

Mineral Aggregates

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Total Canadian shipments of mineral aggregates (mainly crushed stone and sand and gravel) increased less than 1% to 314 Mt in 1994, when preliminary statistics for the year are compared with final figures for 1993. By way of contrast, during the pre-recessionary period from 1987 to 1990, total annual shipments were in excess of 350 Mt/y.

Unit values generally continued to increase in pace with the rate of inflation with selling prices varying considerably depending on proximity to consumers. Housing starts, a broad indicator of demand for most primary construction materials, were 168 300 in 1992, 155 400 in 1993, and about 155 000 in 1994.

CANADIAN DEVELOPMENTS

The importance of mineral aggregates to the economic competitiveness of Canada's urban areas is gaining increasing recognition. In the case of Ontario, the province's new *Aggregate Resources Act*, which in 1990 replaced two related acts and the applicable portion of the province's *Mining Act*, is probably the most comprehensive document of its kind in Canada.

In May 1994, the Aggregate Producers Association of Ontario staged "AGGPAC Canada '94," an international meeting held in conjunction with the "Toronto '94" world mining conference. This event featured a major demonstration of operating equipment and provided an unprecedented opportunity to raise public awareness of the importance of having primary materials relatively accessible to major urban areas.

In October 1994, the first-ever Great Lakes Regional Community Relations Conference was held in Toronto. Sponsors included the Aggregate Producers Association of Ontario, and the National Aggregates Association and National Stone Association of the United States. The main purpose of the conference was to bring together industry leaders and key

decision-makers to discuss a range of land access and environmental issues common to the Great Lakes Region.

Because of its relatively high degree of urbanization, the need for aggregate resources planning is particularly important in southern Ontario. This point is made in a study of the issues that was released in late 1993 entitled, *Aggregate Resources of Southern Ontario - A State of the Resource Study*. This report, commissioned by the Ontario Ministry of Natural Resources, includes a comprehensive review of supply/demand factors, costs, questions concerning legislation and planning, and issues concerning recycling and re-use.

Demand for mineral aggregates is mainly local or regional and is influenced to a major degree by trends in domestic construction. However, in some populated regions, markets are not self-sufficient as evidenced by their reliance on shipments from other areas. In addition, international bulk shipping of aggregates has increasingly been proven to be feasible.

Sand and Gravel

Sand and gravel deposits are widespread and large producers have established plants in locations as convenient as possible to major consuming centres. These large aggregate operations are usually associated with other activities such as ready-mix or asphalt plants. They are also usually complemented by many small producers who serve local markets seasonally or only on demand. Some relatively large operations may operate intermittently, serving as suppliers to heavy construction companies when required. Provincial highway departments may operate regional quarries to supply roadbed material for both repair work and new projects.

The diverse range of entities involved in mineral aggregates has presented challenges in efforts to capture complete production and consumption data. As a consequence, some estimates suggest that total production of aggregates from all sources in some provinces may be 25-30% higher than official statistics indicate. Included in these all-source estimates are designated areas, wayside sources, provincial transportation ministry sites, Crown lands, and private lands.

As existing land-based sources are depleted, there is growing potential for the economically viable marine dredging of sand and gravel in Canada. Offshore sand and gravel resources in Canada have been used to meet special job requirements in the Beaufort Sea, the Prince Rupert area, and at the Roberts Bank port facility near Vancouver. In Atlantic Canada, it has been established that there is a good possibility of defining sufficient quantities of sand and gravel for marine dredging.

Crushed Stone

Many operations producing crushed stone are part-time or seasonal; others are operated as subsidiaries of construction or manufacturing establishments not classified with the stone industry. In addition, some operations are operated by municipal or provincial government departments producing stone only for their own use. Quarries removing rock by drilling, blasting and crushing are generally associated with large construction companies; in contrast, gravel pits are usually associated with smaller, more local needs. Depending on cost and availability, crushed stone competes with gravel and crushed gravel as an aggregate in concrete and asphalt and as railway ballast and road-base aggregates (road metal). In these applications, it is subject to the same physical and chemical-testing procedures as gravel and sand aggregates.

In **Atlantic Canada**, construction continued at Bull Arm, Trinity Bay, Newfoundland, on the \$5.2 billion Hibernia offshore oilfield project. It is expected that work on the concrete gravity-based system for supporting the drilling and production platform will be completed in 1997, with drilling scheduled to begin the following year.

The Newfoundland Resources and Mining Company (NRMC), owned by a subsidiary of Explaura Holdings plc., has been evaluating a high-purity limestone deposit near its established operation at Lower Cove, on the Port au Port Peninsula, in Newfoundland. NRMC plans to produce special products in conjunction with its new aggregates operation designed mainly for long-distance bulk shipping and distribution. (Approximately 500 000 t can be stockpiled and about 4.3 Mt/y can be produced.) The company plans to establish more terminals along the U.S. eastern seaboard to complement its one terminal currently operating in New York City (Brooklyn).

The Province of Prince Edward Island signed an agreement in late 1993 with Strait Crossing, a Calgary-based consortium, to begin preliminary work on the \$840 million, 13.5-km-long fixed transportation link between Prince Edward Island and New Brunswick. Construction is expected to take about five years, barring any unexpected delays.

