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1963

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MISCELLANEOUS NON-METAL MINES
1963

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EXPLANATORY NOTES

Establishment

The reporting unit in the Census of Mines, Quarries and Oil Wells is the **establishment**. Beginning with the 1961 Census, the establishment is defined as follows:

The smallest unit which is a separate operating entity capable of reporting all the following:

- Materials and supplies used,
- Goods purchased for resale as such,
- Fuel and power consumed,
- Number of employees and their pay,
- Inventories,
- Shipments or sales.

The establishment is to be distinguished from smaller subdivisions or departments which do not have records which permit them to report all items required of an establishment. Prior to 1961, some establishments were required to submit two or more separate reports when they were engaged in operations which were classifiable to different industries. Beginning with 1961, separate reports for such operations will be required only in cases where accounting records can provide all the elements of principal statistics enumerated above. Special reporting arrangements were made with respondents when the acceptance of combined reports would

have seriously affected the statistics for particular industries or areas. Where continuity of industry statistics was affected by this change in reporting procedures, adjustments to the data were made back to 1957 in order to maintain comparability of the series for recent years.

A mining establishment is typically a mine, mine/mill, quarry, pit or bog principally engaged in mining operations. Prior to 1961, the Census of Mines, Quarries and Oil Wells attempted to cover the mining activities of all establishments, whether or not they were principally engaged in mining operations. Beginning with the 1961 Census, establishments (accounting entities) which are not primarily engaged in mining are no longer included as mining establishments in the basic industry statistics. Again adjustments to the industry statistics were made to reflect the removal of such reporting units for the period 1957-1960. These reporting units are now listed as establishments in other Bureau industry surveys, such as Wholesale Trade, Construction, etc. In order, however, to maintain complete coverage of certain commodity items produced mainly in mining establishments, many non-mining establishments are now surveyed for commodity information only and the latter are included in the appropriate tables of industry reports.

SYMBOLS

The following standard symbols are used in Dominion Bureau of Statistics publications:

- .. figures not available.
- ... figures not appropriate or not applicable.
- nil or zero.
- amount too small to be expressed.
- ▮ preliminary figures.
- ⋆ revised figures.

SUMMARY

Canadian operators which produce certain industrial or non-metallic minerals, and which are usually too few in number to permit the publication separately of complete details of operations, have been classified for statistical purposes to a group which has been designated as the Miscellaneous Non-metal Mining Industry. Minerals or primary mineral products recovered (or deposits developed) by this industry during 1963 included barite, brucite, diatomite, fluorspar, gemstones, grindstones, iron oxides, magnesitic dolomite, lithia, potash, pozzolan, and sodium sulphate. The general statistics also include some data on development work done on pyrite deposits.

During 1963 there were 24 mines or plants (19 producers and 5 non-producers) classified as establishments in the industry "Miscellaneous Non-metal Mines." Gross value of the producers' shipments amounted to \$35,028,521 in 1963 com-

pared with \$15,148,243 in the preceding year. The value of containers was included in these figures. The industry employed an average of 1,361 persons to whom \$6,988,073 were paid as salaries and wages. Fuel cost \$1,524,530 and 116,499,928 kwh. of electricity were purchased for \$1,072,954. Process supplies cost \$2,404,055 and the containers used were valued at \$115,181. Freight paid amounted to \$317,247.

The report also includes data for arsenious oxide, titanium dioxide, pyrite, pyrrhotite and sulphur in smelter gases; these are by-products of the metal mining and smelting industries, thus output, employment, etc., are credited to the producing industries. Also, for convenience, the statistics for the mica mining industry are published in this report, although they are not included in the figures for the Miscellaneous Non-metal Mining Industry.

**TABLE 1. Principal Statistics: Miscellaneous Non-metal Mines,
Significant Years,¹ 1921-59**

Basis: Standard Industrial Classification in use prior to 1960

Year	Mines or plants	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of production	Net value of production ²
	number				dollars		
1921 .....	..	..	..	..	..	..	..
1929	38	506	545,216	79,463	..	1,502,574	..
1931	34	275	297,394	205,149	..	1,247,697	..
1933	36	297	241,999	176,512	..	913,380	..
1937	53	530	658,723	321,919	228,953	1,687,317	1,136,445
1939	47	465	539,143	260,652	133,705	1,358,922	964,565
1941	62	683	878,700	482,043	315,521	2,442,748	1,645,184
1944	52	865	1,500,250	706,929	462,999	3,986,579	2,797,719
1946	43	911	1,582,846	822,546	493,642	4,248,107	2,859,009
1949	37	1,160	2,632,808	1,011,021	576,919	6,236,811	4,461,930
1951	39	1,359	3,699,789	1,471,290	1,063,878	8,914,360	6,209,886
1954	47	1,343	4,839,822	1,419,441	1,202,247	10,421,552	7,716,472
1956	60	1,773	6,069,934	2,078,573	1,936,327	15,813,812	11,692,288
1957	53	1,597	5,737,254	1,932,295	1,598,110	14,227,781	10,865,027
1958	43	1,240	4,838,000	1,696,159	1,087,789	12,058,468	9,208,809
1959	39	1,425	5,756,818	1,876,804	1,564,067	13,965,675	10,456,674

¹ During the years under review there have been changes in the methods of compilation. Some commodities have been added to this group and some commodities have been removed to form a separate classification.

² Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

TABLE 1 A. Principal Statistics: Miscellaneous Non-metal Mines, 1959 - 63¹

Basis: Revised Standard Industrial Classification and New Establishment Concept

Year	Estab- lish- ments	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of production	Net value of production ²
	number		dollars				
1959	39	1, 425	5, 756, 818	1, 876, 804	1, 564, 067	13, 965, 675	10, 456, 674
1960	46	1, 122	4, 548, 789	1, 859, 585	1, 004, 699	10, 773, 462	7, 600, 509
1961	35	1, 098	4, 682, 743	1, 768, 707	1, 525, 703	11, 457, 737	7, 863, 064
1962	27	1, 156	5, 356, 350	1, 874, 020	1, 476, 503	15, 148, 243	11, 510, 536
1963	23	1, 361	6, 988, 073	2, 597, 484	2, 519, 236	35, 028, 521	29, 594, 554

¹ During the years under review there have been changes in the methods of compilation. Some commodities have been added to this group and some commodities have been removed to form a separate classification. Natural Iron Oxides Industry figures were included in 1957-63.

² Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

TABLE 2. Producers' Shipments of Miscellaneous Non-metallic Minerals, 1962 and 1963

Item	1962		1963	
	Quantity	Value	Quantity	Value
		\$		\$
Barite	226, 600	2, 123, 964	173, 503	1, 693, 119
Diatomite	211	10, 228	798	26, 830
Fluorspar .....	..	1, 870, 184	..	1, 976, 006
Garnet	—	—	—	—
Gemstones .....	..	..	16, 000	15, 529
Grindstones	10	2, 000	10	2, 000
Iron oxides	771	58, 363	978	74, 505
Lithia	499, 736	558, 654	644, 354	682, 029
Magnesitic dolomite, brucite .....	..	3, 431, 873	..	3, 439, 890
Potash, K ₂ O .....	..	3, 000, 000	626, 860	22, 500, 000
Pozzolan .....	..	4, 927	..	17, 994
Sodium sulphate	246, 672	3, 954, 273	256, 914	4, 121, 114
Totals .....	...	15, 014, 466	...	34, 549, 016
Pyrite, pyrrhotite ¹	517, 308	1, 879, 584	476, 438	1, 643, 629
Sulphur ² in smelter gases	292, 728	3, 089, 537	353, 243	3, 488, 181
Sulphur, elemental ³	695, 098	9, 286, 999	1, 249, 887	13, 380, 182
Arsenious oxide ¹	80	6, 832	94	7, 498
Titanium dioxide, etc. ¹ .....	..	11, 573, 862	..	13, 806, 608
Mica	602	84, 598	592	44, 284

¹ General statistics relating to pyrite, arsenious oxide and titanium dioxide are included with the smelting industry.

² Data for 1962 and 1963 include sulphur in smelter gases in the form of acid or sulphur dioxide. General statistics relating to production of sulphur are included with those of the metal mining and non-ferrous smelting industries.

³ Produced from sour natural gas; includes sulphur recovered in processing nickel-copper matte.

Note: Value of containers is excluded.

TABLE 3. Consumption¹ of Non-metallic Minerals, 1962 and 1963

	Used during	
	1962	1963
	tons of 2,000 lbs.	
Arsenic trioxide (refined)	260	285
Barite ² - Lump	2,580	6,610
Ground - Natural	1,440	2,985
Bleached	976	...
Bentonite ³ - Swelling (also called sodium or Wyoming bentonite)	32,440	59,162
Non-swelling (also called calcium or Southern decolorizing bentonite)	5,893	8,162
China clay (Kaolin)	121,290	130,122
Diatomite (diatomaceous earth, Kieselguhr, Celite, etc.):		
Ground or powdered - Natural	8,764	9,434
Calcined	1,480	1,544
Other	16	101
Feldspar	8,802	6,509
Fluorspar - Metallurgical grade (lump)	116,121	131,698
Ceramic	1,093	2,047
Acid	6,480	9,093
Fullers earth	1,547	2,294
Graphite - Natural	3,524	3,824
Mica - Muscovite - Sheet, splittings	117	142
Wet ground	576	693
Other ground	729	777
Nepheline Syenite	42,730	42,824
Phosphate rock	1,112,489	1,166,573
Potash (muriate of potash) - Agricultural	169,741	158,963
Chemical .....	..	..
Silica - Lump (quartz, quartzite, sandstone)	685,290	772,239
Sand (including foundry sand but excluding concrete sand)	1,239,168	1,205,433
Flour or pulverized	17,375	36,444
Sodium sulphate - Lump crude	134	206
Salt cake	179,844	221,204
Glauber's salts	1,095	591
Sulphur - Elemental	486,904	525,709
Liquid sulphur dioxide	96,659	102,785
Talc, soapstone, pyrophyllite	38,399	39,423
Whiting or whiting substitute:		
Ground chalk, whiting, calcium carbonate, precipitated chalk	31,001	36,359
Whiting substitute, ground limestone and ground marble	54,326	59,119
Sold to oil well drilling firms: ³		
Barite	8,873	8,376
Bentonite	30,034	34,459

¹ Due to a difference in coverage and concept the data in this table will differ from those relating to "Available consumption" as reported by specified industries shown in subsequent tables, e.g. Tables 9, 14, 19, 20, etc.

² In addition, barite and bentonite was sold to oil well drilling firms. See end of table.

³ Not included in the consumption of barite and bentonite above.

TABLE 4. Employees and their Earnings: Miscellaneous Non-metal Mines, 1959-63

Year	Employees					Man-hours worked (all employees)	Earnings		
	Office and administrative		Workmen		Total		Office and adminis- trative	Workmen	Total
	Male	Female	Male	Female					
	number					dollars			
1959	197	20	1,205	3	1,425	2,946,865	1,262,671	4,494,147	5,756,818
1960	194	22	905	1	1,122	2,283,721	1,144,583	3,404,206	4,548,789
1961	199	27	871	1	1,098	2,322,097	1,219,901	3,462,842	4,682,743
1962	214	24	917	1	1,156	2,514,435	1,343,528	4,012,822	5,356,350
1963	313	31	1,015	2	1,361	2,926,228	2,388,009	4,600,064	6,988,073

TABLE 5. Workmen, by Months: Miscellaneous Non-metal Mines, 1962 and 1963

Month	1962					1963				
	Mine			Mill	Total	Mine			Mill	Total
	Surface		Under-ground			Surface		Under-ground		
	Male	Female				Male	Female				Male
	number									
January	225	1	205	352	783	344	2	210	435	991
February	215	1	208	356	780	327	2	219	435	983
March	226	1	213	334	774	297	2	227	433	959
April	233	1	215	333	782	307	2	228	460	997
May	269	1	221	345	836	322	2	221	469	1,014
June	301	1	222	371	895	319	3	221	469	1,012
July	302	2	226	380	910	332	1	206	455	994
August	324	3	235	386	948	344	1	213	466	1,024
September	407	2	244	448	1,101	329	1	228	455	1,013
October	406	2	247	462	1,117	344	1	249	478	1,072
November	399	1	194	456	1,050	338	1	256	485	1,080
December	392	1	190	436	1,019	337	1	258	471	1,067
Averages	310	1	219	388	918	328	2	228	458	1,017
Total man-hours worked....					1,998,212					2,207,030

TABLE 6. Fuel and Electricity Used: Miscellaneous Non-metal Mines, 1962 and 1963

Kind	1962		1963	
	Quantity	Cost at plant	Quantity	Cost at plant
		\$		\$
Bituminous coal (a) From Canadian mines..... short ton	716	11,295	657	10,614
(b) Imported "	342	6,395	552	10,322
Sub-bituminous coal (from Alberta mines only)	—	—	—	—
Anthracite coal..... short ton	—	—	9	248
Lignite coal "	11,900	44,625	9,408	35,280
Coke (for fuel only)	—	—	—	—
Gasoline (includes gasoline used in cars and trucks) Imp. gal.	404,122	132,980	238,549	87,619
Kerosene or coal oil..... "	2,349	788	1,513	400
Fuel oil and diesel fuel "	7,016,907	724,875	8,440,370	777,874
Wood (cords of 128 cubic feet of piled wood) cord	4	32	40	360
Gas (a) Liquefied petroleum gases (propane, etc.)..... Imp. gal.	410,199	114,936	1,768	604
(b) Other manufactured gas	—	—	—	—
(c) Natural gas M cu. ft.	792,733	222,059	2,263,668	601,209
Other fuel	—	—	—	—
Electricity purchased for power and lighting..... kwh.	49,252,279	616,035	116,499,928	1,072,854
Electricity purchased for other purposes	—	—	—	—
Totals (cost only) .....	...	1,874,020	...	2,597,484
Electricity generated (a) For own use kwh.	6,431,933	...	6,534,862	...
(b) For sale..... "	72,322	1,610	74,784	1,665

ARSENIOUS OXIDE

During 1963 the producers of arsenious oxide (arsenic trioxide) shipped 187,450 pounds valued at \$7,498. Included in the output was some arsenic which was recovered from foreign ores. The Canadian and foreign ores are mixed for treatment and separate data are not available.

Production in Ontario was at the smelter of the Cobalt Refinery, Cobalt, Ont. which treated the cobalt-silver concentrates from Cobalt and Gowganda, and other custom ores.

Compounds of arsenic such as lead arsenate and calcium arsenate are used in insecticides,

rodenticides and other pesticides. Other uses are: as a decolourizer in glass, as preservatives and depilatories in the tanning of hides, in the chemical debarking of trees; in pyrotechnics; and in paint pigments.

The auriferous quartz ores exported to the United States from British Columbia mines contain considerable amounts of arsenic, but no data are available on the possible recovery of this arsenic and since the Canadian gold mines receive no payment for the arsenic content, it is not credited as commercial production.

