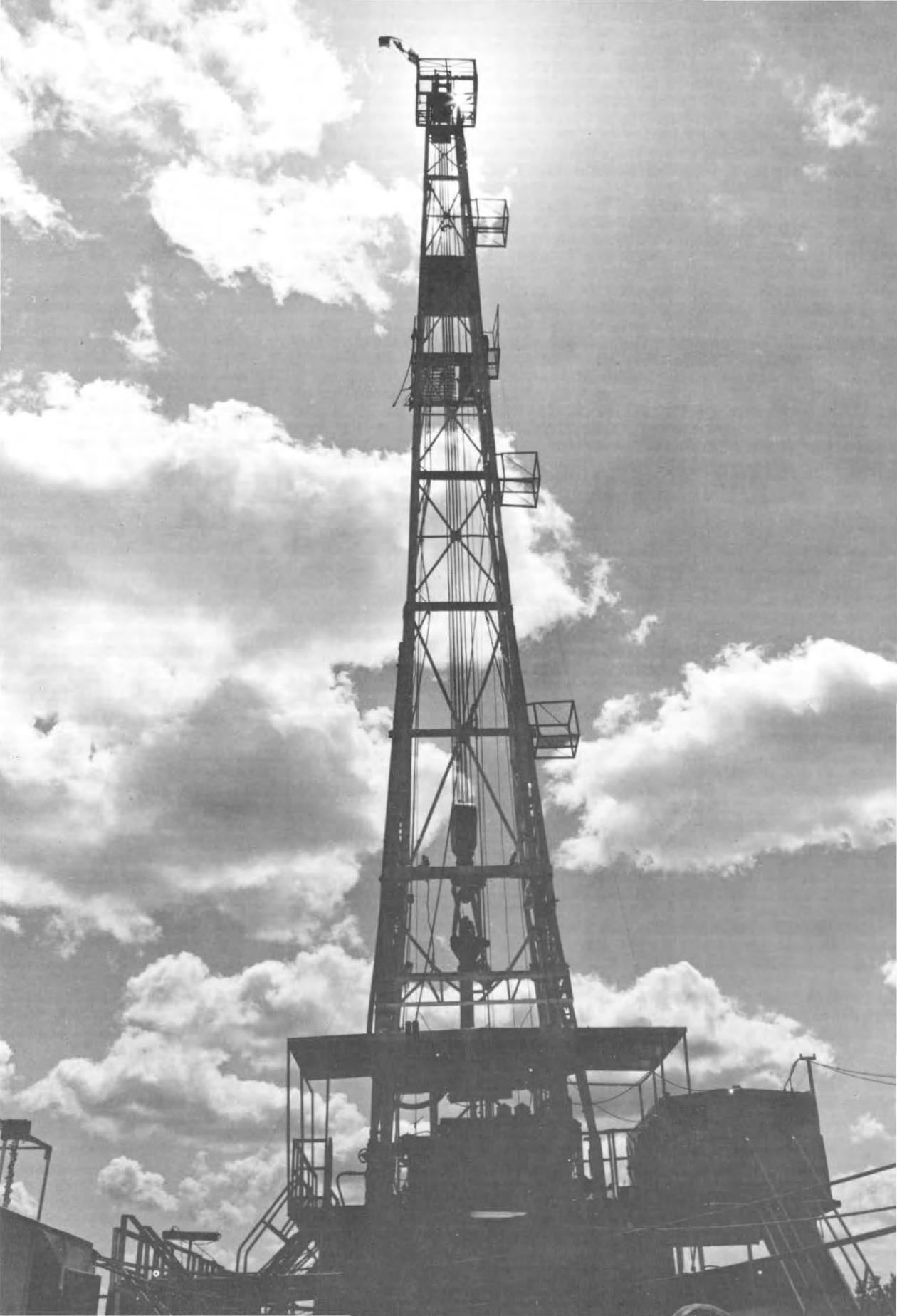


Minister of Mines and
Petroleum Resources
Annual Report

1977

ISSN 0365-9356



*To the Honourable HENRY P. BELL-IRVING, D.S.O., O.B.E., E.D.,
Lieutenant-Governor of the Province of British Columbia.*

MAY IT PLEASE YOUR HONOUR:

**The Annual Report of the Ministry of Mines and Petroleum Resources is
herewith respectfully submitted.**

JAMES R. CHABOT
Minister of Mines and Petroleum Resources

Office of the Minister of Mines and Petroleum Resources
June 1978

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All photographs by R. E. Player except plate on page 16, by B. N. Church.

OBITUARIES

John Fortune Walker died in Victoria on April 10, 1977, at the age of 83, following a distinguished career. He was educated in Montreal and received a B.A.Sc. degree in geological engineering from The University of British Columbia, following war service from 1916-18. He received a Ph.D. from Princeton and then joined the Geological Survey of Canada in 1924. After being in charge of the Vancouver office of the Survey, he became the Provincial Mineralogist with the British Columbia Department of Mines in 1934, and was appointed Deputy Minister in 1937, a position he held until he retired in 1958.