Granite aggregate from the Porcupine Mountain quarry at Auld's Cove, near Port Hawkesbury, Nova

Scotia, has been transported to markets throughout the region. In recent years when favourable back-haul arrangements could be made, 50 000-60 000-t loads have been shipped as far as Houston, Texas.

Atlantic Industrial Minerals continued to supply limestone from its Glen Morrison deposit in Cape Breton to Nova Scotia Power Corporation's Point Aconi thermal-electric station, which uses circulating fluidized bed technology.

Plans by Kelly Rock Limited and an associate to develop a major coastal marine quarry for construction aggregates remained on hold pending an environmental review. The company plans to develop a site on deep water at Kelly's Mountain, about 40 km north of Sydney.

In **Quebec**, Marconi Quarries Ltd., situated on the north shore of the St. Lawrence River at Pointe Noire near Sept-Îles, continued to produce a wide range of construction aggregates for widespread distribution. Reserves of anorthositic gabbro are said to be very large.

In **Ontario**, Dufferin Aggregates (a subsidiary of St. Lawrence Cement Inc.), operating near Milton with a capacity to produce up to 7 Mt/y, remains the largest quarrier in Canada. Following a growing pattern in the industry, the progressive and ongoing rehabilitation of the company's sites has become a major priority in recent years.

Manitoulin Dolomite, owned by Standard Aggregates Inc., is situated on Manitoulin Island in Lake Huron. Approximately 2.2 Mt/y of white-to-grey, fine-grained dolomite is shipped for construction, chemical and metallurgical markets in Canada and the United States.

Emphasis continued to be placed on the search in some areas for new sources of skid-resistant aggregates. Natural materials that have attracted attention, particularly in Ontario, include metavolcanic rocks, quartzite, granitic and igneous gravel, and hard, durable sandy carbonates and sandstones.

In **western Canada**, large-volume ocean transportation facilities have been used for many years in British Columbia to supply high-quality aggregates or high-calcium limestone. For example, limestone producers on Texada Island, situated about 100 km northwest of Vancouver in the Strait of Georgia, supply raw material to cement and lime producers on the lower mainland and in the state of Washington. Holnam West Materials Ltd. and its predecessor have been shipping from Texada since 1957. Road-base material and riprap for use in the lower mainland are also important products; special orders for related materials may be for destinations extending as far away as Alaska or northern California. Imasco Minerals Inc. (formerly International Marble & Stone Co. Ltd.), now owned by Sacks Industrial Group,

continued to produce a wide range of minerals for filler and other applications.

RECYCLING

The recycling of concrete and other construction materials is expected to increase because of limitations on the use of landfill sites as well as growing expertise in materials management within the construction industry. Again looking at Ontario as an example, more than 90 of about 145 asphalt plants in the province are producing some recycled hot-mix asphalt material, according to a recent study. In the future, the recycling of old pavement is expected to increase, provided that quality control and engineering specifications are followed. With varying degrees of success, reclaimed glass, ceramics, brick, and crumb rubber have been investigated as potential aggregates. There has been more emphasis in some regions of the province on developing sources of natural materials since the Ontario Ministry of Transportation stopped the use of steel slag as an aggregate in asphalt pavements.

WORLD DEVELOPMENTS

Large-scale coastal marine quarrying of aggregates for international markets continues to attract considerable attention. In the United Kingdom, environmental and land-use pressures have resulted in relatively less production from inland quarries and more production from large coastal super-quarries. In Ireland, a new coastal marine quarry known as the Wimpey Fleming Adrigole Quarry started production in 1993. Annual production is expected to rise to 1.2 Mt in 1995 and to 2.0 Mt by the end of the decade. The project is only the second large-scale operation of its kind in Europe; it is expected that markets in the United Kingdom and continental Europe will be convenient for backhaul cargo. This scale of aggregates operation was first pioneered in 1986 by Foster Yeoman Ltd. at its Glensanda quarry on the west coast of Scotland. The Glensanda operation has been followed by the Vulcan Materials Co. joint venture on Mexico's Yucatan Peninsula, as well as by NRMCo's large project described earlier.

Tarmac plc is establishing a 5-Mt/y coastal quarry at Jossingfjord in Norway, while Schweden Splitt AB is developing a granite aggregate quarry close to the south coast of Sweden, primarily for the Berlin and German Baltic coast markets. A proposed super-quarry planned by Redlands Aggregates Limited on South Harris Island, Scotland, has been delayed; apparently, environmental concerns are in conflict with the development in a natural scenic area.

Seabed mining of aggregates is currently the principal ocean-mining activity related to non-fuel minerals. In Japan, seabed sands account for about 40% of total domestic production of fine aggregates

needed for concrete. As a general trend, more consideration is being given to the need for offshore dredging for aggregates because of growing demand and environmental and zoning constraints associated with on-shore developments. This is particularly true in the United States, although several factors have contributed to difficulties in drafting a seabed mining law that would alleviate major industry and environmental concerns.