TABLE 7. Producers' Shipments, Imports and Exports of Arsenic, 1962 and 1963

	1962		1963	
	Quantity	Value	Quantity	Value
	lb.	\$	lb.	\$
Producers' shipments:				
White arsenic (crude and refined) ¹	160,750	6,832	187,450	7,498
Imports:				
Arsenic acid	627,558	26,148	664,462	24,165
Arsenious oxide and arsenic sulphide	—	—	—	—
Sodium arsenate and sodium biarsenate	144,522	59,057	132,604	34,526
Arsenate of lead	43,450	8,230	63,840	11,829
Arsenate of lime	187,900	10,258	132,000	8,435
Exports:				
Arsenic .....	..	178	4,800	284

¹ Includes some arsenic recovered from foreign ores.

TABLE 8. Production, Imports and Exports of White Arsenic, 1954-63

Year	Production, crude and refined, but no duplication	Imports ¹	Exports	
			Refined	Crude
			pounds	
1954	1,180,350	—	1,422,600	—
1955	1,571,787	—	940,600	—
1956	1,790,381	16,320	1,168,100	—
1957	3,697,317	1,559	3,229,800	—
1958	2,323,320	—	1,703,200	—
1959	1,578,307	—	1,130,400	—
1960	1,724,326	—	1,054,200	—
1961	419,300	—	244,500	—
1962	160,750	—	100	—
1963	187,450	—	4,800	—

¹ Arsenious oxide and arsenic sulphide.

TABLE 9. Consumption of Refined White Arsenic, 1959-63

Industry	1959	1960	1961	1962	1963
	pounds				
Glass .....	...	224,663	219,934	179,163	172,404
Insecticides ¹	²	²	²	²	²
Metal rolling, casting, extruding	35,299	22,934	46,888	82,529	69,731
Miscellaneous chemicals	73,456	245,635	347,242	426,416	393,860
Totals accounted for .....	...	...	614,066	688,108	635,995

¹ Does not include arsenic acid (As₂O₅) imported for use in making insecticides, as follows: 1959, 595,674 pounds; 1960, 407,465 pounds; 1961, 406,892 pounds; 1962, 627,558 pounds; 1963, 664,262 pounds.

² Included with miscellaneous chemicals total.

TABLE 10. World Production of White Arsenic, by Countries

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
North America:					
Canada	789	862	209	80	94
Mexico	11,536	13,372	13,537	12,000 ³	10,779 ⁴
United States	5,189	⁴	⁴	⁴	⁴
South America:					
Brazil	367	233	64	164	323
Peru	524	433	388	572	683
Europe:					
Belgium (exports)	3,161	⁵	⁵	⁵	⁵
France	8,842	9,200	10,500	7,477	10,540
Germany:					
West (exports)	180	110	150	75	62
Greece	11	11 ⁵	3 ⁵	—	—
Italy	1,254	654	979	140	—
Portugal (exports)	596	810	330	634	622
Spain	320	435	343	234	163
Sweden	12,300	12,950	12,153	6,342	12,100
Asia:					
Japan	1,185	1,247	1,047	1,011	904
Africa:					
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	528	204	—	1,207	605
World totals (estimate)^{1,2}	46,800	57,300	55,200	45,200	51,700

¹ Arsenic is also produced in Argentina, Austria, China, Czechoslovakia, Finland, East Germany, Hungary, U.S.S.R. and United Kingdom, but there is too little information to estimate production.

² This table incorporates revisions of data published in previous white arsenic chapters.

³ Estimate.

⁴ Figure withheld to avoid disclosing individual company confidential data; includes in world total.

⁵ Data not available; estimate included in the world total.

Source: The "Minerals Yearbook" published by the United States Bureau of Mines.

BARITE

The producers of barite in Canada shipped 173,503 tons valued at \$1,693,119 in 1963 compared with 226,600 tons worth \$2,123,964 in the preceding year. Nova Scotia produced most of the nation's barite. The open pit operation is located near Walton at the head of the Bay of Fundy. Shipments are made by boat from Walton. In British Columbia barite was quarried at Brisco in the East Kootenay district, then shipped to a grinding plant at Lethbridge, Alberta. Shipments were made from Sheep Creek mines, to a grinding plant at Onoway, Alberta.

The principal use of barite is in oil-well drilling muds with bentonite and minor conditioning agents. Barite is used also as a pigment and filler in paints, rubber, linoleum and papers; in the manufacture of barium chemicals; as an additive to

glass batches; as an aggregate in concrete where additional weight is required (such as coatings for under water pipes), or where shielding is required against radiation such as in X-ray rooms or atomic energy plants.

Barium compounds are used widely in industry. Barium carbonate is used to reduce "dry house" scum on bricks; in pharmaceuticals; as a flux in the enamelling and ceramic trades; and in heat-treatment compounds. The chloride is used as a pigment in lithographic inks; in the purification of salt brine and in water treatment; as a mordant in dyeing textiles; and in many other applications. Other compounds include the hydrate, phosphate, oxide, sulphide, stearate and chlorate.

TABLE 11. Production of Barite, 1954 - 63

Year	Short tons	Value \$	Year	Short tons	Value \$
1954	221,472	2,003,796	1959	228,967	2,254,582
1955	253,736	2,277,166	1960	154,292	1,462,212
1956	320,835	3,031,034	1961	191,404	1,799,119
1957	228,048	2,992,913	1962	226,600	2,123,964
1958	195,719	2,196,384	1963	173,503	1,693,119

TABLE 12. Imports of Barite, 1962 and 1963

Imported from	1962		1963	
	Tons	Value \$	Tons	Value \$
United Kingdom	—	—	—	—
Germany, West	218	8,436	78	3,051
United States	2,209	106,455	3,752	192,887
Totals	2,427	114,891	3,830	195,938

TABLE 13. Exports of Barite, 1962 and 1963

Destination	1962		1963	
	Tons	Value \$	Tons	Value \$
Trinidad	18,368	332,260	15,680	290,080
Arabia	—	—	—	—
Colombia	—	—	—	—
Iran	—	—	—	—
Venezuela	—	—	3,920	33,318
United States	212,535	1,805,915	140,292	1,215,540
Totals	230,903	2,138,175	159,892	1,538,938

TABLE 14. Consumption of Barite, 1959 - 63

	1959	1960	1961	1962	1963
			tons		
By uses:					
Paints	901	902	984	1,244	1,854
Rubber goods	365	343	361	—	1
Glass	404	366	412	628	838
Oil-well drilling ¹	²	23,809	17,011	8,873	8,376
Miscellaneous chemicals	13	...	...	...	...

¹ See Table 3.² Not available in 1959.

TABLE 15. World Production of Barite, by Countries¹

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
North America:					
Canada	238,967	154,292	191,403	226,600	173,503
Cuba (exports)	—	—	—	—	—
Mexico	314,933	298,458	274,153	350,684	283,246
United States	867,201	771,318	731,381	886,964	803,106
Totals	1,421,101	1,224,068	1,196,937	1,464,248	1,259,855
South America:					
Argentina	19,842	26,987	31,476	13,819	15,558
Brazil	56,009	44,464	68,834	60,241	37,601
Chile	880	1,991	1,551	1,156	1,123
Columbia	11,000	8,000	11,272	8,800	11,600
Peru	105,557	120,800	122,538	126,271	137,600
Totals	193,288	202,242	235,671	210,287	203,482
Europe:					
Austria (marketable)	4,068	4,829	2,716	1,192	2,395
France	95,259	116,860	95,007	92,570	82,080
Germany West (marketable)	486,810	549,134	518,951	512,230	466,419
Greece	143,014	112,203	85,000	78,406	95,000
Ireland	9,157	11,704	4,659	22	10,192
Italy	133,734	157,925	155,999	134,388	117,505
Poland	12,400 ³	12,400 ³	41,161	49,841	50,400
Portugal	3,760	4,310	2,285	1,489	1,828
Spain	28,186	28,596	37,449	42,923	53,312
U.S.S.R. ³	130,000	140,000	165,000	200,000	220,000
United Kingdom ⁴	68,408	67,431	91,677	84,754	61,066
Yugoslavia	118,267	120,691	114,872	114,379	115,176
Totals^{1,3}	1,270,000	1,360,000	1,350,000	1,350,000	1,310,000
Asia:					
Burma	1,120	1,792	2,248	4,462	—
China ³	55,000	65,000	90,000	90,000	100,000
India	14,939	14,976	17,325	36,004	41,129
Iran ⁵	1,904	14,330	20,900	16,500	16,500
Japan	21,331	25,184	32,243	42,016	41,360
Korea:					
North	16,500	45,000	60,000	65,000	75,000
South	—	220	770	1,014	3,040
Pakistan	569	709	489	3,164	5,330
Philippines	186	6,198	2,109	459	1,008
Turkey	2,513	1,653	—	2,094	1,081
Totals	114,000	175,000	226,000	261,000	284,000
Africa:					
Algeria	24,038	61,564	33,883	13,417	7,518
Morocco:					
Southern Zone	40,574	92,945	90,591	98,980	104,228
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	239	—	—	—	1,953
South Africa Republic of	2,355	1,878	1,962	1,873	2,704
Swaziland	461	200	454	68	93
United Arab Republic (Egypt Region)	2,017	2,988	1,734	1,355	4,545
Totals	69,684	159,585	128,624	115,693	121,041
Oceania:					
Australia	6,960	12,787	21,523	14,038	9,206
World totals (estimate)^{1,2}	3,080,000	3,130,000	3,160,000	3,420,000	3,190,000

¹ In addition to countries listed, barite is produced in Bulgaria, Czechoslovakia and East Germany, but production data are not available. Estimates included in total.

² This table incorporates a number of revisions of data published in previous barite chapters.

³ Estimate.

⁴ Includes witherite.

⁵ Year ended March 20, of year following that stated

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

CORUNDUM

No corundum has been produced in Canada since October, 1946, when treatment of the old tailings at the Craigmont property, Renfrew county, Ontario, for the recovery of corundum was completed. This operation was undertaken during the war at the request of the United States Government. During the two years of operation about 2,600 tons of concentrate were shipped from the Craigmont property to American abrasive Company, Westfield, Massachusetts, the only handler of corundum on the continent.

The main and only zone from which production has been obtained is in a belt 100 miles long and

6 miles wide, in Haliburton, Hastings and Renfrew counties in Ontario. Several of the numerous deposits examined in 1961 contain fair amounts of corundum, the most promising being an extensive deposit in Monteagle township on the east side of the York River, about 10 miles northeast of Bancroft. (For a description of corundum-bearing nepheline syenite belts of south and eastern Ontario, see report No. 820 "The Corundum Mineral Industry in 1945", page 53, issued by the Bureau of Mines, Ottawa.) It is doubtful, however, if the production of corundum alone would be economical and consequently marketable by-products would be necessary.

TABLE 16. World Production of Corundum, by Countries^{1,2}

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
India	236	276	363	332	725
Southern Rhodesia	2,799	3,843	2,792	3,348	5,941
South Africa, Republic of	622	123	159	349	79
World totals (estimate) ^{2,3}	8,000	9,000	8,000	9,000	11,000

¹ Corundum is produced in U.S.S.R., data on production are not available, and estimate is included in the total.

² This table incorporated some revisions. Data do not add exactly to totals shown because of rounding where estimate figures are included in the detail.

³ Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

DIATOMITE

In 1963 the producers shipped 798 tons of diatomite which was valued at \$26,830. In the preceding year the production was 211 tons valued at \$10,228. All the diatomite recovered in the past three years came from deposits in British Columbia. The calcining plant in Nova Scotia was dismantled.

Diatomite, also known as diatomaceous earth and keiselguhr, consists of microscopically small, opaline silica, skeletal remains of organisms known as diatoms. The purest varieties of diatomite are chalklike in appearance, free from grit, porous, and friable and an apparent specific gravity under one when dry.

It is the physical properties of porosity and chemical inertness that account for most of the uses of diatomite. The principal uses are as a filtering

medium filler, and as an insulator against heat, cold and sound. Diatomite is important in many industries, such as sugar refining, liquor distilling, dry cleaning and water purification. For filtration the important considerations are size and shape of principal diatoms present, purity, and density of the consolidated material.

Diatomite is used as a filler in rubber, paper, asphalt products, plastics, explosives, insecticides, paints, and many other products. It is used as a concrete admixture and as the mild abrasive in metal polishes and dentifrices. Important properties of diatomite to be considered for such uses include: color, freedom from grit, low density, inertness, and particle size. Diatomite imparts bulk with little increase in weight, along with certain desirable physical properties to the end products.

It is being used successfully as insulation in a wide variety of applications, some of these being: boilers, kilns, furnaces, retorts, anens, fire-resistant safes, chill rooms, ice cellars, cold storage, and building walls. The important properties when used as insulation are porosity and structure and freedom from solid impurities.

Acceptance of diatomite by consumers depends mainly upon the physical properties of the mineral

in relation to its intended use. Microscopic examination can determine, in a general way, to what uses any particular material may be put.

The major Canadian use is in the manufacture of fertilizer, where it is used to coat pellets to prevent caking and sticking. The diatomite should be uncalcined, 95 per cent minus 325-mesh, with less than 5 per cent moisture content. The next major use is in filtration in sugar and brewing industries.

TABLE 17. Producers' Shipments of Diatomite, 1954 - 63

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1954	4	192	1959	5	100
1955	16	352	1960	44	1,430
1956	2	40	1961	214	8,817
1957	120	2,400	1962	211	10,228
1958	27	540	1963	798	26,830

TABLE 18. Imports of Diatomaceous Earth, 1962 and 1963

Imported from	1962		1963	
	Tons	Value	Tons	Value
		\$		\$
United Kingdom	—	—	—	—
Denmark	35	1,285	—	—
United States	26,063	1,379,453	26,612	1,406,073
Totals	26,098	1,380,738	26,612	1,406,073

TABLE 19. Consumption of Infusorial Earth in the Sugar Refining Industry, 1954 - 63

Year	Tons	Value	Year	Tons	Value
		\$			\$
1954	1,871	126,414	1959	2,113	167,117
1955	2,094	158,960	1960	2,218	191,213
1956	2,196	165,026	1961	2,089	188,703
1957	2,260	174,677	1962	2,093	188,850
1958	1,965	164,382	1963	2,317	219,089

TABLE 20. Consumption of Diatomaceous Earth in the Manufacture of Fertilizers, 1959 - 63

Year	Tons	Value
		\$
1959	10,628	570,837
1960	15,984	649,639
1961	11,575	664,021
1962	12,086	717,663
1963	15,771	780,306

TABLE 21. World Production of Diatomite, by Countries¹

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
North America:					
Canada	5	44	214	211	798
Costa Rica	2,425	2,425	717	827	2,000 ³
Guatemala	—	—	—	—	—
Nicaragua	1,887	2,249	2,976	1,414	1,760 ³
United States	449,789	482,202 ⁴	482,202 ⁴	482,202 ⁴	482,202 ⁴
South America:					
Argentina	4,829	117	1,286	180	3,797
Chile	—	—	—	—	—
Columbia	330	440	330	165	2,425
Peru	254	1,127	2,048	1,624	2,422
Europe:					
Austria	4,492	4,431	5,993	4,613	4,339
Denmark:					
Diatomite ⁵	18,200	17,600	21,500	22,000	22,000
Moler ^{5,3}	205,000	204,300	212,900	230,800	212,000
Finland	1,520	1,457	805	1,320	2,535
France ⁶	112,821	140,468	118,429	140,093	140,000 ³
Germany, West ⁷ (marketable)	55,737	51,138	72,200	67,800	98,530
Italy	57,099	51,888	63,050	63,000 ³	62,379
Portugal ⁶	2,075	1,172	847	1,598	2,067
Spain ⁶	11,561	13,840	19,346	13,352	11,229
Sweden ⁷	764	472	732	252	330 ³
U.S.S.R. ⁶	275,000	300,000	330,000	330,000	340,000
United Kingdom	19,000 ³	16,553	24,920	22,800	22,800 ³
Yugoslavia	5,000 ³	5,000 ³	5,000 ³	5,000	11,600 ³
Asia:					
Korea, Republic of	1,865	2,646	1,989	758	1,867
Africa:					
Algeria	38,087	24,266	35,213	30,565	19,401
Kenya	4,041	3,791	3,537	3,207	3,677
Mozambique	—	103	397	385	—
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia ⁶	148	164	409	423	301
South Africa, Republic of	397	346	137	647	220
United Arab Republic (Egypt)	440	805	332	55	55 ³
Oceania:					
Australia	5,700	5,218	6,067	8,189	6,533
New Zealand	8,152	6,992	3,961	2,099	1,796
World totals (estimate) ^{1,2}	1,480,000	1,550,000	1,645,000	1,660,000	1,690,000

¹ Diatomaceous earth is believed to be produced also in Brazil, Bulgaria and Japan, but complete data are not available; estimates included in total.