Soon after joining the Department, Dr. Walker reorganized it to give a more contemporary format, and drafted a number of important Acts. He was adviser to the Premier on oil and gas (1938-44) and was responsible for consolidating a petroleum and natural gas department, renamed the Department of Mines and Petroleum Resources.

Dr. Walker served on many educational bodies, was keenly interested in research, and assisted in the formation of the War Metal Research Board at The University of British Columbia that later became the British Columbia Research Council. His early advocacy of a Provincial conference on mining led eventually to the present annual Provincial Mines Ministers' Conference now in its 35th year. He was a Fellow of the Royal Society of Canada and of other professional bodies, and a life member of the Canadian Institute of Mining and Metallurgy and the Association of Professional Engineers of British Columbia.

John William (Bill) Peck, former Chief Inspector of Mines, died in Victoria on February 21, 1978. Born in Ignace, Ontario, Mr. Peck was educated in Edmonton where he graduated as a mining engineer from the University of Alberta in 1936. Following graduation, he was employed at Britannia Mines in various capacities. After service in the Royal Canadian Air Force during World War II, Mr. Peck joined the staff of the British Columbia Department of Mines as inspector in Lillooet, and later in Nelson. He became Chief Inspector in January 1958 and held this post till he retired, due to ill health, in April 1977.

During his 20-year career as Chief Inspector of Mines, many innovations developed in mining practices which necessitated updating safety standards. With the assistance of his staff, he was successful in establishing the best known criteria in the use of diesel equipment underground, noise suppression in drilling equipment, and in the brake-testing of large trucks used in open pits.

Through his efforts, the Canadian Mine Rescue competitions were begun about 11 years ago. These competitions have standardized and upgraded rescue equipment and procedures throughout the country. Surface-rescue training at open-pit mining operations also was developed.

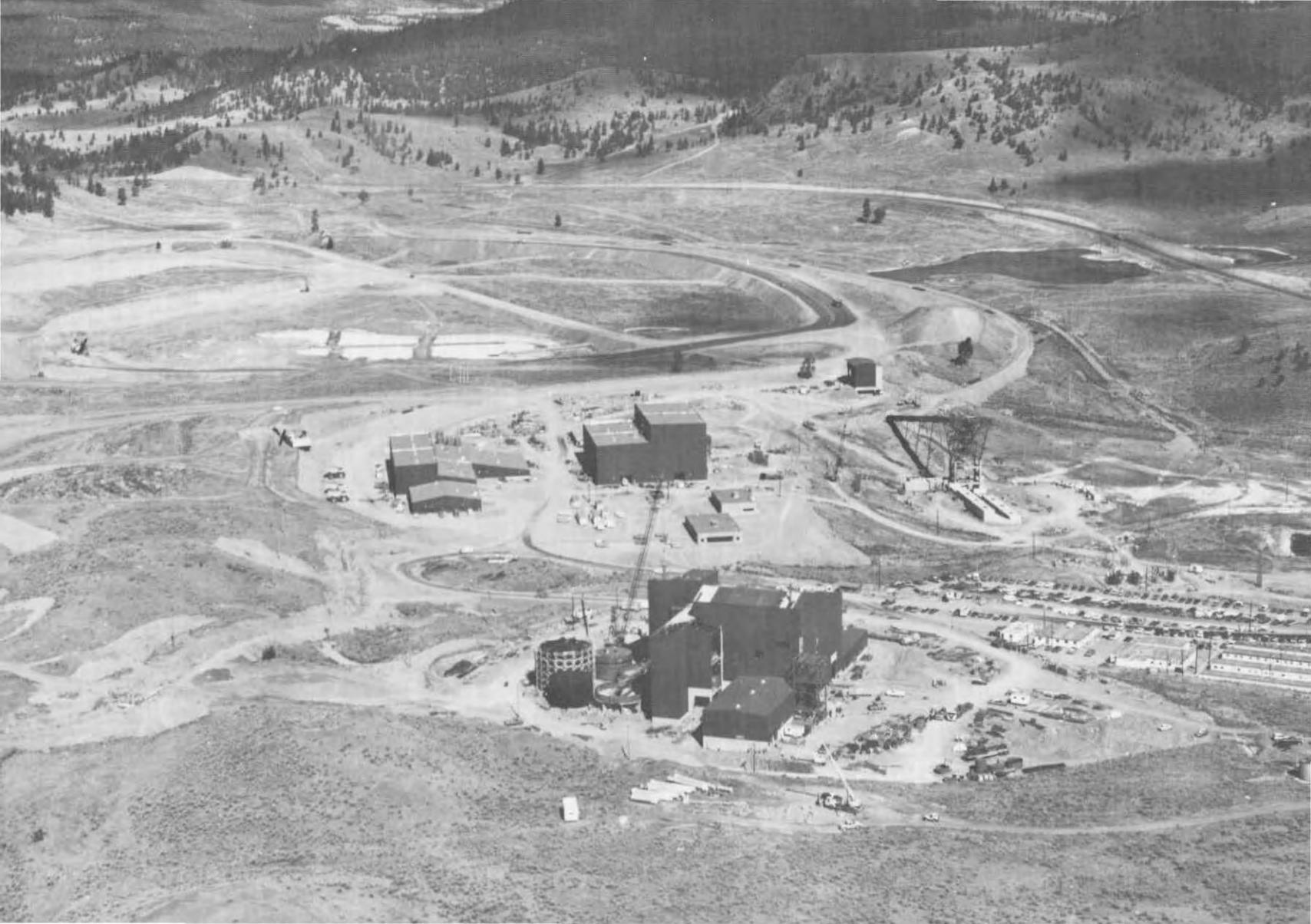
He was a member of the Canadian Institute of Mining and Metallurgy (CIM), serving from 1958 until his retirement on the CIM Council's Medal of Bravery Committee and the John T. Ryan Safety Committee. He was appointed a member of council of the Association of Professional Engineers in 1975 and 1976 and was mining member of the Provincial Pollution Control Board.