LIGHTWEIGHT AGGREGATES

The classification of lightweight aggregates is based on source, processing methods, and end uses. Source rocks include pumice, scoria, volcanic cinders, and tuff. Manufactured lightweight aggregates are bloated or expanded products commonly obtained by heating certain clays, shales, and slates. Ultralightweights, produced mainly from perlite and vermiculite, are expanded or exfoliated by heating. Fly ash (produced mainly as a by-product of the combustion of coal and coke in thermal power plants), ground pelletized slag (resulting from metallurgical processes), and condensed silica fume (a by-product of the smelting process used to produce silicon metal and ferrosilicon alloys) are generally classified as supplementary cementing materials because of their pozzolanic characteristics.

Perlite

Perlite is a glassy volcanic rock containing 2-5% of combined water; after crushing and rapid heating to 760°-1100°C, perlite expands its volume from 4 to 20 times. Through attention to pre-blending of kiln feed and retention time in the kiln, expanded material weighing as little as 30-60 kg/m³ can be produced.

Imported perlite is expanded at numerous locations for use mainly in horticultural peat mixes as well as in lightweight and fire-resistant construction products. Other uses relate to loose insulation and insulating media in concrete products. Imports of crude perlite are mainly from New Mexico and Colorado, with production from companies such as Grefco, Inc., Manville Corporation, USG Corporation, and United Perlite Corp. Perlite has not been produced in Canada since Aurun Mines Ltd. closed its processing plant in Surrey, British Columbia, in 1990. With improved markets over a wider range of grades, there is a possibility that other deposits may be developed in the future.

Pumice

Numerous concrete product manufacturers, mainly block producers, use pumice imported from Greece or the northwestern United States. In Canada, a major potential use for this durable and angular material is in highway asphalt overlay as a highly skid-resistant ingredient.

Vermiculite

Vermiculite refers to a small group of minerals, physically resembling the lamellar structure of the micas, which expand or exfoliate greatly when heated rapidly. Canadian consumption is mainly for horticultural uses, with lesser amounts being used for insulation and other products.

The United States is the world's leading producer of vermiculite, with W.R. Grace and Company being the major supplier from the Enoree region of South Carolina. Canada also imports crude vermiculite from the Republic of South Africa, where Palabora Mining Co. Ltd. is the major producer. Vermiculite occurrences have been reported in British Columbia, and deposits near both Perth and Peterborough in Ontario have attracted attention in the past.

A new processing plant in Zimbabwe was commissioned by Shawa Vermiculite Pvt. Ltd. The total capacity of the company's operations is reported to be 39 000 t/y, when combined with its existing operations.

Clay, Shale and Slag

Common clays and shale are used throughout Canada for manufacturing lightweight aggregates. Raw clay materials, usually quarried adjacent to plant sites, receive little beneficiation other than drying before going to the kiln where they are expanded. Shales are crushed and screened before burning. Slag, a porous, glassy, nonmetallic by-product resulting from controlled cooling conditions at the end of the steel-making process, may be crushed and sized for many construction-related applications.

Ongoing research, sponsored through the Canada Centre for Mineral and Energy Technology (CANMET), relating to supplementary cementing materials led to the successful use of ground granulated blast furnace slag for use as a cementitious material in concrete. Lafarge Canada Inc. now produces this type of material, commonly referred to as "slag cement," at a grinding plant at Spragge, Ontario. The granulated slag is from a plant owned by Algoma Steel Inc. at Sault Ste. Marie. Plant capacity is about 150 000 t/y of slag cement for complete or partial replacement of Portland cement, depending on requirements. The primary use at present is for mine backfill.

PRICES

In addition to supply/demand factors, prices of the various aggregates are determined locally or regionally on the basis of production and transportation costs, the degree of processing prior to final use, and by site-specific volume requirements.

USES

The principal uses for sand and gravel are for highway construction and concrete and asphalt aggregates. Based on a recent study by the Ontario Ministry of Natural Resources, the construction of single-family homes triggers an overall demand of about 300 t of aggregate per unit, while apartment construction requires about 50 t per unit.

More than 90% of the total stone output used by the construction industry is for crushed material used as aggregates for concrete and asphalt, as granular materials for highway and railway construction, and as granular materials for a broad range of other uses such as construction fill. Specifications vary greatly depending on intended uses, and many tests are required to determine the acceptability of aggregates for certain applications. Also of importance are tests concerning: organic impurities or other deleterious materials; resistance of the aggregate to abrasion and to freeze-thaw cycles; the effects of thermal expansion, porosity and absorption; reactivity with associated materials; and surface texture.

Lightweight concrete used in commercial and institutional projects has facilitated the construction of taller buildings and the use of longer clear spans in bridges and buildings. Other advantages of using lightweight aggregates relate to their thermal and acoustical properties, fire resistance, freeze-thaw properties, and low water-absorption characteristics.

Production of, and applications for, lightweight aggregates are based on the American Society for Testing and Materials (ASTM) designations as follows: ASTM C 332-91, Lightweight Aggregates for Insulating Concrete; C 330-89, Lightweight Aggregates for Structural Concrete; and C 331-89, Lightweight Aggregates for Concrete Masonry Units.

OUTLOOK

Shipments of aggregates in 1995 are expected to increase moderately based on continuing strength in engineering construction. The level of residential construction will remain the same with about 156 000 housing starts, according to the Canada Mortgage and Housing Corporation. Engineering-related construction will continue to benefit from the federal-led, cost-shared program for infrastructure renewal involving the cooperative efforts of all three levels of government. The recovery in non-residential building construction is expected to be slower, given relatively high office and industrial vacancy rates.

