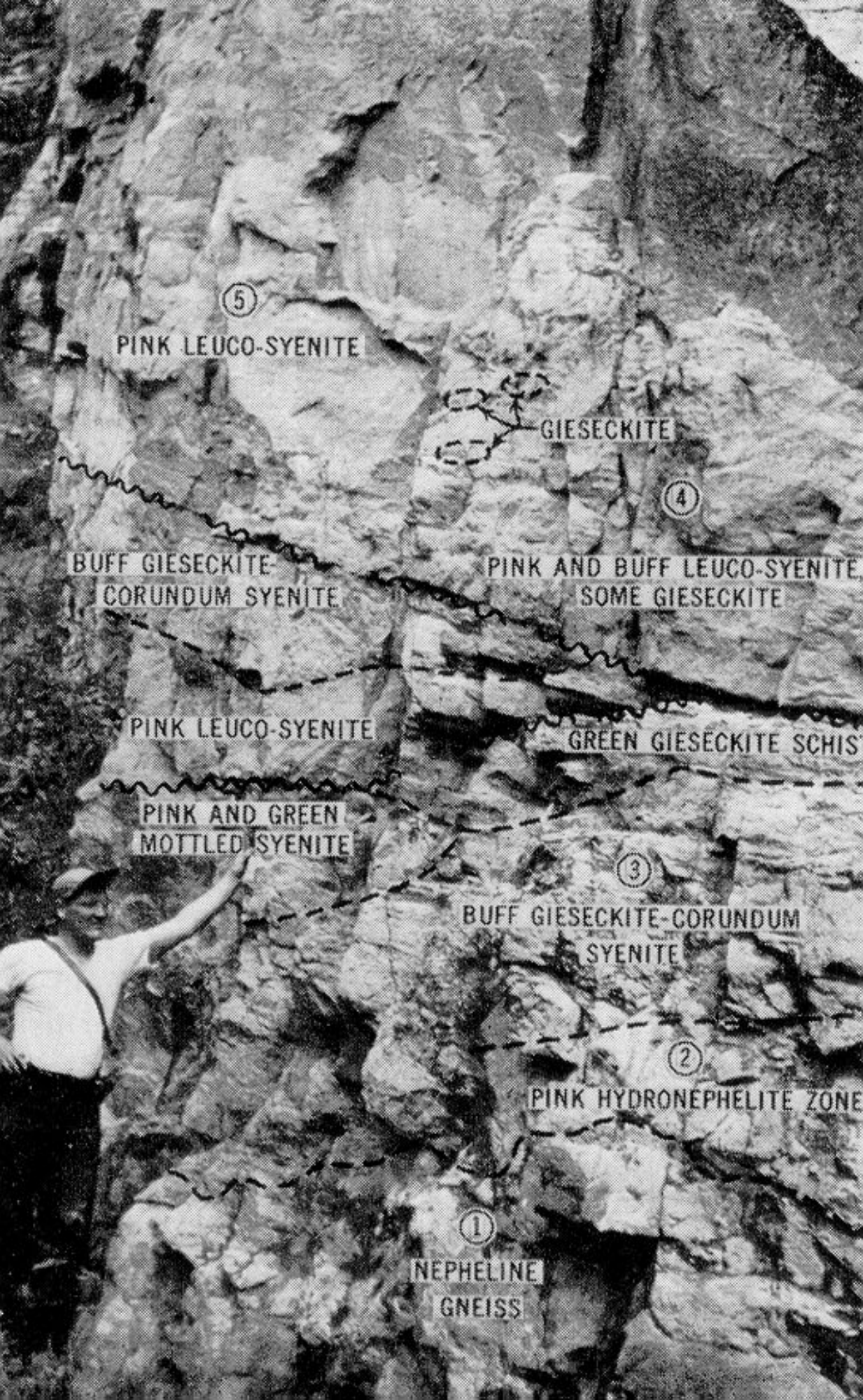

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SEQUENCE
4
HYBRID BUFF AND GIESECKITE SYENITE GNEISSES
5
GREEN SCHIST
3
HYDRONEPHELITE ZONE
2
NEPHELINE-ALBITE-CORUNDUM
GNEISS
1
PINK
LEUCO-SYENITE




GRANITE
PEGMATITE
1
SCAPOLITE
GNEISS
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GRANITE
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PINK LEUCO-SYENITE
GREY CORUNDUM
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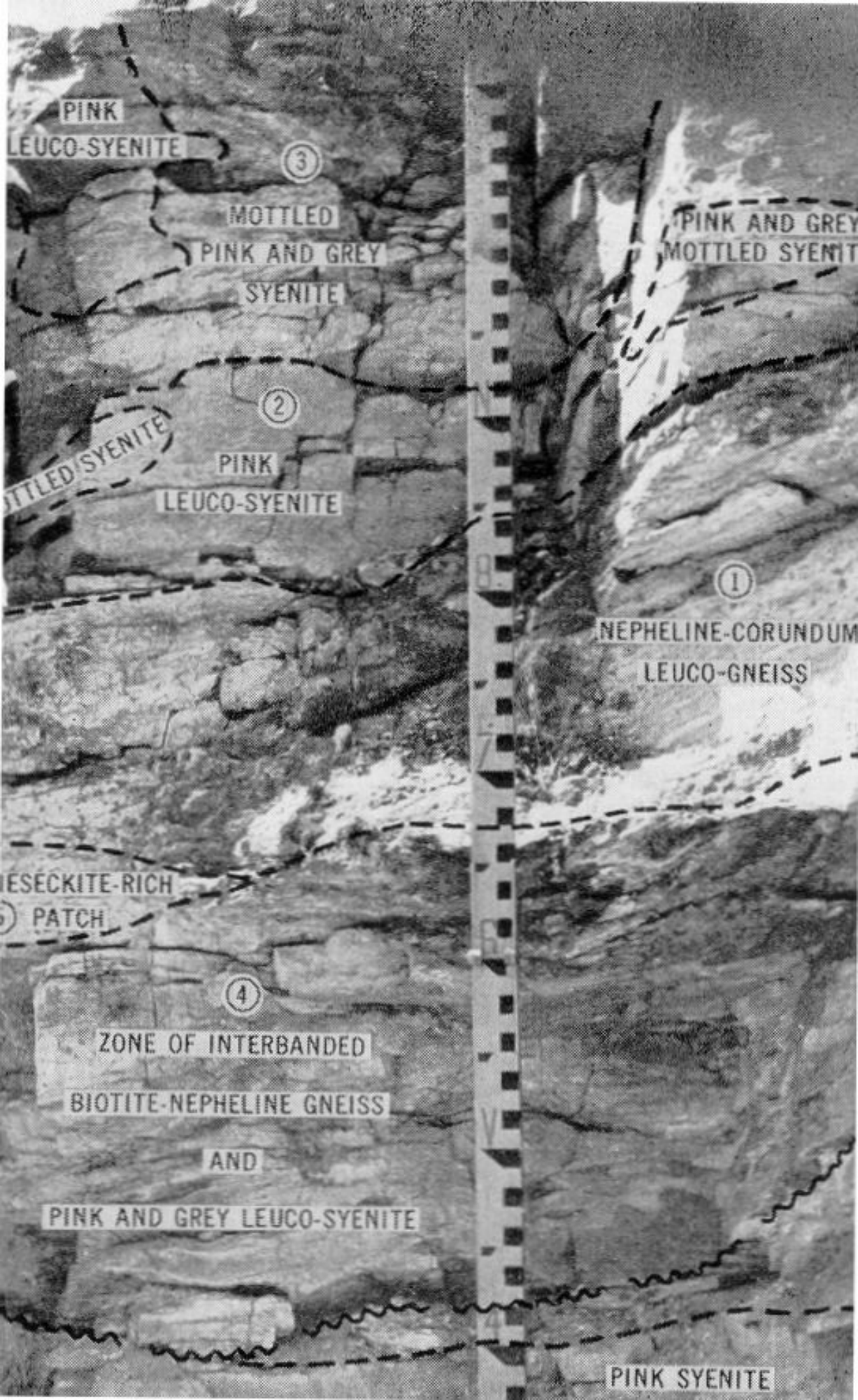


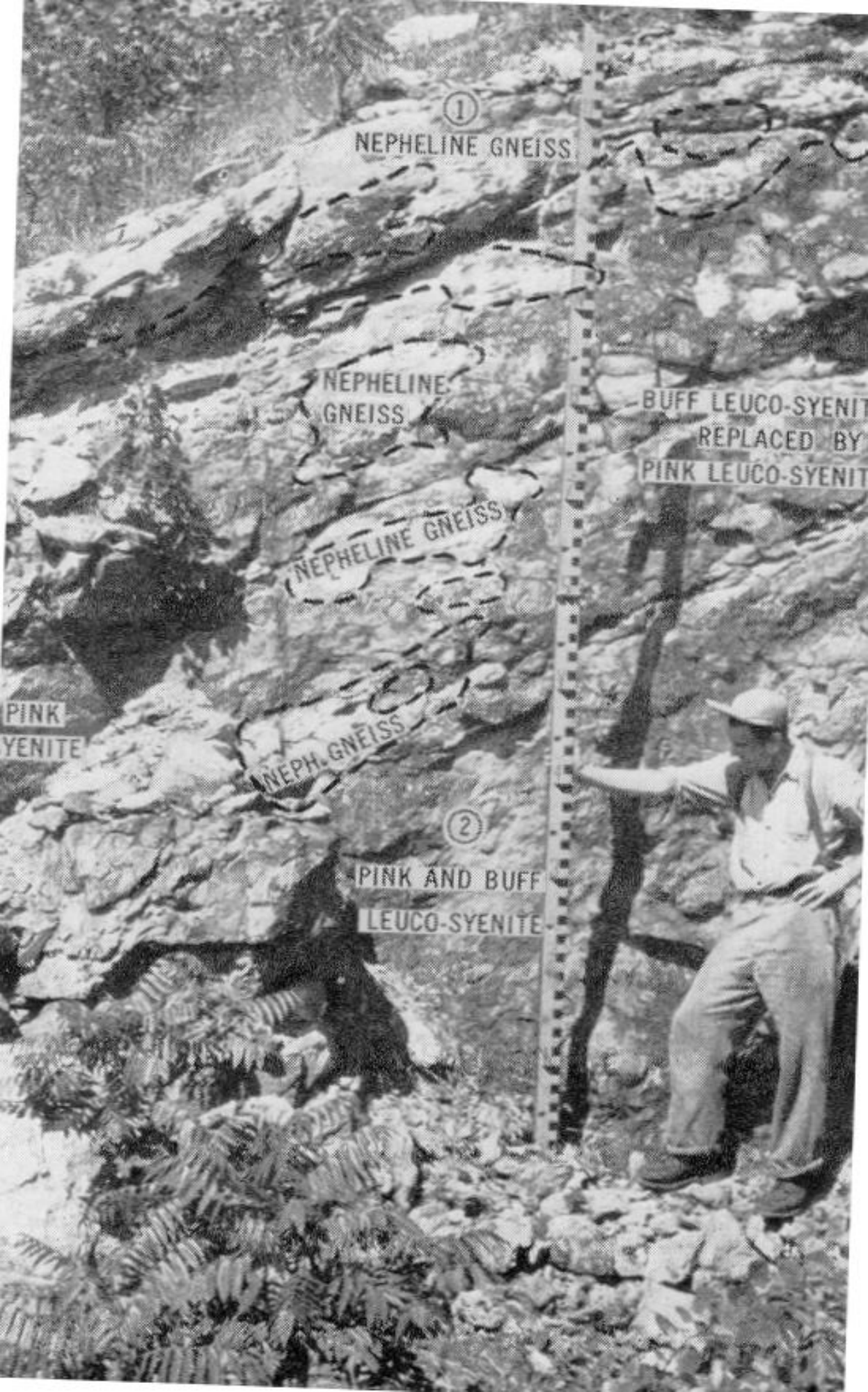



⑤
PINK LEUCO-SYENITE
GIESECKITE
④
BUFF GIESECKITE-
CORUNDUM SYENITE
PINK AND BUFF LEUCO-SYENITE,
SOME GIESECKITE
PINK LEUCO-SYENITE
GREEN GIESECKITE SCHIS
PINK AND GREEN
MOTTLED SYENITE
③
BUFF GIESECKITE-CORUNDUM
SYENITE
②
PINK HYDRONEPHELITE ZONE
①
NEPHELINE
GNEISS






PINK
LEUCO-SYENITE
3
MOTTLED
PINK AND GREY
SYENITE
PINK AND GREY
MOTTLED SYENIT
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LEUCO-SYENITE
1
NEPHELINE-CORUNDUM
LEUCO-GNEISS
PATCH
4
ZONE OF INTERBANDED
BIOTITE-NEPHELINE GNEISS
AND
PINK AND GREY LEUCO-SYENITE
PINK SYENITE


①
NEPHELINE GNEISS
NEPHELINE GNEISS
NEPHELINE GNEISS
NEPH. GNEISS
BUFF LEUCO-SYENIT
REPLACED BY
PINK LEUCO-SYENIT
PINK
YENITE
②
PINK AND BUFF
LEUCO-SYENITE




③
NEPHELINE-ALBITE
GNEISS
②
HYBRID BUFF SYENITE GNEISS
+
BIOTITE-GIESECKITE GNEISS
①
PINK
LEUCO-SYENITE
②
HYBRID
GREY
AND BUFF
CORUNDUM
SYENITE GNEISS
KC-1
KC-3
EPH.
NEISS
-2
YBRID BUFF SYENITE GNEISS
③
NEPHELINE-ALBITE-CORUNDUM
GNEISS



PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-SECOND ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXII, PART 6, 1953

Geology of Sothman Township

By

E. M. ABRAHAM

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO

Printed and Published by Baptist Johnston, Printer to the Queen's Most Excellent Majesty

1954

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GEOLOGICAL MAP
(In pocket at back of report)

Map No. 1953-3—Township of Sothman, District of Sudbury, Ontario
Scale, 1 inch to 1,000 feet.

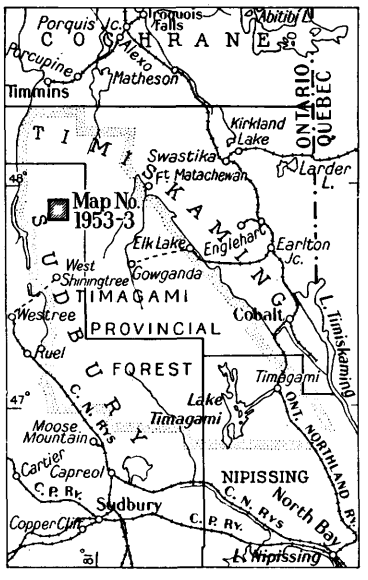
Geology of Sothman Township

By E. M. Abraham

INTRODUCTION

Renewed activity in Sothman township and vicinity since 1944 and the discovery of a zone of nickel mineralization in the southeastern part of the township in 1950 led the Ontario Department of Mines to make a more detailed geological examination of the township. The field work was carried out by the writer and his assistants during the summer of 1951.

Sothman township, which covers an area of about 36 square miles, lies in the district of Sudbury; it is about 40 miles directly south of South Porcupine and 25 miles west of Matachewan.



Key map showing the location of Sothman township, district of Sudbury. Scale, 1 inch to 60 miles.

The base map of Sothman township was compiled on a scale of 1 inch to 800 feet, for publication on a scale of 1 inch to 1,000 feet, from original survey notes of township boundaries made in 1910 and 1911 by the Ontario Department of Lands, Forests and Mines. Additional information was added by the writer from aerial photographs taken in 1946 for the Forest Resources Inventory, Ontario Department of Lands and Forests. The geological mapping was carried out on a scale of 1 inch to 800 feet by running pace-and-compass traverses at 400-foot intervals. The traverses were started from, and tied to, previously established stations along claim, picket, and township lines. Whenever possible, traverses were run along picket lines cut for geophysical surveys. These lines were spaced at 200-, 300-, or 400-foot intervals. Some of the mapping, particularly in the sand-dune terrain, was done directly on the aerial photographs.

The earliest history of prospecting and surveys in Sothman and adjoining townships is described by T. L. Gledhill[1] in his report on the Grassy River area. A discovery of gold in 1944 by R. Edleston of Timmins stimulated considerable interest in the area, and much of the township was staked. Interest continued to grow, and by 1950, Sothman township was all staked. Surface exploration and diamond-drilling were done by various mining companies, but owing to the scarcity of outcrops and extensive overburden, much ground-geophysical prospecting was also necessary. In addition, an aeromagnetic survey of Sothman and adjoining townships was made in 1949 by the Dominion Gulf Company, and on the basis of the results, large blocks of ground were staked by this company. Geological and geophysical work and diamond-drilling were still in progress in 1951. Following some of the geophysical surveys, the ground again became open for staking.

Most of the southwestern part of the township was burned over in late May, 1951. Because of this fire many of the picket lines and parts of the west and south boundary lines of the township were completely destroyed.

Acknowledgments

The writer is indebted to the field men and officials of the various mining companies, who have carried on exploration work in the area, for their co-operation and their provision of much geological and geophysical information. He is particularly indebted to Sherwood Gold Mines, Limited, for the use of their camp on Reading Lake for part of the summer, and to the Dominion Gulf Company, which provided board and lodging at a very reasonable rate during the latter part of the field season. The writer is also grateful to W. S. Savage, resident geologist of the Ontario Department of Mines at Swastika, who spent two days in the area with him.

To T. Cooke of the Air Service Division of the Ontario Department of Lands and Forests, the writer is greatly indebted for help in the transportation of supplies and equipment during the field season.

During the summer the writer was capably assisted by E. E. G. Heaslip, J. Wilson, J. Kavanagh, and D. Graham. Mr. Heaslip as senior assistant, did much of the field mapping.

Means of Access

The most convenient and rapid means of access is by aeroplane from the air base at South Porcupine, about 40 miles to the north. The trip takes about 30 minutes.

The Wicks Lumber Company has built a private logging road south from Timmins to Semple Lake on the boundary between Semple and English townships, about 6 miles to the north, and the Dominion Gulf Company has extended this road to its camp in the southern part of Sothman township.

The best canoe route to the area is from Gogama on the Canadian National railway, via Minisinakwa River, Mattagami Lake, and Sinclair Lake. This route involves some portaging. Sinclair Lake can also be reached from Timmins by coming south on the Mattagami River and Mattagami Lake. A third canoe route from Matachewan crosses the boundary between Zavitz and Hutt townships, enters the Grassy River via Canoeshed Lake, and follows the Grassy River to Halliday Lake on the east boundary of Sothman Township.

[1] T. L. Gledhill, *Grassy River Area, District of Sudbury*, Ont. Dept. Mines, Vol. XXXV, 1926, pt. 6, pp. 57–76.

Travel within the township does not present too much difficulty. A tractor road runs south from the north boundary of the township to the Dominion Gulf camps on Loonwing Lake. A branch road runs eastward to the southeastern part of the township. Numerous foot trails and roads put through by diamond-drillers provide access to the northern part of the area. Navigable lakes and creeks, connected by short portages, make the remainder of the township accessible.

Since the summer of 1951 several logging roads have been constructed.

Previous Geological Work

The following is a bibliography of the previous work done in the area by government geologists:

Report of the Survey and Exploration of Northern Ontario, 1900, Ont. Dept. Crown Lands, 1901, p. 107.

T. L. GLEDHILL, *Grassy River Area, District of Sudbury*, Ont. Dept. Mines, Vol. XXXV, 1926, pt. 6, pp. 57–76.

Geophysical and Geological Assessment Reports

A number of geophysical and geological assessment reports have been submitted to the Ontario Department of Mines to be recorded as assessment work. The reports with their file numbers are given below:

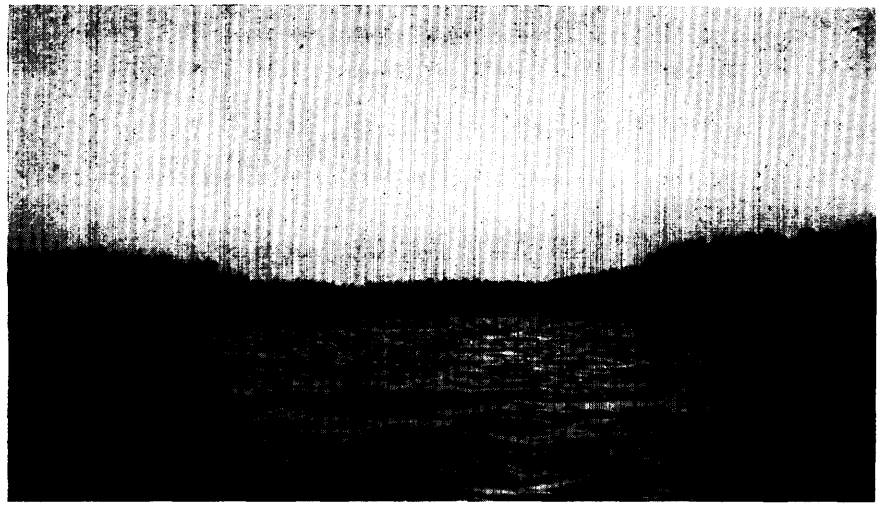
COMPANY	FILE NO.
Bobjo Mines, Ltd.	63.257 (geophysical)
Conwest Exploration Co., Ltd.	63,282 (geophysical)
Dominion Gulf Co.	63A.114 (geological)
Dominion Gulf Co.	63A.117 (geological)
Dominion Gulf Co.	63A.135 (geological)
Dominion Gulf Co.	63A.136 (geological)
Dominion Gulf Co.	63.245 (geophysical)
Dominion Gulf Co.	63.266 (geophysical and geological)
Miami-General Development Mines, Ltd.	63A.40 (geological)
Miami-General Development Mines, Ltd.	63.137 (geophysical)
Preston East Dome Mines, Ltd. (This report was submitted by Buffalo Ankerite Mines, Ltd., which had previously optioned the property)	63A.32 (geological)
Sherwood Gold Mines, Ltd.	63A.61 (geological)
Sirola Gold Mines, Ltd.	63A.24 (geological)
Sirola Gold Mines, Ltd.	63.139 (geophysical)
Wright-Hargreaves Mines, Ltd.	63.249 (geophysical)
Wrigley Prospecting Syndicate	63.61 (geophysical)

Topography and Drainage

The deposits left in Sothman township by the continental ice sheet and its meltwaters have been modified in late Pleistocene and Recent times by the action of wind and water. Numerous lakes and swamps separated by irregular hills of sand and gravel and sand dunes are characteristic of the area.

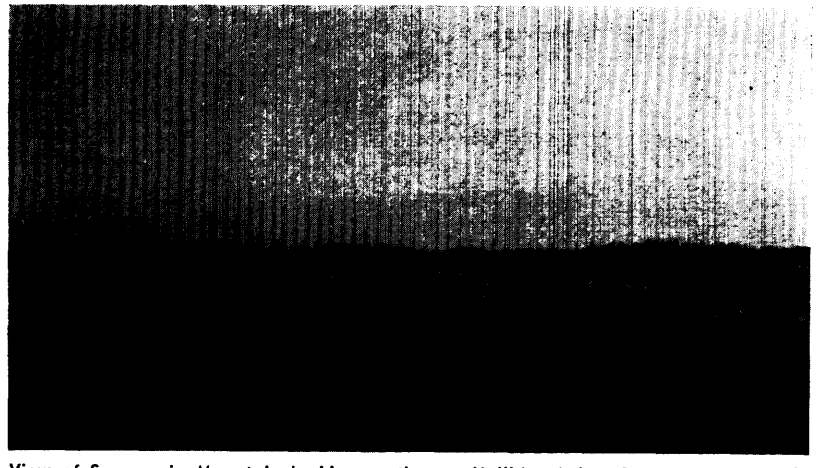
The area is a typically pitted outwash plain with many large and small kettles. These kettles are sometimes a reflection of the pre-Pleistocene topography but more often are irregular in spacing and outline; frequently they have no visible outlet. A few of the basins are dry, but many of them contain water or are swampy. Reading Lake is an example of a crystal-clear kettle lake with an irregular shore line and containing sandy islands. Most of the lakes are surrounded by sand and gravel, but occasionally rock forms a small part of the shore line.

In the central and southeastern part of the township, the outwash plain has been modified by wind into upsiloidal dunes. These rise from a few feet to about 50 feet above the general level, which is sometimes swampy. Swamps and small



View of Sothman Lake looking southeast.

lakes are often embayed by the hooks of these dunes. The dunes open to the northwest. In the southeastern part of the township, the terrain between the the dunes is largely swamp, and it is evident that the water table must have risen considerably, subsequent to the formation of the dunes.



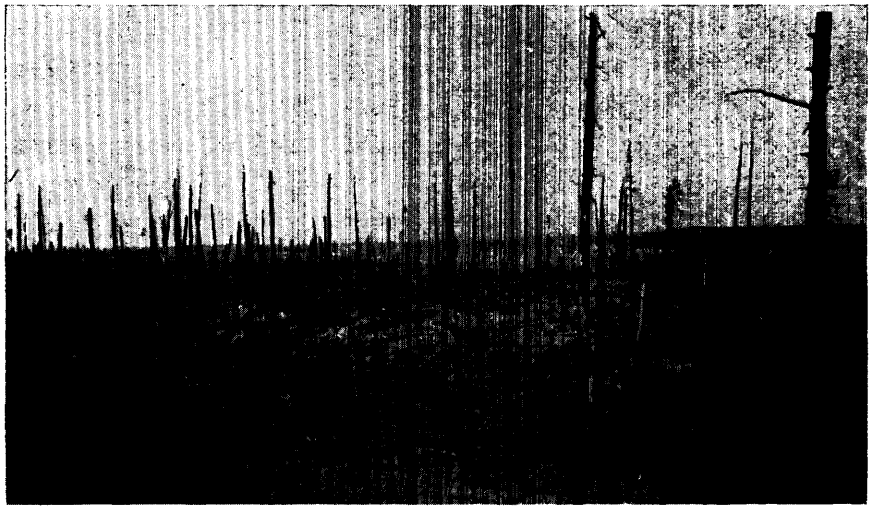
View of Sansawaju Mountain looking south over Halliday Lake. Sansawaju Mountain is 5 miles away on the Kemp-Mond township boundary.

In the northeastern part of the township, there is an area of low ground now mainly blanketed by a thick spruce and cedar swamp. Irregular low hills of sand and gravel rise above this swampy terrain. A narrow, steep ridge of sand, striking about N.8°E. and forming the backbone of a sand and gravel plain,

occurs here. This ridge is part of an esker entering the township from the northeast.

The amount and distribution of outcrop in the township are indicated on the map. Throughout the pitted outwash plain the exposures are few and project through the sand and gravel as small rock islands. It is estimated that less than 5 percent of the township is covered by exposed bedrock. No large outcrop areas occur in the township. Isolated exposures are found sporadically distributed, and except where the area has been burned over, they are very poorly exposed.

The township lies about seven miles northwest of the height of land, and in general the relief is low. Few of the rock ridges or dunes exceed 50 feet in height. Cobalt sediments are confined to the western part of the township, and even here the relief is generally less than 75 feet. Unequal deposition of glaciofluvial material and subsequent modification by wind and water are the other main causes of differences in relief.



View of area in the southern part of the township burned over in the fires of 1941 and 1951.

The flatness of the terrain is well exemplified by the drainage pattern. In the north half of the township, except for Edleston Lake, the drainage is eastward and southeastward into Halliday Lake, which in turn supplies water to the Grassy River in Halliday township to the east. The streams flowing into Halliday Lake have numerous meanders and flow through both swampy and sandy terrain. After making a broad loop to the north, east of Sothman township, the Grassy River flows through a broad sand-and-gravel plain into Loonwing Lake in the southern part of Sothman township. Here the drainage is westward into Net Lake, which in turn flows northwestward, via the Grassy River, into Sinclair Lake.

Edleston Lake in the northwest part of the township flows southwest into Kapiskong Lake in Nursey township; it has a rock basin and is believed to lie in a fault zone.

Most of the lakes in the area form an integral part of the Grassy River drainage system, but a number of the kettle lakes have no visible outlets. Bardwell and Chamandy lakes are of this type.

A dam constructed at the north end of Peterlong Lake in Musgrove township has caused a fluctuating water level for Sinclair, Net, and Loonwing lakes.

Natural Resources

Except in the burned areas the township is well forested. The forest is a mixed growth of poplar and birch, with jackpine, red and white pine, and balsam. Spruce, tamarack, and cedar are usually confined to swamps and the margins of kettle lakes. White and red pine up to 3 feet in diameter, and jackpine up to a foot or more in diameter and in park-like stands, are found in Sothman township. Second-growth pine covers much of the sandy area in the north-central part of the township.

A fire in 1941 destroyed much of the timber in the southwestern and extreme southern parts of the township. Young pine had re-covered much of this area,



View of area between Loonwing and Ritch lakes burned over in 1951. Note the black bear in the background.

but a second fire in 1951, over about 5,800 acres in the western, southwestern, and southern parts of the township, wiped out this second-growth pine. The fire of 1951 moved so rapidly that in places the trunks of the trees were only scorched. The wind currents that immediately preceded the flames felled a number of trees. In the fall of 1951 the Feldman Timber Company began large-scale timber operations in Sothman and adjoining townships, in an endeavour to salvage the partially burned timber. Wind storms, over the years, have destroyed much of the timber in some sections, and as a result travelling is very difficult. This is particularly true of the northern part of the township.