William Douglas McCartney died at his home in Victoria on October 8, 1977. Dr. McCartney was born in Edmonton in 1922 and, after service with the Royal Canadian Navy during World War II, attended The University of British Columbia (B.A.Sc., 1950) and Harvard (M.A., 1952, Ph.D., 1959). He worked with the Geological Survey of Canada and the British Columbia Department of Mines during his undergraduate years and joined the Survey after completion of his M.A. His early field mapping in Newfoundland revealed features characteristic of the remainder of his career—meticulous work and the development of new ideas as clearly displayed in Memoir 341, Whitborne Area, Newfoundland. His later work with the Survey was concerned mostly with metallogeny, the study of the origin and distribution of mineral deposits. His early familiarity with the Russian literature led him to develop similar models in the Canadian Appalachians. He also made the initial Canadian contributions to the world Metallogenic Map. He left the Survey to teach economic geology at Queen's University in 1966, where he stayed four years. He then came to Victoria and joined the small consulting firm of We Healdath, working principally for the British Columbia Ministry of Mines and Petroleum Resources. He joined the staff of the Ministry in 1975. His last few years were particularly productive, during which time he helped to develop and produce the Mineral Deposit/Land Use maps that now cover virtually all of the Province.

FOREWORD

The Annual Report of the Minister of Mines and Petroleum Resources for 1977 follows the format of the 1976 Report. Annual Reports have been published since 1874, from that date to 1959 as the Annual Report of the Minister of Mines, and subsequently as the Annual Report of the Minister of Mines and Petroleum Resources. *Geology, Exploration and Mining in British Columbia* was initiated in 1969, incorporating geological and technical reports previously published in the Annual Report. Starting in 1975, this technical volume has been divided into separate reports that are issued as they are prepared, and eventually bound together. Detailed information on mine safety, fatal accidents, dangerous occurrences, etc., was included in the Annual Report until 1973, for 1974 was issued separately, and subsequently forms part of the separate volume *Mining in British Columbia*.

The Annual Report for 1977 contains four chapters—a general review of the mineral and petroleum industries, a chapter on the activities of the Ministry, one on the statistics of the mineral industry, and one on the performance of the petroleum industry.



The Mining and Petroleum Industries in 1977

CHAPTER I

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Table 1-1—Mineral Production of British Columbia, 1976 and 1977

	1976		1977		
	Quantity	Value	Quantity	Value	
Metals					
	Units	\$		\$	
Antimony	kg	447 001	1 636 871	596 207	2 519 739
Bismuth	kg	20 261	226 462	18 540	187 612
Cadmium	kg	356 422	1 530 800	320 711	1 720 051
Copper	kg	263 618 197	378 984 941	275 224 115	384 736 661
Gold—					
placer	g	26 064	115 613	46 170	289 075
lode, fine	g	5 393 477	21 761 502	5 906 336	31 301 931
Iron concentrates	t	1 255 277	14 760 526	445 317	7 362 345
Lead	kg	85 407 582	32 796 533	78 172 646	42 316 293
Molybdenum	kg	14 088 686	94 109 138	15 521 970	142 057 947
Silver	g	239 720 882	32 532 836	241 503 007	37 934 098
Tin	kg	102 262	712 912	187 478	1 912 300
Zinc	kg	106 498 987	65 499 108	103 780 228	61 301 001
Others			2 083 161		397 654
Subtotals		646 750 403		714 036 707	
Industrial Minerals					
Asbestos	t	70 433	40 727 296	97 033	69 729 205
Diatomite	t	2 737	182 159	1 239	49 595
Fluxes	t	11 378	33 263	28 624	95 461
Granules	t	31 476	1 219 884	29 551	1 238 485
Gypsum and gypsite	t	556 134	4 434 471	653 126	2 357 488
Jade	kg	483 796	1 535 030	266 621	825 523
Sulphur	t	231 704	4 296 189	248 892	3 873 206
Others			488 850		1 017 682
Subtotals		52 917 142		79 186 645	
Structural Materials					
Cement	t	846 548	34 973 746	909 522	42 705 320
Clay products			6 995 917		4 909 799
Lime and limestone	t	2 173 831	5 610 063	2 231 166	5 861 614
Rubble, riprap, and crushed rock	t	2 485 215	5 205 973	2 464 503	7 309 536
Sand and gravel	t	36 073 618	48 138 635	53 994 528	54 809 121
Building-stone	t	657	14 314	4 535	55 602
Subtotals		100 938 648		115 650 992	
Coal					
Coal—sold and used	t	7 537 695	298 683 679	8 424 181	328 846 883
Total solid minerals		1 099 289 872		1 237 721 227	
Petroleum and Natural Gas					
Crude oil	m ³	2 367 450	116 595 050	2 200 303	132 859 085
Field condensate	m ³	18 309	901 711	24 465	1 477 248
Plant condensate	m ³	167 576	7 198 957	180 267	9 751 058
Subtotals		124 695 718		144 087 391	
Natural gas to pipeline	10 ³ m ³	8 799 508	287 997 059	8 895 663	396 601 354
Butane	m ³	109 781	4 591 832	111 357	5 358 167
Propane	m ³	88 195	3 688 955	91 297	4 392 944
Subtotals		296 277 846		406 352 465	
Total petroleum and natural gas		420 973 564		550 439 856	
Grand totals		1 520 263 436		1 788 161 083	