² This table incorporates some revisions. Data do not add to totals shown due to rounding where estimated figures are included in the detail.

³ Estimate.

⁴ Average annual production 1960-62.

⁵ A clay-contaminated diatomite used principally for light weight building brick.

⁶ Includes tripoli.

⁷ Includes calcined.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

FLUORSPAR

During 1963 the value of fluorspar shipped amounted to \$1,976,006 compared with \$1,870,184 worth in the preceding year. Fluorspar is mined in Newfoundland and is produced as a by-product from a silica deposit in British Columbia. The Ontario mines did not operate in 1963.

In Canada fluorspar is consumed chiefly by the aluminum industry. The fluorspar is used to

make hydrofluoric acid, which in turn is used to make a flux (artificial cryolite). The flux, together with a small amount of fluorspar, dissolves alumina, and from this solution aluminum is recovered electrolytically. Fluorspar finds its other major use as a flux in the steel industry. In smaller but increasing amounts, fluorspar is used in the heavy-chemical, glass, enamelling, glazing, white-metal alloy and metal refining industries.

In the United States the largest consumer is the steel industry, which is followed by the hydrofluoric acid manufacturers. Hydrofluoric acid is used in large amounts by the aluminum, fluorine, chemical and uranium industries. It is worth noting that despite the steel-production increase of recent years, the rate of fluorspar consumption is growing faster in the manufacture of hydrofluoric acid than in the use of fluorspar as a flux in steel plants.

Standard fluxing gravel or lump grade for metallurgical purposes is usually sold on a specification of a minimum of 85 per cent CaF_2 and a maximum

of 5 per cent SiO_2 (silica) and 0.3 per cent sulphur. Fines should not exceed 15 per cent.

Ceramic or glass and enamel grades call for not less than 94 per cent CaF_2 with a maximum 3.5 per cent CaCO_3 (calcium carbonate), 3 per cent SiO_2 and 0.1 per cent Fe_2O_3 (ferric oxide). The material must be in mesh sizes ranging from coarse to extra fine.

Acid grade has the most rigid specifications. It must be over 97 per cent CaF_2 and not over 1 per cent SiO_2 . Like ceramic grade, it is used in powdered form.

TABLE 22. Production of Fluorspar, 1954-63

Year	Short tons	Selling value f.o.b. works	Year	Short tons	Selling value f.o.b. works
		\$			\$
1954	118,969	2,987,026	1959 .....	..	1,850,497
1955	128,114	2,708,437	1960 .....	..	1,921,820
1956	140,071	3,407,582	1961 .....	..	1,990,200
1957 .....	..	1,756,841	1962 .....	..	1,870,184
1958 .....	..	1,542,589	1963 .....	..	1,976,006

TABLE 23. Imports of Fluorspar, 1954-63

Year	Tons	Value	Year	Tons	Value
		\$			\$
1954	16,240	382,935	1959	26,588	718,774
1955	21,774	518,002	1960	59,690	1,286,107
1956	28,148	690,779	1961	32,769	914,221
1957	14,547	377,706	1962	67,847	2,052,056
1958	30,408	763,438	1963	66,798	1,946,257

TABLE 24. Consumption of Fluorspar, 1959-63

	1959	1960	1961	1962	1963
	tons				
By uses:					
Steel	20,063	21,029	24,310	33,824	41,822
Glass	462	733	739	1,157	1,968
Heavy chemicals	70,046	87,186	6,150	7,848	8,982
White metal alloys	9	..	..	..	..
Smelting and refining	1	1	77,874	78,034	84,995
Totals accounted for	90,580	108,948	109,073	120,863	137,767
By provinces:					
Nova Scotia	5,974	6,592	5,084	6,060	7,880
Quebec	68,012	86,125	82,945	83,718	92,849
Ontario	16,124	15,420	19,987	30,028	35,215
Manitoba and Saskatchewan	236	291	442	317	324
Alberta	154	379	271	400	693
British Columbia	80	141	344	340	806
Totals accounted for	90,580	108,948	109,073	120,863	137,767

¹ Included in heavy chemicals industry.

TABLE 25. World Production of Fluorspar, by Countries¹

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
North America:					
Canada	74,000 ³	77,000 ³	80,000 ³	75,000 ³	85,000 ³
Mexico	362,456	404,487	439,286	553,642	530,893
United States (shipments)	185,091	229,782	197,354	206,026	199,948
South America:					
Argentina	17,989	13,748	11,105	9,976	9,711
Europe:					
France	110,425	149,345	214,936	154,064	160,307
Germany:					
East ³	70,000	80,000	80,000	80,000	80,000
West	135,956	143,474	133,515	116,592	95,843
Italy	174,091	178,957	172,582	171,474	137,232
Spain	98,318	122,377	161,954	165,356	165,094
Sweden (sales)	2,995	3,212	3,542	3,900	3,307
United Kingdom ⁴	93,078	109,249	99,868	79,525	84,878
Asia:					
China ³	220,000	275,000	220,000	220,000	220,000
Japan	5,684	10,108	16,326	17,120	23,037
Korea North ³	33,000	33,000	33,000	33,000	33,000
Korea, Republic of	6,748	20,834	30,790	36,343	43,855
Mongolia, Outer	37,000 ³	44,400	42,000	41,800	55,000 ³
Thailand .....	..	3,814	5,241	11,806	32,221
Turkey	75	359	42	640	719
U.S.S.R. ^{3,5}	190,000	210,000	230,000	265,000	300,000
Africa:					
Morocco	—	—	869	546	7,000
Rhodesia and Nyasaland Federation of:					
Southern Rhodesia	10	19	—	20	343
South Africa, Republic of	70,317	113,550	95,862	111,683	57,761
South-West Africa	141	—	—	240	480
Tunisia	—	—	—	—	—
Oceania:					
Australia	528	8	—	—	17
World totals (estimate) ^{1,2}	1,900,000	2,230,000	2,275,000	2,365,000	2,340,000

¹ Fluorspar is produced in Bulgaria. Estimates are included in the total.² This table incorporates some revisions. Data do not add exactly to totals shown because of rounding where estimated figures are included in the detail.³ Estimate.⁴ Includes fluorspar recovered from old lead and zinc mine dumps.⁵ U.S.S.R. in Europe included in U.S.S.R. in Asia as deposits are predominantly in Asiatic Russia.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

GARNET

The garnet deposit near River Valley, Ontario was not operated by Industrial Garnet Co. Ltd. The garnets which were mined in the earlier years were used as abrasives for cutting granite building stone at the firms other stone plants.

The garnet group of minerals are aluminum silicates containing variable amounts of iron, magnesium, manganese calcium and chromium. They

are common constituents of many rocks, particularly metamorphic types, and some beach sands.

Garnet is used for making abrasive-coated papers and cloth, which in turn are used mainly in the wood-working and shoe-leather industries. Garnet flour of superfine grade is used as a partial substitute for corundum flour for polishing optical lenses.

GRAPHITE

There were no shipments of graphite during the year. With the exception of 1961 there have been no shipments since 1954 when the Black Donald mine closed in Renfrew county, Ontario.

Graphite has many uses, but is employed principally in foundry facings, lubricants, crucibles, retorts and stoppers, packings, pencils and crayons, paints and stove polish. Important quantities, mostly amorphous or artificial, are used in dry batteries, electrodes and commutator brushes. Flake from the Black Donald deposit is too small for crucible use and finished products consist mainly of amorphous foundry

grades, but include high-grade fine flake and dust sold for use in lubricants, packings and polishes. Prepared facings for the domestic foundry trade also are made.

In Canada, graphite is used chiefly in the foundry, dry battery, packings, lubricants and paint trades. Foundry needs are met in part by domestic production, and in part by plumbago from Ceylon. The battery trade uses mainly Mexican amorphous, and paint requirements are filled largely by low-grade amorphous flake. American imports of Canadian graphite are used chiefly in foundry facings, lubricants and pencils.

TABLE 26. Producers' Shipments of Graphite, 1948-63

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1948	2,539	239,931	1953	3,466	366,528
1949	2,147	212,496	1954	2,463	254,534
1950	3,586	390,815	1955-60	—	—
1951	1,569	231,167	1961	1	146
1952	2,040	255,732	1962-63	—	—

TABLE 27. Imports and Exports of Graphite,¹ 1961-63

	1961	1962	1963
	dollars		
Imports:			
Plumbago, not ground	47,450	58,351	86,991
Crucibles, plumbago, and covers	215,788	254,447	284,206
Plumbago, ground, and manufactures, n.o.p.	945,258	1,362,492	2,353,816
Exports:			
Graphite, crude and refined	—	—	—
Carbon and carbon electrodes	819,658	328,425	400,831

¹ Includes artificial graphite.

TABLE 28. Available Data on the Consumption of Graphite, 1959-63

	1959	1960	1961	1962	1963
	pounds				
By industries:					
Paints	63,507	82,400	53,385	48,577	60,722
Copper and alloy	65,950	49,577	58,711	94,421	119,445
Electrical apparatus	407,063	341,633	...	...	...
Heavy chemicals	834,174	1,239,385	657,355	651,047	955,130
Boilers and platework	17,023	20,166	19,317	1,330	1,219
Iron and steel mills	2,310,000	2,358,000	1,424,000	1,944,000	2,660,000
Agricultural implements .....	...	4,370	7,400	800	1,950
Railway rolling stock	67,535	49,212	44,600	23,849	8,000
Machinery	204,070	200	—	—	—
Iron foundries	762,320	726,845	790,127	738,664	789,671
Heating equipment	3,438	1,900	12	200	240
Refractories .....	...	400,000	372,000	328,000	372,000
Electrical industrial equipment .....	...	...	...	—	1,005
Batteries .....	...	...	299,115	503,157	316,039
Miscellaneous non-metallics .....	...	124,445	3,225	—	—
Miscellaneous metal fabricating	118,900	512,205	648,118	733,807	880,600
Motor vehicle parts .....	...	261,288	330,900	413,900	430,500
Communications equipment .....	...	2,665	1,054	540	262
Miscellaneous machinery and equipment	5,400	205,491	385,868	309,923	612,625
Miscellaneous electrical equipment .....	...	...	150	50	736,343
Miscellaneous chemicals .....	...	1,350	2,725	—	—
Truck and body and trailer .....	...	...	1,300	—	—
Smelting and refining .....	..	..	..	172,644	169,206
Totals for above industries	4,859,380	6,381,132	5,099,362	5,964,909	8,114,957
By provinces:					
Newfoundland	} 49,293	54,516	11,809	9,120	21,384
Nova Scotia					
New Brunswick					
Quebec	1,095,719	2,003,638	1,530,345	1,769,120	2,835,867
Ontario	3,237,866	3,820,453	3,070,985	3,767,981	4,460,073
Manitoba	168,049	156,856	89,253	108,067	76,288
Saskatchewan	1,250	35,110	136,159	1,954	1,650
Alberta	226,603	204,975	180,654	188,236	414,391
British Columbia	80,260	105,584	80,157	120,431	305,304
Totals accounted for	4,859,380	6,381,132	5,099,362	5,964,909	8,114,957

TABLE 29. World Production of Natural Graphite, by Countries

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
North America:					
Canada	—	—	1	—	—
Mexico	30,684	37,827	19,846	31,992	33,065
South America:					
Argentina	554	538	858	468	229
Brazil	1,334	1,430	1,592	1,775	1,775
Europe: ¹					
Austria	68,444	97,043	89,255	98,416	109,778
Germany, West	12,377	12,760	13,349	13,134	13,000 ³
Italy	3,457	4,098	4,484	3,703	1,884
Norway	5,396	6,437	6,300	7,222	8,400
Spain	457	288	303	—	—
Sweden	—	—	—	—	—
U.S.S.R. ³	50,000	50,000	55,000	60,000	60,000
Asia:					
Ceylon (exports)	8,816	10,107	10,016	9,665	9,280
China ⁴	45,000	45,000	45,000	45,000	45,000
Hong Kong	3,676	4,255	1,865	902	891
India	—	—	1,830	—	—
Japan	4,453	4,979	3,836	3,812	3,305
Korea:					
North ³	57,000	68,000	72,000	72,000	77,000
Republic of	91,045	101,777	98,892	204,032	374,428
Taiwan	621	551	882	880 ³	—
Africa:					
Kenya	635	1,113	—	—	—
Malagasy Republic	12,614	15,923	16,473	19,274	21,214
Morocco	132	—	—	—	—
South Africa, Republic of	617	894	963	1,308	671
South West Africa	—	—	—	—	—
Tanganyika	28	26	—	—	—
Oceania:					
Australia	—	—	—	—	—
World totals (estimate) ^{4,2}	410,000	480,000	455,000	590,000	780,000

¹ Graphite has been produced in Czechoslovakia but production data are not available; estimates included in total.

² This table incorporates a number of revisions of data published in previous graphite chapters.

³ Estimate.

⁴ Data not available, estimate by author of chapter included in total.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

GRINDSTONES, PULPSTONES AND SCYTHESTONES

Sandstone beds in Nova Scotia, New Brunswick and British Columbia contain material suitable for grindstones. The output is only from the New Brunswick coast where the stones are removed along the shore area of the Bay of Chaleur. Shipments during

1960 to 1963 amounted to 10 tons valued at \$2,000 for each year. There were 60 tons of grindstones valued at \$9,000 in 1959. Prior to 1959 there had been no shipments of grindstones since 1955.