Game is fairly plentiful in the area; moose, deer, bear, and fox were seen on a few occasions. The carcasses of two moose trapped in the fire of 1951 were seen in the course of traversing. Beaver dams and cuttings are numerous, and the township is trapped for beaver by the Indians. Ducks are plentiful in the vicinity of Halliday Lake and the creeks that feed into it from the northwest.

Pike and pickerel are very abundant in all the larger lakes such as Reading, Sothman, Loonwing, and Halliday.

GENERAL GEOLOGY

Summary

The bedrock formations of the area consist mainly of early Precambrian volcanics cut by basic and ultrabasic rocks of Haileyburian age. More acidic intrusives of Algoman age outcrop in the northern part of the township. Cobalt sediments rest unconformably on the older rocks in the western and southern parts of the township. Two late diabase dikes, classified as Keweenawan in age, cut the early Precambrian volcanics. Cenozoic deposits of sand, gravel, and swamp conceal most of the bedrock, and it is estimated that less than 5 percent of the area is outcrop. The sand deposits have been partly modified since their deposition by wind action, and now occur as dunes in some parts of the township.

The volcanics are the oldest rocks in the area and, on the basis of lithological character, are classified as Keewatin in age. They include basic, intermediate, and acidic flows, fragmental volcanics, and thin tuffaceous bands.

The basic and ultrabasic rocks range in composition from altered dunite and peridotite, to pyroxenite, hornblendite, diabase, gabbro, diorite, gabbro and diorite porphyry, quartz gabbro and diorite, and lamprophyre. They cut the volcanics in a number of localities and are believed to be Haileyburian in age.

The Algoman intrusives are not widespread and include granite, feldspar and quartz-feldspar porphyry, and diorite. In the northwest corner of the township a hybrid zone occurs at the volcanic-intrusive contact.

Prior to deposition of the Huronian series, the Keewatin and Haileyburian rocks underwent intense folding and faulting during the Algoman orogenic period. This was followed by a long interval of erosion during which mountains were worn down to yield a peneplaned surface. Sediments of the Huronian series were subsequently deposited on this surface.

The rock formations are summarized in the following table. Within each group, the rocks are not necessarily arranged in chronological order:

Table of Formations

CENOZOIC	
RECENT:	Windblown sand (dunes); organic accumulations; stream deposits.
PLEISTOCENE:	Sand, gravel, and boulders; windblown sand (dunes).
	Great unconformity
PRECAMBRIAN	
KEWEENAWAN:	Olivine diabase and porphyritic diabase.
	Intrusive contact
HURONIAN:	Conglomerate, greywacke, and argillite.
	Great unconformity
ALGOMAN:	Granite; feldspar and quartz-feldspar porphyry; diorite.
	Intrusive contact
HAILEYBURIAN:	Diorite and quartz diorite; gabbro and diorite porphyry; gabbro, granophyre gabbro and diabase; pyroxenite; serpentinized dunite and peridotite; steatitized dunite and peridotite; hornblendite; lamprophyre.
	Intrusive contact
KEEWATIN:	Basic volcanics: andesite, basalt, pillow lava and dioritic lava; fragmental lava; talc-chlorite and carbonate-chlorite schist; chloritized-actinolitized and chloritized-carbonatized volcanics; amphibolitized volcanics.
	Acidic to intermediate volcanics: amygdaloidal, porphyritic and massive lava; pillow lava; fragmental lava; agglomerate and black slate; sericite schist; cherty tuff; chloritized-actinolitized and chloritized-carbonatized volcanics.

Precambrian

KEEWATIN

The Keewatin rocks occupy most of the central and eastern parts of the township. In the western part of the area they are exposed through windows in the overlying Cobalt series. On the basis of lithology, the volcanics have been divided into two groups: (1) basic volcanics, and (2) acidic to intermediate volcanics and tuff. In the vicinity of intrusives and zones of shearing, the volcanics have been considerably altered.

The rocks classified as basic volcanics are relatively scarce in comparison with the more acidic group. A narrow band of basic volcanics ranging from 400 to 800 feet in width, 2½ miles long and striking southeast, occurs just southwest of Bardwell Lake. Isolated exposures of basic volcanics and their metamorphic equivalents outcrop in the southwest corner of the township. Here they are associated with basic to ultrabasic intrusives. In the vicinity of miles-post II on the north boundary and to the east and south, the basic volcanics have been considerably altered to schists and amphibolites.

The acidic to intermediate volcanics are the commonest rock types in the central and eastern parts of the township. In the northwestern part of the area, they appear as inliers in the Huronian series and as small rock islands projecting through the sand and gravel.

Basic Volcanics

The basic volcanics include all the rocks ranging in composition from andesite to basalt and their fragmental and metamorphic equivalents. Field classification was largely based on colour and mineral assemblage. They are generally dark-green, medium- to fine-grained rocks. The finer-grained facies are often pillowed or porphyritic. In the case of the more massive, structureless flows it is sometimes difficult to distinguish them from intrusives that are lithologically similar. This difficulty was encountered in the northern part of the township.

The band of basic volcanics southwest of Bardwell Lake ranges from massive lava at the north end of the band to pillowed lava towards the south. At the south end, the band is cut by gabbro. Pillow structures in the volcanics indicate that the basic lavas overlie the acidic lavas.

In the southwest corner of the township the volcanics have been highly altered, both by the action of faulting and by the intrusion of basic to ultrabasic rocks. About 2,000 feet north of mile-post I on the west boundary, the volcanics have been sheared and carbonatized in the vicinity of a major fault zone. Southeast of mile-post I and again northeast of the southwest corner of the township, the volcanics have been metamorphosed by the ultrabasic intrusives to a rock composed of secondary hornblende, chlorite, and carbonate. The chlorite and secondary hornblende sometimes occur in alternating bands, clusters of which criss-cross at different angles. This structure is particularly noticeable in the outcrop 1,600 feet southeast of mile-post I; in the field the rock has been called "chicken track" rock. On claim S.40388 of the Sherwood Gold Mines, Limited, property, the basic volcanics have undergone similar alteration to "chicken track" rock in the vicinity of basic intrusives.

Along the east shore at the south end of Edleston Lake, in the northwest part of the township, the basic volcanics have been converted to chlorite schists by the action of faulting. On the west side, at the north end of the lake, the lavas have been injected by granite, and the rock is now a hybrid gneiss.

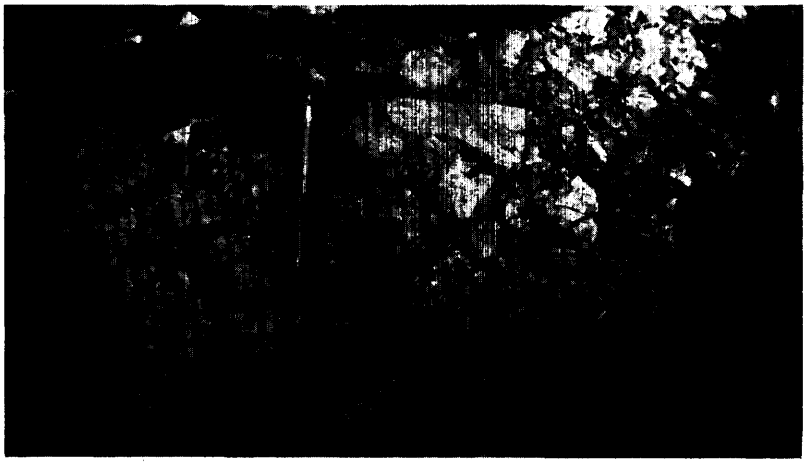
Just north of Pountney Lake, the basic volcanics have been intensely sheared and altered to yield a talc-chlorite and carbonate-chlorite schist. The zone of

alteration is several hundred feet wide, and what appear to be sheared pillows were noted. In the vicinity of mile-post II and eastward on the north boundary, the volcanics have been amphibolitized and cut by feldspar porphyry dikes.

In general, the basic volcanics have been considerably altered, and to a large extent, the original constituents have been destroyed. Except under intense shearing conditions such as those that produced schists, the structures have been retained to some degree. Plagioclase has generally been saussuritized, and the ferromagnesian minerals have been altered to chlorite or secondary amphibole. Other secondary minerals are calcite and leucoxene.

Acidic and Intermediate Volcanics

The acidic and intermediate volcanics include fragmental lavas that are often porphyritic and amygdaloidal, porphyritic and amygdaloidal lavas, pillow lava, the metamorphic equivalents of the foregoing rock types such as sericite schist



Keewatin dacitic breccia outcropping 1,200 feet south of Ritch Lake, in the southwestern part of the township.

and chloritized-carbonatized lava, agglomerate and interbedded black slate, and cherty tuff. These rocks have been distinguished in the field from the basic volcanics on the basis of colour. The colour varies somewhat, but in general the lavas are light grey or green on a freshly broken surface; on a weathered surface they are light grey to white. On the basis of mineral assemblage, the rocks are dacites and trachytes with the former predominating.

North of Loonwing and Ritch lakes in the extreme southern part of the township, the volcanics are generally porphyritic and show such primary structures as pillows and amygdules. The rocks are often brecciated and displacements of the pillow rims were noted in several instances. Flow breccia tops were recognized, but could only be traced for short distances. Non-porphyritic bands of lava interbanded with the porphyritic type were noted in drill core. The amygdules are oval-shaped or round and are generally filled with quartz. They are sometimes an inch and a half in greatest dimension. Well-formed vesicles filled with quartz or calcite are found in the lavas west and south of Deratnay Lake. The pillows are the usual balloon, bun, and blanket types and are up to 10 by 4 feet in size. The rims of the pillows are often vesicular and up to 3 inches in width. Several reliable top determinations were made on the pillows.

The dacite breccia in the southeastern part of the area contains fragments ranging from a fraction of an inch to over a foot in width. The fragments are

generally more acidic in composition and much more amygdaloidal than the matrix.

Near the north contact with the ultrabasic sheet just southwest of Teebone Lake, the dacite has been recrystallized. As a result, the grain size has been coarsened, and the colour darkened. Under the microscope the rock is composed of sericitized plagioclase, quartz, biotite, and epidote with minor accessories.

The volcanics just south of Pountney Lake are light-weathering pillowed dacites, which are similar in many respects to the dacites in the southeastern part of the township. They are locally sheared and brecciated.

The volcanics in the eastern part of the township are mainly breccias and massive flows, which are often porphyritic. The breccia ranges from a rock composed of light fragments of all sizes in a dark-coloured matrix to a rock containing dark fragments in a more acidic matrix. There are all degrees of brecciation; the rock may contain only narrow thread-like stringers of groundmass material, indicative of incipient brecciation with little bodily movement of the fragments, or be composed largely of groundmass material with 50 percent or less fragments. The fragments are angular to round, depending upon the amount of movement of the fragments and degree of absorption of the fragments by the groundmass material. On the west shore of the small peninsula on Kelly Lake, the breccia is composed of very acidic fragments in a dark matrix. The fragments are angular to subrounded in shape, and range in size from a foot to a fraction of an inch in width. The fragments contain feldspar and blue quartz phenocrysts; under the microscope the matrix was too fine-grained to make any determinations.

On claim S.40394 of the Sherwood property, sericite schist grading into massive acidic volcanics was noted. It is believed that this schist was derived from the acidic volcanics under intense shearing conditions.

The acidic and intermediate volcanics, in the neighbourhood of No. 3 post of claim S.55334 belonging to Preston East Dome Mines, Limited, have been profoundly altered by the adjacent basic to ultrabasic intrusives. They have been carbonatized and chloritized, and locally, the characteristic "chicken track" structure has developed. Elsewhere, the rock surface is spheroidal-weathering and slippery. Where the alteration is not pronounced the rock was identified as a dacite.

Two outcrops of cherty tuff were noted about 1,200 feet west of the south tip of Bardwell Lake. The tuff is an aphanitic, green, finely-laminated, white-weathering rock with a conchoidal fracture and a flinty appearance. It contains numerous centres of devitrification and is cryptocrystalline under the microscope. Southward, these tuffs pass into porphyritic lava.

Interbanded with the dacitic breccia in the eastern part of the township is a highly altered zone of agglomerate and black slate about 1,800 feet wide. This zone strikes west-northwest from mile-post IV on the east boundary of the township. The rock is quite schistose and heavily carbonatized. Good exposures of the agglomerate, containing narrow black, graphitic or slaty zones, can be seen on the northeast shore of Kelly Lake. The agglomerate just northwest of the lake has a basic matrix and contains fragments up to 10 inches in diameter, the average size is 4 inches. The fragments are angular to subrounded and consist of chert, dacite, diorite, and "chicken track" rock. One fragment was very slippery on the weathered surface and may have been peridotite. The agglomerate here is sheared and mineralized.

The band of agglomerate is picked up again in a trench just north of Wrigley Lake. Here again graphitic schist is present. The agglomerate, 1,000 feet north of No. 1 post of claim S.55336 on the Preston East Dome property, is sheared and

carbonatized, and contains fragments of dacite, diorite, chert, and "chicken track" rock. Nodular, pyrite-bearing graphitic zones were seen in drill core, and it is believed that this agglomerate may be part of the same band found in the eastern part of the township.

The heterogeneous character of the agglomerate and the presence of graphitic horizons seem to favour a pyroclastic origin for this band of fragmentals. However, the intense shearing, carbonatization, and alteration of this band of rock make a proper identification difficult. The writer is at a loss to explain the occurrence of "chicken track" rock as fragments, if this type of alteration is attributed to the intrusion of peridotite, since the peridotite is believed to be younger than the agglomerate. Three explanations are possible: (1) The "chicken track" rock is not due to the intrusion of peridotite in this case. (2) The "chicken track" rock is due to the intrusion of peridotite and was developed prior to the formation of the agglomerate, thereby making the peridotite older than the agglomerate. (3) The "chicken track" rock is due to the intrusion of peridotite and was developed in the agglomerate by the selective alteration of fragments that were compositionally favourable.

Structural evidence would indicate that this band of agglomerate is interbanded with dacitic breccia of about the same age. The agglomerate has been highly metamorphosed and is now sheared and heavily impregnated with carbonate.

HAILEYBURIAN INTRUSIVES

The Haileyburian intrusives include serpentinized dunite and peridotite, dunite and peridotite now altered to talc and carbonate (steatite), pyroxenite, hornblendite, gabbro, granophyre gabbro, diabase, gabbro and diorite porphyry, diorite, quartz diorite, and lamprophyre. The intrusives cut the Keewatin volcanics and often contain inclusions of them. They occur as lenses, sheets, irregular-shaped masses, and dikes. Surface exposures of serpentinized dunite and peridotite are limited in number, but diamond-drilling and geophysical work have indicated that there are several concealed bodies within the township. The peridotites are generally dark green to black in colour, and soft and slippery on a weathered surface. Owing to the high content of magnetite, the peridotites normally have a profound effect upon the compass needle.

A steeply dipping sheet of serpentinized peridotite and dunite intrudes the Keewatin series in the southeastern part of the township. The strike of the formation is S.80°E. and parallels the regional strike of the volcanics in this part of the township. The thickness is about 800 feet wide at the east end and narrows to about 400 feet at Bowsfield Lake where it plays out. Along strike, particularly at the west end, the sheet has been broken by a number of cross-faults. On a freshly broken surface the rock is medium grained in texture and dark green to black in colour. On a weathered surface it is soft, white, and slippery.

R. W. Baker[1] of the Dominion Gulf Company describes the ultrabasic rock as follows:

> The ultrabasic rock consists of two distinct types, these being a peridotite border phase and a dunite core. The peridotite may contain up to sixty-five percent of pyroxene and amphibole; exclusive of accessories, the balance of this rock is olivine which is now largely altered to serpentine. The olivine of the dunite core is completely serpentinized, and pyroxene or evidence of former pyroxene constitutes less than ten percent of the rock.
>
> The peridotite contains maximum pyroxene and amphibole near the walls of the intrusive. A progressive diminution in these minerals occurs inwardly toward the dunite. Both orthorhombic and monoclinic pyroxene occur together in the peridotite which is thus of the variety named lherzolite. The orthorhombic pyroxene is a pale, non-pleochroic enstatite which has been altered in part to bastite. This alteration, which is a serpentinization of magnesium-rich pyroxene, occurs

[1]R. W. Baker, personal communication.

selectively, crystal by crystal. The monoclinic pyroxene, of the augite type, has been altered in part to brown hornblende and weakly-pleochroic actinolite. Both of these amphiboles may be present within the same pyroxene pseudomorph.

Poikilitic texture is present in the peridotite in the higher pyroxene and amphibole ranges. In this texture, small crystals of olivine are contained at random in the larger pyroxene or amphibole crystals. The olivine, for the most part, is altered to mesh serpentine, but remnants of the fresh mineral may still remain as vestigial islands within the individual pseudomorphs. These remnants are common in the above poikilitic pattern, and it would appear that a shielding effect by the pyroxene or amphibole against the serpentinizing agency took place. Towards the dunite core the pyroxene becomes interstitial in its relationship to the olivine crystal pseudomorphs. A greyish-white alteration product, present in variable amounts in the monoclinic pyroxene, is of cloudy opacity in thin section. This chalk-like material may be a derivative of laumontite which formed initially from the pyroxene, and was in turn altered itself.

The texture of the dunite is holocrystalline. The rock is an aggregate of serpentinized olivine crystals which, on the whole, show well-developed crystal faces. At times, the crystal entities form such a closely-packed assemblage that there is space for very little interstitial material. Parallel orientations of the olivine pseudomorphs, relative to their c-axis directions, occur at certain horizons in the dunite. This feature is possible fluidal structure, the result of movement in the mass before final consolidation. Elongations parallel to the c-axis and acute terminations to these are common to the pseudomorphs. Occasionally, a porphyritic relationship is present wherein relatively large crystals occur in a groundmass of uniformly small but equally-as-well-developed crystals.

Geophysical work in the central part of Sothman township has outlined a narrow, highly magnetic arcuate band, which, in conjunction with the structure in the volcanics, would seem to indicate an anticlinal structure. A few small isolated outcrops of serpentinized peridotite were found within the magnetic band. The south limb of the band of peridotite strikes northwest, and just west of Bardwell Lake at the nose of the fold, the strike changes abruptly to northeast. Just north of Sothman Lake the strike changes again to northwest. The serpentinized peridotite and associated intrusives intrude basic and acidic volcanics of Keewatin age. The band of peridotite appears to be no more than 300 feet wide. At both points of flexure, west of Bardwell Lake and north of Sothman Lake, geophysical work indicates two highly complex areas. The band of peridotite and the complex areas have been broken by cross-faults. Flanking the peridotite to the northeast, on the south arm, is a narrow band of gabbro porphyry about 400 feet wide. The porphyry is characterized by phenocrysts of feldspar set in a fine-grained gabbroic matrix. The feldspar crystals have been partially resorbed, and the corners are now generally rounded. Southwest of the peridotite, on the south arm, is a zone of granophyre gabbro of unknown width; under the microscope it consists of plagioclase and pyroxene with interstitial granophyre and quartz.

Age relations between the gabbro, gabbro porphyry, and peridotite are difficult to determine; however, the outcrop 1,600 feet north of Gelinas Lake shows that the gabbro porphyry and peridotite have a knife-edge contact, in contrast to the gabbro-peridotite contact, which is gradational.

The complex offshoot lying west of Sothman Bay is mainly sheared, carbonatized, and serpentinized peridotite, and dunite. It is broken by numerous cross-faults. Inclusions of porphyritic lava further complicate the already complex magnetic picture.

Just southwest of Gelinas Lake there is a small northwest-trending lenticular, high-magnetic zone, presumably caused by peridotite. From the spacing of the magnetic contours, this lens probably dips southwest in conformity with an anticlinal structure plunging to the west.

Dunite is exposed 1,200 feet northeast of the southwest corner of the township. The rock is now completely altered to talc and carbonate. The alteration products are pseudomorphs after olivine, and magnetite forms the interstitial material. The rock is classified as a steatitized dunite.

Peridotite and dunite occur southeast of mile-post I on the west boundary of

the township. Here the rock is medium-grained in texture and greenish grey in colour. On a weathered surface it is brown. The peridotite and dunite have been completely altered to a rock composed of talc and serpentine with some magnetite. Across the strike the ultrabasics grade into altered volcanics termed "chicken track" rock in the field.

A band of peridotite strikes in a northerly direction for several hundred feet from a point south of claim S.55336. This peridotite zone is not wide, and north of claim S.55336, it seems to pass eastward across the strike into a rock classified as hornblendite, but which may be a uralitized pyroxenite. An examination of drill core indicates that the hornblendite becomes fine-grained eastward and exhibits a chilled border against the carbonatized volcanics.

Peridotite, exposed by trenching, occurs in claim S.40393 and just north of claim S.40399, on the property of Sherwood Gold Mines, Limited. Several outcrops of sheared peridotite occur south of Cork Lake.

Other occurrences of peridotite exposed on surface or indicated by diamond-drilling and geophysical work are shown on the map in the appropriate colour.

The gabbro is a medium- to coarse-grained rock with a brown-weathering surface. The fresh surface is greyish white. Structurally, the gabbro ranges from massive to diabasic. Under the microscope the following types were recognized: gabbro, diabase, granophyre gabbro, and anorthositic gabbro. The mineral constituents of a typical granophyre gabbro are: feldspar now partially saussuritized, ortho- and clino-pyroxenes, granophyric and structureless quartz, magnetite, and ilmenite. The ilmenite is now altered to leucoxene.

Diorite is exposed in the southwest corner of the township, and on the weathered surface, it ranges from brown- to white-weathering. About 1,600 feet north of the southwest corner the diorite has a speckled black-and-white-weathered surface and contains small angular fragments of basic lava up to 2 inches in size. On the weathered surface the fragments weather deeper than the diorite. The diorite exposures, about 1,200 feet north of mile-post I on the west boundary, were thought to be gabbros, but thin-section work revealed that at least some of the exposures are quartz diorite. Diorite was also intersected in drill holes north of claim S. 55336, in the northwestern part of the township.

The lamprophyre in the southwest corner of the township has been grouped with the Haileyburian rocks because of its close association with them. About 1,600 feet northeast of the southwest corner of the township, diorite was noted grading into mica diorite or lamprophyre. Carbonatized lamprophyre cuts the rocks on the large outcrop 1,600 feet southeast of mile-post I. This lamprophyre was also intersected in the drill hole collared on this outcrop. Under the microscope, the biotite was seen to be almost completely converted to chlorite. Other constituents were plagioclase feldspar now saussuritized, actinolite, epidote, and carbonate.

Lamprophyre was intersected in the drill hole just east of No. 1 post of claim S.40400. Haileyburian intrusives were again noted in the immediate vicinity.

A band of gabbro porphyry, about 400 feet wide, occurs southwest of Bardwell Lake and strikes in a southeasterly direction. This has been described on page 12. A second band of porphyry occurs in claim S.40388 of the Sherwood Gold Mines, Limited. It is characterized by white laths of feldspar in a dark-green matrix. The band is 20 feet wide, and its south contact with the volcanics is sheared and mineralized.

ALGOMAN INTRUSIVES

Algoman intrusives are not abundant in Sothman township, and are found only in the northern part of the area. They range in composition from granite to feldspar and quartz-feldspar porphyry, and diorite.

The largest area of Algoman rocks occurs in the northwest corner of the township, and here they represent part of a much larger mass extending into Nursey township to the west. The granite north of Edleston Lake is a medium- to coarse-grained in texture and pink in colour. Just west of the north shore the granite has become contaminated with volcanics, and the rock is now a hybrid gneiss. Farther south, along the west shore of Edleston Lake, the rock becomes dioritic in composition and gneissoid in structure. At the south end of the lake, on the east shore, the rock is a medium-grained feldspar porphyry mineralized with disseminated sulphides. About 1,200 feet south of Edleston Lake, feldspar porphyry has been exposed by trenching and intersected in drill holes. Here it is associated with carbonate rock.

Quartz-feldspar porphyry cuts the Keewatin volcanics 700 feet north-northwest of Budd Lake and north of claim S.55327.

Feldspar porphyry is abundant on the property of Sherwood Gold Mines, Limited, and is exposed on claims S.40388, S.40390, and S.40395. On claim S.40388 the feldspar porphyry contains inclusions of acidic volcanics. On claims S.40390 and S.40395 the porphyry contains euhedral crystals of plagioclase feldspar, partially sericitized, set in a fine-grained, pink matrix of quartz and feldspar. The porphyry is mineralized and contains cubic crystals of pyrite. Some secondary carbonate and chlorite as well as sericite are present.

A third centre of Algoman intrusive rocks is found just north of Pountney Lake in the northeastern part of the township. The Algoman rocks here consist mainly of narrow dikes of feldspar porphyry rarely over 10 feet wide. These dikes are usually mineralized. Under the microscope the porphyry consists of crystals of sodic plagioclase embedded in a cryptocrystalline groundmass. The main accessory minerals are pyrite and biotite. Alteration products include sericite, chlorite, and carbonate.

Carbonated Rocks

The volcanics and intrusives of pre-Algoman age have been partially carbonatized in places by the action of circulating hydrothermal solutions. One area of completely carbonatized rock occurs just south of Edleston Lake in the northwest corner of the township. The development of carbonate is most pronounced in the vicinity of sheared or faulted zones.

The green carbonate just south of Edleston Lake is brown-weathering and is cut by a network of quartz and quartz-carbonate veins and stringers up to 3 inches or more in width. The veins are discontinuous and vuggy with well-developed quartz crystals in some of the vugs. The rock is well-mineralized with fine disseminated pyrite. Shearing is common in the carbonate rock, and the veins often show small drag folds. The carbonate has probably developed along an ancient sheared zone.

Several hundred feet east of the green carbonate, the acidic volcanics have been highly sheared and carbonatized. A stockwork of quartz and calcite stringers cuts the carbonatized volcanics. Sulphide mineralization is mainly in the form of pyrite with some galena, sphalerite, chalcopyrite, and millerite.

Carbonatized peridotite and lava occur in the southwest corner of the township. In the peridotite, the carbonate occurs as pseudomorphs after olivine or as a patchy replacement. The peridotite in the central part of the township has been carbonatized in the vicinity of small cross-faults.

The rocks in the area around Pountney Lake, on the north boundary, have been carbonatized in part, but not to such a degree that they have been completely altered.

A prominent zone of shearing and carbonatization is found in the belt of pyroclastics running west-northwest from mile-post IV on the east boundary of the township. Under the microscope, carbonate was found to be one of the most abundant minerals. On the weathered surface the carbonate has weathered deeper than the other, more resistant, minerals and fragments; as a result the surface of the outcrops is very rough.

HURONIAN

Cobalt Sediments

The Cobalt series in Sothman township is confined to the western section, with the exception of a few small outliers in the south-central part. The rocks



Cobalt conglomerate escarpment 1,400 feet south of the No. 2 post of claim S.38391.

consist of interbedded conglomerate, greywacke, and argillite. On the map these have been shown in one colour, but the conglomerate has been differentiated from the fine-grained sediments by the use of numbers. Topographically, the Cobalt series trends in a north-northeasterly direction. In the northwestern part of the township the rocks are exposed mainly along cliff edges; whereas in the southwestern part of the township, where the country was burned over twice in the past ten years, the Cobalt sediments form fairly high, bold hills.

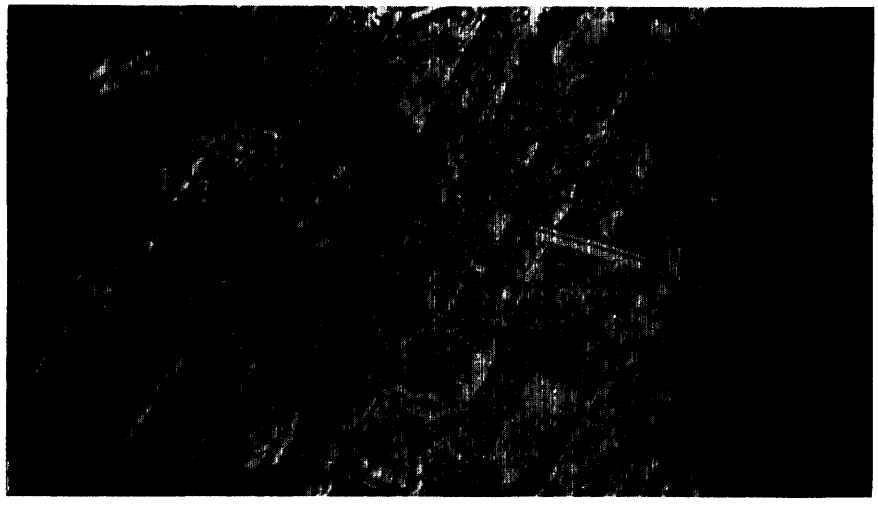
The sediments are relatively flat-lying except for a few outcrops about 2,000 feet east-southeast of mile-post I along the west boundary. Here, they dip at angles up to 65 degrees.