CONVERSION TABLE

Metric	Symbol	
Tonnes	t	÷ .90718=short tons.
Kilograms	kg	÷ .45359=pounds.
Grams	g	÷ 31.103=troy ounces.
Cubic metres	m ³	× 6.29=barrels.
Thousand cubic metres	10 ³ m ³	× 35.49373=thousand standard cubic feet.

INTRODUCTION

By A. SUTHERLAND BROWN

The value of mineral production in British Columbia continued to climb, setting another new record of \$1.79 billion and registering an increase of 17.6 per cent over 1976 or about double the inflation rate. In 1977, the top 10 commodities, in order of value, were natural gas, copper, coal, molybdenum, crude oil, asbestos, zinc, sand and gravel, cement, and lead. All sectors of the industry and most major commodities contributed to the increase but the greatest growth resulted from the significant rise in the value of natural gas. This exceeded the value of copper by a small margin to become the most important commodity. The mineral production of 1977 is shown in detail in Table 1-1 compared to that of 1976, and the production in 1977 is diagrammed in Figure 1-1.

Of the major sectors of mining and petroleum, industrial minerals experienced the greatest increase in value of production (49.6 per cent) due mainly to increased asbestos production, followed in sequence by petroleum and natural gas (30.8 per cent), structural materials (14.6 per cent), metals (10.4 per cent), and coal (10.1 per cent). The only major commodities that experienced decreases in quantity of production were lead, zinc, crude oil, and iron concentrates. Of these only the latter reduction was critical, resulting from the closure of one of the two major producers, the Texada mine and reduced shipments from the other.

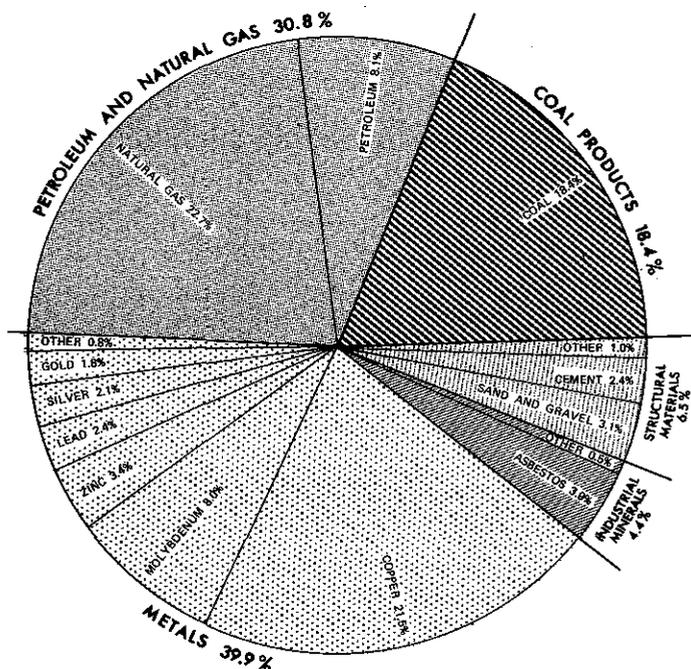


Figure 1-1—Major minerals produced in 1977 (by value).