TABLE 30. Production of Grindstones, Pulpstones and Scythestones, 1952-63

Year	Tons	Value	Year	Tons	Value
		\$			\$
1952	42	5,720	1959	60	9,000
1953	15	900	1960	10	2,000
1954	—	—	1961	10	2,000
1955	10	1,500	1962	10	2,000
1956-58	—	—	1963	10	2,000

TABLE 31. Purchases of Pulpstones by the Canadian Pulp and Paper Industry, 1953-63

Year	Number for 2 ft. wood	Value	Number for 2.5 ft. wood	Value	Number for 4 ft. wood	Value
		\$		\$		\$
1953	100	107,291	16	33,503	160	588,329
1954	78	120,549	18	41,158	201	703,596
1955	83	130,247	15	35,464	168	665,581
1956	109	152,475	15	37,517	200	841,206
1957	67	157,892	9	23,330	150	660,991
1958	37	83,991	9	23,168	108	477,795
1959	35	82,146	7	19,878	122	569,063
1960	51	125,793	10	24,039	140	697,876
1961 .....	..	..	..	..	178 ¹	..
1962 .....	..	..	..	..	174	..
1963 .....	..	..	..	..	187	..

¹ Includes stones for 2 ft. and 2.5 ft. wood.

IRON OXIDES

Iron oxide pigments are used also as colouring agents and fillers in the manufacture of imitation leather, shade cloth, shingle stain, paper and cardboard. Siennas and umbers are used in wood stains and wood fillers. The natural ochre is used as a pigment for linoleum and oilcloth; as a pigment in wood stains and wood fillers; and in colouring cement, stuccos and mortar.

Canadian producers of ochreous iron oxides shipped 978 tons valued at \$74,505 in 1963 compared

with 771 tons worth \$58,363 in 1962. In 1963 the major portion of the shipments was a higher grade milled calcined material.

The ochreous iron oxide used in the manufacture of paints is largely in the calcined form. However, a small quantity of natural iron oxides associated with clay-like materials in the form of umbers and siennas is also used as pigments in paints, both in the raw and calcinated state.

TABLE 32. Principal Statistics of the Natural Iron Oxides Industry, Significant Years, 1921-63

Year	Mines or plants	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of products	Net value of production ¹
	number				dollars		
1921	4	32	42,693	10,858	..	93,610	..
1929	4	48	47,324	13,564	..	115,932	..
1931	4	30	29,194	8,560	..	49,205	..
1933	4	22	15,631	5,755	..	53,450	..
1937	6	50	35,368	13,368	510	83,640	69,762
1939	7	38	26,916	8,094	100	88,418	80,224
1941	4	44	42,152	15,697	5,697	142,069	120,675
1944	6	55	49,876	19,115	6,700	150,250	112,765
1946	5	60	77,727	16,656	4,200	152,268	116,251
1949	8	44	73,111	20,692	4,424	207,887	167,481
1951	5	43	87,283	22,896	3,651	262,277	219,852
1954	3	31	67,564	21,822	3,904	186,856	150,871
1956	3	29	49,669	6,055	545	191,145	152,400
1957-63	²	²	²	²	²	²	²

¹ Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

² Data included in Miscellaneous Non-metal Mines. See Table 1 A.

TABLE 33. Production of Natural Iron Oxides, 1954 - 63

Year	Quantity	Value	Year	Quantity	Value
	short tons	\$		short tons	\$
1954	5,798	183,507	1959	1,235	108,286
1955	7,702	162,512	1960	909	76,780
1956	8,803	186,225	1961	808	68,199
1957	7,518	187,211	1962	771	58,363
1958	1,632	113,390	1963	978	74,505

TABLE 34. Imports and Exports of Ochres and Colours, 1962 and 1963

	1962		1963	
	Quantity	Value	Quantity	Value
	tons	\$	tons	\$
Imports:				
Orange and yellow pigments	414	860,523	539	1,110,314
Pigments color lakes, toners, n.o.p.	1,348	1,143,267	912	1,089,522
Exports:				
Iron oxides	1,865	365,582	2,219	432,158

TABLE 35. Consumption of Iron Oxides in Specified Canadian Industries, 1959 - 63

Year	Coke and gas		Paints and varnishes			
			Iron oxide pigments		Ochres, siennas and umbers	
	Quantity	Value	Quantity	Value	Quantity	Value
	tons ¹	\$	tons	\$	tons	\$
1959	100	1,211	1,889	442,477	138	40,281
1960 .....	..	..	1,858	440,614	150	48,241
1961 .....	..	..	1,755	434,206	130	45,481
1962 .....	..	..	1,955	469,534	150	56,025
1963 .....	..	..	2,009	520,010	168	74,478

¹ Oxide and purifying materials.

LITHIA

During 1963 the producers of lithia shipped 644,354 pounds valued at \$682,029 compared with 499,736 pounds worth \$558,654 in 1962. These figures on quantities are the lithia or lithium oxide content of spodumene concentrates exported for processing and of lithium compounds. The Quebec Lithium Corporation operated the chemical plant which produced lithium carbonate and other lithium chemicals. The mine, mill and chemical plants are located at Barraute, Quebec.

Lithium compounds find their most important applications in the ceramic industry and in the manufacture of lubricating greases. Practically all lithium concentrates are converted chemically to lithium carbonate or hydroxide, the usual basic compounds used in industry. For chemical processing, the only specification available is for the spodumene that Quebec Lithium Corporation is exporting. Four and a half per cent lithia is required as a minimum in the concentrate. However, practically all producers of lithium compounds either own or have a share in mining properties from which they obtain concentrates; standard specifications have, therefore, not been established and grades are a matter of individual negotiation.

Lithium greases, first evolved in 1943, came to play an important role in lubrication wherever operational extremes of temperature were experienced, as they maintain their lubricating qualities between -60° and +320°F and, moreover, have excellent water-insolubility characteristics. In wartime, lithium greases were invaluable for aircraft engines. Since the war their industrial use has grown rapidly, as their unique properties make possible the production of multi-purpose greases, simplifying both manufacture and application.

In ceramics, lithia serves primarily as a flux, permitting the development of low-temperature ceramic bodies with the attendant benefits of refractoriness, fuel economies and wider colour use. It also makes possible the production of glass transparent to ultraviolet light for use in germicidal

lamps. Lithium compounds reduce the maturing temperature and increase the fluidity and gloss of glass, glazes and enamels, facilitate production of certain glasses of high electrical resistance and have many other desirable effects that render them of great benefit in the field of ceramics.

Lithium as a metal has so far had limited application. Its principal use appears to be as a scavenger of impurities in refining non-ferrous metals and as a grain-refining agent. Only very small amounts are added for these purposes. Lithium alloys of magnesium, aluminum, copper, lead and zinc are under development and have promise. The Aluminum Company of America announced during the year the development of a lithium-aluminum alloy which will maintain high strength up to 400°F.

The use of lithium in nuclear-energy production and as a source of fuel for rockets and guided missiles has received much publicity, and speculation as to its exact function has been widespread. Little information is available in either case, but from scientific publications it has become generally known that tritium, a reported constituent of the hydrogen bomb, is obtained by bombarding the lithium-6 isotope with neutrons. The association of lithium with solid fuels is in the form of lithium hydride. The chemical compound furnishes a readily available source of hydrogen, which is a high-energy fuel.

Other common applications include the use of lithium hydroxide as a constituent of the electrolyte in alkaline storage batteries; of lithium chloride and bromide in air-conditioning units, and in refrigeration systems; of lithium fluoride as a flux in the welding and brazing of aluminum; and of compounds in the production of single-crystal optical units, in the control of reactions leading to the formation of alkyd resins for use in paints and in the manufacture of dry-cell batteries which will function at extremely low temperatures where normal cells are inoperative.

TABLE 36. Producers' Shipments of Lithia, 1955-63

Year	Pounds	Value
		\$
1955	114,376	61,752
1956	4,789,380	2,643,950
1957	5,140,257	2,827,143
1958	3,853,322	2,047,880
1959	2,756,280	1,422,153
1960	204,666	84,135
1961	536,190	392,871
1962	499,736	558,654
1963	644,354	682,029

TABLE 37. World Production of Lithium Minerals, by Countries

Country	Mineral produced	1959	1960	1961	1962	1963
short tons						
North America:						
Canada ¹	Spodumene	1,378	103	268	250	322
United States	Lithium minerals					
South America:						
Argentina	Lithium Minerals	187	153	443	496	1,285
Brazil	Spodumene (exports)	468			165	28
	Amblygonite (exports)	590	55	—	—	—
Surinam	Amblygonite	—	—	475	827	568
Europe:						
Spain	Amblygonite	—	29	19	—	—
Africa:						
Mozambique	Lepidolite	99	—	170	302	115
Rhodesia and Nyasaland, Federation of:						
Southern Rhodesia	Eucryptite	57,901 ³	1,334	1,879	866	1,164
	Amblygonite		86	35	52	
	Lepidolite		15,485	24,037	21,244	16,157
	Petalite		63,335	27,698	21,704	29,946
	Spodumene		7,690	1,627	1,496	2,235
Ruanda-Urundi	Amblygonite	2,965	2,569	1,854	359	406
South Africa, Republic of	Lithium minerals	10	173	260	1,263	417
South-West Africa	Amblygonite	242	161	136	141	128
	Lepidolite	2,168	972	1,418	1,781	86
	Petalite	2,787	3,909	2,540	1,008	865
Uganda	Amblygonite	—	—	25	22	53
Oceania:						
Australia	Petalite	—	1	108	94	437
	Amblygonite	—	17	26	31	22
	Spodumene	—	—	6	26	24

¹ Tons of lithia in spodumene concentrates.² Figure withheld to avoid disclosing individual company confidential data.³ Exports.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

MAGNESITE AND BRUCITE

Magnesitic dolomite is mined at Kilmar, Argen-teuil county, Quebec, by Canadian Refractories Limited, and is processed there into basic refractory products. These include dead burned grain material, bricks and shapes (burned and unburned), and finely-ground refractory cements.

Brucitic limestone, a rock composed of granules of the mineral brucite (magnesium hydroxide) thickly distributed throughout a matrix of calcite, is quarried from large deposits near Wakefield, Quebec,

by Aluminum Company of Canada, Limited, and is processed there for the recovery of magnesia and lime. A minor portion of the magnesia was formerly used by the company to make magnesium metal at Arvida, Quebec. The magnesium plant is now closed. Most of the magnesia output is sold for the manufacture of basic refractories, by some is used as a soil conditioner. Hydrated lime, the co-product, is produced in the process of recovering the magnesia and is sold for the various purposes for which lime is used.

TABLE 38. Production of Magnesitic Dolomite, 1954 - 63

Year	Value	Year	Value
	\$		\$
1954	1,909,163	1959	3,050,779
1955	2,151,820	1960	3,279,021
1956	2,783,181	1961	3,064,403
1957	3,046,298	1962	3,431,873
1958	2,529,161	1963	3,439,890

Note: Above figures includes the value of brucite shipped, dead burned magnesitic dolomite and serpentine used or sold.

TABLE 39. Magnesite and Dolomite Used in the Canadian Primary Iron and Steel, 1958-63

Year	Calcined dolomite		Dolomite, crude		Magnesite	
	Short tons	Value	Short tons	Value	Short tons	Value
		\$		\$		\$
1958	75,192	1,980,254	301,960	785,226	6,186	414,789
1959	90,403	2,351,634	331,398	961,531	9,626	662,193
1960	83,121	2,162,556	500,687	1,326,958	10,551	725,458
1961	82,565	2,112,961	604,074 ^r	1,273,530 ^r	8,138	560,650
1962	90,269	2,315,866	667,613	1,257,587	15,320	1,029,598
1963	100,415	2,565,130	707,272	1,347,127	13,588	966,958

TABLE 40. World Production of Magnesite, by Countries¹

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
North America:					
United States	594,307	498,528	603,656	492,471	527,655
South America:					
Brazil	53,378	69,793	84,549	103,348	99,536
Colombia	—	—	110	110	276
Europe:					
Austria	1,324,106	1,791,701	1,982,704	1,771,863	1,447,099
Czechoslovakia ³	440,000	470,000	550,000	580,000	580,000
Greece	123,566	206,451	163,573	299,789	275,000 ³
Italy	7,562	6,584	7,478	9,275	7,512
Norway	—	—	—	—	—
Poland	18,200	23,900	29,900	37,600	29,300
Spain	44,569	53,239	91,702	78,691	93,315
U.S.S.R. ³	—	2,650,000	2,760,000	2,760,000	2,980,000
Yugoslavia	269,851	277,613	301,002	411,561	454,107
Asia:					
China ³	880,000	1,100,000	770,000	880,000	990,000
India	174,129	172,325	231,203	234,669	258,564
Korea North ³	55,000	55,000	220,000	550,000	880,000
Pakistan	443	486	180	336	968
Turkey	—	17	2,414	10,736	19,750
Africa:					
Kenya	3,145	33	1,930	—	288
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	—	8,031	13,880	11,620	12,068
South Africa, Republic of	58,883	66,793	67,732	102,352	108,309
Tanganyika (exports)	118	126	46	—	94
Oceania:					
Australia	67,856	69,626	110,651	69,654	63,780
New Zealand	—	891	650	711	875
World totals (estimate) ^{1,2}	6,100,000	7,850,000	8,300,000	8,750,000	9,200,000

¹ Quantities in this table represent crude magnesite mined. Magnesite is also produced in Canada and Bulgaria, but data on tonnage output are not available; estimates included in total.

² This table incorporates some revisions.

³ Estimate.

⁴ Data not available; estimates included in total.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

MAGNESIUM SULPHATE

Natural hydrous magnesium sulphate (Epsom salts of Epsomite) occurs in deposits in lake bottoms or in solution in brine lakes in British Columbia. In Saskatchewan it is found associated with sodium sulphate. Attempts have been made to produce refined salts, and a number of years ago there was a considerable production from several of the "lakes" in British Columbia. Experimental shipments have been made also from one of the lakes in Saskatchewan.

Canada's output of magnesium sulphate has come chiefly from a deposit in Basque, British Columbia, production from which was discontinued in the autumn of 1942. The salt was refined at Ashcroft, 15 miles south of the deposit, and the grade of the product was high. The refinery, now owned by Ashcroft Salts Company Limited, had a capacity of 10 tons of salt a day. There are a number of other occurrences in British Columbia, near Clinton, north of Kamloops, and in Kruger's Pass, south of Penticton.

In Saskatchewan, two lakes south of Wiseton contain brines high in magnesium sulphate, and

Muskiki Lake, just north of Dana, contains brine high in magnesium and sodium sulphates, which at certain times of the year crystallizes into a bedded deposit with layers of both salts.