In Atlantic Canada, the Hibernia offshore oil project and the planned fixed crossing between Prince Edward Island and New Brunswick, respectively, are expected to reach their maximum needs for primary construction materials in 1995 and 1996.

The demand for aggregates in the United States is forecast to increase about 4% in 1995 based largely on expenditures on institutional facilities and public works; residential construction is expected to moderate. In addition, the outlook for office and industrial building is expected to improve.

Urban expansion has greatly increased the demand for aggregates in support of major construction. Paradoxically, urban spread has not only tended to overrun operating pits and quarries, but has also extended into areas containing potentially valuable reserves and resources. In this context, and in view of advancements in rehabilitation techniques, municipal and regional zoning can be expected to become more coordinated and balanced concerning land planning and management.

Sand and gravel will continue to be competitive with crushed stone in many areas and, in some applications, with lightweight aggregates. New reserves are expected to be located and assessed as part of the community planning or regional zoning process. Prices for aggregates will continue to rise with increasing land values, more sophisticated operating techniques and equipment, the depletion of more accessible reserves, and added rehabilitation expenditures.

Estimates suggest that available sand and gravel supplies in some regions will be depleted during the 1990s, resulting in a need to develop outlying deposits. Predicted shortages could encourage the exploitation of offshore deposits and even underground mining in some regions.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 60. (2) Information in this review was current as of February 1, 1995.

TABLE 1. CANADA, TOTAL PRODUCTION OF STONE, 1992-94

	1992		1993		1994p	
	(000 t)	(\$000)	(000 t)	(\$000)	(000 t)	(\$000)
BY PROVINCE¹						
Newfoundland	1 000	4 758	1 871	7 186	2 388	15 304
Nova Scotia	4 705	24 910	5 179	24 563	5 461	27 733
New Brunswick	2 784	15 799	3 217	18 553	2 599	15 300
Quebec	36 524	207 500	33 294	202 708	30 892	186 107
Ontario	37 666	219 388	37 925	223 496	40 833	215 649
Manitoba	1 549	7 770	2 476	10 948	2 693	11 208
Alberta	316	3 600	325	3 176	346	4 126
British Columbia	3 910	30 113	4 253	32 265	4 987	36 774
Northwest Territories and Yukon	884	2 679	821	4 560	854	2 848
Total	89 338	516 518	89 361	527 454	91 053	515 050
BY USE²						
Dimensional stone						
Rough	186	19 517	363	22 766	..	..
Monumental and ornamental stone (n.f.)	57	5 720	42	4 724	..	..
Other (flagstone, curbstone, paving blocks, etc.)	57	3 666	33	3 336	..	..
Lining open-hearth furnaces	-	-	5	46	..	..
Chemical and metallurgical						
Cement plants, Canada	10 360	30 247	11 472	35 993	..	..
Cement plants, foreign	1 036	4 141	1 329	5 643	..	..
Flux in iron and steel furnaces	562	2 864	198	1 446	..	..
Flux in nonferrous smelters	167	799	230	1 601	..	..
Clay plants, Canada	686	1 839	623	1 951	..	..
Glass factories	154	2 724	184	3 491	..	..
Lime plants, Canada	3 142	22 880	2 893	21 897	..	..
Lime plants, foreign	214	1 495	420	2 474	..	..
Pulp and paper mills	231	2 178	224	2 355	..	..
Sugar refineries	19	99	14	64	..	..
Other chemical uses	264	2 055	244	1 810	..	..
Pulverized stone						
Whiting	35	2 973	41	2 909	..	..
Asphalt filler	292	1 971	54	205	..	..
Dusting coal mines	1	44	7	321	..	..
Agricultural purposes and fertilizer plants	916	13 337	844	13 006	..	..
Other uses	953	14 785	999	14 612	..	..
Miscellaneous stone						
Manufacture of artificial stone	35	424	18	185	..	..
Roofing granules	321	6 853	388	8 048	..	..
Poultry grit	53	1 411	48	954	..	..
Stucco dash	5	424	15	1 147	..	..
Terrazzo chips	5	403	2	308	..	..
Rock wool	18	450	18	440	..	..
Rubble and riprap	664	4 177	997	7 035	..	..
Other uses	1 379	8 952	1 357	9 162	..	..
Crushed stone for						
Concrete aggregate	8 057	49 402	10 253	57 962	..	..
Asphalt aggregate	9 237	53 849	10 130	56 608	..	..
Road metal	34 646	165 053	32 752	162 634	..	..
Railroad ballast	1 684	13 705	1 876	14 243	..	..
Other uses	28 090	133 048	26 280	127 919	..	..
Total	103 526	571 483	104 350	587 295	..	..

Sources: Natural Resources Canada; Statistics Canada.

.. Not available; n.f. Not finished or dressed; p Preliminary.

¹ Data exclude stone used in the Canadian cement and lime industries. ² Data include stone used in the Canadian cement and lime industries.

Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, PRODUCTION OF SAND AND GRAVEL¹ BY PROVINCE, 1992-94

	1992		1993		1994p	
	(000 t)	(\$000)	(000 t)	(\$000)	(000 t)	(\$000)
Newfoundland	3 537	17 610	3 257	14 509	3 128	14 202
Prince Edward Island	444	1 699	295	1 076	295	1 076
Nova Scotia	5 976	20 462	4 656	20 227	4 364	19 179
New Brunswick	6 552	13 161	4 427	12 612	3 855	9 450
Quebec	37 307	116 968	33 987	100 298	29 709	98 234
Ontario	87 647	266 368	94 033	325 526	95 337	349 922
Manitoba	9 591	35 239	13 112	33 679	13 346	36 067
Saskatchewan	6 236	17 841	5 872	16 211	5 876	16 460
Alberta	38 094	125 277	34 324	127 718	35 386	133 500
British Columbia	39 923	128 624	40 241	135 398	41 837	146 790
Yukon	2 318	6 446	2 597	7 764	3 652	10 859
Northwest Territories	2 991	10 673	1 337	4 221	1 326	4 018
Total	240 616	760 367	238 137	799 240	238 110	839 758

Sources: Natural Resources Canada; Statistics Canada.

P Preliminary.

¹ Production represents shipments of natural gravel, sand and crushed gravel, and quartz-silica, excluding silica used in Canadian cement plants.

Note: Numbers may not add to totals due to rounding.

TABLE 3. AVAILABLE DATA ON CONSUMPTION OF SAND AND GRAVEL,¹ BY PROVINCE, 1992 AND 1993

		Atlantic Provinces	Quebec	Ontario	Western Provinces ²	Canada
		(000 tonnes)				
Road bed, surface	1992	11 086	23 230	47 255	61 482	143 052
	1993	7 609	20 562	56 187	58 015	142 373
Roads, ice control	1992	670	969	2 812	494	4 945
	1993	575	1 158	3 454	1 268	6 455
Concrete aggregate	1992	1 365	3 313	10 117	12 298	27 093
	1993	1 202	3 897	9 315	13 048	27 462
Asphalt aggregate	1992	1 798	3 210	4 917	6 105	16 030
	1993	1 672	3 423	6 148	7 195	18 438
Railroad ballast	1992	10	112	432	5 515	6 069
	1993	11	53	11	386	461
Mortar sand	1992	63	259	1 192	302	1 816
	1993	61	234	657	239	1 191
Backfill for mines	1992	. . .	196	737	83	1 016
	1993	. . .	198	502	68	768
Fill	1992	854	2 631	12 239	4 986	20 710
	1993	824	2 275	7 917	6 144	17 160
Other special uses ³	1992	91	641	572	708	2 012
	1993	97	616	549	489	1 751
Other purposes	1992	573	2 797	7 375	7 178	17 923
	1993	583	1 636	9 399	10 815	22 433
Total	1992	16 509	37 359	87 647	99 152	240 667
	1993	12 635	34 053	94 139	97 667	238 494

Sources: Natural Resources Canada; Statistics Canada.

– Nil; . . . Amount too small to be expressed.

¹ Data include natural silica sand, silica sand manufactured from quartz or silica rock, and silica used in Canadian cement plants. ² The western provinces include the Yukon and Northwest Territories. ³ Includes glass manufacture, ferrosilicon carbide manufacture, silica brick manufacture, chemical manufacture, smelter flux, sand blasting, and moulding and core sands.

Note: Numbers may not add to totals due to rounding.