The capping of the Cobalt sediments is not believed to be very thick since numerous basal conglomerates have been recognized. The existence of windows in the Cobalt series further confirms this viewpoint. The capping thins out eastward, until in the south-central part of the township, only small outliers exist, and finally in the eastern part of the area, there are no Cobalt sediments whatsoever.

The basal conglomerate in the southwestern part of the township is well exposed in two places. About 2,200 feet north of the southwest corner, the con-

glomerate rests unconformably on the older eroded surface. The underlying rocks consist of Haileyburian intrusives of dioritic, gabbroic, and ultrabasic composition and Keewatin "chicken track" rock. Dikes of conglomerate ranging from ¼ to 6 inches wide were noted in the flat-lying and vertical joint fractures in the underlying intrusive rocks. The basal conglomerate contains pebbles and boulders of the underlying intrusives and altered lava. It appears that the underlying rocks were disintegrated by weathering, and the matrix and some of the pebbles of the basal member of the Cobalt series were derived from them.

About 1,600 feet southeast of mile-post I another erosional unconformity is well-exposed. Here the basal member of the conglomerate contains pebbles and fragments of "chicken track" rock and other types. Where the conglomerate rests directly on the "chicken track" rock the pebbles are mainly of that type. Once again conglomerate dikes up to 4 inches wide occur in the underlying rocks.



Steeply dipping Cobalt sediments about 2,000 feet east-southeast of mile-post I on the west boundary of the township.

To the east of this unconformity the Cobalt series has dips up to 65°S., and the finer-grained facies are sheared in a direction parallel to the bedding. Incipient fractures in the greywacke strike N.45°E. On the north edge of the outcrop the rock is conglomerate and passes southward on the same outcrop into greywacke and argillite. On the outcrop, 1,800 feet south and 950 feet east of mile-post I the sheared greywacke and conglomerate dip 35°S. and strike N.78°E. A few feet south, the dip flattens until it is 10°S. In the conglomerate, the shearing wraps around the unfractured boulders and pebbles.

North and east of Loonwing Lake there are a few small outliers of Cobalt basal conglomerate. The basal conglomerate on the east shore of Loonwing Lake contains a heterogeneous assemblage of pebbles and boulders in addition to boulders of the underlying gabbro. At one place there is a thin plaster of conglomerate, 2 feet wide and 10 feet long, on the underlying gabbro. Elsewhere, the conglomerate fills irregularities in the pre-Cobalt surface.

Conglomerate predominates in the northwestern part of the township. North of claim S.55327 the basal conglomerate rests unconformably on acidic fragmental volcanics. A study of the conglomerate on the west boundary of claim S.55699 shows that the pebbles and boulders exhibit poor sorting and range from a frac-

tion of an inch to over 2 feet in diameter. They show all degrees of rounding ranging from rectangular to ovoid, and consist of greenstone, diorite, granite, porphyry, slate, and gneiss.

The Cobalt series on the west boundary of claim S.38391 ranges from conglomerate to fine-grained sediments. Near the top of the outcrop, layers of greywacke, about 2 inches thick and similar to varves, can be seen. These layers contain coarse and fine bands. Small pebbles are present in the slaty material, and it can be seen that mud has been depressed on the under side of the pebbles and built up on the upper side.

Subsequent to the Algoman revolution, which involved large-scale regional uplift, there was a long period of erosion during which the rocks were partially decomposed and disintegrated by weathering. This great hiatus was followed by the deposition of rocks of the Huronian series consisting of coarse and fine



Cobalt sediments resting on Haileyburian basic intrusive, 2,200 feet north of southwest corner of the township. Note fracture fillings of Cobalt sediments in the underlying older rocks.

detrital sediments. The presence of Cobalt sediments in the west and south-central parts of the township, the occurrence of numerous basal conglomerates, and the existence of Cobalt sediments to the southeast of Sothman township, seem to indicate that the sediments were deposited in a large body of water, a long arm of which extended from the southeast into the southern and western parts of Sothman township.

Post-Cobalt faulting is believed to have taken place in at least two areas. In the southwestern part of the township the Cobalt series dips 65°S. and is sheared locally. The steep dip is attributed to drag occurring along a fault face. In the northwest corner of the township the absence of Cobalt rocks on the northwest side of Edleston Lake suggests that the block to the southeast has been down-faulted and the sediments preserved. On the northwest side they have been removed by erosion.

KEWEENAWAN

Only two outcrops of diabase were seen in Sothman township, and owing to the scarcity of outcrops, their relations with the Cobalt series are unknown. However, on the basis of the presence of olivine, which is sometimes regarded as a

Keweenawan indicator, they have been tentatively classed as Keweenawan. No information could be obtained about the direction of strike of the dikes, and no contacts were seen by the writer.

The diabase just north of claim S.40399 is a fresh, medium- to coarse-grained, dark, greenish-grey rock with a chilled border on the north edge of the outcrop. The dike is characterized by the presence of large, partially resorbed, plagioclase phenocrysts in both the chilled and grained facies. Under the microscope the diabase has an ophitic texture and contains olivine, apatite, and magnetite, in addition to the usual feldspar and pyroxene.

A second occurrence of diabase was found just northwest of mile-post IV on the east boundary. Here the diabase cuts a band of Keewatin pyroclastics. No contacts were observed.

Cenozoic

PLEISTOCENE

During part of the Pleistocene period Sothman township was completely covered by a continental ice sheet. This is evident because the imprint made by its presence is still clear. Depositional forms developed during the glacial epoch are mainly glaciofluvial in origin. They have been subsequently modified by the action of wind and water. In addition to being responsible for the glaciofluvial deposits, the ice sheet has smoothed rock surfaces and occasionally cut striae into them. The strike of these striae and that of the esker in the northeast corner of the township indicate that the movement of the ice sheet in the township was about S.5°-10°W.

Sothman township is almost completely covered by a pitted outwash deposit of sand and gravel, and as a result, a large part of the bedrock is now concealed. Kettles of all sizes and shapes occur throughout the township. The cause of these kettles is well known. Blocks of ice became buried during the formation of the outwash deposit and remained until after deposition ceased; but they finally melted, and the surface of the overlying sand and gravel slumped down to produce a basin. If the bottoms of these basins lie below the level of the water table they become lakes or ponds. Reading Lake is a good example of a kettle lake.

Only one esker was recognized in the area. It enters the township at the northeast corner and was traced for a little over a mile. It has been partly buried by glaciofluvial outwash deposited after the formation of the esker.

In late Pleistocene and Recent times, following the formation of the outwash plain, winds blowing from the northwest over the sandy surface produced dunes now largely stabilized by forest cover. These dunes are well exhibited in the central and southeastern parts of the township. Upsiloidal dunes are the commonest type. They are V-shaped dunes ranging from a few to 50 feet in height and are often integrated to yield a complex pattern. The dunes strike in a southeasterly direction with the horns pointing to the northwest from which direction the winds blew. The steep slope of the dunes point to the southeast or leeward side. Small ponds or lakes are sometimes found within the horns of the dunes. These upsiloidal dunes, according to H. T. U. Smith,[1] are a type developed on a sand plain of fluvial or glaciofluvial origin.

RECENT

Recent deposits consist mainly of organic material now collecting in swamps and muskegs. Detrital material is also being carried by streams in the area to the lakes.

[1]H. T. U. Smith, *Aerial Photographs and Their Applications*, D. Appleton Century Co., Inc., New York, 1943, pp. 313, 317.

Wind action has partly modified the pitted outwash plain during the summer months. This action is most pronounced in the sections of the township that have lost their forest cover through fire.

STRUCTURAL GEOLOGY

Structural interpretations in the area have been restricted owing to the extensive covering of drift and swamp and the scarcity of good rock outcrops. The field criteria noted were the strikes, dips and tops of lava flows and sediments, horizon markers and contacts and their displacement, and the strikes and dips of faults and sheared zones. Diamond-drill and geophysical data in particular have been extremely useful in the interpretation of the structure. Geophysical work has aided in the tracing of bands of peridotite in areas almost completely covered by overburden and in obtaining regional strikes in similar areas. Diamond-drilling has also permitted a study of subsurface rock types. The writer's interpretation of the structure is indicated on map. No. 1953-3 by the lighter tints of colour and by the location of fold axes, faults, and sheared zones.

Top determinations in the volcanics were made from the shapes of the pillows and from fragmental flow tops. Strikes were obtained from a study of the elongation of pillows, interbanded tuffs, and horizon markers such as flow-breccia tops. Dips of flows were rarely found.

The Cobalt sediments in Sothman township are generally flat-lying or nearly so, except in the southwest corner where they dip about 65°S. Tops were determined by grain gradation.

Faults and sheared zones were recognized by various structural and stratigraphical discordances, visible shearing and brecciation, and on the basis of geophysical work. Occasionally faulting is topographically expressed by linear valleys.

Structurally and chronologically the rocks can be subdivided into two groups. The older rocks such as the Keewatin and Haileyburian types appear to be folded and steeply-dipping. The younger rocks of the Cobalt type overlie unconformably the older group and are generally flat-lying except in isolated cases.

From a study of all the data available it appears that the major structural feature in the township is a broad anticlinal fold plunging to the west. The lavas in the southeastern part of the township strike about S.80°E. and face south. Westward and northward, the lavas strike southeast and dip and face southwest. These field determinations, in conjunction with drilling and geophysical data indicate a plunging anticline, the nose of which lies just west of Bardwell Lake.

The area is broken up by a number of northeast-trending faults, and by at least two major sheared zones trending in an easterly direction. No northwest-striking faults were recognized, but they undoubtedly exist.

Folding

The major fold structure in the township is a faulted anticline, the nose of which lies just west of Bardwell Lake. This fold has been indicated on the basis of field mapping, diamond-drilling, and geophysical work. The rocks involved in the folding include Keewatin volcanics and Haileyburian intrusives. The folded rocks now dip steeply or are vertical. The volcanic-intrusive contact is mainly conformable, but cross-cutting relations do exist and apophyses of intrusive rock extend into the volcanics. In the southeast part of the township the lavas strike S.80°E. and face south. Westward and to the north, the strike changes to southeast and the tops face to the southwest. From determinations made on the acidic

tuffs, the rocks dip to the southwest. Geophysical data indicate that the nose of the fold lies west of Bardwell Lake, and it is believed that it is offset to the southwest by a major northeast-trending fault. Owing to the absence of outcrops, information on the north limb is based solely on geophysical and diamond-drill data. The anticline plunges steeply to the west. The period of folding appears to be post-Haileyburian, since both the Keewatin and Haileyburian rocks have been involved in the movement; unless, of course, the intrusives were injected during or after the folding had taken place along lines of weakness conformable with the folding.

Minor folds have been developed elsewhere in the township. McBean[1] states that, on claim S.40388, the volcanics are folded, and the axis of the fold strikes N.58°E. Owing to the fact that the sides of the trenches have slumped considerably since 1947, bedrock was scarcely visible, and it was impossible to check this during field mapping. However, from a study of McBean's geological map the structure appears to be a small anticlinal fold the axis of which plunges steeply to the northeast. There appears to have been considerable small-scale faulting parallel to the axial plane of the fold. The rocks east of claim S.40399 may be folded, but this interpretation is based solely on geophysical data.

Faulting

Evidence of faulting and shearing is widespread throughout the township, but lack of sufficient rock exposures makes it difficult to trace any continuity. On this account geophysical work has helped considerably in the location of known and assumed faults. The faults and shears are divided into two groups on the basis of their strike.

The eastward-trending group of faults are generally accompanied by intense shearing and carbonatization over considerable widths, and have usually been offset by later cross-faults. They are believed to be pre-Haileyburian in age, although movement along them may be recurrent.

The second group of faults trends in a northeasterly or northwesterly direction and are younger than the eastward-striking faults.

EDLESTON FAULT ZONE

A major sheared zone, striking about N.85°W., enters the township about 2,100 feet south of mile-post V on the west boundary and is indicated by a large outcrop of green carbonate rock impregnated with quartz and carbonate veins. Drilling reveals that the fault zone at depth consists of alternating sections of talc-chlorite schist, green carbonate, and feldspar porphyry. The quartz and carbonate veins and stringers in the green carbonate are often drag-folded, and shearing is common. The fault zone disappears eastward beneath a mantle of Cobalt conglomerates and appears again north of No. 1 post of claim S.55336 as a sheared zone several hundred feet wide in the fragmental volcanics. The rocks have been heavily carbonatized, and sulphide mineralization is widespread. The sheared zone disappears eastward under a cover of drift and swamp. A north-south dike of Haileyburian intrusives cuts across the sheared zone and is itself unsheared. Consequently this fault zone appears to be pre-Haileyburian. A wide sheared zone, estimated to be 1,800 feet wide, enters the township at mile-post IV along the east boundary. The strike of the zone is S.70°E., and the rocks within it are sheared and heavily carbonatized. The principal rock type is a sheared pyroclast similar in many respects to the sheared and carbonatized rocks north of

[1]Assessment report, Ont. Dept. Mines, File No. 63A.61.

claim S.55336. It is conceivable that at one time the two sheared zones were continuous, but have since been offset by the numerous cross-faults known to be present.

POUNTNEY FAULT ZONE

This sheared zone occurs just south of mile-post II on the north boundary and trends in an easterly direction. Here the volcanics have been converted to talc-chlorite and carbonate-chlorite schists. The zone is several hundred feet wide and disappears in both directions beneath a mantle of sand and gravel. The zone has been offset by a northeast-striking cross-fault. Quartz impregnations and sulphide mineralization occur within the zone.

SINCLAIR FAULT ZONE

A third eastward-trending fault zone enters the township just south of mile-post I along the west boundary. The volcanics just west of the boundary in Nursey township are sheared and carbonatized. Eastward, the volcanics disappear beneath the Cobalt sediments, which on one outcrop, dip 65°S. and strike N.85°W. The alteration in the volcanics, in conjunction with geophysical data, lends support to the theory that the Cobalt sediments owe their steep dip to an eastward-trending fault zone.

The Cobalt sediments about 2,000 feet east-southeast of mile-post I dip 65°S., and this dip gradually flattens to the south until it is nearly flat-lying. The steep dip in the Cobalt sediments is attributed to drag occurring along a fault plane to the north; the south side moved down with respect to the north side. The fault may represent an ancient sheared and carbonatized zone along which there may have been recurrent movement in post-Cobalt times.

NORTHEAST-STRIKING FAULTS

A number of northeast-striking faults are indicated on the map. The Edleston Lake fault strikes about N.40°E. across the northwest corner of the township. At the southwest end of the fault zone the rocks are sheared, and the volcanics are now talc-chlorite schists. Cobalt sediments are confined to the area east of the fault, and it is postulated that they have been preserved by down-faulting of the east side. The Edleston lake fault is topographically expressed by a long narrow lake that passes into a linear valley at the northeast end, and swampy terrain at the southwest extremity.

Two almost parallel northeast-striking faults have been postulated in the western part of the township. They enter the township 2,000 feet north of mile-post I and 700 feet north of mile-post II, along the west boundary. The latter fault extends up the northeast arm of Sinclair Lake and through the south end of Reading Lake as shown on the map. The former fault is more definite and its position is based on geological and geophysical data. The lavas in the vicinity of the fault just east of the west boundary are highly sheared, carbonatized, and mineralized. Northeastward, this fault cuts across the nose of the major anticlinal structure and then parallels the north arm of the fold. It is postulated, on the basis of geological and geophysical information, that the northwest side of the block moved southward.

A northeast-striking cross-fault, just north of Loonwing Lake, has displaced the band of volcanics and intrusives. The apparent horizontal displacement is, the southeast side about 800 feet to the southwest relative to the northwest side. Geophysical data lend support to the field evidence.

A number of minor cross-faults occur east of Bowsfield Lake. The apparent

horizontal displacement has not been great, but the faults are believed to be significant in that they may have served as channelways for nickel-bearing ore solutions.

Cross-faults trending in a northeasterly direction are found in the north-central part of the township. On claim S.40388 the shearing trends about N.58°E. and parallels the axial plane of a minor anticlinal fold. The dip of the shearing is steep to vertical. Gold-bearing pyrite is found in the sheared zones. A second sheared zone, on claim S.40388, trends in a northerly direction and follows the contact between the acidic and basic volcanics. Pyrite and pyrrhotite are the common sulphide minerals present. This sheared zone is probably due to differential movement along the acidic-basic volcanics contact.

Other sheared and faulted zones are shown on the geological map. Many are accompanied by quartz stringers and pyrite mineralization.

ECONOMIC GEOLOGY

Minerals of economic interest that have been found to date in Sothman township are, gold, argentiferous galena, sphalerite, pyrrhotite, pentlandite, and asbestos; other minerals that have been recognized are, pyrite, specularite, millerite, and chalcopyrite. Early prospecting in the area was for gold, but since the inception of the airborne magnetometer and its application, prospecting has been mainly for nickel and asbestos associated with ultrabasic bodies. There are no producing mines or shafts in the area, and exploration has been confined to surface-trenching and stripping, diamond-drilling, and geophysical surveys.

Gold

In 1944, R. Edleston of Timmins uncovered a gold showing in the northwestern part of the township. As a result, interest in the area became acute, and eventually other gold showings were discovered. The gold is associated with quartz in or near sheared, fractured, or faulted zones.

On the property of Sherwood Gold Mines, Limited, the gold is associated with fine-grained pyrite and sphalerite in or adjacent to veins, lenses, and stringers of quartz. These quartz masses lie in sheared zones, the most important of which is along the south contact of diorite porphyry with andesite.

On the Preston East Dome Mines, Limited, property in Sothman township, the main gold showing is in carbonatized and sheared agglomerate cut by a stockwork of quartz and calcite stringers. The sulphides present are pyrite with minor chalcopyrite, pyrrhotite, millerite, sphalerite, and galena. Again gold is associated with quartz stringers and veins. Low gold values were obtained in an outcrop of green carbonate cut by a plexus of quartz and carbonate stringers and veins and intruded by feldspar porphyry. Pyrite mineralization is abundant.

Argentiferous Galena and Sphalerite

On the Preston East Dome property in the northwestern part of the township, four narrow bands of sphalerite and galena occur in a mineralized zone of volcanics several hundred feet wide. The four bands are only a few inches wide, and the associated minerals are pyrite and calcite. The sphalerite and galena occur as stringers, platings, and disseminations. The host rock is a carbonatized and mineralized agglomerate containing light and dark fragments in a basic matrix.

Nickel

Air surveys outlined a high magnetic anomaly in the southeast corner of the township. Prospecting over the anomaly and in the vicinity led to the discovery of a nickel showing in and adjacent to the acidic volcanic-ultrabasic contact. The deposit is confined mainly to the ultrabasic rock and is in the form of disseminated nickeliferous pyrrhotite. A narrow tongue of massive sulphides cutting across the volcanic-intrusive contact at an acute angle was intersected in two drill holes.

Traces of nickel have been found elsewhere in the township in association with peridotite, but to date, only the one showing has merited extensive diamond-drilling.

Disseminated and massive pyrrhotite is common in outcrops of rhyolite and rhyolite breccia on claim S.40388 of Sherwood Gold Mines, Limited, and north of claim S.55327 of the Preston East Dome, Limited, option.

Asbestos

Chrysotile asbestos and serpentine were noted in a number of diamond-drill holes in serpentinized peridotite and dunite. The veinlets are generally small and never exceed ⅛ inch in width. The outcrop of dunite just west of Pountney Lake is fractured and contains picrolite stringers up to ¾-inch accumulated width per linear foot.

The peridotite bodies are favourable host rocks for asbestos, but no deposits approaching commercial grade were seen by the writer. Carbonatized peridotite is common in many places.

Prospecting and Exploration

Prospecting and exploration in Sothman township and vicinity have been intensive in the past few years, but owing to the large amount and depth of the overburden, surface prospecting by the conventional stripping and trenching method is very restricted. Consequently, an accurate geophysical survey and, if practical, a geological survey, followed by diamond-drilling, is the most favourable method of prospecting in this area.

To the end of 1951 geophysical surveys had been made of 40 percent of the township.

There has been no mineral production from the area to date, but this is to be expected since the township is largely drift-covered and only since 1944 has it been actively prospected.

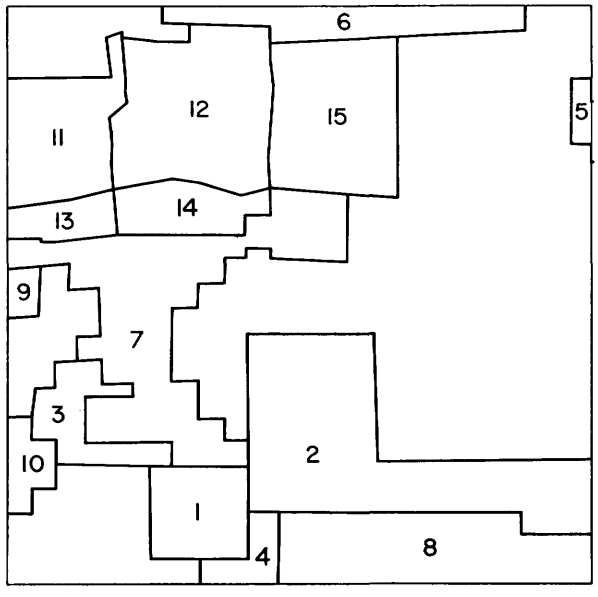
In the summer of 1951 prospecting and exploration was being done on the following properties: (1) Preston East Dome option, drilling and surface work; (2) Miami General Development Mines, Limited, drilling and surface work; (3) Dominion Gulf Company, surface prospecting on the north, central and southern groups and drilling on the south group.

Sothman township appears to have geological and structural conditions that are favourable to ore deposition. There has been considerable folding and faulting in the west half of the township, and Haileyburian intrusives are abundant. Granite and allied rock types of Algoman age occur in the northwest corner of the township.

North of Pountney Lake and in the vicinity of mile-post II on the north boundary, zones of shearing and intrusions of acidic to ultrabasic rocks occur. These zones of shearing are generally mineralized, and quartz impregnations are common.

At the north end of Kelly Lake there is a strong sheared and carbonatized zone several hundred feet wide. Pyrite mineralization is abundant in places. At the south end of the lake on the west shore, the fragmental volcanics are strongly sheared. Here, the fragments are elongated, and the outcrop has a rusty capping.

The ultrabasic intrusives contain minor amounts of asbestos fibre and are known as favourable host rocks for this mineral. No fibre approaching ore grade was seen by the writer in surface exposures or drill core, although some fibre is present. Disseminated nickeliferous pyrrhotite occurs in the peridotite in the southeast corner of the township. This sill is currently being explored by the Dominion Gulf Company by surface prospecting, geophysical work, and diamond-drilling.



PLAN SHOWING THE LOCATIONS OF MINING PROPERTIES IN SOTHMAN TOWNSHIP.

1—Bobjo Mines, Limited.
2—Conwest Exploration Company, Limited—main block.
3—Conwest Exploration Company, Limited—west block.
4—Conwest Exploration Company, Limited—south block.
5—Dominion Gulf Company — block 1.
6—Dominion Gulf Company — block 2.
7—Dominion Gulf Company — block 3.
8—Dominion Gulf Company — block 4.
9—Miami-General Development Mines, Limited —north of Miami-General group.
10—Miami-General Development Mines, Limited —south or Hansen group
11—Preston East Dome Mines, Limited.
12—Sherwood Gold Mines, Limited.
13—Sirola Gold Mines, Limited.
14—Wright-Hargreaves Mines, Limited.
15—Wrigley Syndicate.

DESCRIPTION OF PROPERTIES

Bobjo Mines, Limited

In 1951, Bobjo Mines, Limited, held a block of 12 unsurveyed claims in the southwest quarter of the township. The area is almost completely covered by sand and gravel except for a few isolated outcrops of Cobalt sediments, basic volcanics, and gabbro.

A magnetometer survey was completed for the company in March, 1951, by

Mining Geophysics Corporation, Limited, but this survey failed to reveal any significant anomalies. The trend of the formations indicated by the magnetic contours is north-northwest.

The geophysical survey represents the only work done on the property to the end of 1951.

Conwest Exploration Company, Limited

Conwest Exploration held claims in Sothman township in 1951. The west group, consisting of 11 unsurveyed claims, lies about ¼ mile east of mile-post II on the west boundary of the township. The group is covered by sand ridges, swamp, and water. A magnetometer survey of the claims failed to uncover any significant anomalies.

The south group consists of 8 claims in Sothman township and 35 claims in Kemp township. The south boundary of the 8 claims lies along the south boundary of the township, between mile-posts III and IV. On the claims in Sothman township, outcrops are present in only the eastern part of the block. These rocks are acidic and basic volcanics of Keewatin age, cut by gabbro. Several small outliers of Cobalt conglomerate are present. Pillow structures in the volcanics indicate that the strata face southwest and strike northwest. A magnetometer survey of the group revealed no significant anomalies.

The third and by far the largest group of claims held under option by Conwest Exploration in 1951 has since been dropped. This group consisted of about 63 unsurveyed claims in the south-central and southeastern part of the township. The block is underlain mainly by sand, gravel, swamp, and water, but scattered outcrops of Keewatin acidic to intermediate volcanics and Haileyburian diabase and gabbro are present. Top determinations obtained from pillow lavas in the west part of the group conform with determinations made on the south group. A magnetometer survey over this group gave no high anomalies.

Dominion Gulf Company

In 1951 the Dominion Gulf Company held four separate blocks of claims in Sothman township. These blocks all form parts of larger groups in adjacent townships.

The east block, or block 1, consists of 5 claims; two are on the east boundary of Sothman township in the vicinity of mile-post V, and the other 3 are in Halliday township. The rocks on the claims in Sothman township are Keewatin acidic volcanics and Haileyburian serpentinized peridotite. The volcanics are brecciated and white-weathering. The peridotite, although serpentinized, differs from most peridotites in that it is not always magnetic.

The north block, or block 2, consists of 14 claims extending from near mile-post I to mile-post IV along the north boundary. This block is part of a much larger claim group, the greater portion of which lies in Semple township to the north. The bulk of the rock on the claims in Sothman township lies in the vicinity of Pountney Lake, and except for a few scattered exposures, the remainder of the claims in the township are covered by drift and water.

The claims have been explored by surface-trenching, and several mineralized zones were uncovered. A magnetometer survey was made in 1950 and 1951 on the claim group.

The outcrops are basic lavas, now largely altered, basic and ultrabasic intrusives, and narrow feldspar porphyry dikes that cut the lavas and intrusives. The volcanics north and east of Pountney Lake have been highly sheared and

altered to talc-chlorite schists and carbonate-chlorite schists. The sheared volcanics strike east and dip vertically, or steeply north. The zone of shearing is several hundred feet wide, and northeast of Pountney Lake, the zone has been impregnated by quartz and felsitic stringers

Just west of mile-post II, trenching has exposed a mineralized porphyry dike cutting amphibolitized volcanics. The volcanics have been brecciated in part, and both the dike and country rock have been cut by quartz stringers and patches. Grab samples of the mineralized rock, taken for assay, gave no gold values. The sheared and mineralized volcanics on the north shore of Pountney Lake were also sampled for assay but yielded no gold values. Another mineralized porphyry dike, about 800 feet east and 400 feet south of mile-post II, strikes about N.75°E. It contains inclusions of the altered volcanics. Grab samples of the mineralized material taken for assay gave no gold values. About 1,600 feet east and 800 feet south of mile-post II, the volcanics have been silicified and carbonatized. They are brecciated and locally sheared. Disseminated pyrite is abundant, and samples of the best mineralized material, taken for assay, gave no gold values. This sheared and altered zone is picked up again several hundred feet to the east. About 2,200 feet west and 700 feet south of mile-post I, trenching has exposed a well-mineralized zone grading from feldspar porphyry at the north end to amphibolitized andesite at the south end. Between the two rock types there is a hybrid zone. The rocks are carbonatized and cut by quartz stringers and veins. Selected samples of the best mineralized material gave only a trace of gold on assay.

At 1,600 feet east of mile-post II, amphibolitized basic lava rich in disseminated sulphides was trenched. An 8-foot porphyry dike cuts the lava just south of the township line. Grab samples of the mineralized amphibolitized lava gave only a trace of copper and nickel.

The west block, or block 3, consists of an arcuate group of 49 claims in the central and west-central part of the township. Over much of the group, the bedrock is buried by sand, gravel, swamp, and water, but the exposed rocks indicate that the property is underlain by acidic and basic volcanics, and basic to ultrabasic intrusives. The ultrabasic rocks have been serpentinized. A magnetometer survey has been made of the claim group, and the results of the survey, together with the known geology, indicate that the main structure is an anticline plunging steeply west. This structure has been described on page 19. In addition to geophysical work, the company did considerable surface-trenching and some diamond-drilling. Two holes were drilled totalling 1,665 feet. One hole was put down on the south limb, about 1,500 feet north of Gelinas Lake, and intersected gabbro. The second hole was collared just west of North Bay on Sothman Lake. It intersected 7 feet of acidic volcanics cut by quartz-carbonate stringers, then passed into gabbro, and finally into serpentinized peridotite.