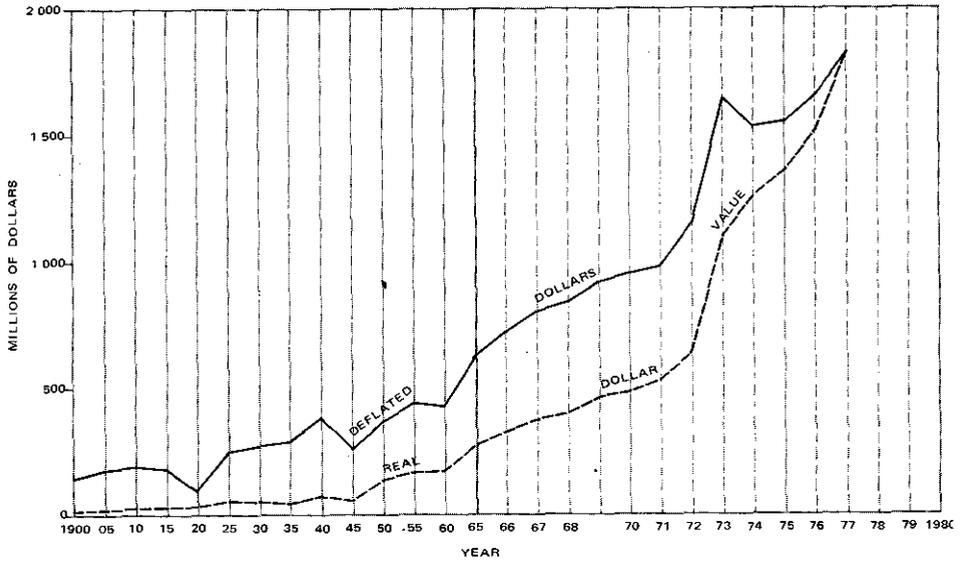


Figure 1-2—Growth of the mineral industry in total value in real dollars and deflated dollars.

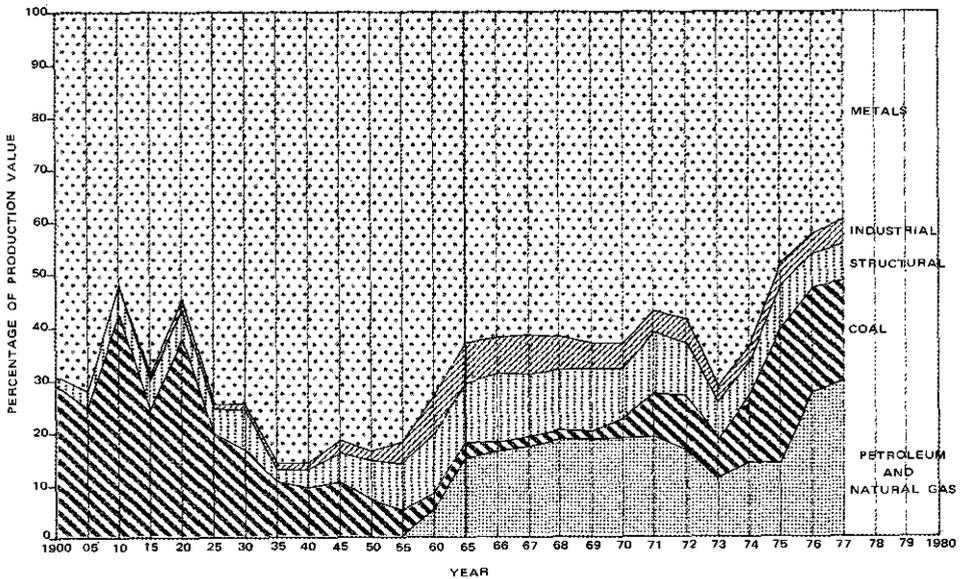
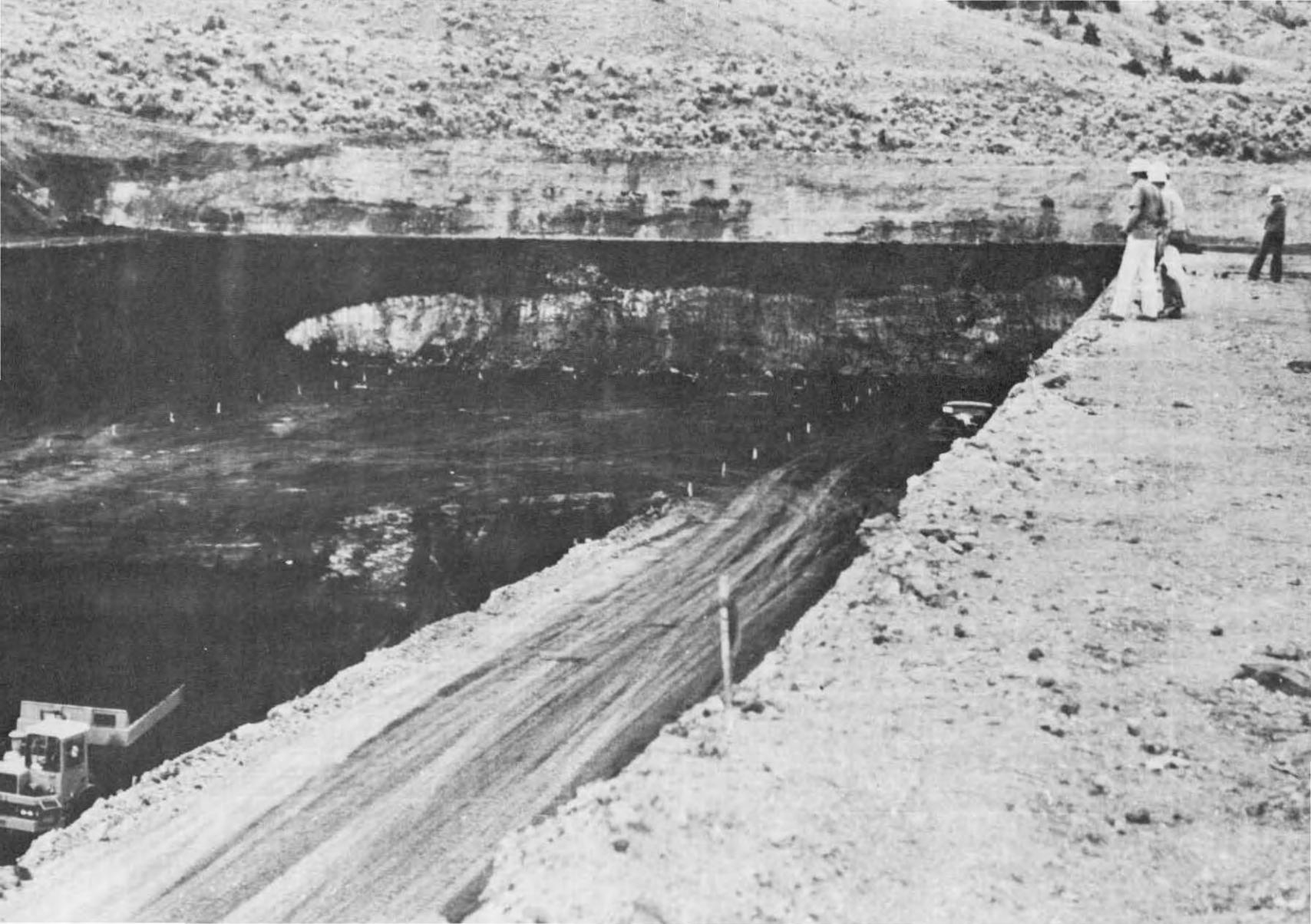