TABLE 4. CANADA, EXPORTS AND IMPORTS OF SAND AND GRAVEL AND CRUSHED STONE, 1992-94

Item No.	1992		1993		1994p		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
EXPORTS							
2505.90	Natural sands n.e.s., excluding metal-bearing sands						
	United States	113 347	912	118 636	917	95 466	874
	Taiwan	—	—	—	—	900	67
	Hong Kong	—	—	—	—	100	15
	Cuba	—	—	—	—	42	7
	Bahamas	7 628	143	—	—	—	—
	St. Vincent Grenada	11 688	250	—	—	—	—
	St. Helena	—	—	69 544	722	—	—
	Saint Lucia	6 621	124	—	—	—	—
	Other countries	31 617	343	7 446	87	—	—
	Total	170 901	1 772	195 626	1 726	96 508	964
2517.10	Pebbles, gravel, broken or crushed stone used for aggregates, etc.						
	United States	1 866 513	10 856	1 991 839	14 497	2 052 322	17 640
	Bermuda	25 395	215	15 296	138	4 705	53
	Taiwan	—	—	79	8	—	—
	Antigua	—	—	1 800	10	—	—
	Saint Lucia	12 814	265	—	—	—	—
	St. Vincent Grenada	25 867	512	—	—	—	—
	Bahamas	27 312	397	—	—	—	—
	Other countries	184	50	—	—	85	25
	Total	1 958 085	12 295	2 009 014	14 655	2 057 112	17 718
2517.41	Marble granules, chippings and powder of 25.14 or 25.16, heat-treated or not						
	United States	5 632	712	33 673	4 360	50 401	6 495
	Total	5 632	712	33 673	4 360	50 401	6 495
2517.49	Granules, chippings and powder, n.e.s., of 25.15 or 25.16, heat-treated or not						
	United States	21	7	27 505	168	3 011	178
	Other countries	36	5	40	5	3	1
	Total	57	12	27 545	173	3 014	179
2518.10	Dolomite, not calcined						
	United States	92 727	455	294 857	1 397	198 991	1 228
	Trinidad and Tobago	—	—	—	—	20 892	289
	Other countries	—	—	20	4	82	16
	Total	92 727	455	294 877	1 401	219 965	1 533
2518.20	Calcined dolomite						
	United States	23 610	4 185	33 237	5 075	38 590	5 136
	Japan	—	—	20	2	39	15
	Trinidad and Tobago	—	—	17 465	236	—	—
	Total	23 610	4 185	50 722	5 313	38 629	5 151
2518.30	Agglomerated dolomite (including tarred dolomite)						
	Trinidad and Tobago	—	—	76 598	953	70 681	1 030
	Other countries	—	—	—	—	40	8
	Total	—	—	76 598	953	70 721	1 038
2521.00	Limestone flux; limestone and other calcareous stone used for lime or cement						
	United States	1 528 530	8 137	1 943 174	10 507	2 272 651	16 795
	Other countries	—	—	—	—	4 022	15
	Total	1 528 530	8 137	1 943 174	10 507	2 276 673	16 810
IMPORTS							
2505.90	Natural sands n.e.s., excluding metal-bearing sands						
	United States	239 904	3 454	399 008	4 303	317 468	3 880
	Japan	292	42	1 210	226	418	96
	Norway	—	—	—	—	1 066	64
	United Kingdom	103	15	616	42	110	29
	Other countries	73	15	176	34	47	14
	Total	240 372	3 526	401 010	4 605	319 109	4 083

TABLE 4 (cont'd)

Item No.	1992		1993		1994 ^p		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
IMPORTS (cont'd)							
2517.10	Pebbles, gravel, broken or crushed stone used for aggregates, etc.						
	United States	910 550	6 948	948 187	7 430	629 825	6 692
	Germany	379	5	1 061	15	2 342	20
	France	433	6	437	6	800	11
	Belgium	363	5	267	4	526	4
	Other countries	1 049	17	94	5	723	9
	Total	912 774	6 981	950 046	7 460	634 216	6 736
2517.20	Macadam of slag, dross or similar industrial waste, etc.						
	United States	2 165	32	832	12	492	7
	Total	2 165	32	832	12	492	7
2517.30	Tarred macadam						
	United States	80	5	261	11	95	7
	Total	80	5	261	11	95	7
2517.41	Marble granules, chippings and powder of 25.15 or 25.16, heat-treated or not						
	United States	71 935	8 222	54 928	7 270	50 507	7 230
	France	330	65	600	71	284	56
	Italy	463	82	149	21	150	20
	Other countries	—	—	—	—	197	40
	Total	72 728	8 369	55 677	7 362	51 138	7 346
2517.49	Granules, chippings and powder, n.e.s., of 25.15 or 25.16, heat-treated or not						
	United States	99 133	1 586	173 636	2 199	221 045	3 508
	France	68	8	298	36	568	70
	Other countries	28	1	3	1	79	9
	Total	99 229	1 595	173 934	2 236	221 692	3 587
2518.10	Dolomite, not calcined						
	United States	6 460	1 288	10 619	2 071	4 643	1 030
	United Kingdom	8	2	28	9	30	10
	Total	6 468	1 290	10 647	2 080	4 672	1 040
2518.20	Calcined dolomite						
	United States	6 312	552	5 911	470	11 967	790
	Total	6 312	552	5 911	470	11 967	790
2518.30	Agglomerated dolomite (including tarred dolomite)						
	United States	194	79	54	28	299	158
	Total	194	79	54	28	299	158
2521.00	Limestone flux; limestone and other calcareous stone used for lime or cement						
	United States	3 334 296	14 118	4 022 341	17 766	3 962 535	18 146
	France	—	—	—	—	26 892	426
	Portugal	—	—	—	—	7 681	44
	Lebanon	—	—	—	—	3 228	18
	Thailand	388	2	162	—	139	—
	Other countries	213	1	703	5	178	4
	Total	3 334 897	14 121	4 023 206	17 771	4 000 653	18 638

Source: Statistics Canada.

— Nil; . . Not available; n.e.s. Not elsewhere specified; ^p Preliminary.

Note: Numbers may not add to totals due to rounding.