Several areas of this group have been trenched, but to date, most of the work has been confined to two spots. The first is just north of Bardwell Lake where the gabbro-dacite contact was exposed by trenching. Here the gabbro is chilled against the volcanics. North of the contact, the dacite outcrop was laid bare by stripping, and zones rich in disseminated sulphides have been exposed. The sulphides are pyrite, pyrrhotite, and some chalcopyrite. The whole outcrop has been mineralized, but certain sections are richer than others. Sulphides are more prominent towards the south edge of the outcrop, and here the rock has a rusty capping. The sulphides occur as disseminations, in fine cracks as fillings, and occasionally as massive material in small pockets. Selected samples of the best mineralized dacite taken for assay gave only traces of gold, copper, and nickel. The second area to receive attention lies about 950 feet east of North Bay on

Sothman Lake. Trenching has exposed a serpentinized peridotite dike in gabbro. On the north side of the dike there occurs a small concentration of pyrrhotite, and selected samples taken for assay by the company are reported to have yielded up to 0.66 percent nickel.

Some stripping and trenching has been done on the ground west of Sothman Bay. The magnetometer survey reveals that magnetically this is a highly complex area. Geologically, the rocks are acidic volcanics, gabbro, and serpentinized peridotite. The peridotite contains inclusions of the volcanics, and it is sheared locally. Nothing of economic interest was seen by the writer.

The south block, or block 4, consists of 34 claims in Sothman township, but forms only the north part of a larger group in the adjoining townships to the east and south. The block is located in the southeast corner of the township and much of it is covered by sand, gravel, swamp, and water. An aeromagnetic survey conducted by the company revealed a strong linear magnetic anomaly, about 2 miles long, in Sothman township. At the east end the anomaly bends to the south into Kemp township. Following the aeromagnetic work, the company made a ground magnetometer survey over the anomaly. Further exploration work consisted of geological mapping, trenching, and drilling. The anomaly is caused by a band of serpentinized peridotite and dunite striking N.80°W.; it has a width of 800 feet at the east end and narrows down to 400 feet at the west end. Other rocks exposed on the claims, in addition to the peridotite and dunite, are acidic volcanics. The volcanics are either pillowed, brecciated, or massive. They are often porphyritic and amygdaloidal. The peridotite and dunite occur as a nearly vertical sheet in the volcanics. The sheet appears to be conformable with the volcanics. At the north contact with the peridotite, the volcanics have been recrystallized. A series of cross-faults at the west end of the sheet displace the contact. Pillow determinations in the volcanics indicate that the rocks face south and form part of the south limb of a major anticline.

Nickel-bearing float was found by company prospectors during the checking of the strong linear aeromagnetic anomaly in the spring of 1950. Following the discovery of the float, three trenches were put down through the overburden to bedrock. These trenches exposed a mineralized ultrabasic intrusive in contact with acidic volcanics (see accompanying map). Subsequent drilling revealed sulphide mineralization consisting of pyrrhotite, pentlandite, and chalcopyrite as disseminations, and occasionally as veinings, at or near the north contact of the intrusive, over a strike length of 1,200 feet. A total of 16,413 feet of drilling was done on the two-mile band of ultrabasic and volcanic rocks, and according to company officials, a zone 160 feet long, 9.3 feet wide, and 280 feet deep, averaging 1.46 percent nickel and with minor amounts of copper, was outlined. The zone, like the intrusive volcanic contact, trends in an easterly direction and drops steeply south.

Miami-General Development Mines, Limited

Miami-General Development Mines, Limited, holds two groups of unsurveyed claims straddling the Sothman-Nursey township line. The north, or Miami-General group, consists of 2 claims in Sothman township and 13 in Nursey township in the vicinity of mile-post III. The south, or Hansen group, consists of 9 claims, 6 of which are in Sothman township. It lies about a mile south of the Miami-General group.

On the Miami-General group, in Sothman township, the outcrops are all Cobalt sediments. In the latter part of 1947 a magnetometer survey was made for

the company by Geo-Technical Development Company, Limited, and no anomalies were discovered on the 2 claims in Sothman township.

On the Hansen group, rock outcrops are more plentiful and variable. They include basic volcanics with some amygdaloidal and fragmental members, basic and ultrabasic intrusives, and Cobalt sediments. The Cobalt sediments lie about 1,600 feet southeast of mile-post I. Here an erosional unconformity is well exposed, and the basal member of the conglomerate contains fragments of the underlying rock. To the east the sediments dip about 65°S. and strike east. The sediments owe their steep dip to faulting. Incipient northeast-trending fractures cut the Cobalt sediments, and the minor folds that have developed indicate that the west side of the fracture moved north relative to the east side. About 1,200 feet north of mile-post I there occurs a small stock of diorite that is locally gabbroic. An offshoot from the mass cuts the sheared and mineralized volcanics to the north.

Structurally, the basic volcanics on the shore of Sinclair Lake range from massive to sheared rocks that are locally amygdaloidal and fragmental; they strike northeast. One of the showings on the property is a rusty, sheared and carbonatized zone in the volcanics on the lake shore, 2,200 feet north and 400 feet east, of mile-post I. Surface-trenching has exposed pyrite-pyrrhotite mineralization in the zone, and grab samples of the best-looking material, taken by the writer, gave only a trace of gold and nickel on assay. A self-potential survey made over the sulphide zone revealed that it extended only a short distance in a southwesterly direction.

Altered peridotite and volcanics are exposed 1,600 feet southeast of mile-post I. On the basis of the magnetometer survey, a diamond-drill hole was collared on the outcrop. The hole first intersected altered volcanics with narrow widths of "chicken track" rock cut by basic intrusives, and then serpentinized peridotite and dunite. No fibre approaching commercial grade was found in the peridotite.

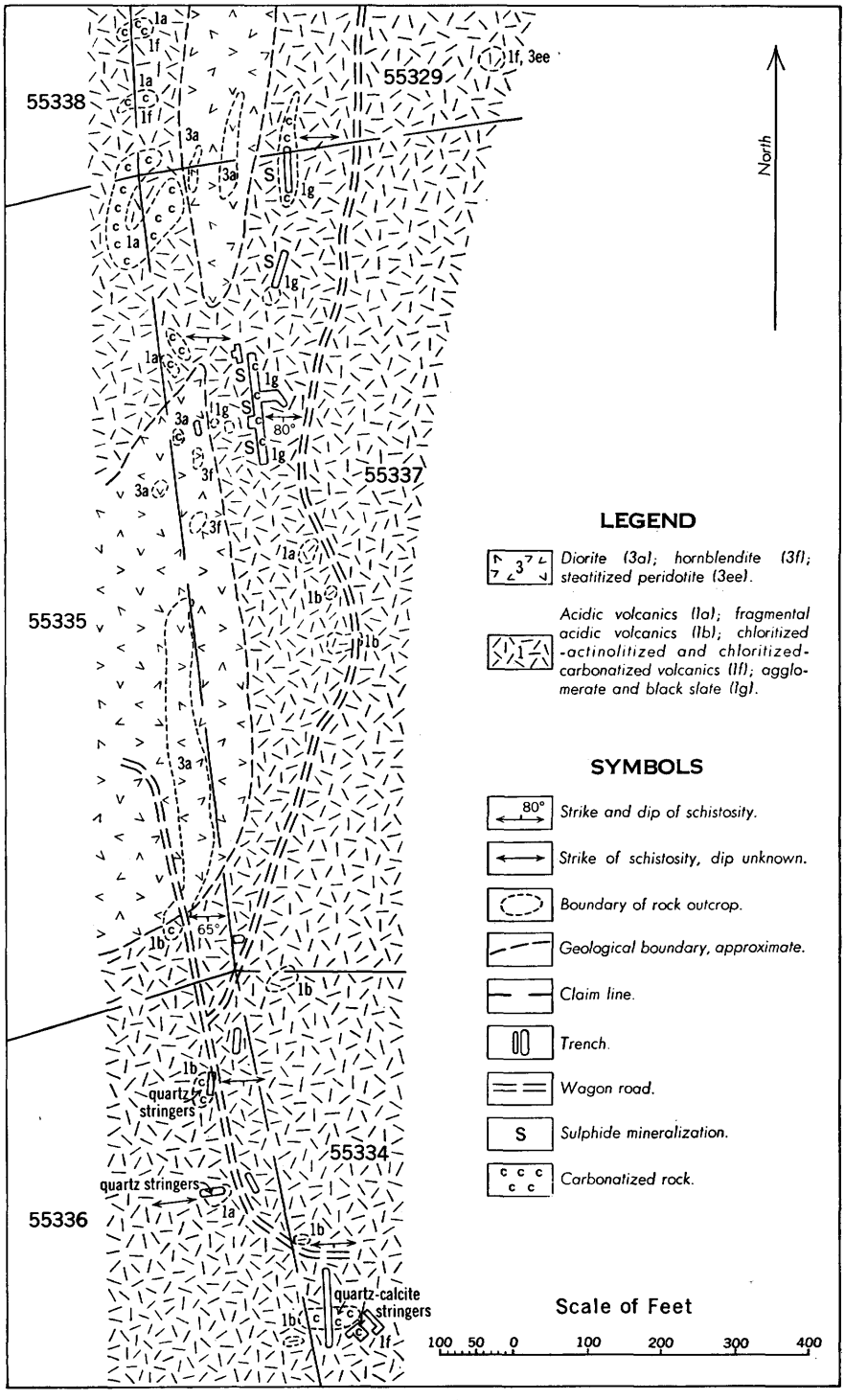
Preston East Dome Mines, Limited

The Preston East Dome Mines, Limited, held an option on the Philips-Edleston group of 11 surveyed and 13 unsurveyed claims in the northwest corner of Sothman township and 2 adjoining claims in Nursey township in 1951. These claims were previously held by Buffalo Ankerite Gold Mines, Limited.

From 1944 to 1947, Buffalo Ankerite Gold Mines did considerable surface-trenching and stripping and some diamond-drilling. Twelve holes, having a total footage of 3,050 feet, were drilled. In the summer of 1951, Preston East Dome Mines did some further drilling.

Northwest of Edleston Lake the rocks are acidic to intermediate intrusives belonging to the border phase of a large granite batholith. They include granite, diorite, and a hybrid granite gneiss. Southeast of the lake the property is underlain mostly by Cobalt sediments. Where the rocks of the Cobalt series have been removed, the older volcanic-intrusive complex is exposed. Some of the volcanics have been highly sheared and carbonatized. Near the south end of Edleston Lake they have been altered to talc-chlorite schists, and south-southwest of the lake, the rocks have been completely converted to green carbonate and impregnated with quartz and carbonate stringers. Pyrite is distributed throughout the green carbonate.

The bulk of the exploration work has been done on a sheared and mineralized zone 700 feet north of No. 1 post of claim S.55336 (see accompanying sketch map). The main trench is 150 feet long and trends in a northerly direction. A second



Geological sketch map of part of the property optioned by Preston East Dome Mines, Limited, in Sothman township.

subsidiary trench lies 80 feet to the north. The rock exposed in the trenches is a volcanic fragmental which has been heavily pyritized. Owing to oxidation of disseminated pyrite the rock now has a rusty capping. In the trenches there are several sheared and carbonatized zones. Four of these zones, all in the main trench, contain narrow widths of sphalerite and galena. Zone 1, at the south end of the main trench, and zone 2, about 50 feet to the north, contain sphalerite and little or no galena. The zones are only a few inches wide. Between the two zones there is a little disseminated sphalerite. Zones 3 and 4 lie about 50 and 65 feet, respectively, north of zone 2. In these zones galena predominates over sphalerite. Calcite and sometimes quartz is present in the zones. Associated metallics are nodular and disseminated pyrite, chalcopyrite, and pyrrhotite. The galena and sphalerite occur as stringers, platings, and disseminations. The shearing strikes about N.80°W. and dips south. Where the sulphides occur as stringers, they strike in the same direction. In addition to sphalerite and galena, low gold and silver values were obtained.

Visible gold was reported to have been panned from the trench in the northeast corner of claim S.55336. Here the rock is a mineralized dacitic fragmental volcanic cut by quartz stringers.

On claim S.55326 the volcanics have been sheared and intruded by numerous small quartz stringers. Visible sulphides include sphalerite, galena, pyrite, and chalcopyrite. Gold values up to 0.18 ounces per ton have been reported by the company.

About 425 feet west and the same distance north of No. 1 post of claim S.55327, a trench exposed a sheared fragmental volcanic containing massive pyrrhotite. Grab samples of the sulphide taken by the writer for the Provincial Assayer gave only traces of nickel and copper and 0.01 ounces of gold per ton. About 110 feet to the southwest, Cobalt conglomerate rests directly on the fragmental. Two hundred feet southwest of this unconformity, another trench exposed feldspar porphyry.

A large body of green carbonate cut by feldspar porphyry occurs 800 feet southwest of the tip of Edleston Lake. It is cut by numerous and discontinuous quartz and quartz-calcite veins and stringers. On the north side of the outcrop the stringers strike east. The west edge of the exposure is sheared at N.40°E. and dips south. Disseminated pyrite is present throughout the rock. Weathering has led to the development of a soft, reddish-brown capping. According to company officials, two drill holes were put down and, except for two small sections that ran 0.02 ounces of gold per ton, the samples ran nil.

Sherwood Gold Mines, Limited

The property of Sherwood Gold Mines, Limited, consists of 37 claims, 34 of which are surveyed, in the northwest quarter of Sothman township. The company is a subsidiary of Upper Canada Mines, Limited.

The claim group was mapped by geologists of Upper Canada Mines during the 1947 and 1948 field seasons, and a considerable amount of surface-trenching and sampling was done on the main showings in claim S.40388 (see accompanying sketch map). By 1951 the walls of the trenches had slumped to such a degree that it was impossible to examine all the rocks originally exposed in the trenches. Consequently much of the following information had to be taken from a report submitted for assessment work credit.

To date no geophysical work or drilling has been done on the property.

GENERAL GEOLOGY

The claims are largely covered by sand, gravel, and water; however, small outcrops are found on 9 of the claims. Except for the exposures on claim S.40388 none of the outcrop areas are large. The rocks consist of acidic and basic Keewatin volcanics, diorite porphyry, gabbro, pyroxenite and serpentinized peridotite of Haileyburian age, feldspar porphyry, and olivine diabase.

Sericite schist, developed from acidic volcanics under intense stress conditions, is exposed on the north boundary of claim S.40394.

Most of the exploration has been confined to claim S.40388. Here, acidic and basic volcanics, now partly altered, have been sheared, folded, and cut by dikes of diorite-porphyry and quartz-feldspar porphyry. Mineralized sheared zones are found close to and along the diorite-porphyry-andesite contact and along the andesite-acidic volcanic contact.

STRUCTURAL AND ECONOMIC GEOLOGY

From the information available it is not possible to obtain an accurate structural picture of the claim group as a whole. Outcrop areas are too few and scattered to permit correlation of structure from even one claim to another except, of course, where the outcrops lie on the boundary of two claims. However, the structure within individual claims is sometimes determinable.

The main structure on claim S.40388 is described by McBean and Tully[1] as follows:

> The volcanic rocks of claim S.40388 are folded. The axis of fold strikes north 58 degrees east. A large portion of the north limb is covered by deep overburden. A feldspar porphyry body possibly cuts the south limb of fold. The spatial relationship of the two limbs of fold suggests possible faulting at nose in a direction parallel with axial plane.
>
> A diorite porphyry dike traverses the north limb of fold close to the axial plane position. Gold occurs in a sulphide mineralized shear zone on the south contact of dike.

They describe two types of sheared zones on claim S.40388. One type parallels the axial plane of the fold, and the second type is located along the andesite-acidic volcanic contact. McBean and Tully describe them as follows:

> *Through-going Shears.*—The principal through-going shear from an economic viewpoint is on the south contact of the diorite porphyry dike. Shear varies in width from one to four feet over an exposed length of 230 feet. Accurate dips are difficult to secure. Average dip is steeply north in the west half of the shear zone, and possibly steeply south to the east. Deep drift covers both ends of shear.
>
> Pyrite is the most abundant sulphide mineral in this schist. Coarsely crystalline pyrite has a wide distribution in the zone. Gold is associated with fine-grained pyrite and massive sphalerite in or adjacent to veins, lenses, and stringers of grey quartz . . . The highly oxidized nature of surface exposure prevents accurate determination of grade and occurrence.
>
> South-dipping rusted shears, possibly subsidiary to the zone described above, strike north 58 degrees east across trenches numbered 8, 9, and 35. [See accompanying map.]
>
> Thirty feet east of survey station A.10, gold values were obtained from discontinuous narrow rusted quartz stringers in a weak shear striking north 72 degrees east.

The location of gold values of over 0.05 ounces per ton from channel samples in shears are shown on the detailed sketch of claim S.40388.

> *Contact Shear.*—A strongly magnetic shear zone occupies the folded contact of rhyolite and andesite rock types. Pyrite and pyrrhotite are the common sulphide minerals in this schist. The white coating of melanterite on oxidized samples from this section is distinctive. No gold values were obtained from channel samples in this shear.
>
> The shearing and brecciation of the contact zone is believed to have resulted from differential movement between rhyolite and andesite rock during folding. The contact shear is presumed to predate the through-going type.

In addition to the sheared zones on claim S.40388, McBean and Tully mapped a number of small faults parallel to the axial plane of the fold and one cross-fault. These are shown in the sketch map.

[1]Assessment report, Ont. Dept. Mines, file No. 63A.61.

From the attitude of the formations, the writer believes that the fold is an anticline plunging steeply to the northeast.

Other sheared zones that have been found on the property are shown on map No. 1953-3. No gold values are reported from these localities.

Sirola Gold Mines, Limited

In 1947 the Sirola Gold Mines, Limited, held a block of 24 unsurveyed claims in the western part of Sothman and the eastern part of Nursey townships. The block straddles the township line at a point about half a mile north of mile-post III. Geological and dip-needle surveys were conducted by the company in the summer of 1947; the ground has also been explored by surface-trenching. In 1951 the company's holdings were reduced.

In Sothman township the bulk of the outcrops are Cobalt sediments occurring as northeast-trending ridges. Serpentinized peridotite and altered volcanics occur just south of No. 2 post of claim S.55336. About 200 feet west and 400 feet south of this post, mineralized, carbonatized, and sheared volcanics are exposed in a north-south trench. The dacitic volcanics are cut by quartz stringers and feldspar porphyry containing disseminated pyrite and minor amounts of chalcopyrite. Grab samples of the mineralized rock taken for assay by the writer gave only a trace of gold.

The dip-needle survey outlined two anomalous belts on the Sothman claims. The first zone is located in the north-central part of the block and trends in a northerly direction; it is produced by peridotite. The second zone is located near the east boundary and trends in a westerly direction; it is also believed to be produced by peridotite.

Wright-Hargreaves Mines, Limited

In 1951, Wright-Hargreaves Mines, Limited, owned 9 unsurveyed claims adjacent to the south boundary of the Sherwood Gold Mines property. The claims are covered by sand ridges and water except for one outcrop on the east boundary. The rocks exposed on this outcrop are porphyritic dacite on the west side and chilled gabbro on the east side.

A magnetometer survey was made for the company by Koulomzine, Geoffroy and Company in the spring of 1951. The central part of the group gave uniform and low magnetic, readings which would seem to indicate that this area is underlain by volcanics. In the northeast corner of the property very high readings were obtained. These readings, with geological data obtained from the adjoining properties, suggest that the high anomaly is due to the presence of peridotite. In the southwest corner of the property there are more high anomalies, and it is assumed that they are caused by drift-covered ultrabasic intrusives.

Four holes were drilled in 1947, but only one of these reached bedrock. This hole intersected dacitic volcanics at a vertical depth of 62 feet. Some idea of the depth of overburden may be obtained from the fact that one hole had to be abandoned after going through a vertical depth of 100 feet of overburden.

Wrigley Prospecting Syndicate

The Wrigley Syndicate holdings in Sothman township consist of 30 unsurveyed claims in the north-central part of the township. In 1947, Hollinger Consolidated Gold Mines, Limited, optioned these claims and made a magnetometer

survey of the central 15 claims. Four holes, totalling 1,766 feet, were drilled in 1948.

The property is largely covered by sand ridges and swamps, and so far as can be determined from the limited outcrops available, beneath this mantle bedrock consists of acidic and intermediate volcanics, and basic and ultrabasic intrusives. The volcanics range from pillow lavas in the northeast and northwest corners of the claim group to fragmental volcanics in the southeast corner. Considerable trenching has been done on the mineralized fragmental volcanics 800 feet north-northeast of Wrigley Lake. Sulphide mineralization is heavy, particularly in the matrix, which is more basic and softer than the fragments. Selected samples taken for assay by the writer gave only a trace of gold.

The exposure, 400 feet east of the south tip of Waterman Lake, has been trenched along an 8-inch quartz vein dipping northeast. Numerous stringers branch off from the main vein. The country rock is a pillowed lava containing disseminated pyrite. The vein is barren on surface.

Peridotite outcrops in several places on the claim group, and geophysical work has outlined other areas where, although no peridotite is exposed, its presence was verified by drilling. Narrow widths of fibre, up to $\frac{1}{8}$ inch wide, were noted in the peridotite from the diamond-drill hole located 1,600 feet east of No. 1 post of claim S.40403. According to the magnetics this band of peridotite strikes N.70°E. and dips steeply to the south. The peridotites and porphyritic volcanics just west of Mills Lake are highly sheared in a northwesterly direction.

Geophysical work has indicated that the average depth of overburden is 60 to 100 feet.

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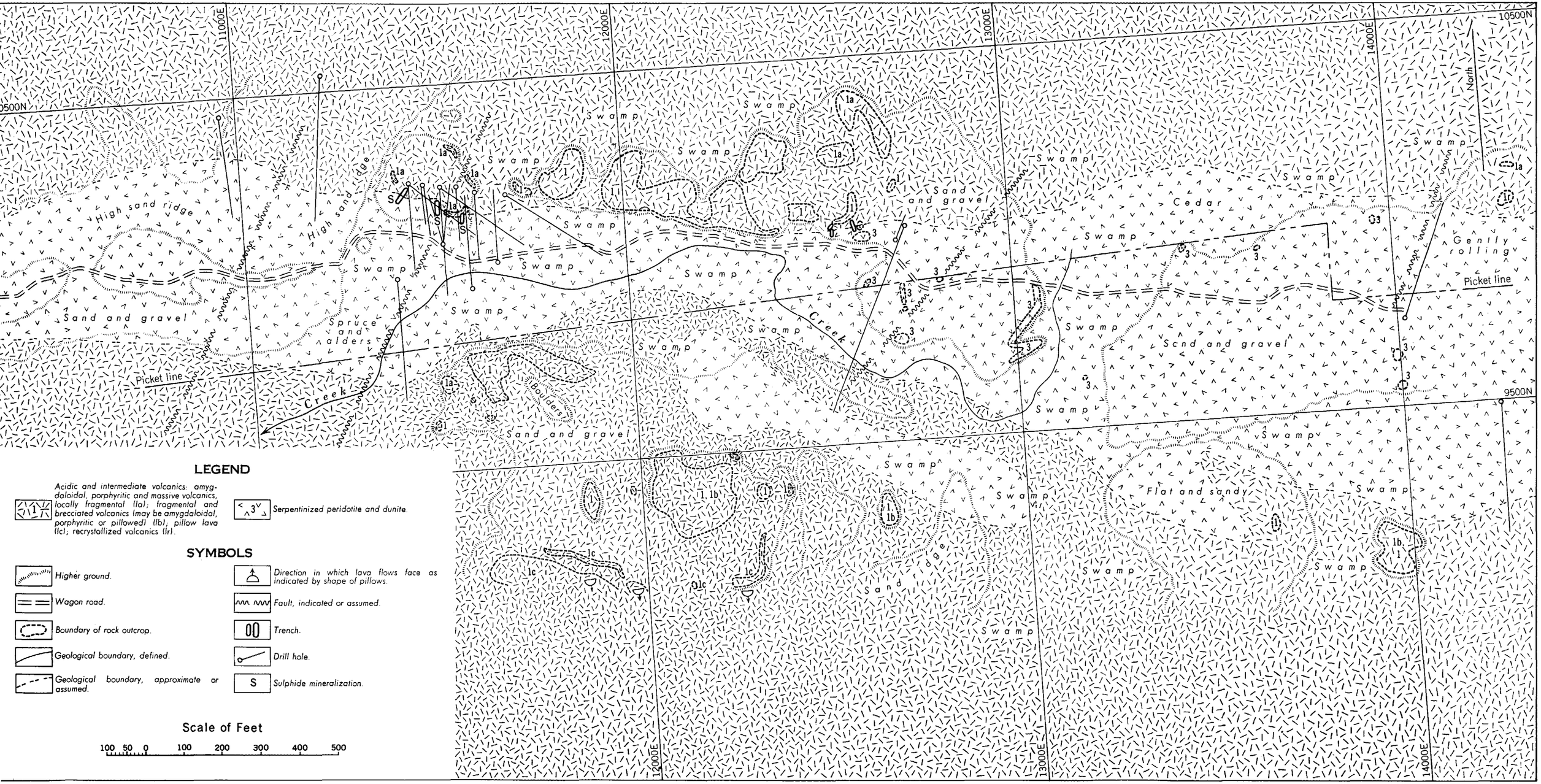
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LEGEND

Acidic and intermediate volcanics: amygdaloidal, porphyritic and massive volcanics, locally fragmental (1a); fragmental and brecciated volcanics (may be amygdaloidal, porphyritic or pillowed) (1b); pillow lava (1c); recrystallized volcanics (1r).

Serpentinized peridotite and dunite.

SYMBOLS

Higher ground.

Wagon road.

Boundary of rock outcrop.

Geological boundary, defined.

Geological boundary, approximate or assumed.

Direction in which lava flows face as indicated by shape of pillows.

Fault, indicated or assumed.

Trench.

Drill hole.

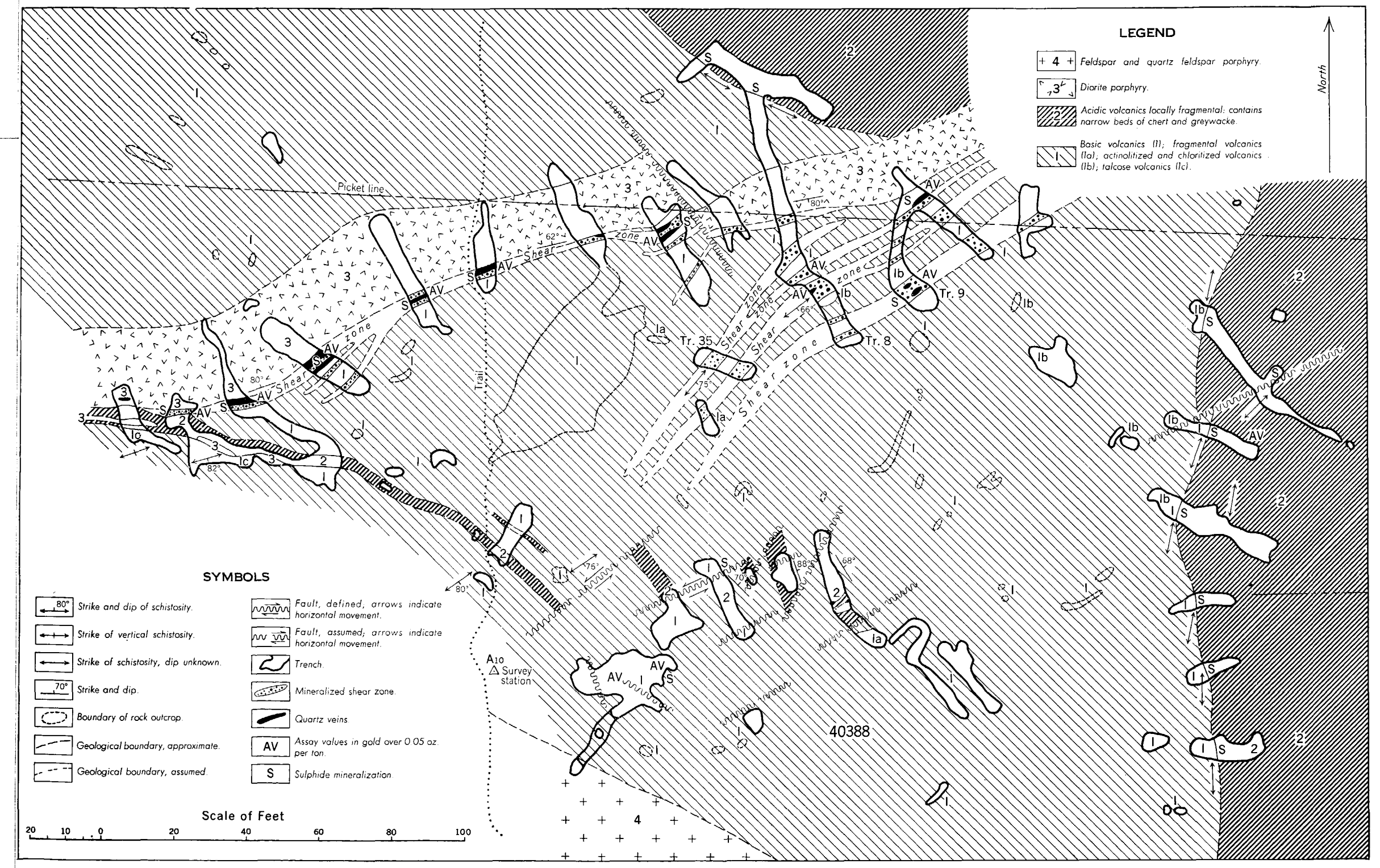
Sulphide mineralization.