Figure 1-3—Total value of industries by percentage.

The growth of mineral industry and the changing proportion contributed by the various sectors is illustrated by two diagrams. Figure 1-2 shows the growth in total value in dollars and in deflated dollars. Figure 1-3 shows the relative proportion contributed by the various sectors. In both diagrams these trends are shown in five-year increments to 1965 and yearly thereafter. Figure 1-2 shows that growth has been fairly steady, with an average increase of about \$80 million per year since 1965. Comparison of the figures reveals major shifts in trends and allows growth comparisons of specific commodity sectors. The important changes illustrated are as follows:

- (1) A dominance of metals throughout the whole period, but a fairly constant decrease in importance since 1935.
- (2) The collapse of the coal industry between 1945 and 1970, related significantly to the conversion of railways to oil.
- (3) Compensating rapid growth of petroleum and natural gas between 1955 and 1965.
- (4) Regeneration of significant coal production related to growth of export markets from metallurgical coals in the early 1970's.
- (5) Surge in value of metals related to copper and molybdenum production in 1972 and 1973 when the major porphyry-deposit open-pit mines came on stream.
- (6) The increase in value of natural gas in 1975.
- (7) The relative decrease in importance of metals, dropping below 50 per cent of the total for the first time in 1975.
- (8) Trends set in 1974/75 continuing through 1977.



THE MINING INDUSTRY IN 1977

By A. SUTHERLAND BROWN, A. J. RICHARDSON, AND W. P. WILSON

The total value of solid minerals, that is, metals, industrial minerals, structural materials, and coal, set another new record of nearly \$1.24 billion, up 12.6 per cent from 1976. This was achieved in spite of a slight decline in the production of lead and zinc and co-products bismuth and cadmium. Most other major commodities had increased quantities of production.

Table 1-1 and Figure 1-1 show the quantity and value of each solid mineral commodity produced in 1977 compared with 1976. The ratios of the various sectors of the mining industry are as follows: metals, 57.7 per cent; coal, 26.6 per cent; structural materials, 9.3 per cent; industrial minerals, 6.4 per cent.

METALS

The growth and long-term trends of the quantities of major metals produced are shown on Figure 1-4. Lead and zinc production advanced sharply in the period 1920 to 1943, thereafter starting a slow decline, a feature dependent principally on the production history of the Sullivan mine. In contrast, copper production remained at a modest level until the onset of major porphyry copper production in the late sixties. Molybdenum production also started its growth in this period, related principally to mining of porphyry deposits. Precious metals are not shown but their history in this period is principally one of byproduct origin related to the production of major base metals. Detailed graphs of metal production are shown in Chapter 3. It can be seen that the quantities of copper and molybdenum were up in 1977, but lead and zinc were slightly down.

The year 1977 was a difficult one for copper producers even though copper continued to be the most valuable mineral commodity produced. Because of copper's low price, the value of copper production was exceeded slightly by natural gas. Copper at \$384.7 million, contributed 54 per cent of the value of all the metals and 21.5 per cent of total minerals produced. Both quantity and value of production were up slightly although the average monthly price of copper was down slightly to \$1.40 per kilogram from \$1.44 in 1976. World stocks of copper and excess copper production continued through 1977. Except for the relative devaluation of the Canadian dollar, the Provincial copper producers would have been in an even worse position.