TABLE 5. LIGHTWEIGHT AGGREGATE PRODUCERS IN CANADA, 1993

Company	Location	Commodity	Remarks
ATLANTIC PROVINCES			
Annapolis Valley Peat Moss Company Limited	Berwick, N.S.	Vermiculite	Processed for use in horticulture.
Avon Aggregates Ltd.	Minto, N.B.	Expanded shale	Processed for concrete products industry.
Fafard Peat Moss Company Ltd.	Shippagan, N.B.	Perlite, vermiculite	Processed for use in horticulture.
Sun Gro Horticulture Inc.	Maisonnette, N.B.	Perlite	Processed for use in horticulture.
QUEBEC			
Miron Inc.	Ville St-Laurent	Pumice	Purchased for concrete block manufacture.
Premier Peat Moss Ltd.	Rivière du Loup	Perlite, vermiculite	Processed for use in horticulture.
Vermi-lite Inc.	Baie-du-Febvre	Perlite	Processed for use in horticulture, insulation and concrete products.
ONTARIO			
National Slag Limited	Hamilton	Slag	Used in concrete products industry and as slag cement.
V.I.L. Vermiculite Inc.	Woodbridge	Vermiculite	Processed for use in loose insulation, horticulture and concrete products.
W.R. Grace & Co. of Canada Ltd.	St. Thomas	Vermiculite	Vermiculite processed for use in horticulture, as loose insulation, in refractories, and in friction materials.
	Ajax	Vermiculite, perlite	Perlite processed for use in gypsum plaster, horticulture, refractories, as loose insulation, in friction materials, and in fire-proofing.
PRAIRIE PROVINCES			
Cindercrete Products Limited	Saskatoon, Sask.	Expanded clay	Processed for concrete products industry.
	Regina, Sask.	Expanded clay	Processed for concrete block manufacture.
Inland Cement Limited	Calgary, Alta.	Expanded shale	Processed for concrete products industry and for loose insulation.
	Edmonton, Alta.	Expanded clay	Processed for concrete block manufacture.
Kildonan Concrete Ltd.	Winnipeg, Man.	Expanded clay	Processed for concrete products industry.
Sun Gro Horticulture Inc.	Elma, Man.	Perlite	Processed for use in horticulture.
Sun Gro Horticulture Inc.	Seba Beach, Alta.	Perlite	Processed for use in horticulture.
W.R. Grace & Co. of Canada Ltd.	Winnipeg, Man.	Vermiculite, perlite	Perlite processed for use in gypsum plaster and in horticulture.
	Edmonton, Alta.	Vermiculite, perlite	Vermiculite processed for use in horticulture and as loose insulation.
BRITISH COLUMBIA			
Ocean Construction Supplies Limited	Vancouver	Pumice	Purchased for concrete products industry.
W.R. Grace & Co. of Canada Ltd.	Vancouver	Vermiculite, perlite	Mainly for horticulture.

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."

TABLE 6. CANADA, IMPORTS OF VERMICULITE, PERLITE AND PUMICE, 1992-94

Item No.		1992		1993		1994 ^p	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
2513.11	Pumice stone, crude or in irregular pieces, including crushed pumice						
	United States	4 540	563	7 095	700	7 428	776
	Turkey	3 054	567	3 602	636	4 591	740
	Greece	4 500	73	511	83	697	103
	France	—	—	1	—	19	3
	Other countries	47	8	9	3	3	2
	Total	12 141	1 211	11 218	1 422	12 738	1 624
2513.19	Pumice stone, other						
	United States	3 396	672	3 754	718	3 345	737
	Germany	247	83	123	42	104	36
	Ecuador	155	50	358	117	168	28
	Turkey	—	—	105	17	144	20
	Taiwan	48	16	29	10	48	16
	South Korea	83	29	36	12	8	2
	United Kingdom	25	8	444	155	—	—
	Other countries	10	6	25	12	13	8
	Total	3 964	864	4 874	1 083	3 830	847
2530.10.10.10	Vermiculite, unexpanded						
	South Africa	8 608	1 539	7 917	1 488	10 734	2 037
	United States	8 320	1 256	7 479	1 021	6 610	1 189
	Netherlands	—	—	—	—	72	19
	Brazil	—	—	—	—	100	13
	Greece	—	—	79	7	—	—
	Total	16 928	2 796	15 475	2 517	17 516	3 260
2530.10.10.20	Perlite, unexpanded						
	United States	26 709	3 295	21 908	3 531	26 231	4 016
	Greece	6 796	547	8 735	707	11 324	1 004
	Mexico	—	—	19	2	—	—
	Morocco	—	—	—	—	50	2
	Total	33 505	3 842	30 663	4 241	37 605	5 022
3802.90.20	Activated perlite, excluding expanded perlite ground to be employed in filtering						
	United States	101	42	158	90	266	170
	Total	101	42	158	90	266	170
6806.20.00.10	Exfoliated (expanded) vermiculite						
	United States	321	689	266	575	274	620
	Total	321	689	266	575	274	620
6806.20.00.20	Expanded perlite						
	United States	4 281	2 130	4 251	2 404	5 149	3 198
	Taiwan	—	—	—	—	1	3
	Total	4 281	2 130	4 251	2 404	5 150	3 201

Sources: Natural Resources Canada; Statistics Canada.

— Nil; ^p Preliminary.

Note: Numbers may not add to totals due to rounding.

TABLE 7. CANADA, LIGHTWEIGHT AGGREGATES PRODUCED, SOLD AND USED, 1992 AND 1993

	1992 ^r				1993			
	Produced		Sold and Used		Produced		Sold and Used	
	(m ³)	(\$)	(m ³)	(\$)	(m ³)	(\$)	(m ³)	(\$)
From domestic and/or imported raw materials								
Expanded clay, shale and slag ¹	193 368	5 853 046	186 970	5 589 880	173 782	5 058 380	177 438	5 193 838
From imported crude materials								
Expanded perlite and exfoliated vermiculite ¹	491 623	25 774 631	493 093	25 844 281	380 436	19 233 050	402 927	20 510 149
Total	684 991	31 627 677	680 063	31 434 161	554 218	24 291 430	580 365	25 703 987

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada" (see Table 5 for list of establishments surveyed).