In the chemical industries Epsom salts has many uses. It is employed for tanning and in dyeing, and for textile and medicinal use. Magnesium sulphate is used in the paper industry for weighting paper. In the sole leather industry it is used to obtain a clean shiny cut, and it also helps to retain moisture in the leather and increases its weight. Magnesium salt is used to a small extent in the dyeing industry. In some cases it is used in the treatment of leather to increase the fastness of the colour in washing. It is used extensively and in large quantities in medicine and for various purposes in the manufacture of textiles. In bleaching wool, magnesium sulphate is added to destroy the corrosive effect of sodium peroxide. It is also used for weighting textile fabric, especially silk. Mixed with gypsum and ammonium sulphate, it is used in the manufacture of non-inflammable fabrics.

TABLE 41. Production of Natural Magnesium Sulphate,¹ 1941-63

Year	Tons	Value
1941	265	\$ 7,343
1942	1,140	38,760
1943-63	—	—

¹ Produced entirely in British Columbia.

TABLE 42. Imports of Magnesium Sulphate, 1954-63

Year	Tons	Value	Year	Tons	Value
		\$			\$
1954	2,365	70,374	1959	2,721	70,697
1955	2,376	69,009	1960	2,434	63,998
1956	2,614	69,517	1961	2,591	69,524
1957	2,558	71,295	1962	2,806	81,389
1958	2,453	71,209	1963	3,361	88,348

TABLE 43. Available Data on Consumption of Magnesium Sulphate, 1959-63

Industry	1959	1960	1961	1962	1963
			tons		
Leather tanneries	388	355	431	412	436
Medicinals	539	501	572	571	408
Fertilizers	104	130	162	40	131
Textiles	—	—	—	—	—
Totals accounted for	1,031	986	1,165	1,023	975

MICA

Amber mica or phlogopite is mined in Quebec and Ontario. The major portion of the output is derived from Quebec mines. Muscovite production

is from Ontario mines. The mica obtained from the schist rock in British Columbia is included for statistical purposes in the muscovite class.

TABLE 44. Principal Statistics: Mica Mines, Significant Years, 1921-57

Basis: Standard Industrial Classification in use prior to 1960

	Mines or plants	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of production	Net value added ¹
	number		dollars				
1921	20	104	74,432	4,404	..	70,063	..
1929	14	83	47,362	355	..	118,549	..
1931	11	28	22,556	444	..	54,066	..
1933	15	41	25,007	80	..	49,284	..
1937	34	199	97,547	3,768	13,778	133,731	116,185
1939	61	224	112,653	7,570	11,444	147,321	128,307
1941	81	246	181,800	17,705	21,824	335,288	295,759
1944	70	178	359,797	23,586	33,038	841,026	784,402
1946	27	129	153,616	20,308	17,778	199,039	160,953
1949	34	96	115,667	14,490	6,026	108,458	87,942
1951	31	138	182,033	14,580	18,148	447,650	414,922
1954	32	44	59,194	7,778	6,154	85,139	71,207
1956	23	23	37,673	4,796	4,045	97,049	88,208
1957	25	47	66,283	5,585	7,411	113,458	100,462

¹ Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

TABLE 44 A. Principal Statistics: Mica Mines, 1959-63

Basis: Revised Standard Industrial Classification and New Establishment Concept

	Estab- lish- ments	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of production	Net value added ¹
	number		dollars				
1959	14	16	37,106	3,810	4,090	64,029	56,129
1960	29	21	38,022	3,303	4,457	95,997	88,237
1961	30	34	58,258	9,623	7,694	128,296	110,979
1962	15	21	55,664	5,532	6,315	86,828	74,981
1963	9	12	37,660	3,909	3,439	45,553	36,936

¹ Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

TABLE 45. Employees and their Earnings: Mica Mines, 1959-63

Year	Employees					Man-hours worked (all employees)	Earnings		
	Office and administrative		Workmen		Total		Office and administrative	Workmen	Total
	Male	Female	Male	Female					
	number						dollars		
1959	1	—	15	—	16	37,106	4,800	32,806	37,106
1960	1	1	19	—	21	34,904	4,836	33,186	38,022
1961	2	—	29	3	34	50,996	3,899	54,359	58,258
1962	1	—	20	—	21	42,366	9,320	46,344	55,664
1963	1	—	11	—	12	26,224	6,037	31,623	37,660

TABLE 46. Workmen: Mica Mines, by Months, 1962 and 1963

Month	1962				1963			
	Male				Male			
	Mine		Mill or shop	Total	Mine		Mill or shop	Total
	Surface	Under-ground			Surface	Under-ground		
	number							
January	3	9	4	16	—	5	7	12
February	3	10	4	17	—	—	4	4
March	3	11	4	18	—	—	4	4
April	3	10	4	17	—	—	4	4
May	11	7	3	21	3	—	8	11
June	16	8	1	25	8	—	10	18
July	14	8	1	23	8	—	10	18
August	10	8	1	19	6	—	8	14
September	12	11	1	24	6	—	8	14
October	8	7	3	18	9	—	7	16
November	5	7	4	16	9	—	6	15
December	5	8	4	17	—	—	7	7
Averages	8	9	3	20	4	1	6	11
Total man-hours worked				55,664				24,424

TABLE 47. Fuel and Electricity Used: Mica Mines, 1963

Kind	Quantity	Cost at plant
		\$
Bituminous coal (a) From Canadian mines	76	1,336
(b) Imported	—	—
Sub-bituminous coal (from Alberta mines only)	—	—
Anthracite coal	—	—
Lignite coal	—	—
Coke (for fuel only)	—	—
Gasoline, (includes gasoline used in cars and trucks)	1,680	705
Kerosene or coal oil	—	—
Fuel oil	—	—
Wood (cords of 128 cubic feet of piled wood)	—	—
Gas (a) Liquefied petroleum gases (propane, etc.)	—	—
(b) Other manufactured gas	—	—
(c) Natural gas	—	—
Other fuel	—	—
Electricity purchased for motors and lighting	97,440	1,868
Electricity purchased for other purposes	—	—
Total (cost only) .....	...	3,909
Electricity generated (a) For own use	—	—
(b) For sale	—	—

TABLE 48. Mica Production (Primary Sales), by Classes, 1962 and 1963

Grade	1962		1963	
	Pounds	Total value f.o.b. shipping point	Pounds	Total value f.o.b. shipping point
		\$		\$
Rough, mine-run or rifted	72,187	4,596	12,021	1,390
Mica sold for mechanical splitting	26,400	7,695	—	—
Splittings	—	—	—	—
Ground or powdered	609,968	29,366	813,935	36,759
Scrap, mine or shop waste and mica mined and sold, for grinding	455,805	4,559	352,850	3,529
Trimmed mica	33,437	33,906	4,235	2,606
Unspecified	6,237	4,476	—	—
Totals, mica shipments	1,204,034	84,598	1,183,041	44,284
Varieties:				
Phlogopite mica (amber) and biotite	1,204,034	84,598	1,182,041	42,684
Muscovite mica (white) and schist	—	—	1,000	1,600

TABLE 49. Production of Mica, by Provinces and by Varieties, 1963

Province	Phlogopite and biotite		Muscovite and schist		Total	
	Pounds	Value	Pounds	Value	Pounds	Value
		\$		\$		\$
Quebec	840,856	39,170	—	—	840,856	39,170
Ontario	341,185	3,514	1,000	1,600	342,185	5,114
Totals, Canada	1,182,041	42,684	1,000	1,600	1,183,041	44,284

TABLE 50. Production of Mica, 1954-63

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1954	853	85,139	1959	407	63,004
1955	820	77,541	1960	856	94,203
1956	922	95,666	1961	908	125,377
1957	641	111,583	1962	602	84,598
1958	752	89,651	1963	592	44,284

TABLE 51. Imports and Exports of Mica, 1961-63

	1961		1962		1963	
	Pounds	Value	Pounds	Value	Pounds	Value
		\$		\$		\$
Imports:						
Mica, unmanufactured	1,475,800	175,455	2,306,300	286,047	1,737,600	333,458
Mica, manufactures of, n.o.p. ....	...	358,499	...	439,069	...	642,695
Exports:						
Mica, rough, scrap and schist	181,100	52,357	97,900	30,355	..	..
Mica, fabricated	41,300	55,645	102,300	64,463	..	..
Totals, mica exports reported ....	...	108,002	...	94,818	..	..

TABLE 52. Consumption of Mica, in Specified Industries, 1959-63

	1959	1960	1961	1962	1963
	pounds				
By industries:					
Paints	1,929,365	2,364,002	2,428,880	1,780,195	1,938,765
Electrical apparatus	361,710	...	...	...	...
Rubber footwear	609,155	824,556	483,729	6,524	7,123
Roofing	200,000	204,000	658,000	42,000	38,000
Non-metallic mineral products	127,142	60,000	45,000	150,000	213,000
Small electrical appliances .....	...	30,200	1,200	120,000	54,770
Major appliances .....	...	64,034	120,018	250,000	255,000
Communications equipment .....	...	1,034	12,384	18,141	4,150
Electrical industrial equipment .....	...	195,831	56,912	87,239	390,728
Electrical wire and cables .....	...	14,480	11,830	7,400	13,900
Miscellaneous electrical products .....	...	...	1,500	4,000	8,000
Totals accounted for	3,227,372	3,758,137	3,819,453	2,465,499	2,923,436
By provinces:					
Quebec, Nova Scotia and Newfoundland	1,619,077	1,453,869	1,482,932	1,307,237	1,469,183
Ontario	1,288,436	1,515,780	1,064,183	985,910	1,271,958
Manitoba	44,318	54,467	54,622	60,830	54,217
Alberta	198,000	390,436	855,524	42,000	42,000
British Columbia	77,541	343,585	362,192	69,522	86,078
Canada	3,227,372	3,758,137	3,819,453	2,465,499	2,923,436

TABLE 53. World Production of Mica by Countries¹

Country ¹	1959	1960	1961	1962	1963
	thousands of pounds ²				
North America:					
Canada (shipments):					
Block	49	175	155	1,204	1,183
Splittings	—	—	22		
Ground	591	792	1,434		
Scrap	174	735	205		
United States (sold or used by producers):					
Sheet	706	587	526	363	103
Scrap	203,082	195,824	198,088	215,404	218,646
South America:					
Argentina:					
Sheet	110	190	119	273	75
Scrap	—	—	—	—	—
Brazil	2,553	4,440	9,101	3,885	3,289
Europe:					
Austria ³	216	317	194	33	—
France	670	686	304	190	381
Germany, West	20	22	18	20	20 ⁴
Norway, including scrap	12,059	6,400	7,700	2,200	—
Spain	11	5	—	—	—
Sweden:					
Block	—	—	—	—	—
Ground	328	348	110	126	—
Yugoslavia	4	4	4	4	77
Asia:					
Ceylon .....	..	..	..	..	..
India (exports):					
Block	6,305	5,216	4,592	4,396	3,979
Splittings	15,988	17,469	18,208	18,838	15,595
Scrap	29,242	42,829	35,355	45,523 ⁵	55,547 ⁶
Taiwan, including scrap	3	—	—	—	—
Africa:					
Angola:					
Sheet	20	26	4	—	—
Scrap and splittings	384	721	51	108	—
Kenya	22	2	5	2	2
Malagasy Republic (phlogopite):					
Block	269	256	223	181	214
Splittings	1,922	1,973	2,002	2,780	1,914
Morocco:					
Sheet	—	—	—	—	—
Scrap	—	—	—	—	—
Mozambique, including scrap	13	2	4	2	—
Rhodesia and Nyasaland, Federation of:					
Northern Rhodesia:					
Sheet	3	3	—	—	—
Southern Rhodesia:					
Block	106	90	64	33	60
Crude and scrap	—	754	101	172	225
South Africa, Republic of:					
Sheet	—	2	2	2	39
Scrap	3,761	6,710	5,440	4,900	4,680
South West Africa	234	—	—	150	1,197
Sudan:					
Block	882	—	—	—	—
Scrap					
Tanganyika (exports):					
Sheet	117	179	196	218	236
Scrap	190	—	—	—	—
Oceania:					
Australia:					
Block	33	9	—	—	—
Scrap	187	648	185	—	—
Damourite	1,100	1,252	1,138	1,087	1,100
World totals (estimate)^{1,2}	350,000	365,000	365,000	390,000	400,000

¹ Mica is also produced in China, Rumania and U.S.S.R., but data on production are not available; estimates are included in total.

² This table incorporates some revisions. Data do not add exactly to totals shown because of rounding where estimated figures are included in the detail.

³ Including reclaimed from dumps.

⁴ Estimate.

⁵ Less than 500 pounds.

⁶ Includes condenser film as follows: 1962, 412 thousand pounds; 1963, 234 thousand pounds.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

PERLITE

Perlite is a volcanic glass characterized by a concentric "onion skin" fracture and usually a 2 to 6 per cent water content. When heated rapidly in a furnace it expands into a frothy material of low density.

Commercially-expanded perlite is granular material and is generally white. Because of its cellular nature it is light in weight and has good insulating and sound-proofing qualities. Expanded perlite is used chiefly in lightweight concrete aggregates, insulating and sound-proofing pre-cast wallboard, and in lightweight plaster. A sack of

expanded perlite containing 3 cubic feet weighs approximately 30 to 36 pounds.

Development work has been done on deposits of perlite at Francois Lake, British Columbia, about eighteen miles by road from Burns Lake on the C.N.R. Other deposits have been found in British Columbia at Empire Valley northwest of Clinton.

Shipments of 1,112 tons of perlite valued at \$11,120 were made from the British Columbia deposits to the expanding plant of Western Gypsum Products Ltd., Calgary, Alberta, during 1953. There was no production reported since.

PHOSPHATE

Phosphate in the form of apatite was mined in Canada on a fairly substantial scale up to 1895, but since then the production has been small and spasmodic. In 1951, about 6 tons were shipped but there were no shipments in subsequent years.

For many years, the Electric Reduction Company Limited, Buckingham, Quebec, has purchased most of the small output for use in the production of

elemental phosphorus and various phosphorous compounds. This company, however, obtains most of its phosphate rock requirements from Florida. That state and Montana supply the great bulk of the phosphate rock which Canada imports for the manufacture of fertilizer, occasional shipments being obtained also from North Africa. Rock low in fluorine is obtained from Curacao, Netherlands, West Indies, for use in stock feeds.