Molybdenum markets continued strong, and molybdenum became firmly entrenched as the Province's second most valuable metal. At \$142 million it was more than double zinc, its nearest competitor. Production of molybdenum was up 1.4 million kilograms or 10 per cent and the value up 51 per cent as a result of increased prices as well as production.

Zinc production decreased slightly (2.5 per cent), but the value was down even more (6.4 per cent) because of poor markets.

Lead remained in fourth position, although production dropped significantly (8.4 per cent). Price increases, however, more than compensated and the value increased 29 per cent to establish it well ahead of the fifth metal, silver.

The precious metals, silver and gold, continued as fifth and sixth most valuable metals. The dominant production is as a byproduct of lead and copper production at major base metal mines and so reflects the fortunes of these metals, in spite of strengthening markets for precious metals. Primary silver or gold now form an important minor part of production. Silver production in 1977 was up slightly

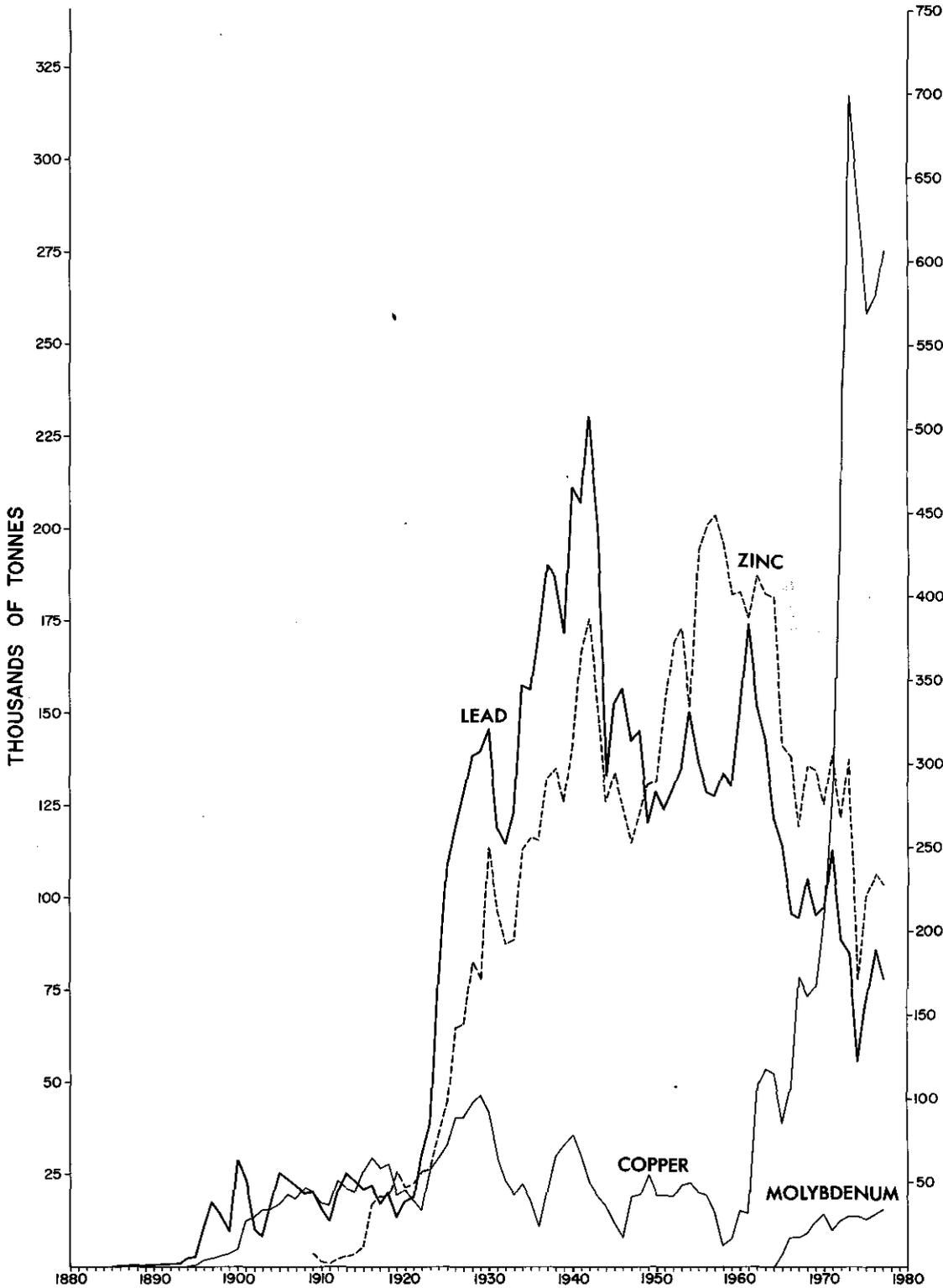


Figure 1-4—Quantities of major metals produced, 1885–1977.