^r Revised.

¹ Combined to avoid disclosing confidential company data.

TABLE 8. CANADA, SALES OF EXPANDED SLAG, PERCENTAGE BY END USE, 1991-93

Use	1991	1992	1993
Concrete block manufacture	60.0	90.0	90.0
Ready-mix concrete	20.0	10.0	10.0
Miscellaneous uses	20.0	–	–

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."

– Nil.

Notes: See Table 5 for list of establishments surveyed. Sales also imply quantities consumed for own use.

TABLE 9. CANADA, SALES OF EXPANDED CLAY AND SHALE, PERCENTAGE BY END USE, 1991-93

Use	1991	1992	1993
Loose insulation	33.1	49.9 ^r	47.6
Concrete block manufacture	49.4	38.1 ^r	37.5
Precast concrete manufacture	13.9	10.3 ^r	12.9
Ready-mix concrete	3.0	1.0	2.0
Horticulture and miscellaneous uses	0.6	0.7	–

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."

– Nil; ^r Revised.

Notes: See Table 5 for list of establishments surveyed. Sales also imply quantities consumed for own use.

TABLE 10. CANADA, SALES OF EXPANDED PERLITE, PERCENTAGE BY END USE, 1991-93

Use	1991	1992	1993
Horticulture and agriculture	70.3	69.5 ^r	92.3
Insulation in gypsum products	0.2	0.2	0.4
in other construction materials	23.0	25.4 ^r	–
Loose insulation and miscellaneous uses	6.5	4.8	7.3

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."

– Nil; ^r Revised.

Notes: See Table 5 for list of establishments surveyed. Sales also imply quantities consumed for own use.

TABLE 11. CANADA, SALES OF EXPANDED VERMICULITE, PERCENTAGE BY END USE, 1991-93

Use	1991	1992	1993
Horticulture	72.8	82.5 ^r	84.2
Loose insulation	9.0	2.9	7.1
Miscellaneous uses	18.2	14.6 ^r	8.7

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."

^r Revised.

Notes: See Table 5 for list of establishments surveyed. Sales also imply quantities consumed for own use.

**TABLE 12. CANADA, VALUE OF CONSTRUCTION BY TYPE,¹
1991-93**

	1991	1992	1993
	(\$ millions)		
BUILDING CONSTRUCTION²			
Residential	34 768	37 315	38 432
Industrial	3 642	2 777	2 594
Commercial	13 436	11 185	11 146
Institutional	5 845	5 964	6 205
Other building	3 210	2 707	2 937
Subtotal	60 901	59 948	61 315
ENGINEERING CONSTRUCTION²			
Marine	553	556	576
Highways, airport runways	6 334	6 374	6 800
Waterworks, sewage systems	2 660	2 701	3 026
Dams, irrigation	399	306	334
Electric power	6 859	7 867	7 645
Railway, telephones	3 135	3 053	3 070
Gas and oil facilities	9 629	7 790	8 081
Other engineering	3 686	3 267	3 565
Subtotal	33 254	31 913	33 096
Total construction	94 154	91 861	94 411

Sources: Natural Resources Canada; Statistics Canada, Catalogue no. 64-201 discontinued, to be replaced with Catalogue no. 61-223.

¹ Actual expenditures 1991, preliminary 1992, intentions 1993. ² Includes total value of new and repair work purchased.

Note: Numbers may not add to totals due to rounding.

TABLE 13. CANADA, VALUE OF CONSTRUCTION BY PROVINCE,¹ 1991-93

	1991			1992			1993		
	Building Construction ²	Engineering Construction ²	Total	Building Construction ²	Engineering Construction ²	Total	Building Construction ²	Engineering Construction ²	Total
	(\$ millions)								
Newfoundland	906	871	1 777	824	1 048	1 873	836	1 438	2 275
Nova Scotia	1 544	955	2 499	1 460	696	2 157	1 526	602	2 129
New Brunswick	1 150	837	1 987	1 160	1 057	2 217	1 120	712	1 832
Prince Edward Island	257	99	356	242	106	348	227	98	326
Quebec	14 032	6 369	20 401	13 106	7 027	20 133	13 261	7 323	20 584
Ontario	24 980	8 978	33 958	23 132	8 941	32 074	23 473	9 502	32 974
Manitoba	1 500	1 226	2 725	1 517	1 200	2 717	1 578	1 135	2 713
Saskatchewan	1 269	2 254	3 523	1 306	1 754	3 060	1 286	1 449	2 735
Alberta	5 577	7 170	12 747	6 204	5 995	12 199	6 030	6 348	12 378
British Columbia, Yukon and Northwest Territories	9 684	4 497	14 182	10 995	4 088	15 083	11 978	4 488	16 465
Total Canada	60 901	33 254	94 155	59 948	31 913	91 861	61 315	33 096	94 411

Source: Statistics Canada.

¹ Actual expenditures 1991, preliminary 1992, intentions 1993. ² Includes total value of new and repair work purchased.

Note: Numbers may not add to totals due to rounding.