TABLE 54. Production of Phosphate Rock, 1943 -63

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1943	1,451	18,385	1948	—	—
1944	482	6,716	1949	20	291
1945	299	4,356	1950	129	1,070
1946	57	869	1951	6	94
1947	—	—	1952-63	—	—

TABLE 55. Imports of Phosphate Rock, 1954 -63

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1954	644,860	4,577,633	1959	747,068	7,468,368
1955	588,209	4,512,833	1960	941,998	8,320,129
1956	627,648	5,185,597	1961	1,056,885	9,678,644
1957	723,220	5,897,784	1962	1,155,966	10,842,509
1958	744,164	6,854,243	1963	1,297,427	12,203,728

TABLE 56. Consumption of Phosphate Rock, 1959-63

	1959	1960	1961	1962	1963
	tons				
By uses:					
Fertilizers, mixed	621,126	157,421	239,408	339,509	400,217
Chemicals	143,865	731,164	747,920	752,796	781,427
Feed manufacturers	30,697	29,649	33,236	34,659	30,325
Miscellaneous	75	...	...	...	...
Totals	795,763	918,234	1,020,564	1,126,964	1,211,969
By provinces:					
Prince Edward Island	427	221	416	356	773
Nova Scotia					
New Brunswick	963	1,030	1,241	1,367	1,587
Quebec	203,042	219,891	223,120	235,502	251,742
Ontario	95,355	118,951	186,358	288,046	352,031
Manitoba	1,702	1,220	2,007	2,231	2,093
Saskatchewan	442	706	968	995	961
Alberta	98,120	157,814	174,904	176,574	179,378
British Columbia	395,712	418,401	431,550	421,893	423,404
Canada	795,763	918,234	1,020,564	1,126,964	1,211,969

TABLE 57. World Production of Phosphate Rock, by Countries¹

Country ¹	1959	1960	1961	1962	1963
	thousand long tons ²				
North America:					
Mexico	29	27	29	30 ³	30 ³
United States	15,869	17,516	18,559	19,382	19,855
West Indies:					
Netherlands Antilles (exports)	97	113	150	129	126
Totals	15,995	17,656	18,738	19,541	20,011
South America:					
Argentina (guano)	1	4	4	4	1
Brazil: Apatite	131	200	240	305	212
Phosphate rock	860	666	409	251	63
Chile: Apatite	19	17	14	12	14
Guano	21	18	19	16	22
Peru: Guano	125	155	157	203	189
Venezuela .....	..	..	..	..	—
Totals	1,157	1,056	839	787	501
Europe:					
Belgium	13	8	14	12	14
France	76	57	80	66	50
Poland	40	40	46	55	64
Spain	4	3	—	—	—
U.S.S.R.: Apatite ³	4,040	4,630	5,510	6,500	6,890
Sedimentary rock ³	1,970	2,260	3,150	3,350	3,940
Totals^{1,4}	6,140	7,000	8,800	9,980	10,960

See footnotes at end of table.

TABLE 57. World Production of Phosphate Rock, by Countries¹ — Concluded

Country ¹	1959	1960	1961	1962	1963
	thousand long tons ²				
Asia:					
China ³	500	600	500	600	700
Christmas Island (Indian Ocean) (exports)	494	503	694	521	651
India: Apatite	16	15	20	29	13
Indonesia	10	7	10	6	6 ³
Israel	201	221	217	207	295
Jordan	332	356	416	450	405 ³
Korea, North (apatite) ³	50	100	150	200	200
Philippines: Guano	⁴	10	⁴	⁴	1
Phosphate rock	—	⁴	—	4	1
Vietnam, North: Apatite	256	480	555	667	740 ³
Phosphate rock	50	50	57	33	49 ³
Totals^{1,3}	1,910	2,340	2,620	2,720	3,060
Africa:					
Algeria	563	554	433	384	343
Malagasy Republic	7	5	—	—	—
Morocco	7,050	7,354	7,824	8,033	8,413
Mozambique (guano)	⁴	⁴	—	—	—
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	2	3	⁴	—	—
Senegal: Aluminum phosphate	94	104	137	139	124
Calcium phosphate	—	106	401	489	463
Seychelles Islands (guano)	6	7	8	5	7
South Africa, Republic of	228	263	292	302	448
South-West Africa: Guano	1	—	1	1	1
Togo	—	—	116	190	1,051
Tunisia	2,150	2,063	1,950	2,064	2,333
Uganda	3	4	⁴	1	7
United Arab Republic (Egypt Region)	619	576	617	592	634
Totals	10,723	11,039	11,779	12,200	13,824
Oceania:					
Angaur Island (export)	—	—	—	—	—
Australia	5	2	5	4	5
Makatea Island (French Oceania)	362	407	375	312	330
Nauru Island (exports)	1,192	1,351	1,282	1,516	1,547
Ocean Island (exports)	314	320	338	257	356
Totals	1,873	2,080	2,000	2,089	2,238
World totals (estimate)^{1,2}	37,800	41,170	44,780	47,320	50,590

¹ A negligible amount is produced in Jamaica, Japan, Sarawak, Somalia Republic and Tanganyika.

² This table incorporates some revisions. Data do not add exactly to totals shown because of rounding where estimated figures are included in the detail.

³ Estimate.

⁴ Less than 500 tons.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

POTASH

Potash shipments were made in 1962-63 by the International Minerals and Chemical Corp. The shaft of the Potash Company of America was undergoing repairs. Shipments had been made in 1959 and 1960 from the plant at Patience Lake, Saskatchewan. Kalium Chemicals Limited began construction of a plant which will produce potash by the solution mining process. The plant is located at Belle Plaine, 25 miles west of Regina.

Although the products may be potassium chloride, the market quotations and other calculations

are usually based on the K_2O equivalent. In recent years many millions of dollars have been expended in developing the extensive potash deposits in Saskatchewan. Core drilling has indicated that these beds of sylvite and carnallite extend westward from the Manitoba border through the Saskatoon area to Unity, a distance of nearly 400 miles. Firms which are experienced potash producers were sinking shafts to mine these deposits which lie at depths of from 2,550 to 3,500 feet.

TABLE 58. Producers' Shipments of Potash (K_2O), 1959-63

Year	Tons	Value
		\$
1959 .....	..	1,408,462
1960 .....	..	178,700
1961	—	—
1962 .....	..	3,000,000
1963	626,860	22,500,000

TABLE 59. World Production of Potash (Marketable, Unless Otherwise Stated) in Equivalent K_2O , by Countries¹

Country ¹	1959	1960	1961	1962	1963
	short tons				
North America:					
Canada	46,500	—	—	150,000 ²	626,860
United States	2,383,259	2,638,574	2,732,602	2,452,921	2,864,037
South America:					
Chile (Nitrate)	15,482	16,500 ²	15,504	19,541	20,500 ²
Europe:					
France	1,611,466	1,688,635	1,884,791	1,897,958	2,112,026
Germany:					
East ³	1,764,000	1,836,000	1,846,000	1,931,000	2,034,000
West	2,022,697	2,181,206	2,253,122	2,138,637	2,147,300
Italy	10,698	54,338	149,187	170,142	207,565
Spain	269,790	291,356	289,037	259,156	286,876
U.S.S.R. ²	1,160,000	1,212,500	1,455,000	1,650,000	1,700,000
Asia:					
Israel ³	76,000	91,000	93,600	100,200	124,560
Japan:					
Alunite	210	190	130	—	—
Carbonate	—	—	—	—	—
Africa:					
Eritrea	—	—	—	—	—
World totals (marketable estimate) ¹	9,400,000	10,000,000	10,700,000	10,800,000	12,100,000

¹ This table incorporates some revisions. Data do not add to totals shown due to rounding where estimated figures are included in the detail.

² Estimate.

³ Year ended March 31 of year following that stated.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

POZZOLAN

This mineral name has alternate spellings, pozzuolana, pozzuolane and pozzolana. It is a siliceous rock or leucitic tuff which was first quarried near Pozzuoli, Italy and used in the manufacture of hydraulic cement. Artificial pozzolan is made from slag, fly ash, etc. In British Columbia,

at Bamberton the British Columbia Cement had facilities to produce this commodity. At Saltspring Island a rotary-kiln plant was operated by Holdfast Natural Resources Ltd. Producers' shipments in 1962 were valued at \$4,927 and in 1963 the value was \$17,994.

PYRITE, PYRRHOTITE

Pyrite and pyrrhotite are by-products which are produced from the processing of the metal sulphide ores of Noranda, Quemont, and Normetal Mines in Quebec and Britannia Mine in British Columbia. At Kimberley the waste iron sulphides are used to produce acid for the fertilizer plant. Shipments of pyrite were made to pulp and paper mills and chemical plants in Canada and abroad.

At Cutler, Ontario the pyrite and pyrrhotite concentrates from Noranda Mines are treated to

produce sulphuric acid which is sold to the uranium mines in the Elliot Lake area. At Copper Cliff, a plant of the International Nickel Co. of Canada Ltd. treats pyrrhotite, containing some nickel, to produce iron oxide pellets and nickel carbonate. Since 1961 the data on this material have been included in the figures on by-products iron ore. Falconbridge Nickel Mines Ltd. calcines the sulphide ore to produce a feed material for the iron and steel furnaces.

TABLE 60. Producers' Shipments Pyrite and Pyrrhotite, 1954-63

Year	Gross weight	Sulphur content ¹	Value	Year	Gross weight	Sulphur content ¹	Value
	tons		\$		tons		\$
1954	687,928	311,159	2,663,499	1959	1,099,564	465,611	3,433,095
1955	878,452	403,986	3,740,383	1960	1,032,288	437,790	3,316,378
1956	1,046,740	473,605	4,538,785	1961	517,258	255,376	1,830,566
1957	1,166,416	515,096	4,808,228	1962	517,308	257,084	1,879,584
1958	1,191,731	512,427	4,248,668	1963	476,438	235,410	1,643,629

¹ Data for 1954-55 include sulphur content of acid made from roasting zinc sulphide concentrates at Arvida.

TABLE 61. World Production of Pyrites (including Cupreous Pyrites), by Countries¹

Country ¹	1960		1961		1962		1963	
	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content
	thousand long tons ²							
North America:								
Canada	922	391	462	228	462	236	425	218
Cuba ³	18	8	20	9	26	12	33	15
United States	1,016	416	987	399	916	379	825	344
South America:								
Venezuela	—	—	—	—	—	—	—	—
Europe:								
Bulgaria	117	49	120	50	140	59	128	54
Czechoslovakia	384	148	363	141	395	155	342	133 ³
Finland	256	108	270	114	468	215	529	248
France	273	117	281	118	299	125	247	109
Germany:								
East	130 ³	46	115 ³	40	120 ³	41	125 ³	43 ³
West	529	210	524	221	404	173	398	175
Greece	161	74	185	86	142	65	148 ³	66 ³
Italy	1,523	694	1,555	716	1,560	711	1,377	628
Norway	820	356	722	319	780	320	700	315
Poland	223	83	198	76	219	82	213	85
Portugal	645	297	643	296	631	290	593	273
Rumania	263	105	259	103	300	120	328	131
Spain	2,217	1,053	2,097	1,001	2,095	997	1,995	941
Sweden	406	203	431	220	370	189	396	197 ³
U.S.S.R. ³	2,750	1,460	2,750	1,460	2,950	1,565	3,150	1,670
United Kingdom	4	4	4	4	27	11 ³	26	10 ³
Yugoslavia	410	164	358	143	407	163	350	140

¹ See footnotes at end of table.

TABLE 61. World Production of Pyrites (including Cupreous Pyrites), by Countries¹ — Concluded

Country ¹	1960		1961		1962		1963	
	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content
	thousand long tons ²							
Asia:								
China ³	985	440	985	440	1,080	490	1,180	530
Cyprus	914	439	824	396	809	388	905	440
Japan ⁵	3,634	1,517	3,869	1,624	3,952	1,664	3,833	1,623
Korea:								
North ⁴	245	98	295	118	345	138	395	157
South	2	4	1	4	—	—	4	4
Philippines	25	11 ³	51	22 ³	55	26	57	27
Taiwan	42	16	47	20	45	20	46	17
Turkey	42	20	97	46	105	51	96	44
Africa:								
Algeria	38	17	48	22	42	19	37	17
Morocco	13	5	14	5	20	7	23	7
Rhodesia and Nyasaland Federation of:								
Southern Rhodesia	49	19	58	23	50	19	65	27 ³
South Africa, Republic of	492	212	440	176	434	175	412	165 ³
Oceania:								
Australia	239	115	213	102	149	65	194	87
World totals (estimate) ^{1,2}	19,800	8,900	19,300	8,700	19,800	9,000	19,600	9,000

¹ Pyrites is produced in Brazil, but production data are not available.² This table incorporates some revisions. Data do not add to totals shown due to rounding where estimated figures are included in the detail.³ Estimate.⁴ Less than 500 tons.⁵ Years 1960-63 include pyrrhotite, cupreous pyrites, sulfur ore, and zinc concentrates.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

SODIUM CARBONATE (NATURAL)

Deposits of natural sodium carbonate in the form of "natron" (sodium carbonate with 10 molecules of water) and of brine occur in a number of small "lakes" throughout the central part of British Columbia, chiefly in the Clinton mining division and in the neighbourhood of Kamloops. As the deposits are far from the main eastern Canadian markets,

production is restricted to the requirements of consumers with economical rail haul.

Sodium carbonate has many industrial uses, notably in the manufacture of glass and soap, in the purification of oils, in the production of aluminum, in the flotation of minerals, in the refining of metals and in the production of caustic soda.

TABLE 62. Production of Sodium Carbonate (Natural), 1941-63

Year	Tons	Value	Year	Tons	Value
		\$			\$
1941	186	1,488	1946	—	—
1942	256	2,048	1947	163	1,793
1943	468	5,148	1948	—	—
1944	44	484	1949	47	513
1945	286	3,146	1950-63	—	—

SODIUM SULPHATE (NATURAL)

All the natural sodium sulphate produced in Canada was obtained from the brine lakes in Saskatchewan. Producers shipped 256,914 tons valued at \$4,121,114 in 1963 compared with 246,672 tons valued at \$3,954,273 in the preceding year.

Sodium sulphate occurs as crystals or in the form of highly concentrated brines in many lakes and deposits throughout Western Canada. From

these, hydrated sodium sulphate, known as Glauber's salt, and anhydrous sodium sulphate, known to the trade as "salt cake", are produced in Canada.

Glauber's salt is used widely in the chemical industries and the demand is increasing. Sodium sulphate is used chiefly in the sulphate process for the manufacture of kraft pulp. It is used in the glass, dye and textile industries, and to a smaller extent for medicinal purposes and for tanning.

TABLE 63. Producers' Shipments of Natural Sodium Sulphate, 1954-63

Year	Short tons	Selling value f.o.b. shipping point	Year	Short tons	Selling value f.o.b. shipping point
		\$			\$
1954	158,417	2,385,573	1959	179,535	2,881,861
1955	178,888	2,799,715	1960	214,208	3,449,155
1956	181,053	2,838,186	1961	250,996	4,036,625
1957	157,800	2,568,728	1962	246,672	3,954,273
1958	173,217	2,862,915	1963	256,914	4,121,114

TABLE 64. Production of Manufactured Sodium Sulphate,¹ 1945-63

Year	Salt cake		Year	Salt cake	
	Tons	Value		Tons	Value
		\$			\$
1945	2,850	35,226	1950	3,674	74,555
1946	2,584	33,333	1951	3,297	72,206
1947	3,175	51,047	1952	2,382	54,956
1948	3,198	69,876	1953	2,345	59,793
1949	3,738	83,996	1954-63 .....	..	..

¹ Salt cake produced as a by-product is not included.