Scale of Feet

100 50 0 100 200 300 400 500

GEOLOGICAL MAP OF PART OF THE PROPERTY OF THE DOMINION GULF COMPANY IN THE SOUTHEASTERN PART OF SOTHMAN TOWNSHIP.

(From a map by company geologists, with modifications by E. M. Abraham.)



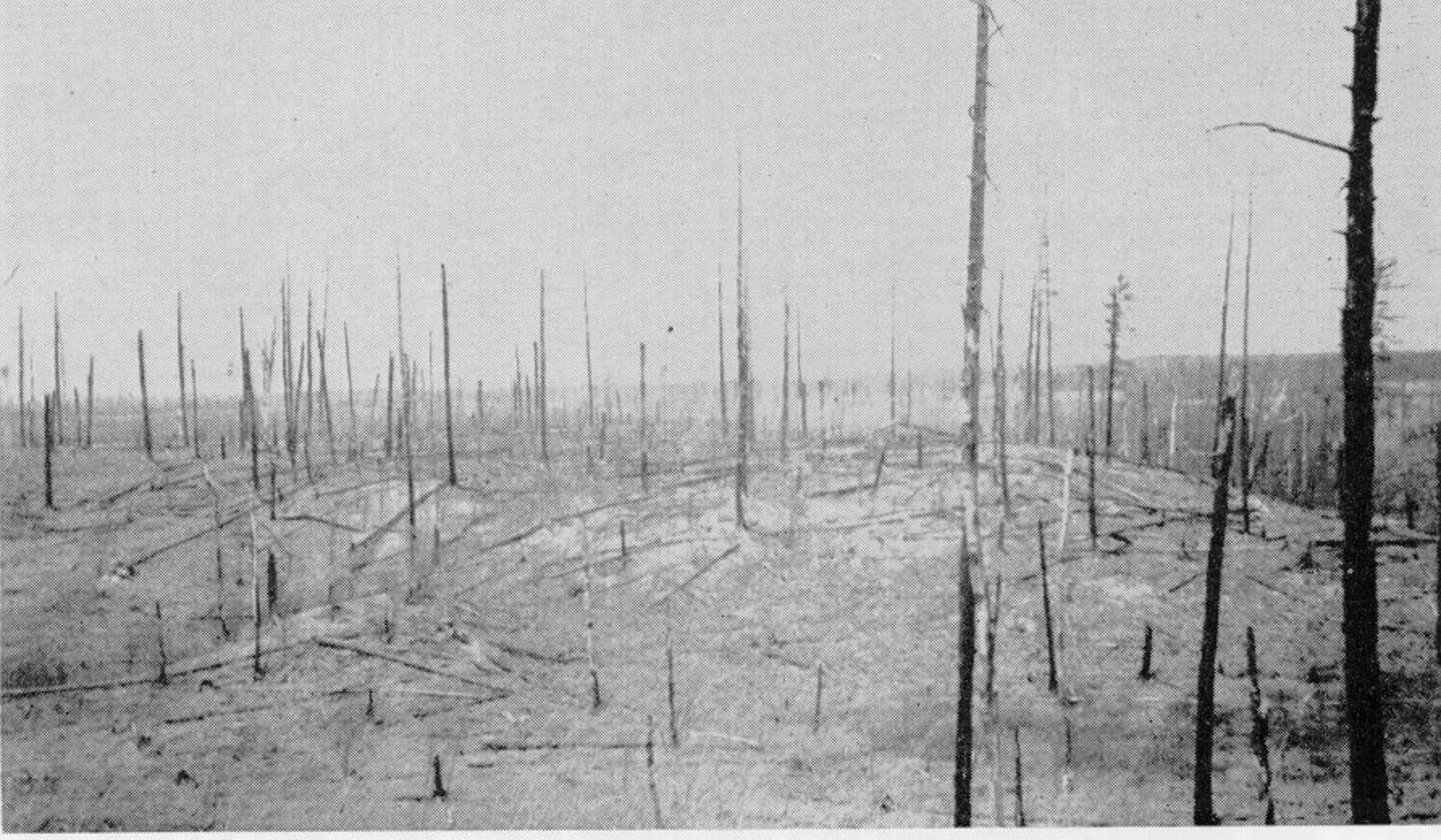
GEOLOGICAL MAP OF PART OF THE PROPERTY OF SHERWOOD GOLD MINES, LIMITED, IN SOTHMAN TOWNSHIP.
(From a map by J. W. McBean and D. W. Tully, with modifications by E. M. Abraham.)















PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-SECOND ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXII, PART 7, 1953

Geology of the North Half of Holloway Township

By

J. SATTERLY

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO

Printed and Published by Baptist Johnston, Printer to the Queen's Most Excellent Majesty

1954

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COLOURED GEOLOGICAL MAP
(In pocket at back of report)

Map No. 1953-4—Township of Holloway, District of Cochrane, Ontario. Scale, 1 inch to 1,000 feet.

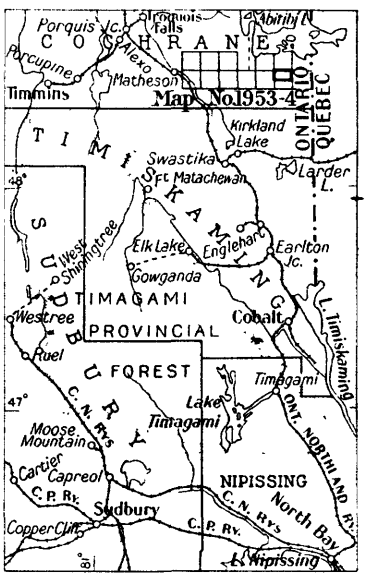
Geology of the North Half of Holloway Township

By J. Satterly

INTRODUCTION

In 1952 the program of mapping townships along the Destor-Porcupine fault zone eastward from Matheson was continued with the detailed mapping of the north half of Holloway township, district of Cochrane.

Holloway township is accessible by highway No. 101 to the centre of the township; a right-of-way for the highway has been cut through the remainder of Holloway and through Marriott township to the Quebec boundary. The end of



Key map showing the location of Holloway township, district of Cochrane. Scale, 1 inch to 60 miles.

the road is about 39 miles east of Matheson. Matheson, a town of about 500 people, is on the Ontario Northland railway and highway No. 11; it is 420 miles north of Toronto by road.

Until quite recently the interest in the township was confined to gold. Knight[1] reports that the first gold discovery was made in the southwestern part of the township by Messrs. Howey, Cochenour, and Willans in August, 1917. This was staked as claim L.7135 and is now part of a group held by Coin Lake Gold Mines, Limited. In 1922 W. S. Seagers[2] found gold in a series of quartz veins on a low hill on claim L.10080, now the property of Teddy Bear Valley Mines, Limited. Gold values were also found on the McDermott and Mining Corporation claims in the same year. Some additional exploration and development work was carried out on these properties in the years following.

[1]C. W. Knight, A. G. Burrows, P. E. Hopkins, and A. L. Parsons, *Abitibi-Night Hawk Gold Area*, Ont. Bur. Mines, Vol. XXVIII, 1919, pt. 2, pp. 44, 46, 49.

[2]C. W. Knight, *Lightning River Gold Area*, Ont. Dept. Mines, Vol. XXXIII, 1924, pt. 3, pp. 41–46.

Interest in the area was revived in 1944; it was thought that gold deposits might be found associated with the Destor-Porcupine fault zone, which was believed to cross the northern part of the township.[1] Exploration during this period was confined almost entirely to diamond-drilling because of lack of rock exposures along this fault zone.

In 1949 the Canadian Johns-Manville Company, Limited, explored and developed an asbestos deposit in Munro township, 10 miles east of Matheson. This led to widespread prospecting for asbestos in bodies of peridotite. In 1950 the Dominion Gulf Company carried out a magnetometer survey and drilled a peridotite body in the northwestern part of the township and the extension of that body in adjoining Frecheville township.

No exploration or prospecting was in progress in 1952.

Mapping Methods

The field mapping of the township was carried out on a scale of 1 inch to 800 feet by pace-and-compass traverses. The outlines of the township and claims were compiled by cartographers of the Ontario Department of Mines from surveys made by the Division of Surveys and Engineering, Ontario Department of Lands and Forests; and of highway No. 101 from surveys made by the Ontario Department of Highways. Planimetric detail was plotted by the writer from pace-and-compass traverses and air photographs taken in 1946 for the Forest Resources Inventory, Ontario Department of Lands and Forests; they are on the scale of 1 inch to 1,320 feet and were enlarged for field use to 1 inch to 800 feet.

Several methods were used in the compilation of the geological map. In the area between highway No. 101 and the north boundary, traverses were run at 400-foot intervals between the highway and the north boundary, which were chained and picketed using a 200-foot steel tape. Picket lines were run from about mile-posts XXII and XXI on the west boundary to about mile-posts IV and III, respectively on the east boundary and an intermediate line between these. These lines were labelled "A," "B," and "C" base lines from north to south; they were chained and picketed and four tie lines were run north and south between the *A* and *C* lines. This 6-mile strip was traversed at 400-foot intervals. The area between this strip and highway No. 101, which contains the Mattawasaga (Teddy Bear) River, was not traversed systematically, but was searched for rock exposures using the air photographs as a guide and information on outcrop locations supplied by mining companies. It is believed that most of the rock exposures in this area have been found and mapped.

Surveys

The boundaries of Holloway township were surveyed in 1907 and 1918, the west and south boundaries by J. J. Newman in 1907, and the north and east boundaries by H. J. Beatty in 1918. Owing to the age of these surveys, parts of the lines are overgrown, and other parts that were burnt by forest fires do not exist. In the following paragraphs the state of the lines and posts, as seen during the field season of 1952, is recorded.

The north boundary was partly re-opened in 1945 and 1950 by mining companies making geophysical surveys but has been filled in by second-growth alders and hazel. The following posts were found: iron bars and wooden posts marking the corners and mile-post III, wooden posts at mile-posts II and IV, but no trace of mile-post V.

[1]W. C. Martin, map of the Porcupine belt presented at a meeting of the Prospectors and Developers Association, Toronto, Mar. 9, 1946.

The east boundary has been largely overgrown since it was re-opened by the Mining Corporation of Canada, Limited, in 1945 from the northeast corner of the township southward for 6,500 feet. In 1952 it was also badly flooded at one point by a new beaver pond (see map). The mile-post III iron bar and wooden post was found while cutting the *C* picket line, but no trace of mile-post IV was found. Near the position of mile-post V a cairn of stones was found on a large outcrop and may indicate the location of this post, which was destroyed by fire.

The west boundary is marked by old wagon roads northward from highway No. 101 to the Teddy Bear property and southward to the Coin Lake and Harker properties in Harker township. The road to the Teddy Bear property is just to the east of the township boundary. Mile-post XIII was not found; a wooden post for No. 1 post of claim L.10085 was, however, found. To the south of highway No. 101 the wagon road swings back and forth across the township line. No trace of mile-post XXII could be found. The wooden post for mile-post XXI was discovered in a clump of second-growth balsam fir and is the starting point of the *C* picket line.

Surveys of some of the properties are of relatively recent date and the lines may still be found; these are as follows: (1) Ghostmount Mines, Limited, (part), 1944, by J. A. Lonergan, (2) Lobanor Gold Mines, Limited, 1946, by J. A. Lonergan; and (3) The Mining Corporation of Canada, Limited, (east group), 1949, by R. W. Brotherhood.

The claim surveys on most of the other properties are from 25 to 30 years old, and only a few of the posts were found during the course of the field work in 1952.

Acknowledgments

The writer was assisted in the field mapping by the following university students: G. A. Checklin, E. S. Jones, and D. B. Murray. In addition J. W. R. Walker and J. G. Tanner were attached to the party for the month of June before going to another departmental field party for the balance of the field season.

The writer wishes to express his appreciation for the information supplied by N. Hogg;[1] namely, logs of diamond-drill holes, files on a number of properties in the township, and a provisional geological map compiled from company plans covering part of the area to be mapped. All these data were most useful in planning the mapping and in the compilation of the final map. To the officials of several mining companies the writer is indebted for maps and plans of their properties.

Thanks are tendered to J. M. McDougall of the Ontario Department of Lands and Forests at Matheson for the winter storage of field equipment.

Means of Access

Highway No. 101, a gravel-surfaced road, extends 39 miles east from the town of Matheson to about half way across Holloway township. The right-of-way continues across the remainder of the township, and Marriott township, to the interprovincial boundary where it meets a gravel-surfaced road on the Quebec side of the border by which it is 18 miles to Duparquet, Quebec.

Access to the township other than by the highway is limited to a few old wagon roads and tractor roads to drill-sites on a number of properties, the more important of which are shown on the accompanying map. Many of these are partly overgrown with alders.

On the west boundary of the township a wagon road goes northward to the

[1]N. Hogg, resident geologist of the Ontario Department of Mines at Timmins, 1946–51.

Teddy Bear property. The old Lightning River wagon road goes northeast from this property crossing the north boundary just west of mile-post I. An old fire ranger's cabin is located just north of the north boundary. The road continues north to Lightning River Landing on the Lightning River. This was the route used by prospectors from La Reine, Quebec, in the early days for exploration in the township. Another wagon road and tractor road crossed the township and was used in 1945 by the Mining Corporation of Canada, Limited, for access to their claims in the northeastern part of Holloway and northwestern part of Marriott townships. It is now superseded by highway No. 101 and the right-of-way.

The wagon or tractor road on the west boundary south of highway No. 101 leads to the Coin Lake, the Harker, and other properties. The bridge over the Mattawasaga (Teddy Bear) River has been washed out by floods.

In 1950 the Asbestos Corporation, Limited, put in a number of tractor roads between Holloway Lake and Lightning Mountain to service a diamond-drill program on the Dominion Gulf Company's property. Similarly, McIntyre Porcupine Mines, Limited, put a tractor road into McIntyre Lake in 1945. The bridge over the Mattawasaga (Teddy Bear) River was in good condition in 1952.

The three base lines, *A*, *B*, and *C*, are the only means of access to the 6-mile strip extending west from between mile-posts III and IV on the east boundary of the township. The *A* and *B* lines intercept the McIntyre tractor road. There is a good campsite at McIntyre Lake.

Previous Geological Work

The first geological work in the township was carried out by Knight and associates.[1] Additional information on the geology and properties in the township may be found in reports by Knight[2] and Gledhill.[3]

A geological survey of a group of 95 unsurveyed claims formerly held by McIntyre Porcupine Mines, Limited, and Castle-Trethewey Mines, Limited, in the central part of the township has been filed for assessment work credit with the Ontario Department of Mines: file No. 63A.63.

Geophysical Surveys

A number of ground magnetometer surveys have been made in the township.

Companies known to have made surveys are listed below. Reports that have been filed for assessment work credit with the Ontario Department of Mines are noted by the file number.

Dominion Gulf Company.—16 unsurveyed claims, 6 of which are in Frecheville township.

Ghostmount Mines, Limited.—31 patented claims.

Mining Corporation of Canada, Limited.—File No. 63.23, 28 unsurveyed claims in the northeastern part of the property, only 11 claims retained by the company.

N. Strong property.—File No. 63.225 (dip-needle survey), 7 unsurveyed and 4 patented claims in the northeast corner of the township.

The writer is indebted to the Dominion Gulf Company and Ghostmount Mines, Limited, for copies of the magnetometer surveys of their properties and for permission to use them in the map compilation.

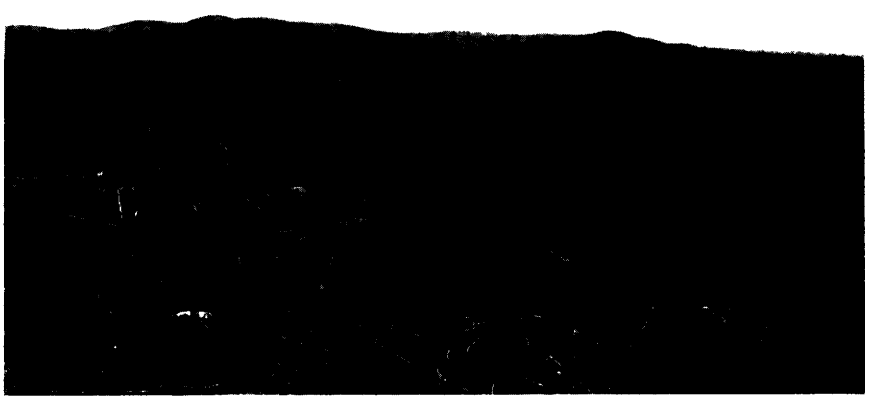
[1]C. W. Knight, A. G. Burrows, P. S. Hopkins, and A. L. Parsons, *op. cit.*, pp. 2, 4, 6–8, 11–14, 43, 46, 48.

[2]Cyril W. Knight, *Lightning River Gold Area*, Ont. Dept. Mines, Vol. XXXIII, 1924, pt. 3, pp. 41–49.

[3]T. L. Gledhill, *Lightning River Gold Area (District of Cochrane)*, Ont. Dept. Mines, Vol. XXXIV, 1925, pt. 6, pp. 91, 95–97.



View of the Ghost range in Harker township west from Lightning Mountain in Frecheville township, just north of mile-post II on the north boundary of Holloway township. Note the thick growth of mixed mature forest.



Hills of volcanics in Marriott and Holloway townships. View southeast from Lightning Mountain, just north of mile-post II on the north boundary of Holloway township.

Topography and Drainage

Holloway township lies within the clay belt of northern Ontario. Its topographic features may be classified as those due to the nature of the underlying bed rock and its structure; and those due to the nature and distribution of the Pleistocene deposits, both glaciofluvial and glacial lake deposits. The Precambrian rocks project through the Pleistocene deposits to form hilly exposures in some parts.

Altitudes[1] in the north half of the township range from a low of about 900 feet on the Mattawasaga (Teddy Bear) River at the east boundary to a maximum of 1,300 feet for a rock hill on the east boundary just east of Yelle Lake.

ROCK EXPOSURES

Rock exposures are mainly confined to a number of hilly areas, elsewhere exposures are scattered and few. The best exposed rock types are the volcanics and the pre-Algoman gabbro. The sediments and pre-Algoman peridotite outcrop rarely.

The volcanics form high ground in three areas: (1) a range of hills extending west from Lightning Mountain along the north boundary of the township rises to altitudes of 1,025–1,100 feet; (2) a belt of hilly outcrops extending westward from McIntyre Lake almost to mile-post XXI on the west boundary with altitudes of 1,075–1,150 feet; and (3) a strip, a mile wide, adjacent to the east boundary, being the west end of a large range of hills in Marriott township, with a maximum altitude of 1,300 feet.

The pre-Algoman gabbro forms a range of hills with altitudes of 1,050–1,150 feet in the northwestern part of the township. This is the eastward extension of the Ghost range.

Lightning Mountain is an isolated monadnock of volcanics, with an altitude of about 1,175 feet, just north of mile-post II on the north boundary of Holloway township. It is, therefore, 250 feet above the valley of the Mattawasaga (Teddy Bear) River.

GLACIOFLUVIAL DEPOSITS

The central part of the township is blanketed by an oval outwash deposit about 2 miles wide and 3 miles long with an altitude within the map area from 1,025 to 1,125 feet. An esker ridge extends south from Lightning Lake in Frecheville township, along the east side of Holloway Lake to join the outwash deposit just south of the Mattawasaga (Teddy Bear) River. The Mattawasaga River has cut through the esker to form a bouldery rapids.

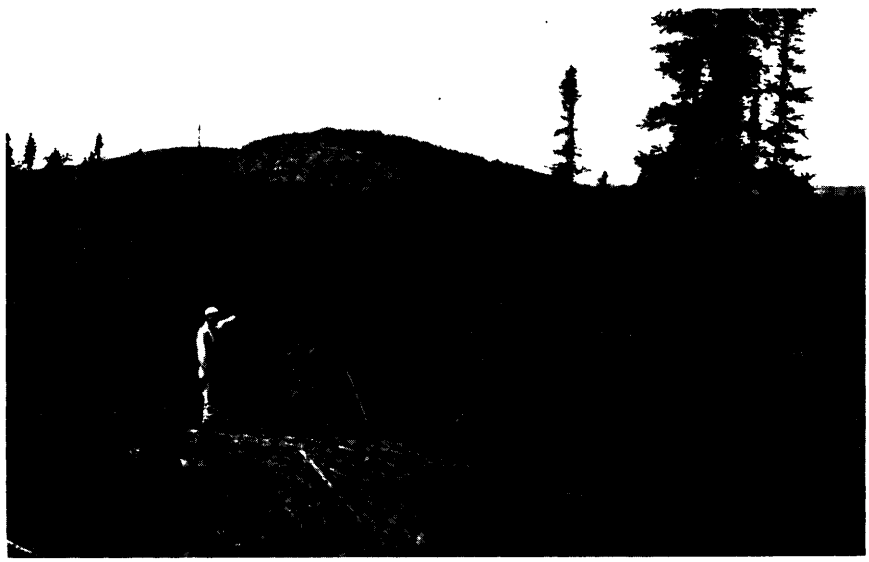
DRAINAGE

Almost the entire area of the north half of the township is drained by the Mattawasaga (Teddy Bear) River which flows east into Marriott township and then north through Stoughton township to Lake Abitibi. A small area in the northwestern part of the township is drained by the Lightning River north to Lightning Bay on Lake Abitibi.

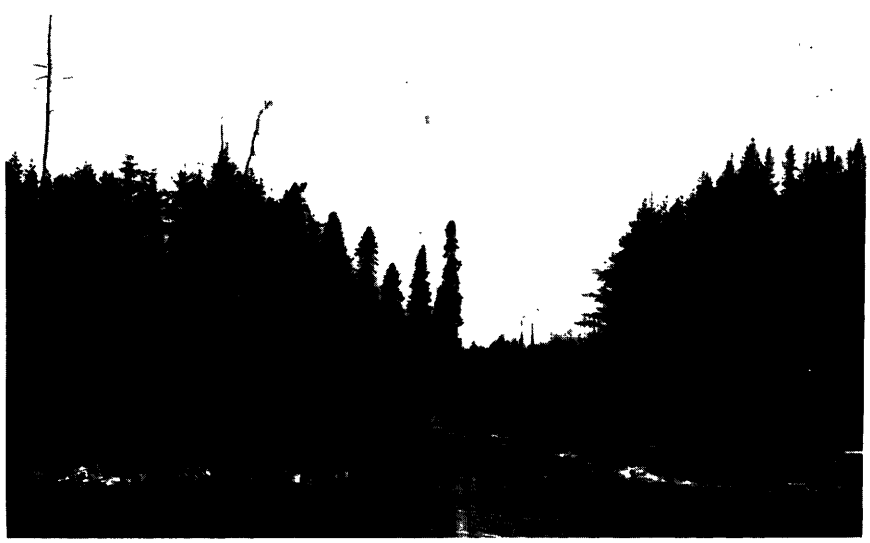
The south half of the township, which is outside the scope of this report, is drained by tributaries of the Magusi River, which flows in and out across the south boundary of the township on its way east to Lac Duparquet in Quebec.

In 1952 beavers were abundant, and many dams were built or under construction on the Mattawasaga (Teddy Bear) River and its numerous tributaries and on the Lightning River. The flooding of low areas by these dams made access to some parts of the township extremely difficult or impossible.

[1]Altitudes (approximate) are from form lines on Plan F.3248, of the Ontario Department of Highways, June, 1945.



Lightning Mountain, a monadnock of volcanics, seen from an outcrop hill just south and west of mile-post III on the north boundary of Holloway township. View west.



Bouldery rapids on the Mattawasaga (Teddy Bear) River at cut in esker on east boundary of Ghostmount claim L.32929. View west.

GENERAL GEOLOGY

The bedrock formations in Holloway township are all Precambrian in age. In parts of the township, they are largely covered by unconsolidated sediments of Pleistocene age ranging from clays to boulders. Recent deposits are of minor importance, consisting of peat in formation beneath muskegs.

Rock is fairly well exposed in the rocky uplands in a belt across the middle of the township. These exposures were excellent in the few years following the Matheson forest fire of 1916, but are now partly covered by second-growth poplar, birch, and jackpine and a thick mat of labrador tea and moss so that it is difficult to trace flow contacts for any distance. In the mixed, mature forest from highway No. 101 to the north boundary, rock exposures are few, and many are poorly exposed. The depth of overburden, based on a small number of diamond-drill holes, is from 50 to 120 feet in the clay, and was over 150 feet in one hole in the outwash deposit. The lack of exposures and little diamond-drill exploration of heavily drift-covered areas has made it difficult or impossible to interpret the geology, particularly the structural geology, of the township.



Beaver house and pond on the Holloway-Marriott boundary line just south of mile-post V. Flooding of the area by beaver ponds was a major nuisance in traversing during the 1952 field season. Note the thick second-growth tree cover on the hills of lavas in the background.

From the evidence available the oldest rocks are volcanics and sediments. Contact relations between the exposures of so-called Timiskaming greywacke and conglomerate and the volcanics are obscured by shearing and faulting. It seems better to include all the sediments together and to classify them with the volcanics as Keewatin. A series of basic and ultrabasic intrusives representing the eastern extension of the Ghost range in Harker and Lamplugh townships is assigned to the pre-Algoman. In Holloway township younger intrusives are rare. A few lamprophyre and porphyry dikes are assigned to the Algoman, and a few diabase dikes to the Matachewan and Keweenawan.

The location of the Destor-Porcupine fault zone in Holloway township must be largely assumed because of lack of rock exposures, little diamond-drill exploration, and few geophysical surveys. A table of formations follows:

Table of Formations

CENOZOIC	
RECENT:	Peat: stream deposits.
PLEISTOCENE:	Sand, gravel, boulders; varved clay.
	Great unconformity
PRECAMBRIAN	
KEWEENAWAN:	Quartz diabase.
	Intrusive contact
MATACHEWAN:	Quartz diabase, diabase.
	Intrusive contact
ALGOMAN:	Feldspar porphyry; felsite; lamprophyre.
	Intrusive contact
PRE-ALGOMAN:	Diabase, gabbro; peridotite and dunite (serpentinized); pyroxenite.
	Intrusive contact
KEEWATIN:	
Volcanics:	Rhyolite; rhyolite agglomerate and tuff. Andesite, basalt; pillow lava; diabasic lava; spherulitic lava; fragmental lava (flow breccia or agglomerate); tuff and chert; talc-chlorite schist; carbonate-chlorite schist.
	Faulted contact
Sediments:	Greywacke; slate; conglomerate; iron formation.

PRECAMBRIAN

KEEWATIN

Sediments

Surface exposures of sediments in Holloway township are limited to a few scattered outcrops on the Teddy Bear and Mining Corporation (north group) properties and a small exposure on the Lobanor property. Similar sediments have been found by diamond-drilling on the Ghostmount and Mining Corporation (east group) properties. As all these occurrences lie within or close to the Destor-Porcupine fault zone, the sediments have been slightly to intensely altered, making it difficult to identify them correctly in some exposures. These alterations include carbonatization, sericitization, and feldspathization.

The sediments are greywacke, slate, conglomerate, and iron formation. The highly altered types are schists. Many of the so-called slates might be better termed phyllites.

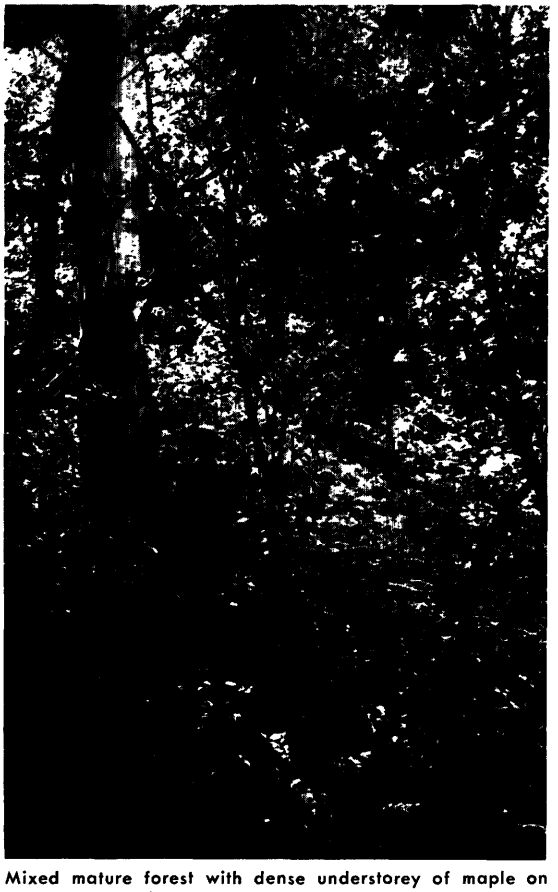
The contact relations between the sediments and volcanics are not known since there is a gap between exposures, or the contact as seen in drill holes is marked by a strong fault. For some of the earlier drilling, the logs merely indicate the location of the contact between sediments and volcanics. In drill holes for which there are detailed logs, the contact relations are obscured by fault zones in the sediments adjacent to the contact (Ghostmount), carbonate zones (Lobanor), and a zone of brecciation and sericitization (Mining Corporation, east group, hole No. 9, claim L.43072).

Conglomerate.—Except for some bands of conglomerate intersected in drill holes, our knowledge of this rock is limited to a few poorly exposed outcrops on claims L.10082, L.10476, and L.9864.

On the Teddy Bear property in the northwest part of claim L.10082 there are a few small exposures of conglomerate. No bedding was observed in the conglomerate. It is a pebble conglomerate with pebbles up to 4 inches across, although most of them are less than 2 inches; they compose 80 percent of the rock. The rock types represented by the pebbles are mostly pink to light-weathering porphyries (acid volcanics?) and grey volcanics. A striking characteristic of the rock is the fairly common occurrence of red jasper pebbles. In one outcrop 15 were counted in an area a yard square. No pebbles of granite or basic vol-

canics were noted. The pebbles are well-rounded but somewhat flattened because of the shearing. They weather pinkish because of carbonatization.

Thomson[1] has noted that at Kirkland Lake the Timiskaming conglomerate is characterized by the consistent occurrence of red jasper pebbles. This characteristic has been considered diagnostic by other workers in Holloway township, and these conglomerate exposures have therefore been dated Timiskaming. In the writer's opinion the lack of information on contact relations with the volcanics, the few contacts observed being all marked by faults, breccia zones, or



Mixed mature forest with dense understorey of maple on Teddy Bear claim L.11088. This is typical forest of the northwestern part of the township and makes it difficult to find rock exposures.

zones of replacement (carbonatization, sericitization, and silicification), precludes dating these exposures. On purely lithological and structural grounds they appear to be a part of a belt of sediments which may be traced westward through the townships of Harker, Garrison and Michaud into Guibord township. In Michaud and Guibord townships the sediments are known to be interbedded with the volcanics, that is, they underlie the volcanics to the south.

The conglomerate exposures on Mining Corporation claim L.9864 are highly sheared and altered by carbonatization or sericitization. In drill holes on the Ghostmount property the conglomerate occurs as interbeds in greywacke, the

[1]J. E. Thomson, *Geology of Teck Township and the Kenogami Lake Area Kirkland Lake Gold Belt*, Ont. Dept. Mines, Vol. LVII, 1948, pt. 5, p. 8.

thicknesses being less than 100 feet. These conglomerates are largely altered by feldspathization, sericitization, and carbonatization, even the pebble outlines being obscured in some sections of the core.

Greywacke.—The sediments named greywacke are grey to greenish, fine to medium-grained rocks showing good bedding in places (drill cores). With a hand lens, grains of clear quartz, jasper, white feldspar, and rock fragments may be seen. Under the microscope in thin sections the groundmass contains much chlorite, scattered grains of leucoxene, and secondary carbonate.

Like the conglomerate, the greywacke has also undergone carbonatization, sericitization, and feldspathization. This is especially noticeable in some of the drill core from the Ghostmount property.

The more shaly phases of the greywacke in surface exposures are intensely sheared, carbonatized, and in places, heavily mineralized with pyrite. They weather blotchy brown and green in colour, are very fissile, and some have a sheen, so that they might be called phyllite. On Teddy Bear claim L.10083, the sediments are altered to a pale green muscovite-carbonate schist with lenses and stringers of pyrite-carbonate-quartz. Both the phyllite and schist are highly crenulated locally.

Iron Formation.—The only occurrence of iron formation in the map area is recorded by N. Hogg in diamond-drill hole No. 9 from Mining Corporation claim L.43078 in which a 7-foot core length of red jasperoidal iron formation was intersected. It is similar to that found by the Wright-Hargreaves drilling on the Caswell property in Michaud township.[1]

Volcanics

The volcanics have been divided into two groups: basic and intermediate volcanics; acid volcanics and pyroclastics. Because of the alteration of the flows, further subdivision does not seem advisable. The quartz-free lavas, mainly dark in colour, are classed in the first group, and the quartz-rich lavas, usually light in colour, in the second. Even with this simple division it is at times difficult to assign a name to a rock, especially the pyroclastics. This problem has been discussed at length by others.[2]

The volcanics are well exposed in numerous hilly outcrops south of the Mattawasaga (Teddy Bear) River between the *A* and *C* picket lines to the east and west of an outwash deposit occupying the centre of the township. Outcrops are scattered and are few in the Teddy Bear valley. They are fairly abundant in a chain of hills along the north boundary. None of the exposures are as good as when seen by Knight and others in 1918, shortly after the Matheson fire of 1916. Although the accompanying map shows large outcrop areas, many of these, even in the area burnt in 1916, are now largely covered with thick second-growth poplar, birch, jackpine, labrador tea, or moss, making it extremely difficult to trace flows or correlate possible horizon markers. (See photograph on page 10.)

Basic and Intermediate Volcanics.—The flows classified as basic and intermediate volcanics are believed to be mainly basic in composition, that is, basalt, although some of the pillowed varieties may be intermediate in composition and, therefore, andesite. The flows may be massive, pillowed, or spherulitic. The massive varieties are fine- to medium-grained, the latter frequently having a typical diabasic texture and so have been called diabasic flows. Many of these flows have a flow-breccia top.

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[1] J. Satterly, *Geology of Michaud Township*, Ont. Dept. Mines, Vol. LVII, 1948, pt. 4, pp. 19, 20.

[2] H. C. Cooke, W. F. James, and J. B. Mawdsley, *Geology and Ore Deposits of Rouyn-Harricanaw Region, Quebec*, Geol. Surv. Can., Memoir 166, pp. 26, 27.

H. C. Gunning and J. W. Ambrose, *Malartic Area, Quebec*, Geol. Surv. Can., Memoir 222, pp. 5, 6.

The apparent sequence of about 60 flows in the extensive area of outcrop in the southeast corner of the map area indicates that the flows range from 30 to 600 feet in thickness, the average being about 100 feet.

The commonest type of basaltic flow shows a gradation in grain size from a chilled bottom upwards through fine-grained, to a medium-grained centre with diabasic texture, to fine-grained, the upper part or top being a flow breccia, or occasionally amygdaloidal lava. An amygdaloidal section may underlie the flow breccia in some flows. Porphyritic zones parallel to the contacts are not uncommon in the diabasic flows and consist of feldspar crystals or aggregates of crystals ranging from less than an inch to over an inch in size and may average ½ inch. These zones may be a single row of crystals or a zone, with scattered crystals, 20 feet thick; they can be traced short distances but appear to be lenticular and discontinuous. These flows form a very monotonous series extending southward from the Mattawasaga (Teddy Bear) River; they are a part of the same series described in the reports on Harker[1] and Michaud[2] townships and have been named the Redstone Series by W. C. Martin.[3]

Pillowed flows are present as interflows with those just described. They are also found on the Lobanor property just south of the Mattawasaga (Teddy Bear) River, on the north boundary east of mile-post III and as a horizon of spherulitic pillowed basalt south of the peridotite sill in the northwestern part of the township. The pillows in these flows are not so well preserved as those in some of the other townships mapped and did not provide top determination material except in a few places. Probably, the best exposures seen are on claim L.43697 of the Lobanor property. On the north boundary of the claim an exposure of pillowed grey andesite shows excellent pillows, the following being typical sizes: 2 by 3, 2 by 4, 2 by 5, 2½ by 7, and 2 by 11 feet. On the outcrop to the southwest in the same claim the largest pillow observed measured 3 by 13 feet.

A horizon of pillowed spherulitic[4] basalt extends westward from the Lobanor property to the west boundary of the township and continues into Harker township; parts of it are unpillowed. It is a pale-grey to dark-grey rock, which thin-section study shows to be completely altered by saussuritization, hence the grey colour. The selvages and spherules (varioles) of the pillows weather white, and the rock matrix, brown.

A volcanic breccia is exposed in the northern part of the Lobanor property. It is composed of angular fragments, mostly under two inches across, of grey, green, and purple, fine-grained volcanic rocks in a softer, green matrix. The exposed width on surface is about 1,000 feet. To the east of the Lobanor property it merges rapidly downwards into a pillowed andesite with large pillows and thick selvages; it would appear to be an agglomerate. Nothing quite like this rock, except the rhyolite agglomerates, has been previously mapped in other townships in this belt; this agglomerate, however, appears to be intermediate in composition.

A very interesting flow, about 600 feet thick, was mapped just north of Yelle Lake near the east boundary of the township. The lower part of this flow is a medium-grained enstatite diabase similar lithologically to those mapped as pre-Algoman. It contains greenish-black crystals of enstatite, about 1/10 inch across, which weather reddish-brown. It is in chilled contact against a flow breccia. The enstatite diabase is from 300 to 400 feet thick. Owing to the forest and plant

[1] J. Satterly, *Geology of Harker Township*, Ont. Dept. Mines, Vol. LX, 1951, pt. 7, p. 10.
[2] J. Satterly, *Geology of Michaud Township*, Ont. Dept. Mines, Vol. LVII, 1948, pt. 4, pp. 6–8.
[3] W. C. Martin, map of the Porcupine belt presented at a meeting of the Prospectors and Developers Association, March 9, 1946.
[4] Technically "variolitic;" the term "spherulitic" has always been used in the Porcupine Belt to describe these rocks.

cover on the outcrops, it is difficult to determine its relations with the next rock to the south, which is a medium to almost coarse-grained diabase. It appears to be gradational. North of Yelle Lake this diabase grades into fine-grained basalt, amygdaloidal basalt, and a flow breccia top; the total thickness for this sequence is about 200 feet. The enstatite diabase may be a sill, but the field evidence found to date would indicate that it is part of a thick flow. A similar horizon, called gabbro by the McIntyre geologists, is shown on a map of the McIntyre claims.[1] An exposure of enstatite diabase was also noted by the writer south of the drill hole sites to the southwest of McIntyre Lake. These occurrences may be the same flow as noted above. This flow might be used as a key horizon, especially to work out the presence or absence of cross-faults. As the flows dip 60°–67°S. and the local relief is over 100 feet, it is rather difficult by pace-and-compass methods of mapping, to determine whether on crossing a "canyon" any offset of the contacts has taken place. Although no faults are shown on the map, there is known to be some minor offset of the contacts.

Metamorphism.—Hydrothermal alteration by saussuritization, carbonatization, and silicification has completely altered the lavas in places. This alteration is well developed within the Destor-Porcupine fault zone. In or adjacent to shear and fault zones, the lavas have been rendered schistose by the development of talc-chlorite schist and carbonate-chlorite schist. Broad zones of carbonate rock with no vestiges of the original lava may be the end result of these hydrothermal processes.

Tuff and Chert.—Interflow tuff and chert are relatively uncommon in the map area. This may be partly because of the small amount of rock exposure, but even in the well exposed area of volcanics in the central part of the township, between the *A* and *C* picket lines, very few tuff or chert beds were found.

Well banded white and grey chert forms interflow beds in the southwest corner of the map area on claims L.11481, L.10222, L.10221, and north of claim L.11481. These beds are from less than 1 to 20 feet wide, and average about 5 feet; on bush-covered outcrops some may have been missed. They are particularly useful for the structural data they provide, namely the strike and dip of the enclosing flows, and they may also show drag-folding as on claim L.10221.

An isolated exposure of cherty rocks was found in the volcanics on the west boundary of the Mining Corporation claim L.9863. The exposure consists of a grey cherty rock with white quartz stringers, but to the east of the township boundary, the rock is a thinly laminated, carbonatized, dark-grey fine-grained siliceous sediment. At the north edge of the outcrop there is a grey cherty rock with minute eyes of quartz which looks like an acid volcanic. All these exposures were revealed by stripping.

No tuffs were recognized by the writer. Possibly some of the so-called chert beds may be acid tuffs.

Acid Volcanics and Pyroclastics.—Exposures of acid volcanics and pyroclastics are practically confined to the northwestern part of the map area and are very poorly exposed. The exposures are adjacent to the Lightning Mountain sill of peridotite and gabbro and may have been altered by it. They are an extension of the band mapped in Harker township.[2]

Surface exposures are confined to the vicinity of the Lightning River. On the north boundary just west of the river a small exposure of lava and tuff is found. The lava is a dark grey, very fine-grained rock with an occasional grain of glassy quartz; the associated tuff is a grey rock that weathers greyish-white and con-

[1]Ont. Dept. Mines, File No. 63A.63.
[2]J. Satterly, *Geology of Harker Township*, Ont. Dept. Mines, Vol. LX, 1951, pt. 7, p. 12.

tains fragments of creamy white to dark-grey, fine-grained rocks in a greenish-grey groundmass containing minute ($\frac{1}{20}$ inch) grains of feldspar. The rock is slightly mineralized with splashes of fine-grained pyrrhotite. The rock fragments are intermediate to acid in composition and the rock is a crystal lithic tuff of dacitic composition.

Just east of the Lightning River, within the mass of gabbro, are two exposures of acid volcanics. The contact with the gabbro may be seen in the southern exposure. The southern exposure is a highly shattered, dark-grey porphyritic acid lava. The northern exposure is a grey acid lava, mineralized with disseminated pyrrhotite.

West of the Lightning River and south of the peridotite sill there is a small exposure of grey porphyritic acid lava with a narrow interbed of breccia.

N. Hogg has recorded acid lavas in three diamond-drill holes (Nos. 1, 6, and 9) on the Dominion Gulf claims, one is in Holloway just north of claim L.34835 and two in adjoining Frecheville township, all are adjacent to the peridotite sill. These rocks are grey porphyritic lavas and associated fragmentals.

An isolated occurrence was found on the north edge of an outcrop of basic lava just south of mile-post IV on the north boundary. It exposes a white-weathering, dark-grey crystal tuff with grains of feldspar and quartz, and a thinly laminated grey and white acid tuff. These rocks are slightly mineralized with disseminated pyrite. Lack of exposures makes it impossible to decide whether this occurrence is a narrow interflow tuffaceous horizon or part of an interfingering wedge of acid pyroclastics from the northwest.

PRE-ALGOMAN

Basic to Ultrabasic Intrusives

Basic to ultrabasic intrusives ranging from gabbro to dunite outcrop in the northwestern part of the township. Most of the exposures form part of the eastern extension of the Ghost Range complex of Harker and Lamplugh townships, but there are a few other isolated occurrences. The rocks of the Ghost range are described in some detail in the Harker report.[1]

The gabbro is a light-weathering, medium-grained rock characterized by a reddish-weathering, dark-green orthorhombic pyroxene. The feldspars have been completely saussuritized. In some exposures the gabbro has a diabasic texture, so that the rocks may be named enstatite diabase and quartz enstatite diabase. This rock locally contains a coarser diabase which may occur in irregular clots or patches in enstatite diabase. Near the contacts with the peridotite it may show a lenticular banding or shearing approximately parallel to the contact; the dip is vertical or nearly so.

The peridotite is very poorly exposed, only a few outcrops being found. A few outcrops that are part of the Ghost Range complex are just south of Lightning Mountain. There, the rock is a reddish-brown weathering, black serpentinized peridotite with poikilitic pyroxene crystals about $\frac{1}{4}$ inch across. The only other exposures are in trenches and a small outcrop on the Strong property, where a dark-green peridotite is cut by a 6-foot, grey lamprophyre dike and a 3-inch, light-coloured dike. No asbestos fibre was noted in these exposures.

Most of the information on the character of the peridotite has been supplied by drilling on the Dominion Gulf property. In Holloway township the intrusive has been cut by 11 holes. The logs of these holes by N. Hogg[2] show that the bulk of the intrusive is a greenish-black, serpentinized peridotite with poikilitic ortho-

[1] J. Satterly, *Geology of Harker Township*, Ont. Dept. Mines, Vol. LX, 1951, pt. 7, pp. 13–16.
[2] Formerly resident geologist, Ont. Dept. Mines, Timmins.

pyroxene crystals from 1/10 to 1/4 inch across. Some parts of the peridotite contain interstitial zoisitized feldspar and were originally feldspathic peridotite, whereas other parts are pyroxene-rich peridotite.

There is an isolated occurrence of peridotite on claim L.11088 where a highly shattered, greenish-black serpentinized peridotite is in contact with the volcanics. The actual contact is the site of a zone of shearing or faulting.

Another small mass is represented by exposures of pyroxenite and gabbro (diabase) on claims L.9863, L.27221, L.11088, and L.27220. This is also the eastern extension of a band mapped in Harker township.[1] The band appears to be cut off by a fault with the result that the diabase is variously sheared, carbonatized, and amphibolitized on claims L.11088 and L.27220.

Two other occurrences are noted. One is an isolated outcrop of diabase in the northwest corner of Mining Corporation's claim L.10476; and the other was intersected in a drill hole on claim L.32929 of the Ghostmount property.



The Ghost range and Lightning Mountain (right centre). View N.80°W. from a high hill of basic lavas near the east boundary of the township.

Ghost Range Complex

The Ghost Range complex in Holloway township consists of gabbro and peridotite. Although the gabbro is fairly well exposed, there are only a few outcrops of peridotite. The section of the complex on the property of the Dominion Gulf Company has been explored by 14 drill holes, 3 of which are in adjoining Frecheville township. The logs[2] of these holes, and a plan of the magnetometer survey supplied by the company, have been of considerable help in outlining the limits of the ultrabasic intrusive. The peridotite is a V-shaped mass and the gabbro occupies the interior of the V. The axis of the V trends east within the township. Two drill holes (Nos. 11 and 12) on the south side of the nose of the V passed from volcanics into peridotite at depths of 181 and 339 feet respectively. Top determinations in the volcanics off the east end of the V indicate that the intrusive occupies a syncline, which the opening of the V suggests is plunging

[1] J. Satterly, *op. cit.* p. 16.
[2] By N. Hogg.

west. It is therefore assumed that the intrusive was injected prior to the folding of the volcanics and underwent gravity differentiation with separation into a gabbro top and peridotite bottom followed by folding. The shearing or faulting along the gabbro-peridotite contact is believed to have taken place during this folding. The complex is cut by several cross-faults the movement of which would appear to be largely vertical.

ALGOMAN

No large intrusive masses of Algoman age are present in the north half of the township, only a few dikes being mapped. The most obvious Algoman activity is the hydrothermal alteration of the volcanics and sediments in the Destor-Porcupine fault zone by such processes as carbonatization, sericitization, and silicification.

Porphyry

Dikes of porphyry are extremely rare, the only surface exposure being a dike on the O'Neill property just south of the Teddy Bear property in the western part of the township. N. Hogg records a few dikes cutting the sediments in diamond-drill holes on the Ghostmount and Mining Corporation properties.

On the O'Neill property, on claims L.11009 and L.11010, a dike of pink feldspar porphyry cuts the volcanics. It is 1–5 feet wide, strikes N.85°E., and has been mapped for just over 400 feet. The dike is partly mineralized with disseminated pyrite.

On the Ghostmount property, in hole No. 12 on claim L.32924, dikes of greenish-red and grey feldspar porphyry were intersected for core lengths of 15 and 11 feet. These dikes contain small white feldspar phenocrysts. The grey dike contains some finely disseminated pyrite. In hole No. 13, 23 feet of a salmon-pink feldspar porphyry was intersected. It contains 1/5-inch white feldspar phenocrysts. In its lower 8 feet the dike is a mottled pink and grey colour with less prominent phenocrysts. It is probably the same dike as the greenish-red one in adjacent hole No. 12.

On Mining Corporation claim L.43072, diamond-drill hole No. 9 intersected 12 feet of a yellow feldspar porphyry with obscure white feldspar phenocrysts to 1/16 inch in diameter in a very fine-grained sericitized groundmass.

Felsite

N. Hogg records an occurrence of felsite in diamond-drill hole No. 12 on claim L.32924 on the Ghostmount property for a core length of 31 feet. It is described as a massive, vitreous yellow felsite with sharp contacts. Much quartz is present near the margins of the dike.

Lamprophyre

In adjoining Harker township dikes of lamprophyre are quite common, but in the north half of Holloway township they are relatively uncommon; only ten dikes were found and mapped. They are all narrow, ranging from less than 1 to 25 feet in width, the majority being less than 6 feet. Most of the dikes parallel the contacts of the volcanic flows or cut them at a small angle.

No detailed petrographic study has been made because the rocks are essentially the same as those mapped in Harker township.[1] They usually contain large crystals of one, two, or occasionally all three of the minerals, biotite, hornblende, and augite. Most of the dikes are grey to green in colour. Only five were examined in thin sections. Two of these show much epidote, often in radiating clusters.

[1] J. Satterly, *Geology of Harker township*, Ont. Dept. Mines, Vol. LX, 1951, pt. 7, p. 7.

In one, apatite is a common accessory mineral.[1] Carbonate, replacing the groundmass, or pyroxene was noted in only one of the five studied.

On the N. Strong property in the northwest corner of the township two interesting dikelets were found cutting the peridotite in a trench, a 6-foot greyish-green lamprophyre striking approximately northeast, and a 3-inch greyish-white dike striking northwest. The age relations of the two dikes to one another could not be determined, although additional trenching would probably reveal this.

Examination of thin sections of these dikes under the microscope showed them both to contain garnet. The lamprophyre contains augite and chloritized biotite both as phenocrysts and in the groundmass. A colourless garnet occurs as granular aggregates in the groundmass, and in the chloritized biotite books. A modal analysis gave augite, 56; chloritized biotite, 26; and garnet, 18 percent.

The greyish-white dikelet is a garnet-pyroxene rock composed of a colourless garnet in granular aggregates, a pale-brownish pyroxene, and a minor amount of a pale-coloured chlorite in clusters or veinlets. Accessories are titanite in fractured irregular grains, some showing remnants of an opaque mineral, and a single rounded prismatic grain of apatite. A modal analysis gave garnet, 50; pyroxene, 47; chlorite, 2; and titanite, 1 percent.

Carbonatized Rocks

The carbonatized rocks have been formed by hydrothermal solutions replacing the pre-existing rocks. All gradations exist from slightly to intensely carbonatized rocks, the end product being a carbonate rock in which no trace of any textures remain to indicate the origin of the rock. The carbonate rock is composed of magnesium, calcium, and iron carbonates and is therefore ankeritic in composition. Frequently a green mica is present and gives the carbonate a green colour. Stringers and veins of quartz may form a stockwork in the carbonate. In the Kirkland Lake-Larder Lake area gold mineralization is found in or adjacent to quartz-carbonate bodies of this type, so that their occurrence may be of some significance. The carbonatized rocks and carbonate bodies are found in or adjacent to pre-existing fault zones both cross-faults or strike faults but more especially the latter. In Holloway township the carbonatized rocks are found within or adjacent to the Destor-Porcupine fault zone. All the Precambrian rocks, except those of the Matachewan and Keweenawan age, have been altered.

Few carbonate bodies are exposed on surface, but a number have been recorded by N. Hogg in diamond-drill holes within the Destor-Porcupine fault zone. These are on the Ghostmount, Lobanor, and Mining Corporation properties. On the Ghostmount property in hole No. 7, on claim L.32923, 101 feet of carbonate rocks and sericite schist was intersected. The carbonate rocks include a green carbonate breccia, and olive green to grey carbonates. In hole No. 12, on claim L.32924 on the same property two carbonate zones were intersected. The first zone, from 417 to 438 feet, consists of a brecciated buff carbonate with sericite in fractures. Considerable green mica is present as stringers and flakes. The second zone, from 600 to 765 feet, includes a highly sheared and brecciated dull-green carbonate with some green mica. In one section the mica increases in amount so as to form the bulk of the rock. A short section of only slightly altered greywacke in this zone suggests that all the green carbonates in this hole may be replaced sediments.

In the unsurveyed part of the Lobanor property hole No. 1 was drilled south from an outcrop of green carbonate rock and carbonatized greywacke. Three sections of carbonate rock were cut in the hole: from 14 to 59 feet, a light-green

[1]cf. J. Satterly, *op. cit.*, p. 17.

carbonate breccia with quartz stringers; from 134 to 460 feet, green carbonate-quartz breccia, dark olive-green, light apple-green, or yellow-green in colour, with sections preserving volcanic structures such as spherulites and agglomeratic fragments; from 630 to 688 feet, a dull-green carbonate breccia with dark-green chloritic material filling fractures, and numerous quartz stringers. The carbonate rocks in this hole replace greywacke in the upper part and volcanics in the lower part.

On the Mining Corporation property (east group) hole No. 9, from claim L.43078 into claim L.43072, intersects two short sections of carbonate rock: from 207 to 216 and 223 to 228 feet a green carbonate breccia with sparsely disseminated pyrite, both replacing greywacke.

Owing to the very limited exploration by diamond-drilling, nothing is known as to the size and shape of the carbonate bodies. From those in other townships in the east Porcupine belt it may be assumed that they form lenticular bodies parallel to the direction of shearing or faulting.

Surface exposures of carbonatized rocks were only found in the northwestern part of the map area within or adjacent to the Destor-Porcupine fault zone or a cross-fault. Carbonatized volcanics are exposed on claims L.8246, L.8247, L.43923, L.10476, and L.10080. Disseminated pyrite and quartz veins may be present and have been explored by pits, trenches, and drilling. These occurrences are described under "Description of Properties," on page 26.

Carbonatized sediments may be seen on claims L.10697, L.10082, L.10476, L.9864, and L.9863. The carbonatized greywacke and conglomerate on the weathered surface are pinkish in colour with rusty specks.

Heavily carbonatized gabbro is exposed in small outcrops and strippings adjacent to the old Lightning River road on claims L.11088 and L.27220, and at the west edge of an outcrop on claim L.27221.

Sericitized Rocks

Sericitization is confined to the sediments and Algoman intrusives within the Destor-Porcupine fault zone. Nearly all the occurrences are in diamond-drill holes and have been recorded by N. Hogg. The most obvious result of sericitization is the change in the colour of the rock to a shade of yellow and the development of the mineral sericite. Quartz frequently accompanies the alteration, but very little sulphide mineralization seems to be associated with sericitization.

The only surface exposure showing sericitization is a sheared pebble conglomerate on Mining Corporation claim L.9864. It is now a rusty-weathering, yellow rock, which has been intensely carbonatized and sericitized.

Sericitized sediments are recorded by N. Hogg in drill holes Nos. 7, 12, and 13 on the Ghostmount property and are described in more detail on page 28.

Silicified Rocks

Silicification is not nearly as common, if the injection of quartz stringers and veins is excepted, as carbonatization and sericitization.

The only occurrence is on claims L.11382 and L.11548 of the McDermott property (see pages 29, 30) where surface exposures and drill holes indicate a zone of silicification in the basic lavas. In this zone the basalt has a purple colour, and a thin section of the silicified lava shows that it has been completely replaced by an aggregate of quartz, feldspar, carbonate, and pyrite accompanied by disseminated magnetite and leucoxene.

MATACHEWAN

Diabase dikes with a north-south strike are arbitrarily considered to be of Matachewan age. In the north half of the township such dikes are quite rare, the

only occurrence being a 40-foot dike cutting the basic volcanics and an Algoman lamprophyre dike 10,500 feet east on the *C* base line.

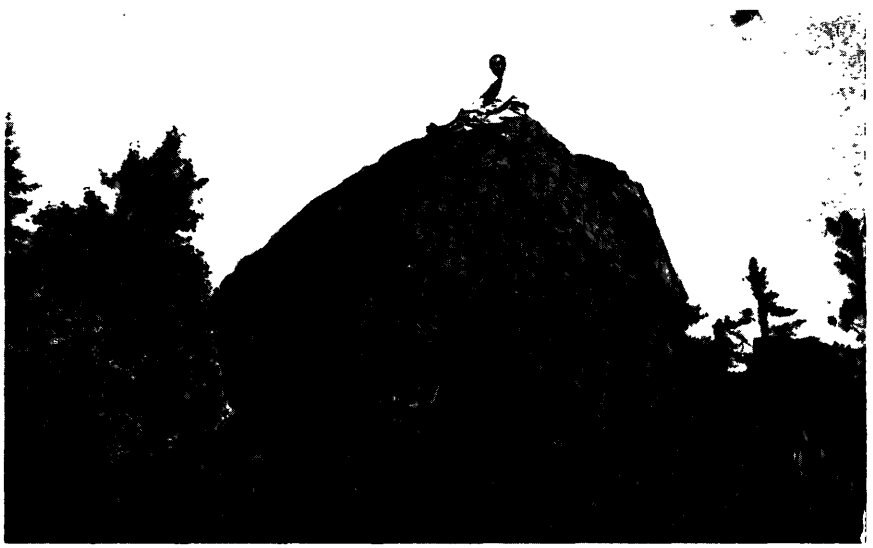
KEWEENAWAN

Dikes of possible Keweenawan age are as uncommon as those of Matachewan age, the only occurrence mapped being a 40-foot dike 14,850 feet east on the *C* base line. The dike trends approximately N.60°E.; it is a quartz diabase.