TABLE 65. Imports of Sodium Sulphate, 1954 - 63

Year	Salt cake		Glauber's salt	
	Tons	Value	Tons	Value
		\$		\$
1954	30,235	482,652	5,134	144,979
1955	29,928	574,440	3,888	131,447
1956	30,319	558,656	2,768	91,330
1957	28,086	511,457	1,512	50,527
1958	25,812	478,215	1,217	38,798
1959	27,157	511,162	966	39,907
1960	24,706	472,084	1,156	38,350
1961	32,310	575,015	899	29,023
1962	31,347	608,958	426	22,579
1963	19,002	386,037	495	28,180

TABLE 66. Exports of Sodium Sulphate, 1954 - 63

Year	Long tons	Value	Year	Short tons	Value
		\$			\$
1954	58,972	1,039,284	1959 ¹	47,922	752,116
1955 ¹	67,762	1,263,911	1960 ¹	63,831	1,025,632
1956 ¹	60,579	985,801	1961 ¹	87,131	1,331,428
1957 ¹	37,023	593,390	1962 ¹	74,049	1,210,958
1958 ¹	39,763	645,670	1963 ¹	65,348	1,076,969

¹ Source: "Trade of Canada, Exports" - Quantity is shown in short tons.

Note: Exports from Canada were not recorded separately prior to 1955 in the official trade statistics of Canada, but the imports into the United States from Canada are shown as above in the "U.S. Imports for Consumption of Merchandise" by the U.S. Department of Commerce.

TABLE 67. Available Data on Consumption of Sodium Sulphate (Salt Cake) in Canada, by Industries, 1959 - 63

Industry	1959	1960	1961	1962	1963
	short tons				
Pulp and paper	168,215	178,449	192,912	200,166	221,107
Glass, including glass wool	2,078	2,813	2,756	3,026	3,035
Medicinals	54	54	16	56	71
Soaps	952	1,394	517	1,136	958
Mineral wool	335	352	204	259	306
Explosives and ammunition	—	—	—	—	200
Totals accounted for	171,634	183,062	196,405	204,643	225,677

SULPHUR

Native sulphur deposits of commercial grade have not been found in Canada, but large tonnages of metal sulphide ores are smelted. In smelting these ores sulphur dioxide gas is produced, some of which is recovered to make sulphuric acid or liquid sulphur dioxide. At Trail, British Columbia, the sulphur dioxide generated by smelting lead-zinc sulphide ores is converted into sulphuric acid. At Copper Cliff, Ontario, the Canadian Industries Limited uses the smelter gases from the International Nickel plant to make sulphuric acid and sulphur dioxide. Zinc sulphide concentrates are shipped to Arvida where the concentrates are calcined to produce sulphur dioxide which is used to make sulphuric acid. The roasted material is exported to smelters for the recovery of zinc and other metals. Concentrates are similarly processed at the

Sherbrooke Metallurgical Co. Limited, Port Maitland, Ontario and at Allied Chemical Canada Ltd, Valleyfield, Quebec.

Sour natural gas in the western provinces is processed to remove the hydrogen sulphide. The treatment of large volumes of natural gas means that there are large tonnages of elemental sulphur produced as a by-product. The output of sulphur has exceeded the market demand. Statistics on the operations of the sulphur plants are shown in Natural Gas Processing Plants, Standard Industrial Classification, - 065.

Elemental sulphur is also produced in the processing of nickel sulphides at the nickel refinery.

TABLE 68. Sulphur in Smelter Gases, 1954 -63

Year	Quantity ¹	Value	Year	Quantity ¹	Value
	tons	\$		tons	\$
1954	221, 247	2, 212, 470	1959 ²	277, 030	2, 716, 416
1955	224, 457	2, 244, 570	1960 ²	289, 620	2, 854, 623
1956 ²	236, 088	2, 323, 590	1961 ²	277, 056	2, 708, 110
1957 ²	235, 123	2, 322, 067	1962 ²	292, 728	3, 089, 537
1958 ²	241, 055	2, 361, 252	1963 ²	353, 243	3, 488, 181

¹ Does not include in 1954-55 sulphur in acid made from roasting zinc sulphide concentrates at Arvida.

² Includes sulphur in acid made from zinc sulphide at Arvida, Port Maitland and Valleyfield.

TABLE 69. Sulphur (Elemental)¹ Made from Natural Gas and Nickel Sulphide, 1954 - 63

Year	Output	Shipments	
		Quantity	Value
	short tons	tons	\$
1954	22, 320	18, 665	..
1955	29, 093	25, 976	..
1956	33, 464	34, 784	..
1957 ²	107, 478	93, 338	..
1958 ²	186, 055	94, 377	1, 872, 832
1959 ²	294, 775	145, 656	2, 620, 787
1960 ²	454, 045	274, 359	4, 298, 906
1961 ²	550, 101	394, 762	7, 287, 881
1962 ²	1, 167, 999	695, 098	9, 286, 999
1963 ²	1, 440, 802	1, 249, 887	13, 380, 182

¹ Does not include sulphur made from imported crude petroleum.

² Includes sulphur produced at nickel refinery.

TABLE 70. Imports of Sulphur, 1954-63

Year	Tons	Value	Year	Tons	Value
		\$			\$
1954	310,127	7,816,301	1959	332,430	6,924,938
1955	373,373	9,386,983	1960	328,765	6,629,239
1956	474,117	11,857,556	1961	329,555	7,094,216
1957	416,930	9,752,368	1962	195,089	4,637,588
1958	380,331	8,324,191	1963	150,637	3,505,395

TABLE 71. Available Data on the Consumption of Sulphur (Brimstone), 1958-63

	1959	1960	1961	1962	1963
	tons of 2,000 pounds				
By industries:					
Pulp and paper	275,362	286,293	299,736	315,279	332,550
Industrial chemicals	193,737	197,212	213,190	243,318	257,669
Rubber footwear	2,868	3,200	3,221	108	102
Medicinal	21	15	14	—	—
Adhesives	62	...	...	...	...
Miscellaneous foods	234	282	301	323	416
Fruit and vegetable preparations .....	...	...	5	1	1
Sugar refining	150	113	126	169	147
Petroleum refining	219	198	120	186	160
Steel and iron	171	1,224	1,548	1,349	1,407
Miscellaneous chemicals	10,667	19,273	25,047	27,880	30,537
Asbestos products .....	...	...	...	...	...
Malt products .....	...	...	109	127	...
Totals accounted for	483,482	507,810	543,417	588,740	622,989
By provinces:					
Newfoundland	21,094	22,624	24,122	21,998	23,115
Nova Scotia	5,029	5,236	5,802	11,883	11,456
New Brunswick	35,117	36,586	38,227	42,722	44,942
Quebec	138,063	156,397	171,665	165,364	174,867
Ontario	162,145	141,044	153,862	188,197	207,656
Manitoba and Saskatchewan	23,037	22,679	26,457	27,959	25,175
Alberta	42,127	63,030	66,487	68,188	71,904
British Columbia and Northwest Territories	56,870	60,214	56,795	62,429	63,874
Canada	483,482	507,810	543,417	588,740	622,989

TABLE 72. Exports of Sulphur and Pyrite, 1958-63

Year	Pyrite	Sulphur	
	Value	Tons	Value
	\$		\$
1958	1,879,251	7,608	170,966
1959	1,018,608	26,526	504,961
1960	1,259,151	143,040	2,762,372
1961	899,755	217,866	3,967,884
1962	890,055	400,026	6,649,943
1963	937,883	820,929	11,972,346

TABLE 73. World Production of Elemental Sulphur, by Countries^{1,2}

Country ¹	1959	1960	1961	1962	1963
	long tons ²				
Frasch:					
Mexico	1,293,181	1,261,574	1,148,494	1,350,375	1,456,656
United States	4,553,634	4,942,935	5,385,468	4,984,578	4,881,512
Totals	5,846,815	6,204,509	6,533,962	6,334,953	6,338,168
From sulphur ores:					
Argentina	25,207	39,265	22,183	22,303	22,142
Bolivia (exports)	—	1,175	4,896	7,247	9,793
Canary Islands	2,900	4,000	5,000	6,000	6,900
Chile	21,676	30,901	43,994	63,228	57,861
China ³	100,000	120,000	120,000	120,000	120,000
Columbia	8,824	8,899	9,941	10,046	12,795
Italy	116,252	79,703	68,668	53,068	41,128
Japan ⁴	215,669	243,684	238,456	220,438	219,095
Mexico	17,700 ⁵	17,700 ⁵	25,116	26,751	28,968
Philippines	—	43	158	926	47
Poland	10,500	25,885	130,900	206,684	231,486
Spain	2,851	1,336	—	—	—
Taiwan	5,533	5,725	5,732	7,462	7,144
Turkey	13,174	16,830	15,506	18,247	19,123
U.S.S.R. ³	600,000	800,000	900,000	950,000	950,000
United Arab Republic (Egypt)	1,200	3,543	8,858	6,000 ³	4,675
United States	86,182	94,357	92,025	40,840	415
Totals^{3,5}	1,230,000	1,490,000	1,690,000	1,760,000	1,730,000
Totals, native sulphur	7,075,000	7,700,000	8,225,000	8,100,000	8,100,000
Recovered:					
Bulgaria ⁶	4,000	5,310	4,949	5,502	6,291
Canada (Sales) ⁷	130,050	244,963	352,465	620,622	1,115,908
China ^{3,6,8}	100,000	130,000	130,000	130,000	130,000
Finland	—	—	—	—	37,611
France ⁸	419,273	778,157	1,080,013	1,325,538	1,386,285
Germany:					
East	106,153	110,232	115,153	118,100	118,100
West	78,474	82,807	82,861	89,268	84,949
Iran ^{3,9}	19,000	20,000	20,000	15,000	20,000
Italy ³	4,000	3,200	2,000	2,000	2,000
Japan ⁸	7,829	8,326	8,163	8,549	11,429
Mexico ⁹	45,054	33,487	51,086	46,545	43,308
Netherlands ⁶	30,700	30,018	27,952	30,511	34,447
Netherlands Antilles: Aruba, Curacao ³	30,000	40,000	40,000	40,000	30,000
Norway ⁶	77,111	71,254	61,156	45,175	—
Portugal ⁶	15,888	10,915	8,813	6,677	2,943
South Africa, Republic of ⁸	—	—	2,163	1,913	1,981
Spain ⁶	25,719	40,194	48,324	41,836	68,036
Sweden ¹⁰	37,576	39,368	30,511	29,920	25,885
Taiwan ⁸	810	876	1,968	2,130	2,310
Trinidad ^{3,6}	5,000	5,000	5,000	5,000	7,000
U.S.S.R. ³	180,000	210,000	275,000	370,000	400,000
United Arab Republic (Egypt)	2,403	2,369	2,545	2,039	2,355
United Kingdom ¹¹	53,173	62,402	58,405	51,929	46,600
United States	686,407	766,566	858,169	899,598	946,753
Totals^{3,2}	2,060,000	2,700,000	3,270,000	3,890,000	4,525,000
World totals (estimate)	9,135,000	10,400,000	11,500,000	12,000,000	12,600,000

¹ This table incorporates some revisions.² Data do not add exactly to totals shown because of rounding where estimated figures are included in the detail.³ Estimate.⁴ Includes sulphur from mixed sulphur-sulfide ore.⁵ In some years Iran produces mined sulphur equivalent to 250–1,500 tons sulphur. No estimate in total.⁶ From sulphide ores.⁷ Produced from natural gas, includes a small quantity derived from treatment of nickel sulfide matte at Port Colborne, Ontario.⁸ From refinery gases.⁹ From natural gas.¹⁰ From shale oil.¹¹ Including sulphur recovered from petroleum refineries.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

STRONTIUM MINERALS

In Ontario, several occurrences of celestite are known in the general Ottawa region, but very little mining has been undertaken for the mineral, and production has been small and intermittent.

Between 1918 and 1920, about 250 tons of white, fibrous celestite were mined from a deposit in Bagot township, Renfrew county, and after grinding in a small mill erected on the property, were sold for use in paint. The material was not very pure and contained about 18 per cent of barium sulphate. The old pit was pumped out in 1941 and a few tons of ore were scaled down from a small

drift. This, together with some stockpile material from the earlier work, was shipped to Montreal for grinding and pigment use. The property has since been idle. The above comprises the only production of strontium minerals in Canada of which there is any official record.

In British Columbia, celestite occurs near Birch Island, North Thompson River, Kamloops mining division. The deposit is reported to contain a large tonnage of ore consisting of a fine-grained intergrowth of fluor spar, celestite, feldspar, quartz, mica and pyrite.

VERMICULITE

Vermiculite, a hydrated magnesian aluminum silicate, resembles mica closely but is softer and inelastic. Colours range from black through brown and dark green to almost colourless. Its principal characteristic is its ability to expand many times on heating, and in its expanded form it possesses low bulk density, low thermal conductivity, high heat resistance, chemical inertness and acoustic properties. Vermiculite is generally regarded as a product of alteration and is usually associated with metamorphosed ultra-basic rocks.

Known deposits of vermiculite in Canada are located at Stanleyville, near Perth, Ontario and

at Blue River, Kamloops mining division, British Columbia.

The principal uses for vermiculite are loose insulation in buildings; concrete and plaster aggregate; lightweight fire-resistant and acoustic tile and wallboard; rooting medium and soil amendment. It is also used in lubricants, dry chemicals, (as a diluent), combination refractory and insulating brick, as a pigment and extender in paint and as decorative filler in wallpaper. Vermiculite has been used as fireproof deck covering and partitions on ships, as loose insulation in fire and sound-proof partitions in vehicles and aircraft, as filler for life jackets and in finely-powdered forms, for oilless bearings.

TABLE 74. World Production of Vermiculite, by Countries¹

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
Argentina	880 ³	349	541	2,962	1,532
India	2	17	697	410	746
Kenya	112	283	—	22	101
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	50	—	—	—	—
South Africa, Republic of	52,398	69,022	71,118	85,534	98,758
Sudan	130 ³	—	55	55	—
Tanganyika	125	20	157	72	30
United Arab Republic (Egypt) ⁴	331	121	85	313	33
United States (sold or used by producers)	206,579	199,072	206,637	205,749	226,278
Totals ^{1,2}	260,607	268,884	279,290	295,117	327,478

¹ Vermiculite is produced in Brazil and U.S.S.R., but data are not available, and no estimates are included in the total.

² This table incorporates some revisions.

³ Estimate.

⁴ Includes mica.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

VOLCANIC DUST

Volcanic dust (pumice or pumice dust) is a natural glass or silicate, atomized by volcanic explosions and thrown into the air in great clouds which ultimately settle forming beds of varying thickness, often hundreds of miles from its source. In many instances the dust has been washed down from higher levels and redeposited by the agency of waters, in which case the beds are stratified and mixed with foreign substances. It consists of aluminum silicate (80 to 90 per cent) and of oxides and silicates of iron, sodium, magnesium, calcium, etc.

During 1924 to 1933 the annual production varied from 30 to 485 tons. There has been no production in recent years. The last recorded shipments were 50 tons in 1943.

Volcanic dust deposits have been found in Alberta, Saskatchewan and British Columbia. Pumice dust is used for concrete aggregate, acoustic plaster, cleansing compounds, paint fillers, absorbents, etc.