CENOZOIC

PLEISTOCENE

In Pleistocene time the Abitibi region was covered by the ice of the Laurentide continental glacier, which on its retreat left deposits of boulders, cobbles, pebbles, sand, and clay. In Holloway township the nature and distribution of



Glacial erratic, 15 by 25 feet, just east of mile-post V on the east boundary of Holloway township.

these deposits indicate that some of them are glaciofluvial, some glaciolacustrine, and some are probably glacial in origin.

The exposures of the Pleistocene deposits are of a limited character. Although the rock uplands in the central part of Holloway township were swept by forest fire in 1916, much of the north half of the township is covered by thick mixed mature forest with a heavy undergrowth, so that over much of the map area the nature of the Pleistocene drift can only be told by examining the roots of upturned trees. Road cuts along highway No. 101 expose the drift, but slumping since the road was built in 1949, conceals the bedding in the sediments. A large outwash deposit occupies the centre of the township and has fairly well defined limits.

Very few glacial striae were found in the course of the mapping. Some of these were found on exposures in stream valleys and may, therefore, record a direction influenced by local topography. Only 11 readings were obtained. From these few readings it appears that the direction of movement of the ice on the two sides of the esker and outwash deposit occupying the centre of the township is

different. To the west the direction is S.15°–48°E., the average of 7 readings being S.27°E. To the east the direction is S.3°E.–S.10°W., the average of 4 readings being S.6°W. As only a relatively few readings were recorded, this apparent divergence in direction of glacial movement may not be significant. The monadnock, Lightning Mountain (see photograph on page 7), just beyond the north boundary of the township, may have influenced the direction of the ice movement.

Glacial Deposits

Many of the outcrops, outcrop areas, and areas of higher ground are flanked or partly covered by deposits of boulders, or sand, pebbles, and boulders. The internal structure of these deposits is not known. It is assumed that some of them are ground moraine. Some are possibly glaciofluvial in origin. Some large erratics were observed, a very conspicuous one being a block of pillowed lava, 15 by 25 feet, just east of mile-post V on the east boundary.

Glaciofluvial Deposits

The central part of the township is covered by a large outwash deposit approximately 2 miles across in an east-west direction and 3 miles long in a north-south direction. This deposit has an altitude of 1,025–1,125 feet within the map area, and therefore rises to a maximum of 200 feet above the valley of the Mattawasaga (Teddy Bear) River. The southern part, outside the map area, may be lower. The deposit consists of boulders, cobbles, pebbles, sand, and silt—near the margins.

There are a number of kettles, the most important one being that containing McIntyre Lake.

An esker forms the backbone of the deposit. This esker enters the township just southwest of Lightning Lake, Frecheville township, and extends south, forming the east side of Holloway Lake, crosses the Mattawasaga (Teddy Bear) River where there is a water gap (see photograph on page 7), and merges with the outwash deposit about ½ mile south of the river. The esker is exposed again on the east side of the McIntyre Lake and to the east of two dry kettles ½ mile southeast of the lake. Beyond the map area esker ridges may be seen on air photographs for 1½ miles south of McIntyre Lake. Very few outcrops project through the outwash deposit. Just west of McIntyre Lake a diamond-drill hole failed to reach ledge at a depth of 150 feet.

The only excavation in the deposit is a gravel pit in the esker at highway No. 101 at which place the clays of glacial Lake Ojibway-Barlow may be seen to lap the slopes of the esker.

The outwash deposit is near the end of a chain of eskers that may be traced northward for 120 miles to a point just south of Kesagami Lake.[1]

Glacial Lake Ojibway-Barlow

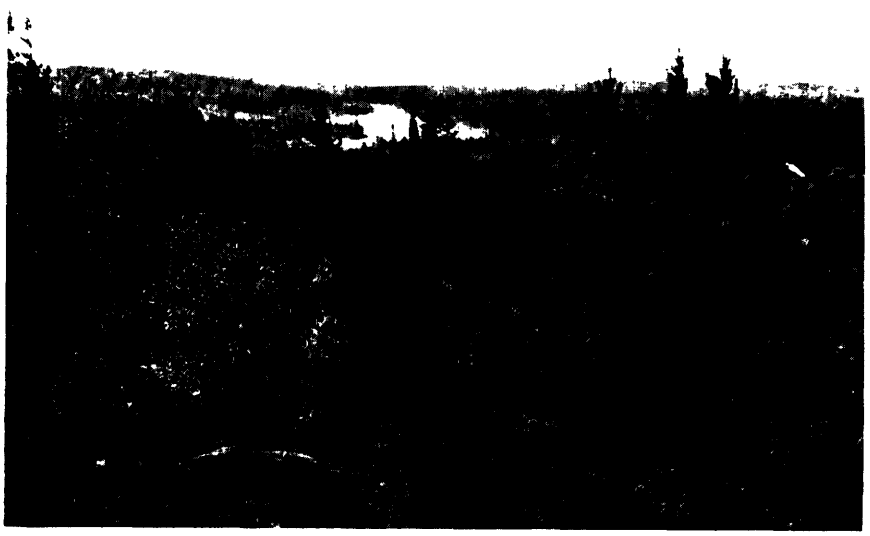
The overburden, outside the area of the outwash deposit and boulder deposits on the slopes of rock exposures or higher ground, is mainly clay. Good sections available for examination in 1949 were no longer available in 1952 because of slumping. The clays are thinly varved and slightly brownish-grey in colour. They are believed to have been laid down in glacial Lake Ojibway-Barlow. Near Holloway Lake at the road cut in the esker on highway No. 101 the varved clays may be seen to overlie part of the sand and boulders of the esker.

Diamond-drilling on the Ghostmount property indicates a depth of overburden of 50–120 feet; it is assumed that most of this thickness is Ojibway-Barlow clay.

[1]G. A. Hills, unpublished map of northeastern Ontario showing glacial deposits.



McIntyre Lake, a kettle in the outwash deposit of central Holloway township. View east.

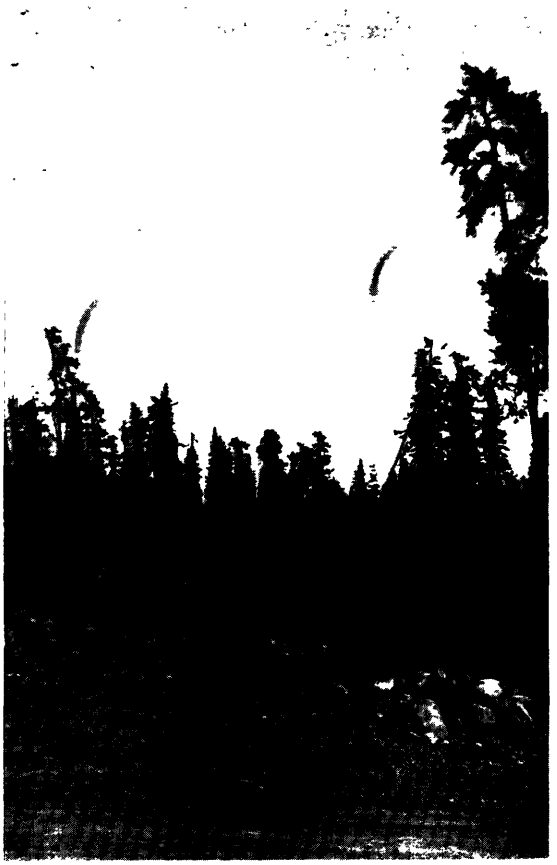


Large beaver pond on base line C, 6,400 feet east of the west boundary of Holloway township. Outcrop of basic lavas with scattered second growth of jackpine and birch. View south.

Few old beaches were found such as in McCool and Munro townships. The only pebble beach noted by the writer is on the north edge of an outcrop area about ½ mile southwest of mile-post V on the east boundary. The elevation of this beach indicates that at the time of its formation the rocky uplands were islands in glacial Lake Ojibway-Barlow.

RECENT

During Recent time organic material has accumulated in swampy depressions to form peat. Such occurrences are not abundant in Holloway township, being



Gravel pit in an esker on highway No. 101 on Ghostmount claim L.32924.

most obvious in the gradual filling-in of some of the kettles in the outwash deposit in the centre of the township.

On highway No. 101 the Ontario Department of Highways found 1–3 feet of black muck over clay.

Also during the Recent, deposits of silt, clay, and organic matter have been accumulating in the numerous beaver ponds in the township. The largest beaver pond just crosses the south edge of the map area into claim L.10220; it is about 3,600 feet long, and 400 feet across at its widest point.

The water gap in the esker ridge south of Holloway Lake is the most obvious evidence of erosion. This cut has been made by the Mattawasaga (Teddy Bear) River either in late Pleistocene or Recent time (see photograph on page 7).

STRUCTURAL GEOLOGY

The structural geology of the north half of Holloway is difficult to interpret owing to lack of evidence. No well-defined marker horizons are present in the lavas or sediments; most faults are assumed or inferred from few data; and top determinations in the lavas and sediments are scattered so that the interpretation of the structural geology of the north half of the township is based on rather inadequate information. All top determinations are shown on the geological map. The small amount of diamond-drill exploration has provided useful data in the broad drift-covered strip overlying the Destor-Porcupine fault zone. Geophysical surveys in this same belt have also helped considerably in the structural interpretation.

Top-determination material in the sediments is scarce. N. Hogg was successful in making some determinations in diamond-drill cores by grain gradation. The best source of top-determination material in the lavas was flow breccia tops followed by the shape and packing of pillows.

Most of the faults shown on the map are inferred from geophysical surveys, confirmed in a few places by diamond-drill holes and to some extent from schisting and shearing on exposures, or from topographical evidence such as lineal swamps, gullies, creeks, and scarps.

Folding

The sediments and lavas have been folded across east-west axes and have steep dips. South of the Mattawasaga (Teddy Bear) River the structure is relatively simple, the lavas face south, being on the north limb of a syncline or alternatively, the south limb of an anticline. North of the Mattawasaga the rock sequence contains sediments, acid and basic volcanics, and a sill of basic and ultrabasic intrusives. Limited top determinations indicate close isoclinal folding, and there is much strike faulting, the sediments and lavas being involved in the movements associated with the formation of the Destor-Porcupine fault zone. To the north of the Destor-Porcupine fault zone the major structural unit is the Ghost Range syncline.

Ghost Range Syncline

The Ghost Range syncline is indicated by a V-shaped complex of basic and ultrabasic intrusives (see page 15) and by top determinations in the volcanics adjacent to the complex. This syncline is offset by at least three cross-faults within the township, and its eastern extension may be terminated by the Destor-Porcupine fault zone. It may continue at N.70°W. through Frecheville into Lamplugh township, but no detailed mapping has been carried out in those townships. In Harker township the lavas on the south side of the complex face north.

Faulting

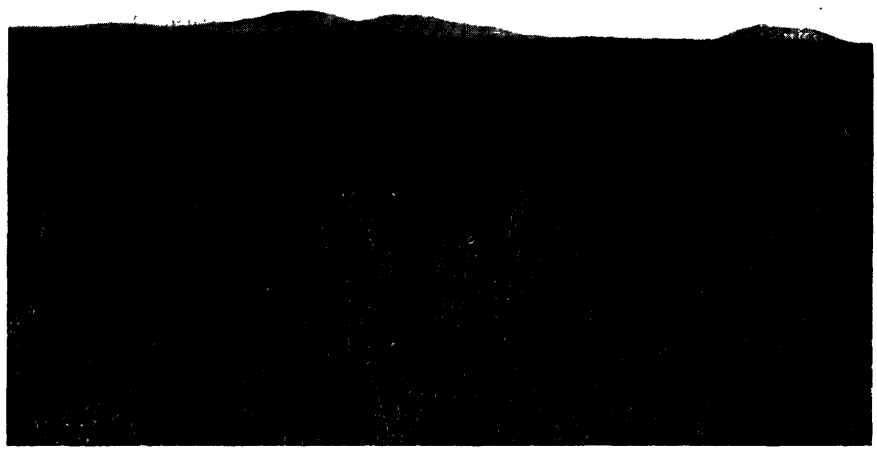
The faults in the township are conveniently classified as strike faults, which trend east and west approximately parallel to the strike of the formations, and cross-faults which offset the formations and the strike faults. The most important strike fault is the Destor-Porcupine fault zone. Little diamond-drill information, few geophysical surveys, and surface exposures have permitted only a sketchy delineation of the fault pattern.

STRIKE FAULTS

Destor-Porcupine Fault Zone

Owing to the few data available the boundaries of the Destor-Porcupine fault zone are rather vague. There is apparently a broad zone of faulting trending east from the Teddy Bear property through the Ghostmount, Lobanor, and Mining Corporation (east group) properties. The evidence, as may be seen on the map, is confined in some places to less than one drill hole per mile of fault zone. Rock exposures within the fault zone are confined to a few on the Mining Corporation and Teddy Bear properties on the west side of the township.

From the west boundary east to Holloway Lake the fault zone has been indicated as consisting of four parallel faults. These serve as mapping limits to bands of volcanics and sediments. Additional faults are known to be present. On the Mining Corporation (north group) property exposures of sediments and



View N.70°W. across the broad valley of the Mattawasaga (Teddy Bear) River from a hill of volcanics on the south boundary of Lobanor claim L.43697 towards the Ghost range, Harker township (left), and Lightning Mountain, Frecheville township (right). The Destor-Porcupine fault zone closely parallels the north side of the Mattawasaga valley.

volcanics are extensively altered and sheared, and it is assumed they lie within the Destor-Porcupine fault zone. It is also assumed, from the intense carbonatization, that the lavas of Seagers Hill on Teddy Bear claim L.10080 are also within the fault zone. A strong east-west zone of faulting is recorded by N. Hogg in drill holes Nos. 7, 7V, 12, and 13 on the Ghostmount claims L.32923 and L.32924. These holes intersect sericitized sediments, carbonatized lavas, and carbonate rocks. Similarly carbonates, carbonate breccia, and carbonatized greywacke were cut in drill hole No. 1 near the centre of the unsurveyed part of the Lobanor property (see page 17) and sericitized sediments and brecciated volcanics in hole No. 9 claim, L.43078, on the Mining Corporation property (see page 18). These occurrences are all assumed by the writer to be within the Destor-Porcupine fault zone. The limits of the zone are either assumed or inferred from magnetometer surveys.

Consular–Ben-Arch–McDermott Fault

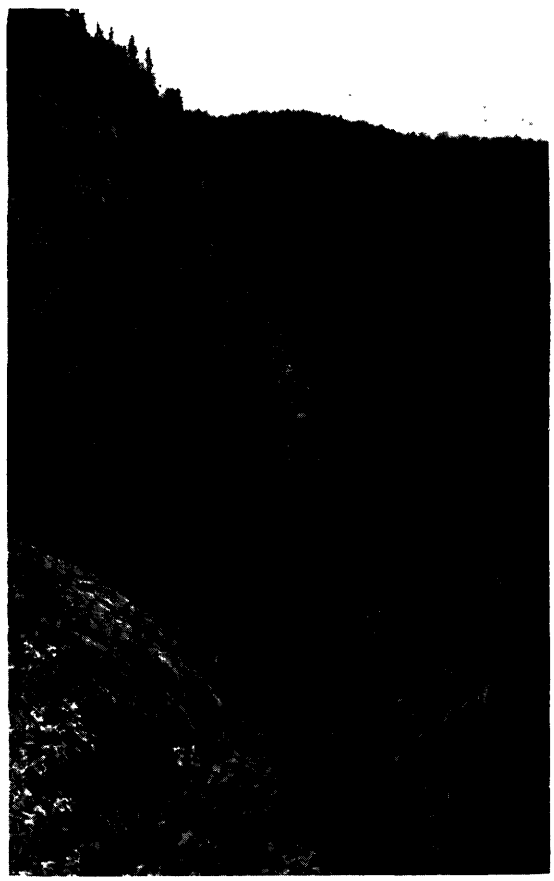
A strike fault trending N.70°E. was described in the Harker report[1] as

[1] J. Satterly, *Geology of Harker Township*, Ont. Dept. Mines, Vol. LX, 1951, pt. 7, p. 23.

crossing the Consular and Ben-Arch properties in Harker township, and the McDermott property in Holloway. A strong zone of brecciation and silicification in the basic lavas has been noted by N. Hogg in the diamond-drill holes on the McDermott property. The location of this fault zone beyond the McDermott property is not known.

Ghostmount Fault

A well-defined fault, trending N.60°E., was indicated by a magnetometer survey on the Ghostmount property. This was confirmed by drill hole No. 3



Rugged terrain in the area of volcanics in northeastern Holloway township. View south along a cliff face (fault scarp ?) near the east boundary of the township, north of base line A. Note the second-growth jackpine on the rock hills and poplar in the valley below.

on claim L.32928, which intersected an intensely fractured and altered zone at the sediments-volcanics contact at 287 feet. This is interpreted as a fault zone and was called the Ghostmount fault.[1] The fault zone is practically confined to the sediments; only a few short sections of the core in the lava above 287 feet are fractured and silicified. Only 13 feet of core was recovered in the 88 feet below 287 feet. This consists of intensely altered and fractured yellow-grey sediments, which have been carbonatized and sericitized. Streaks of sericite and stringers of

[1] J. Satterly, *op. cit.*, p. 23.

quartz are present but very little sulphide mineralization. The same alteration continues for an additional 175 feet but gradually diminishes until a normal, hard, grey greywacke appears at 550 feet.

CROSS-FAULTS

Mapping in the East Porcupine belt has shown that a great many cross-faults are present but can only be indicated if exposures are abundant and horizon markers present. However, in areas with few exposures and lacking horizon markers, it is difficult to prove whether a number of linear creeks, valleys, gullies, and scarps indicate cross-faults or not. In Holloway township very few cross-faults have been found, but the writer believes this may be largely owing to lack of evidence. A few faults trending N.20°W. have been found, and many more may be present as indicated by creeks, valleys, gullies, and scarps in the volcanics area in the south half of the map area. In the southeast corner of the map area the apparent offset of flow contacts across such gullies is small, and owing to the relief and the 60°–70°S. dip of the flows, it is difficult to determine by pace-and compass methods of mapping whether any faults are present.

Several cross-faults are shown in the northwest quarter of the map sheet. A cross-fault trending N.35°–45°E. has been assumed to cross the Teddy Bear, Mining Corporation, and N. Strong properties to account for the distribution of exposures of sediments, volcanics, and basic intrusives. Lack of exposures prevents showing any offset of the contacts of the Ghost Range intrusive complex.

Another cross-fault, trending N.10°W., is believed to follow Lightning Creek and to account for the distribution of exposures of gabbro and acid volcanics.

A third cross-fault, trending N.30°E., cuts the peridotite south of Lightning Lake. The location of this fault is based on the magnetometer survey of the Dominion Gulf property.

ECONOMIC GEOLOGY AND DESCRIPTION OF PROPERTIES

Gold was discovered in the southwest part of Holloway township in August, 1917, by Messrs. Howey, Cochenour, and Willans and was staked as claim L.7135.[1] This lies beyond the boundaries of the map sheet.

The next discovery was by W. S. Seagers, who found gold by panning on a low hill in the northwest corner of the township in February, 1922.[2] This location became known as Seagers Hill and was staked as claim L.10080. It is now part of the Teddy Bear property.

Knight reports that there was considerable staking during 1922; 168 claims were recorded in the west half of Holloway township by September 11 of that year.

In 1944 renewed interest in gold exploration resulted in several large blocks of claims being staked along the Destor-Porcupine fault zone by the Ghostmount, Lobanor, and Mining Corporation companies and also, in the centre of the township, by McIntyre Porcupine Mines, Limited. Exploration during this period was entirely by geophysical surveys and diamond-drilling. No important gold discoveries were made.

The last exploration for gold was done in 1949 by Sylvanite Gold Mines, Limited, which carried out a small program of diamond-drilling on the property of McDermott Mines, Limited.

In 1950 the relatively unexposed body of peridotite, being the east part of the

[1]C. W. Knight, A. G. Burrows, P. E. Hopkins, and A. L. Parsons, *Abitibi–Night Hawk Gold Area*, Ont. Bur. Mines, Vol. XXVIII, 1919, pt. 2, pp. 44–48.

[2]Cyril W. Knight, *Lightning River Gold Area*, Ont. Dept. Mines, Vol. XXXIII, 1924, pt. 3, pp. 41, 42, 45, 46.

Ghost Range intrusive complex, was outlined by a magnetometer survey by the Dominion Gulf Company, and was explored for asbestos fibre in a diamond-drill program carried out jointly by Asbestos Corporation, Limited, and the Dominion Gulf Company.

No prospecting or exploration was in progress during the 1952 field season.

Asbestos

DOMINION GULF COMPANY

The Dominion Gulf Company holds a block of 16 claims in Holloway and Frecheville townships near Lightning Mountain; ten of the claims are in Holloway township. A magnetometer survey of the claim group was carried out in 1950. This survey outlined a V-shaped anomaly, which is very poorly exposed at surface in outcrops of a brown-weathering, black peridotite with poikilitic pyroxene. In 1950 this anomaly was explored by 14 diamond-drill holes, totalling 8,806 feet, in a joint exploration program by the Dominion Gulf Company and Asbestos Corporation, Limited.[1] Eleven of the drill holes are in Holloway township. Those holes in which some asbestos fibre was noted are marked on the map by the symbol "Asb."

N. STRONG

In 1949, N. Strong staked a group of seven unsurveyed claims in the northwest corner of the township and held four patented claims, L.11088, L.27220 L.27221, and L.27223.

Geological and geophysical surveys, prospecting, and trenching were carried out in 1950 by Lesjack Exploration Company, Limited, of Haileybury under the direction of J. M. Powelson.

On the unsurveyed claims, rock is well explosed adjacent to the north boundary of the township, but elsewhere there is a heavy overburden and a dense, mature mixed forest. On and parallel to the north boundary there are a number of outcrops of pre-Algoman enstatite diabase or gabbro. On the whole this is a massive rock with minor shearing at S.80°E. and a dip of 85°S. Peridotite is exposed in two trenches and a small outcrop in the centre of the claim group. A narrow lamprophyre dike cuts the peridotite. The peridotite is a massive greenish-black variety with poikilitic pyroxene. No asbestos fibre was observed. The peridotite and gabbro are part of a sill-like mass, which is an eastern extension of the Ghost Range complex in Harker township. In the southeast corner of the claim group there is an exposure of grey acid lava and agglomerate. Similar rocks are exposed on the north boundary just west of the Lightning River.

On the four patented claims peridotite, pillowed spherulitic basalt, and gabbro are exposed. The pillowed spherulitic basalt is part of a horizon that can be traced east for nearly three miles. Poor top determinations on this horizon east of the N. Strong property suggest that the flows face north. Intrusive into the lava is a small sill of gabbro, which has been sheared and carbonatized adjacent to an assumed northeast fault on claim L.27220. In the southern part of claim L.11088 the gabbro has been amphibolitized. In faulted contact with the lavas on claim L.11088 there is a peridotite, which has been explored by two trenches. The peridotite is a sheared, fine-grained, dark-green rock, which has been completely serpentinized. A little harsh slip fibre was noted in fractures, but no cross fibre. The extent of the peridotite body is not known.

[1] In 1953, an additional vertical hole was put down to a depth of 700 feet. It intersected serpentinized peridotite from 170 to 315 feet, and serpentinized dunite from 315 to 700 feet. A little asbestos fibre was encountered in the section from 170 to 230 feet in lengths not exceeding 1/16 to 1/8 inch.

Gold

GHOSTMOUNT MINES, LIMITED

In 1952, Ghostmount Mines, Limited, held 31 patented claims in the northwest part of Holloway township. Highway No. 101 passes through the middle of the claim group.

A magnetometer survey of the group was made by C. S. Davidson in 1944. The claims were surveyed in 1944. Between 1945 and 1948, 14 diamond-drill holes, totalling 6,446 feet, were put down by the Hoyle Mining Company, Limited. Three of these holes were lost in overburden, No. 1 at 156 feet, No. 2 at 172 feet, and No. 6 at 156 feet. There are no records available on holes Nos. 10 and 11. The remaining holes have all been logged by N. Hogg.[1]

Very little rock is exposed on the claims. Exposures of poorly pillowed spherulitic basalt are found on claims L.34834, L.34836, and L.34837. The writer was unsuccessful in finding any pillows suitable for top determinations, but they appear to face north. Massive basalt, mineralized with finely disseminated pyrite, is exposed in a small outcrop and in four trenches in the north part of claim L.34839.

The diamond-drill holes and magnetometer survey have provided most of the information on the geology of the property. Sediments were found in six of the holes. Correlation of these sediments to those on adjoining properties is difficult owing to the lack of exposures. In the holes in claims L.32924, L.32923, and L.32922 the sediments are greywacke and conglomerate, which Hogg's logs show have been intensely altered by carbonatization, sericitization, and feldspathization. The sediments are cut by porphyry and felsite dikes, with the formation of zones of carbonate rock. These sediments are believed to be in the Destor-Porcupine fault zone. Similarly altered sediments were found in holes to the southwest of Holloway Lake on claims L.32928 and L.32923. Top determinations by grain gradation by Hogg indicate that all these sediments face south. The geology of some of these holes is recorded briefly below.

In hole No. 8V (vertical) in the northwest corner of claim L.32922 highly sericitized greywacke was intersected from 50 to 325 feet. Hogg records a fine-grained, sheared, deep-green rock, possibly a tuff from 325 to 377 feet.

In the next holes to the east, Nos. 7 and 7V on claim L.34839, faulting is indicated in hole No. 7 at several points. Sheared andesite was cut from 65 to 76 and again from 125 to 137 feet. From 158–259 feet the hole cuts a carbonate-sericite schist. This wide zone of shearing and alteration ends against a fault zone, 259–267 feet, containing much graphite. A zone of brecciation and alteration begins in altered greywacke at 496 and extends to 698 feet. From 500 feet the rocks are brecciated and consist largely of sericite and quartz. Graphite is present on some slip planes and short sections of core show contorted banding. Pebble conglomerate is found at 625 to 688 feet, being completely sericitized from 625 to 643, and again at 787 to 812 feet.

Holes Nos. 12 and 13 on claim L.32924 intersected greywacke with conglomerate interbeds cut by feldspar porphyry dikes. There is a narrow interflow of andesitic lava near the top of each hole. Several carbonate zones are developed. The sediments and lavas are in part highly altered. The alteration in the sediments is either feldspathization (pink to purple) or sericitization (yellow) or both. In hole No. 12 the core lengths of feldspar porphyry are 15 and 16 feet. A little finely disseminated pyrite is present in one of the dikes. In hole No. 13 there is 23 feet of unmineralized feldspar porphyry.

No other mineralization was recorded from the drill holes.

[1]Formerly resident geologist, Ont. Dept. Mines, Timmins.

A fault zone found in hole No. 3, claim L.32928, confirms the location of a fault indicated by the magnetometer. This has been named the Ghostmount fault. It trends N.60°E. and is believed to join the Destor-Porcupine fault zone at the east boundary of the property. The fault zone is marked by a 13-foot core section of yellow-grey fractured rock which is intensely carbonatized and sheared with streaks of sericite and stringers of quartz. Hogg believes these to be altered sediments. This carbonatization and sericitization continues in the sediments for almost 200 feet (core length) from the fault zone. The basic intrusive recorded in this hole has chilled margins against greywacke. Its designation as 4b by the writer is quite arbitrary, it may be younger or older.

Drill holes in the volcanics to the south of the Ghostmount fault on claims L.32928 and L.32930 intersect a series of massive basaltic and diabasic flows with flow breccia tops with minor amounts of spherulitic and pillowed lava. These flows were found by Hogg to all face south.

Hole No. 6V on claim L.32923 is a vertical hole. It cuts greywacke and a brecciated zone with carbonate filling for a vertical intersection of 55 feet.

LOBANOR GOLD MINES, LIMITED

Lobanor Gold Mines, Limited, holds a block of 42 unpatented claims in the northeastern part of the township. Sixteen of the claims have been surveyed forming an L-shaped group. In 1949 the group was explored by five diamond-drill holes totalling 5,129 feet.

Rock exposures are largely confined to the northern and southern parts of the claim group. The Destor-Porcupine fault zone is believed to cross the central part of the claim group as indicated by a small exposure of carbonate and the intersection of carbonates and talc-chlorite schists in hole No. 1, near the centre of the unsurveyed part of the claim group. This hole also intersected greywacke in the upper part of the hole. In the southern part of the property the rocks are basic volcanics, mainly diabasic flows with flow breccia tops, pillowed lavas, or pillowed spherulitic lava. Similar rocks were intersected in the three drill holes in this part of the group. These rocks all face south and dip vertically to steeply south. In the northern part massive and pillowed basic volcanics are exposed in hilly outcrops, and in the western part, as agglomerate. The pillow lavas face south. On claim L.43683 a pillowed spherulitic lava has tops to the north.

It is assumed that the Ghost Range synclinal axis lies between this exposure and the south-facing lavas on the north boundary.

The small exposure of green carbonate-quartz rock, which is about 600 feet north of the right-of-way for highway No. 101, has been stripped and trenched; the openings are now overgrown. Owing to the smooth glaciated surface and the rusty-weathering it is difficult to obtain samples. Fresh material was obtained from the extreme north edge of the outcrop, and a grab sample taken by the writer, showing scant pyrite mineralization, gave only a trace of gold on assay.

McDERMOTT MINES, LIMITED

McDermott Mines, Limited, holds a block of ten patented claims in the west-central part of the map area adjacent to the Mattawasaga River. P. A. McDermott carried out some work on these claims in 1922.[1]

The claims have been explored by trenching and diamond-drilling. By 1924, 10 trenches, totalling 207 feet, had explored a silicified pyritized zone in the basalt adjacent to the south boundary of claim L.11548. A vertical shaft, 7 by 10

[1]Cyril W. Knight, *Lightning River Gold Area*, Ont. Dept. Mines, Vol. XXXIII, 1924, pt. 3, p. 49.

feet in the northwest corner of L.11382, is 14 feet deep. One diamond-drill hole was put down at this time for a length of 402 feet. In 1949 the claims were under option to Sylvanite Gold Mines, Limited, which carried out a program of diamond-drilling on the same mineralized zone with eleven holes spaced over a length of 250 feet, totalling 3,035 feet. Three of the holes were lost at shallow depths.

Rock exposures and trenches exposing rock are confined to the area around the claim post common to the three claims L.11548, L.11381, and L.11382. The rest of the claims are covered by clay and swamp. The rocks are fine-grained, dark-green to black basic lavas, carbonatized and silicified, and cut by quartz-carbonate stringers. Pyrite is scattered irregularly through the silicified lava, which has a purple tint. Since the trenches are overgrown with moss and alders, the recent diamond-drilling supplies the most useful information on the geology. The core was logged by N. Hogg. The drilling indicates an east-west zone of silicification and carbonatization in basalt with disseminated pyrite carrying low to medium gold values. In some of the holes two zones of silicification and mineralization are present. The dip of the zones appears to be steeply north.

McINTYRE PORCUPINE MINES, LIMITED

In 1948, McIntyre Porcupine Mines, Limited, held a block of 77 unsurveyed claims in the central part of Holloway township. The claims were staked at various times between 1944 and 1947. In 1948, the company made a geological map[1] of the property, and between 1944 and 1948, 10 diamond-drill holes, totalling 5,488 feet, were put down.

The claims were allowed to lapse in 1950. The ground covered by these claims extended east from surveyed claims L.13999 and L.10220, and claims L.10219, L.10218, and L.11483 in the south half of the township to within 1¼ miles of the east boundary and approximately 2 miles south of McIntyre Lake.

Much of the area covered by the claims is blanketed by a large outwash deposit. Little rock is exposed in the outwash area. Exposures are fairly abundant from west of McIntyre Lake to the surveyed claims noted above. These exposures are a very monotonous series of basic flows with flow breccia tops ranging from 40 to 200 feet in thickness. The coarser parts of the flows have a diabasic texture. The lavas face south, trend N.70°E., and dip vertically. Porphyritic zones may be present. Pillowed lavas are relatively uncommon. Later intrusives are rare, being represented by a few narrow lamprophyre and diabase dikes. A minor amount of cross-faulting was noted.

Drill-hole exploration was confined to an area between the main outcrop areas and McIntyre Lake. These holes as may be noted from the geological map, cross-sectioned a strip of ground just under 4,000 feet in length. Company logs and plans indicate that a similar series of flows, with flow breccia tops such as are exposed on surface were intersected. Several sections of slightly carbonatized rock were intersected in the drilling, but no wide zones were found. Bonnell and Hamilton report that quartz and quartz-carbonate veins, ½ inch to 10 feet in width, were found in the drilling and appear to strike at all angles to the line of the drill holes. Mineralization is mainly pyrite with very rarely a little chalcopyrite, arsenopyrite, and pyrrhotite. The carbonate is calcite. Low gold values were found in such quartz veins in three of the holes drilled. No values were found in surface showings of veins of this type.

Pyrite mineralization is also recorded by Bonnell and Hamilton in flow top breccias, altered sections of flows, and around pillow selvages. No gold values

[1] J. W. B. Bonnell and J. D. Hamilton, *Interim Report, McIntyre Holloway Claims, Holloway Township, Larder Lake Mining Division, Ontario, up to Dec. 1948*, Ont. Dept. Mines, File No. 63A.63.

were found. In one hole silicified sections from 1 to 15 feet in width, all slightly mineralized with finely disseminated pyrite, were intersected. Assays failed to reveal any gold in this type of mineralization. Numerous stringers of calcite, from 1/16 to 1 inch, were found throughout the drill cores. No samples showed any gold on assay.

Epidote is also reported to be very widespread both on the surface and in drill cores. Epidote or quartz-epidote veins were not found to carry gold values. Because of the abundance of epidote the McIntyre geologists believe that a large intrusive must be present at depth.

THE MINING CORPORATION OF CANADA, LIMITED

The Mining Corporation of Canada, Limited, holds two groups of claims in the north half of the township. These are referred to as the east and north groups. A third group known as the south group is in the south half of the township, which was not mapped in 1952.

East Group

The east group is a block of 11 patented claims in the northeast part of the township. In 1945, the company held a group of 65 unsurveyed claims, 28 in Holloway, and 37 in adjoining Marriott township. Of the 28 claims in Holloway, 11 were retained, surveyed, and patented.

A magnetometer survey of the claim group was carried out in 1945. This survey indicated three belts of anomalies: (1) a narrow, fairly persistent anomaly trending N.70°E. across the southern part of the group in which a number of discontinuities were interpreted as due to cross-faults, changes in overburden depth, or changes in the amount of talc developed in a fault zone; (2) a wide linear anomaly also trending N.70°E., lying just to the north of the Mattawasaga (Teddy Bear) River, which was thought to be a diorite sill; and (3) a narrow linear anomaly trending N.85°E. in the northeastern part of the township.

In 1949 the claims in Holloway and Marriott townships were explored by 14 diamond-drill holes. Six of these holes were in Holloway township, the combined length being 4,328 feet.

Rock exposures on the claims held in 1945 in Holloway township are adjacent to the north and east boundaries of the township. These are massive to pillowed, basic to intermediate lavas cut by a lamprophyre sill in exposures southwest of mile-post V on the east boundary.

The drill holes at the Mattawasaga (Teddy Bear) River intersected a series of diabasic flows with flow breccia tops. The linear anomaly in this locality, which was thought to be a diorite sill, is apparently due to a higher content of disseminated magnetite in the diabasic flows. Drill hole No. 9, from claim L.43078 into L.43072, intersected sediments and volcanics. The sediments are greywacke and a narrow interbed of jasper iron formation, and narrow bands, 9 and 5 feet, of green carbonate. Top determinations, by grain gradation by N. Hogg,[1] gave tops both north and south, suggesting minor folding. The lower part of the hole intersected spherulitic basic lava, flow top breccia, and coarse and pillowed flows. The contact between the sediments and volcanics is marked by a 7-foot (core length) zone of yellow-grey breccia. It is assumed that this breccia marks one of the limits of the Destor-Porcupine fault zone.

North Group

The north group consists of five patented claims in the northwest corner of the map area; one of the claims, L.9862, is in adjoining Harker township. These

[1]Core logged by N. Hogg.

claims were staked by R. Cryderman in 1922, and considerable stripping and trenching was carried out at that time on claim L.10476. In 1923, two diamond-drill holes, totalling, 1,131 feet, were put down. This work is now 30 years old, and most of the strippings and trenches were found to be completely overgrown in 1952.

Sediments, basic volcanics, and pre-Algoman intrusives are exposed on the claims. On claim L.10476 the basic volcanics include fine-grained, massive to sheared basalt, diabasic flows, and pillowed lavas. These lavas are in faulted contact with the sediments. Zones of shearing and carbonatization are present in the lavas near faults. On the west boundary of claim L.9863 there are carbonatized basalt and a siliceous sediment (see page 13). On claim L.10476 the sediments are greywacke and their sheared or schistose equivalents. On claims L.9863 and L.9864 there are exposures of conglomerate (see page 10). These sediments are variously carbonatized and sericitized. In the northwest corner of claim L.10476 there is an isolated exposure of diabase believed to be pre-Algoman in age. Part of an east-west sill of pre-Algoman intrusive is exposed on claims L.9863 and L.9864, pyroxenite on L.9863, and gabbro on L.9864.

The shearing and crenulation in the sediments adjacent to the volcanics on claim L.10476 is taken to indicate a fault zone along the contact, possibly the north boundary of the Destor-Porcupine fault zone, or a fault within that major zone of faulting. At the west edge of the claim a cross-fault is shown offsetting the sediments-volcanics contact and the Destor-Porcupine fault zone. Minor drag folding in the sediments indicates that the movement during faulting was such that the north side moved east.

On the outcrop of pillow lava southwest of No. 1 post of claim L.10476 a shear zone cuts the lavas at N.55°E.; the dip is vertical. In 1922, W. H. Emens[1] took 41 samples from this shear zone with gold assays ranging from nil to 0.16 ounces per ton; 33 samples were below 0.05 ounces per ton. Emens' sample plan indicates that the shear zone has a width of 4–7 feet. Near the west boundary of the same claim there is an old trench on a pale yellow sericitized slate or phyllite with disseminated pyrite. Emens took 56 samples for gold assays in this trench, 48 samples ran nil to 0.13 ounces, 7 samples 0.20–0.36 and 1 sample gave 1.61 ounces per ton. In one cross trench the average of 12 samples over 32 feet was 0.026 ounces per ton. On other exposures on this same claim an additional 17 samples were taken with negative to low gold assays. Since the assays were so disappointing, no additional exploration of the claims has been carried out in the last 30 years.

O'NEILL PROPERTY

The O'Neill[2] property consists of three patented claims L.11009, L.11010, and L.12314, just south of the Teddy Bear property.

Exploration consists of a shaft, pits, and trenches on a porphyry dike cutting andesitic volcanics. These workings are on outcrops adjacent to the north boundary of claims L.11009, and L. 11010. The shaft is 14 feet deep. The workings are now overgrown with moss and alders. In 1952 stripping in these old pits and on the outcrops revealed a pink feldspar porphyry dike from 10 inches to 5 feet in width which could be traced for 400 feet. The dike strikes N.85°E. and, near the shaft, dips 65°S. Disseminated pyrite was observed in the dike and in feldspathized andesite adjacent to the dike.

[1]W. H. Emens, private report for the Mining Corporation of Canada, Limited, Jan. 1923.
[2]Cyril W. Knight, *Lightning River Gold Area*, Ont. Dept. Mines, Vol. XXXIII, 1924, pt. 3, p. 47, 48, 49.

There is a photograph in Gledhill's report[1] illustrating the dike with a series of tension cracks filled with white quartz. Gledhill states that the best gold values were found in crumpled schist along the contacts of the dike.

A grab sample of slightly mineralized porphyry taken by this writer gave 0.04 ounces of gold per ton.

At the east end of the workings an isolated outcrop exposes basalt slightly sheared at N.75°E. A pit has been put down on felspathized basalt containing scattered splashes of pyrite. The porphyry dike could not be found in the trench on the south side of this outcrop.

REMO PROPERTY

The Remo property, claims L.8246 and L.8247, is in the northwest part of the township, just east of the Mining Corporation claims. The claims are referred to as the "east" and "west" Remo claims.[2]

On the east Remo claim, L.8246, a pit on the north edge of an outcrop of sheared carbonatized basic lava in the centre of the claim exposes a rusty-weathering, silicified, carbonatized shear zone carrying disseminated pyrite. The shearing is at S.70°E., and the dip is vertical. A grab sample of the mineralized lava taken by the writer failed to show a trace of gold on assay.

In the north part of the west Remo claim, L.8247, a rusty-weathering shear zone, striking N.82°E. and dipping 70°S., is exposed on the north face of an outcrop of basic lava. It has been explored by stripping and pits, and traced for a length of 200 feet. In the east pit the zone, which has an exposed width of 10 feet, contains ½- to 1-inch white quartz-carbonate stringers, and rarely a little disseminated pyrite and chalcopyrite. A grab sample of this material taken by the writer gave 0.10 ounces of gold per ton on assay. In the west pit a quartz vein 9 inches wide is exposed.

TEDDY BEAR VALLEY MINES, LIMITED[3]

Teddy Bear Valley Mines, Limited, owns 40 patented claims in Harker and Holloway townships. Thirty-nine claims are in a single block: 31 in the northeast corner of Harker township and 8 in the northwest corner of Holloway township. A single claim, L. 10904, in Holloway township, lies about a mile east of the Harker boundary.

Early History

In February, 1922, W. S. Seagers staked three claims north of the Mattawasaga River and uncovered a series of quartz veins on a low hill on claim L.10080 in Holloway township. The Canadian Mining Syndicate optioned the Seager group and six adjoining claims. Surface exploration resulted in the discovery, in July, 1922, of coarse native gold in the quartz veins previously located. Abitibi Mines, Limited, was formed to take over the groups. Later an amalgamation of Abitibi Mines, Limited, with the Teddy Bear Valley Syndicate group was arranged, and a new company, the Teddy Bear Valley Mines, Limited, was formed in 1929.

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[1]T. L. Gledhill, *Lightning River Gold Area, (District of Cochrane)*, Ont. Dept. Mines, Vol. XXXIV, 1925, pt. 6, p. 91.

[2]Cyril W. Knight, *Lightning River Gold Area*, Ont. Dept. Mines, Vol. XXXIII, 1924, pt. 3, p. 47.

[3]In the preparation of this summary the writer has had access to a report to the company by E. H. Orser, dated November, 28, 1935, and maps by W. C. Martin, dated August, 1945, and January, 1948. The information is published with the permission of C. Elwood Hofmann, president and managing director of the company. This description of the property appeared previously in *Geology of Harker Township*, Ont. Dept. Mines, Vol. LX, 1951, pt. 7, pp. 41–43, and is reprinted here with some additions.

Exploration

In 1925 a program of diamond-drilling from surface was completed totalling 4,500 feet in 8 holes (Nos. 1 to 8). In 1933 two trenches were cut across the opposite ends of Seagers Hill, and a number of other pits were put down around the outcrop.

In 1934 a vertical two-compartment shaft was started on the site of the old No. 2 Abitibi shaft, which was down about 37 feet. The shaft was sunk to a depth of 300 feet with two stations cut at 151 and 276 feet below the collar. In 1935 a second shaft was sunk to a depth of 32.5 feet. By October 17, 1935, underground development on the first level amounted to 398.7 feet of drifting and 524.2 feet of crosscutting, and on the second level to 186.7 feet of crosscutting.

Diamond-drilling carried out in 1935 was as follows: holes Nos. 9 to 15, underground, with a total footage of 2,310.4 feet, and hole No. 16, from surface, 602.0 feet under an outcrop on claim L.10085, Harker township. Additional diamond-drilling and surface work was carried out in 1942, but no details are available. In 1947, a magnetic survey of the property was made by C. S. Davidson.

Geology

In Harker township (see map No. 1951-4), the rock exposures are scattered and few, except in the eight claims in the northern part of the group. In the southwest corner of the property the rocks are pillowed and diabasic flows with flow breccia tops. These lavas face south. Just north of highway No. 101 sediments are exposed in four outcrops. These are fine-grained, dark-grey greywackes, which strike approximately east-west and dip from 50°S. to vertical. One top determination indicates that they face south. In the northern eight claims an east-west sill of diabase with minor pyroxenite and peridotite divides the volcanics. The lavas south of this sill are dark-green, fine-grained basic flows, some of which show pillow structures. A single top determination based on pillows shows that the lavas face north. These lavas are locally sheared, carbonatized, and are apparently cut off on the south by an east-west strike fault called the "north" fault by W. C. Martin.[1] The lavas to the north of the sill are grey saussuritized basic flows. On claim L.10533 in Harker township they are highly carbonatized. Pillow lavas form a hilly outcrop in the centre of claim L.10691, Harker township. They face north. A north-south dike of Matachewan diabase cuts the flows and the sill of basic intrusives on claims L.10531 and 10533, Harker township. This dike appears to be offset by an east-west fault subsidiary and parallel to Martin's north fault.

Carbonate-chlorite schists exposed in small outcrops in the north part of claim L.10084, Harker township, may be highly altered sediments within the north fault zone.

A cross-fault trending northeast may be indicated by the relative distribution of outcrops of the basic intrusives on claim L.10537, Harker township, and the strike of shearing in nearby lavas. There are probably other cross-faults judging from the apparent offsets of contacts in the Ghost Range intrusive on the claims to the north.

In Holloway township sediments are exposed on claims L.10697, L.10082, and L.10083. On L.10697 they are very fine-grained, carbonatized and feldspathized, greyish-green greywacke slightly mineralized with finely disseminated pyrite. On L.10082 there are a number of exposures of a pink-weathering carbonatized greywacke and pebble conglomerate (see page 9). There is also a small

[1]W. C. Martin, manuscript map of Lightval, Teddy Bear Valley, and Ghostmount properties, January, 1948.

exposure of carbonatized greywacke and conglomerate on the north boundary of claim L.10083. On the east boundary of this claim, slate and greywacke have been altered to muscovite-carbonate schist with lenses and stringers of pyrite-carbonate-quartz and chlorite-carbonate-quartz schist. There is a small exposure of carbonatized, fine-grained green basalt just north of the outcrop of sediments. The writer believes these rocks lie within and near the north limit of the Destor-Porcupine fault zone. A northeast-trending fault has been assumed by the writer to slightly offset these bands of sediments (see page 26). The most important outcrop is that on claim L.10080 known as Seagers Hill on which the original gold discovery was made. It is a heavily carbonatized and sheared, basalt, diabase, and flow breccia. The flow contact strikes east, and the flows face north. Rock samples on the dump from the shaft indicate that some of the lava underground is a relatively uncarbonatized saussuritized diabase. Drilling from surface and underground indicates that the sediments and lavas have an average dip of about 60°S. Since they face north, they are overturned.

Three major strike faults cross the claims, according to Martin. The north fault is placed by him in the north part of L.10083 where the sediments are highly sheared. A strong fault zone in the volcanics on Seagers Hill, in which the original gold discovery was made, has also been picked up in Hole No. 5. It trends N.77°W., and dips 70°S. Martin places his shaft fault at the contact between the sediments and lavas just to the south of this outcrop. Martin believed that the Destor-Porcupine fault zone was intersected in hole No. 18, which was drilled in the northwest corner of claim L.11169. C. E. Hofmann reports that highly carbonatized rocks were cut in this hole. The hole flows water with a high iron content. The writer believes that all these faults are a part of the Destor-Porcupine fault zone.

The underground development shown in the accompanying plan and section was largely confined to a belt of basic lavas lying between two bands of sediments, the limits of which have been determined by surface and underground drilling. The belt of lavas has a crosscut width of about 570 feet. The dip of the flows and sediments is about 60°S., and the strike slightly south of east. On the south side of the band of lavas a 30-foot band of graphitic schist lies at the contact between the volcanics and sediments. A number of strike faults were encountered in the underground work and are shown in the section. No. 1 fault was intersected on both levels and in two holes below the second level. It strikes east, and the dip flattens from 87°S. above the first level to 75°S. below the second level. No. 2 fault dips 88°S. No. 3 fault, only noted on the second level, is shown with a dip of 69°S. Fault *K* is shown as a branch of No. 1 fault. The plans and sections do not show any displacement by the faults; these appear to be zones of shearing and brecciation.

Gold Occurrences

Surface exploration on Seagers Hill consists of three north-south trenches and an east-west trench crossing them. Parts of these trenches are overgrown or contain water, but most of them could be examined in 1952. The grey carbonatized lavas in these trenches have been exposed for 30 years so that they have weathered to a rusty-brown colour. Owing to carbonatization it is somewhat difficult to determine the contact between the flow breccia on the south and the massive flow to the north. This contact crosses the east-west trench at a small angle. In the west north-south trench this contact is just south of the intersection of the trenches, and the flow breccia is 20 feet thick. To the east in the east-west trench fairly fresh flow breccia is exposed. To the north the lava ranges from a fine-grained basalt to medium-grained diabase. Almost all of the lavas have been

sheared, minutely fractured and intensely carbonatized and sericitized. Numerous quartz stringers and veins fill fractures or shears and range from a fraction of an inch to 2 or 3 feet in width. The lavas contain an erratic pyrite mineralization in cubes which is most abundant adjacent to the quartz-bearing zones. Three of these zones strike N.77°, 83°, and 85°E., and dip 70–80°N. Most of the quartz is unmineralized, the pyrite mineralization being confined to the wall rock. Five grab samples taken by the writer from well-mineralized zones in the two westerly north-south trenches were assayed by the Provincial Assay Office and gave a trace to 0.03 ounces of gold per ton. Knight[1] reports that the vein from which the high-grade material came averaged a few inches in width but bulged 15–20 inches. Most of the native gold was found in the widest part of the vein. This vein had a strike of N.20°–25°E., and an apparent dip of 45°E. It was slightly mineralized with pyrite, but pyrite was most abundant in the country rock. Detailed sampling of the hill has shown that the over-all grade is low.

C. E. Hofmann reports two high assays on sludge samples from hole No. 18 drilled north from the northwest corner of claim L.11169. These were 0.50 ounces of gold per ton at 307 feet from 11 feet of sludge, and 1.14 ounces of gold per ton at 647 feet from 8 feet of sludge. Another high assay is reported from hole No. 19 on claim L.10081 from a sample taken at ledge or from loose rock at a depth of 88 feet.

[1]Cyril W. Knight, *Lightning River Gold Area*, Ont. Dept. Mines, Vol. XXXIII, 1924, pt. 3' p. 45.

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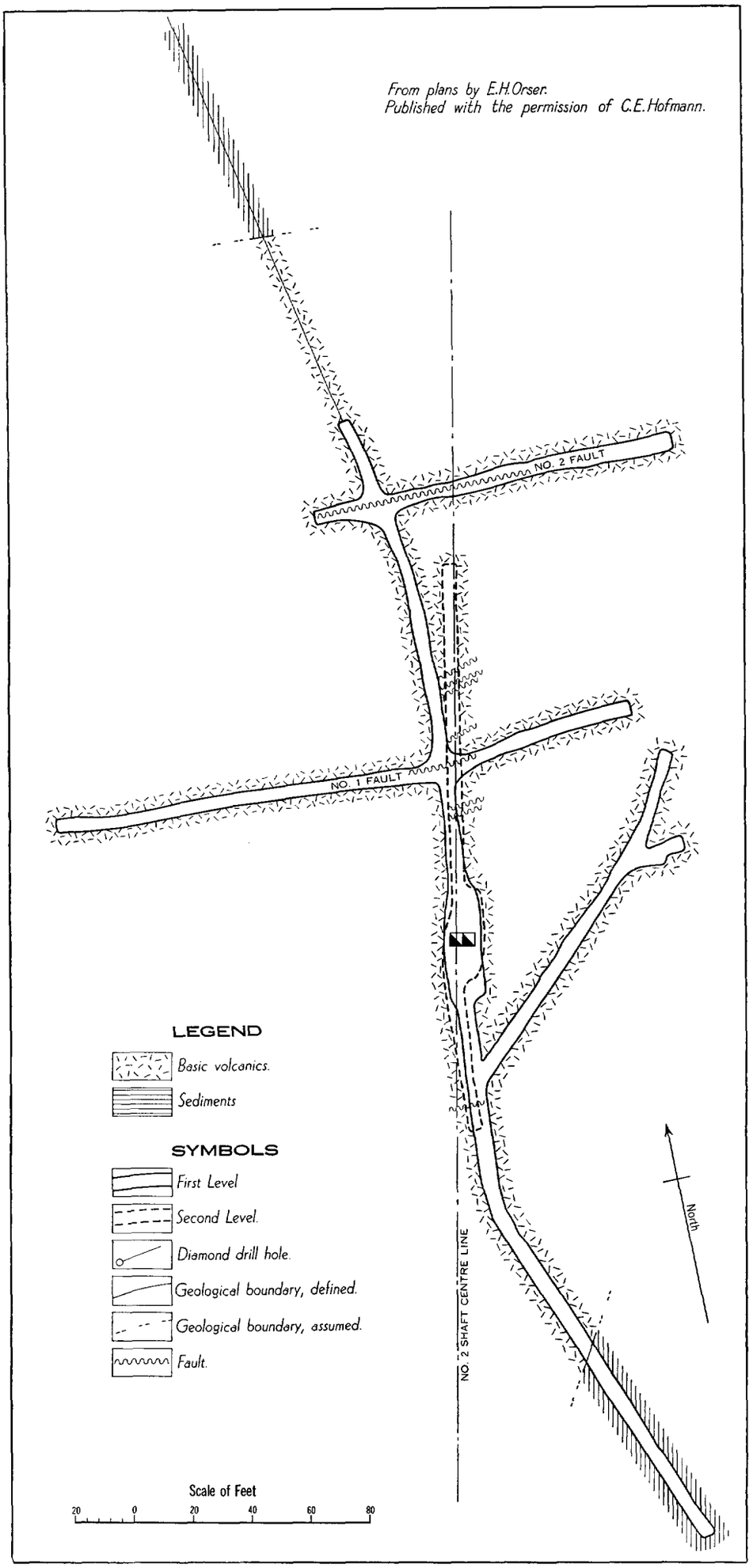
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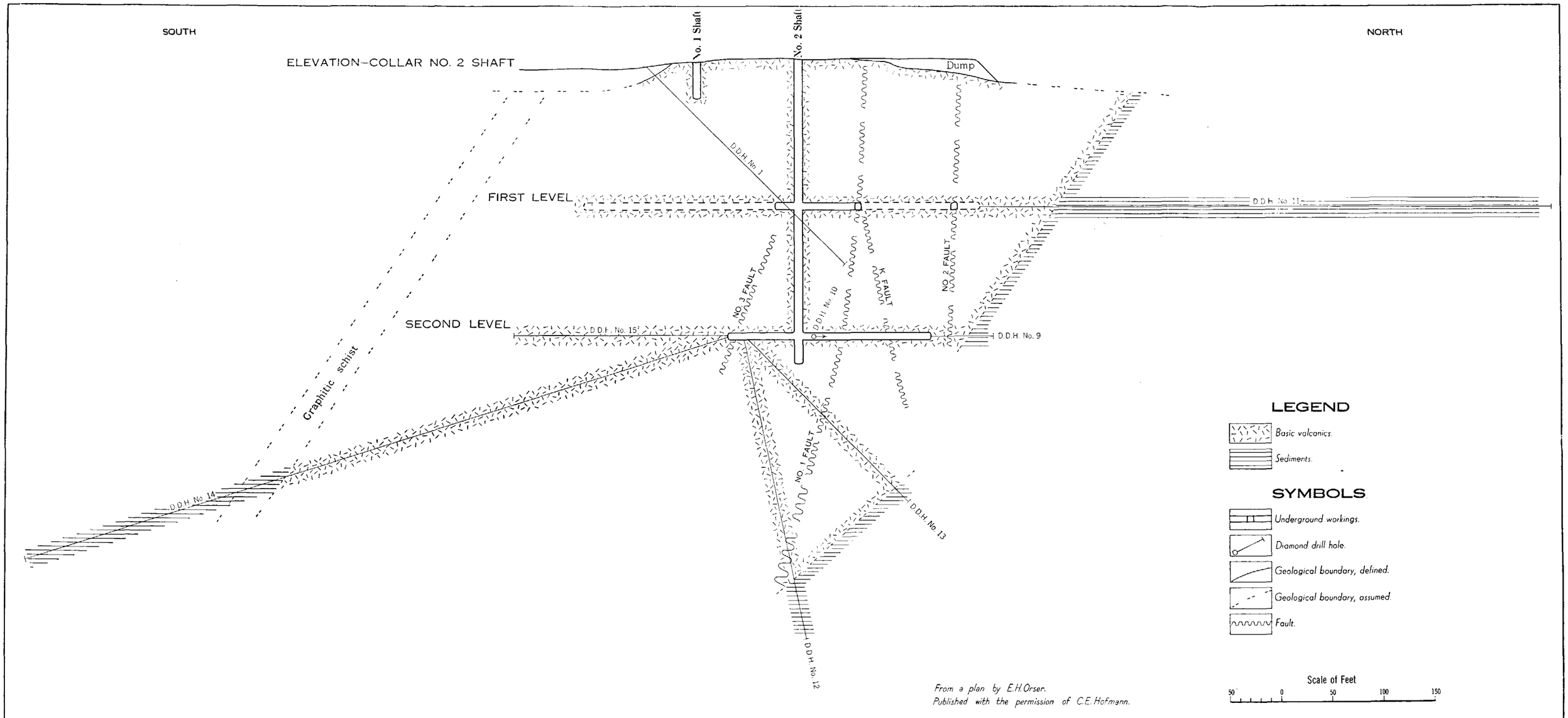
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Plan showing the Underground Workings of Teddy Bear Valley Mines, Limited.



From a plan by E.H. Orser.
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Vertical Section along the Centre Line on No. 2 Shaft of Teddy Bear Valley Mines, Limited.