TABLE 75. World Production of Pumice, by Countries¹

Country ¹	1959	1960	1961	1962	1963
	short tons ²				
Argentina ³	19,842	16,573	32,321	12,585	7,790
Austria:					
Trass	34,885	38,581	40,846	30,696	23,349
Canary Islands	1,836	1,614	1,585	1,918	1,685
Cape Verde Islands: Pozzolan	10,033	7,094	7,361	7,503	13,035
France:					
Pumice	2,064	995	1,455	1,876	849
Pozzolan	482,683	475,484	485,724	521,751	601,488
Germany, West (marketable)	4,039,966	4,742,138	5,898,461	6,290,883	7,044,863
Greece:					
Pumice	71,650	88,185	77,162	87,938	88,000 ⁴
Santorin Earth	93,696	198,416	209,439	207,273	220,000 ⁴
Iceland	10,000 ⁴	9,000 ⁴	9,000 ⁴	7,200 ⁴	13,779
Italy:					
Pumice	258,254	345,390	310,893	349,862	} 3,970,000 ⁴
Pumicite	146,717	124,671	161,488	165,000 ⁴	
Pozzolan	3,055,978	3,494,273	3,212,787	3,320,114	
Japan	121,250 ⁴	"	"	"	"
Kenya	2,515	2,711	779	1,243	1,245
New Zealand	31,803	49,204	36,637	36,425	18,599
United Arab Republic (Egypt Region)	2,756	3,307	4,335	2,276	9,614
United States (sold or used by producers):					
Pumice and pumicite	783,873	601,315	936,039	583,716 ⁶	1,050,178
Volcanic cinder	1,492,247	1,609,050	1,526,546	1,737,587	1,567,825
World totals (estimate)^{1,2}	10,700,000	11,900,000	13,100,000	13,500,000	14,800,000

¹ Pumice is also produced in Mexico, U.S.S.R. and a few other countries, but data on production are not available; estimates are included in total, but it is believed that U.S.S.R. produces a sizable quantity.

² This table incorporates some revisions. Data do not add exactly to totals shown because of rounding where estimated figures are included in the detail.

³ Includes volcanic ash and cinders, and pozzolan.

⁴ Estimate.

⁵ Data not available, estimate included in total.

⁶ Includes American Samoa.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

Operators of Miscellaneous Non-metallic Mineral Deposits, 1963

Name of operator	Head office address	Plant or mine location
BARITE		
Nova Scotia:		
Magnet Cove Barium Corp. ⁴	Walton	Pembroke
Quebec:		
Beach, Mahlon W. ¹	Box 9, Barrie, Ontario	Woodbridge Twp.
Roy, Phillippe ¹	62 L'Évêché, Rimouski	St-Fabien
British Columbia:		
Baroid of Canada Ltd. ⁴	Box 250, Onoway, Alberta	Spillimacheen
Mountain Minerals Ltd. ⁴	Box 700, Lethbridge, Alberta	Brisco
Sheep Creek Mines Ltd. ⁴	490 Baker St., Nelson, B.C.	Invermere
BRUCITE		
Quebec:		
Aluminium Company of Canada Ltd. ⁴	Box 6090, Montreal	Wakefield
DIATOMITE		
British Columbia:		
Cariboo Diatomite Ltd.	12470-113 B Ave., North Surrey	Cariboo
Crownite Diatoms Ltd. ⁴	108-12th Ave., Calgary, Alberta	Quesnel
Fairey and Co. Ltd. ⁴	661 Taylor St., Vancouver	Quesnel
FLUORSPAR		
Newfoundland:		
Newfoundland Fluorspar Ltd. ⁴	327 Duckworth St., St. John's	St. Lawrence
St. Lawrence Corporation of Nfld., Ltd. ²	120 Broadway, New York U.S.A.	St. Lawrence
Ontario:		
Huntingdon Fluorspar Mines Ltd. ¹	Madoc	Huntingdon Twp.
Quebec:		
Lake Otter Uranium Mines Ltd. ¹	62 Richmond St. W., Toronto, Ont.	Sandy Creek
White River Exploration Ltd. ¹	507 Place d'Armes, Montreal	St. Ubald
British Columbia:		
Pacific Silica Ltd.	Oliver	Oliver
GARNET		
Ontario:		
Stonefield's Industrial Minerals Ltd. ¹	1774 Harriet St., North Bay	River Valley
GEMSTONES		
British Columbia:		
Bouvette, R.W. ³	Box 55, Lillooet	Lillooet
Osterlund, Ed ³	Lillooet	Lillooet
Purvis, Ron ³	Box 426, Lillooet	Lillooet
Seyward, Josef ³	226-2nd Ave., Chilliwack	Chilliwack
Yarmark, William ³	Box 248, Chase	Chase

Operators of Miscellaneous Non-metallic Mineral Deposits, 1963 - Continued

Name of operator	Head office address	Plant or mine location
GRAPHITE		
Quebec:		
Clement, Guy ²	Venise	Canton Amherst
Clot, Oscar Graphite Mining Ltd. ⁴	St. Jovite	Canton Joly
Italia Copper Ltd. ¹	96 Mozart Est, Montreal	Boutillier
Laurentide Graphite Corp.	161-4e Ave., Ville St. Pierre	Labelle
Westfield Minerals Ltd. ¹	25 King St. W., Toronto, Ontario	Buckingham
Ontario:		
Krefeld Graphite Gold Mines Ltd. ¹	R.R. No. 2, Cooksville	Vogt Twp.
Portland Graphite Co. ¹	Portland	Bastard Twp.
GRINDSTONES		
New Brunswick:		
Bay of Chaleur Grindstone Co. ¹	1434 Ste-Catherine St. W., Montreal, Quebec	Gloucester Co.
Read, H.C. ⁴	65 Verdun St., Moncton	Stonehaven
IRON OXIDE		
Quebec:		
Gelinas, Bruno ¹	1521 Notre Dame, Trois-Rivières	Portneuf Co.
Sherwin-Williams Co. of Canada (The) ⁴	2875 Centre St., Montreal	Red Mill, Champlain Co.
LITHIUM MINERALS		
Quebec:		
International Lithium Mining Corp. ¹	25 Adelaide St. W., Toronto, Ontario	Lamotte Twp.
Massval Mines Ltd. ¹	132 St. James St. W., Montreal	Lacorne
Quebec Lithium Corp. ⁴	1403 Edifice Aldred, Montreal	Barraute
Vallee Lithium Mining Corp. ¹	80 Richmond St. W., Toronto, Ontario	Fredmont Twp.
Ontario:		
Alba Exploration Ltd. ¹	119 Adelaide St. W., Toronto	Barbara Lake
Dunvegan Mines Ltd. ¹	357 Bay St., Toronto	Cosgrave Lake
Lithigean Mines Ltd. ¹	44 King St. W., Toronto	Barbara Lake
Lun Echo Gold Mines Ltd. ¹	67 Yonge St., Toronto	Nipigon
Manitoba:		
Chemalloy Minerals Ltd. ⁴	25 Adelaide St. W., Toronto, Ontario	Lac du Bonnet
Lithium Corp. of Canada Ltd. ¹	25 Adelaide St. W., Toronto, Ontario	Lac du Bonnet
Viola Mac Mines Ltd. ¹	25 Adelaide St. W., Toronto, Ontario	Cat Lake
MAGNESITIC DOLOMITE		
Quebec:		
Canadian Refractories Ltd. ⁴	540 Canada Cement Bldg., Montreal	Kilmar
PERLITE		
British Columbia:		
Perlite Mining Corp. Ltd. ¹	44 King St. W., Toronto, Ontario	Uncha Lake
Western Gypsum Products Ltd. ¹	Childs Building, Winnipeg, Manitoba	François Lake
PHOSPHATE		
Quebec:		
Bigelow, Robert ¹	Buckingham	Bowman Twp.
Blackburn Bros. Ltd. ¹	85 Sparks St., Ottawa, Ontario	Perkins
Industrial Phosphate Mines Ltd. ¹	18 Toronto St., Toronto, Ontario	Portland East Twp.
Luckridge Phosphate Mines Ltd. ¹	1421 Lakeshore Rd. Burlington, Ontario	Portland East Twp.
Quebec Smelting and Refining Ltd. ¹	215 St. James St. W., Montreal	Notre-Dame-de-la-Salette

Operators of Miscellaneous Non-metallic Mineral Deposits, 1963 — Continued

Name of operator	Head office address	Plant or mine location
POTASH		
Saskatchewan:		
Alwinal Potash of Canada Ltd. ¹	4th Floor, Derrick Bldg., Regina	Lanigan
Continental Potash Corp. Ltd. ^{2,4}	508 Credit Foncier Bldg., Vancouver	Unity
Duval Sulphur and Potash Co. ¹	Mellie Esperson Bldg., Houston, Texas	Saskatoon
Freeport Sulphur Co. ¹	161 East 42nd St., New York 17	Saskatoon
International Minerals & Chemical Corp. ⁴	Esterhazy	Esterhazy
Kalium Chemical, Ltd. ²	500 Financial Bldg., Regina	Pense
Potash Co. of America Ltd. ^{2,4}	Box 509, Saskatoon	Patience Lake
Southwest Potash Corp. ²	25 Adelaide St. W., Toronto, Ontario	Saskatoon
Tombill Mines Ltd. ¹	60 Yonge St., Toronto, Ontario	Riddle-Tidewater
United States Borax & Chemical Corp. ²	3075 Wilshire Blvd., Los Angeles, California, U.S.A.	Various
POZZOLAN		
British Columbia:		
Canadian Pozzolan Industries Ltd.	640-7th Ave. W., Calgary, Alta.	Cariboo
Holdfast Pozzolan, Ltd. ⁴	1253 Burrard St., Vancouver	Saltspring Island
PYRITE, PYRRHOTITE		
Quebec:		
Noranda Mines Ltd. ⁵	44 King St. W., Toronto, Ontario	Noranda
Normetal Mining Corp. Ltd.	44 King St. W., Toronto, Ontario	Normetal
Queмонт Mining Corp. Ltd. ⁵	44 King St. W., Toronto, Ontario	Rouyn Twp.
Ontario:		
International Nickel Company of Canada Ltd. ⁵	Copper Cliff	Copper Cliff
Falconbridge Nickel Mines Ltd. ⁵	7 King St. E., Toronto	Falconbridge
British Columbia:		
Consolidated Mining & Smelting Company of Canada Ltd. ⁵	Trail	Kimberley
Howe Sound Co. ⁵	500 Fifth Ave, New York, N.Y., U.S.A.	Britannia Beach
SODIUM CARBONATE (Natural)		
British Columbia:		
Bishop, V.C. (Mrs.) ¹	c/o Boyd's Garage, Clinton	Clinton area
SODIUM SULPHATE (Natural)		
Saskatchewan:		
Midwest Chemicals Ltd. ⁴	Palo	Palo
Ormiston Mining & Smelting Co. Ltd. ⁴	Ormiston	Ormiston
Sybouts Sodium Sulphate Co. Ltd. ⁴	Box 291, Wilmington, Delaware, U.S.A. ...	Gladmar
Saskatchewan Minerals (Sodium Sulphate Div.) ⁴	Chaplin	Chaplin, Bishopric
MICA		
Quebec:		
Bastien, Laurier	Buckingham	Portland
Blackburn Bros. Ltd. ⁴	85 Sparks St., Ottawa, Ontario	Cantley
Boissonnault, F. ⁵	East Templeton	Villeneuve
Boland, Charles	Chelsea	Wakefield
Cameron, Don & Earl	Buckingham	Portland West
Cross, W.C. ⁶	7 Hadley Blve., Hull	Hull
Desiel, A. ⁶	Wilson Corner	Wakefield
Desormeaux, Gaudias ¹	St. Pierre de Wakefield	Portland West
Duquette, Waldick	55 Maple St., Gatineau	Cantley
Gagne, C. ¹	St. Michel de Wentworth	Wentworth
Gagne, Edgar & Richard ¹	Cascades	Pike Lake
Joannis, L.M.	31 Graham St., Hull	Gatineau
Larmont, Edouard	Buckingham	Portland East
Lavigne, E.	St. Pierre de Wakefield	Wakefield
Laviolette Mining & Metallurgical Corp. ^{2,6}	5083 St. Denis, Montréal 34	Suzar

Operators of Miscellaneous Non-metallic Mineral Deposits, 1963 - Concluded

Name of operators	Head office address	Plant or mine location
MICA - Concluded		
Quebec - Concluded:		
Mica Co. of Canada Ltd.	2 Lois St., Hull	Hull
Mont-Laurier Mica Enr'g.	Mont-Laurier	Robertson
Nadon, Ronald A. ¹	Buckingham	Papineau
Poirier, C. ⁶	St-Pierre de Wakefield	Portland West
Reed, Bazel	Otter Lake	Pontiac
Renaud, J. ¹	Perkins	Wakefield
Rousseau, C. ¹	St. Remi d'Amherst	Labelle
Sargent, Fred ¹	R.R. 3, Wakefield	Hull
Trudeau, Victor H. ¹	279 Bronson Ave., Ottawa, Ont	Hull Twp.
Wallingford, E. Ltd. ²	Perkins	Papineau
Wallingford, G.E. ²	63 Pinehurst Ave., Ottawa, Ontario	Templeton
Zimmereling, A.	Otter Lake	Cawood
Ontario:		
Arvay, Robt. & John McConnell ⁶	1370 Montreal St., Kingston	Loughborough
Duggan Wm. ⁶	Dunchurch	Hagerman
Green, W.E., W.C. and A.W. ¹	Perth Road	Perth Road
Green, R. ¹	Parry Sound	Parry Island
Fowler, Don	532 Eastern Ave., Toronto	Frontenac
Jones, Ed ¹	Sharbot Lake	Oso
Watts, R.W. ⁶	21 Isabella St., Perth	Lanark
Wilson, Richard	R.R. 1, Hartington	Frontenac
British Columbia:		
Fairey & Co. ¹	661 Taylor St., Vancouver	Vancouver
Georgian Mica Co. Ltd. ¹	5010-47 Ave., Red Deer, Alberta	Valemont
SULPHUR (in smelter gas)		
Quebec:		
Allied Chemical Canada Ltd. ^{3,5}	Valleyfield	Valleyfield
Aluminum Co. of Canada Ltd. ^{3,6}	Sun Life Bldg., Montreal	Arvida
Ontario:		
Canadian Industries Ltd. ⁵	Box 10, Montreal, Quebec	Copper Cliff
Sherbrooke Metallurgical Ltd. ^{3,5}	Dunnville	Dunnville
British Columbia:		
Consolidated Mining & Smelting Company of Canada Ltd. ⁵	Trail	Trail

¹ Holds dormant property.² Active but not producing.³ Produces acid by calcining zinc sulphide concentrates.⁴ Firms comprising Miscellaneous Non-metal Mines for statistical purposes covered by Tables 1A, part of 2, 3, 4, 5, and 6.⁵ Firms producing miscellaneous non-metal products which are otherwise credited to other industries. See paragraph 3 of text on page 5.⁶ Firms comprising mica mines for statistical purposes covered by Tables 44A, 45, 46, and 47.

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