Mines in British Columbia Which Produced More Than 1 000 Tonnes of Ore in 1977

Name of Mine	Products	NTS Location	Rated Capacity of Mill/Cleaning Plant (Tonnes/Day)	Mine Type	Name of Company	Company Address	Mine Address
Metal Mines							
Phoenix	Cu, Au, Ag	82E/2E	2 500	O	Granby Mining Corp.	17th Floor, 1050 W. Pender St., Vancouver V6E 2H7	Box 490, Grand Forks (mining ended in 1976)
Dusty Mac	Au, Ag	82E/3E	-----	O	Dusty Mac Mines Ltd.	433, 355 Burrard St., Vancouver	Box 402, Okanagan Falls
Highland Bell	Ag, Zn, Pb, Au, Cd	82E/6E	110	U	Teck Corp. Ltd.	1199 W. Hastings St., Vancouver V6E 2K5	Beaverdell V0H 1A0
HB	Zn, Pb, Ag, Cd	82F/3E	1 090	U	Cominco Ltd. (HB mine)	700 Granville Square, Vancouver V6C 2R2	Salmo
Bluebird	Ag, Zn, Pb, Au	82F/4W	-----	U	Standonray Mines Ltd.	3567 W. 27th Ave., Vancouver V6S 1P9	Box 669, Rosland
Simonac	Zn, Pb, Ag, Au, Cd	82F/14	140	U	Kam-Kolla Mines Ltd. and Simonac Mines Ltd.	420, 475 Howe St., Vancouver V6B 2B3	Box 189, New Denver
Scranton	Au, Ag, Zn, Pb	82F/14E	-----	U	Silver Star Mines Ltd.	c/o Kikkishik, 1900 Guinness Tower, 1055 W. Hastings St., Vancouver V6E 2E9	Keelo
Ottawa	Ag, Pb, Zn	82F/14W	68	U	Slocan Development Corp.	2009, 1177 W. Hastings St., Vancouver V6E 2K6	Box 2000, Kimberley
Sullivan	Zn, Pb, Ag, Cd	82G/12W	9 500	U	Cominco Ltd. (Sullivan mine)	200 Granville Square, Vancouver V6C 2R2	VIA 203
Lynx, Myra	Zn, Cu, Ag, Pb, Au, Cd	92F/12E	900	O	Western Mines Ltd.	Room 1103, Box 49066, 595 Burrard St., Vancouver V7X 2C4	Box 8000, Campbell River
Siwikameen	Cu, Ag, Au	92H/7E	13 600	O	Siwikameen Mining Co. Ltd.	14th Floor, 750 W. Pender St., Vancouver V6C 1K2	Box 520, Princeton
Brends	Cu, Mo, Ag	92H/8E	22 000	O	Brenda Mines Ltd.	Box 420, Peachland V0H 1X0	Box 420, Peachland
Craigmont	Cu	92I/2W	4 860	U	Craigmont Mines Ltd.	700, 1030 W. Georgia St., Vancouver V6E 3A8	Box 3000, Merritt
Lornex	Cu, Mo, Ag, Au	92I/6E	40 900	O	Lornex Mining Corp. Ltd.	202, 380 Granville St., Vancouver V6C 1W8	Box 1400, Logan Lake
Bethlehem	Cu, Ag, Au	92I/7W	16 800	O	Bethlehem Copper Corp.	2100, 1035 W. Hastings St., Vancouver V6B 2H8	Box 520, Ashcroft
Afton	Cu	92I/10E	6 350	O	Afton Mines Ltd.	1199 W. Hastings St., Vancouver V6E 2K5	Box 937, Kamloops
Warman	Au, Ag	92J/3E	426	U	Noribat Mines Ltd.	333, 885 Dunsmuir St., Vancouver V6C 1N5	Squamish
Astra (Van Silver)	Ag, Au, Cu, Pb, Zn	92J/3E	91	U	Van Silver Mines Ltd.	501, 409 Granville Mall, Vancouver V6C 1J2	Box 2000, Granisle
Inland Copper	Cu, Mo, Ag, Au	92L/11W	34 500	O	Utah Mines Ltd.	1600, 1050 W. Pender St., Vancouver V6E 3S7	Box 370, Port Hardy
Boss Mountain	Mo	93A/2W	1 590	U	Noranda Mines Ltd. (Boss Mt. Div.)	1050 Davie St., Vancouver V6B 3W7	VON 290
Gibraltar	Cu, Mo, Ag	93B/9W	36 330	O	Gibraltar Mines Ltd.	700, 1030 W. Georgia St., Vancouver V6E 3A8	Box 130, McLeese Lake
Endako	Mo	93K/3E	24 500	O	Canex Placer Ltd. (Endako Div.)	700, 1030 W. Georgia St., Vancouver V6E 3A8	VOL 1P0, Endako
Granisle	Cu, Ag, Au	93L/16E	12 260	O	Granisle Copper Ltd.	17th Floor, 1050 W. Pender St., Vancouver V6E 2H7	Box 1000, Granisle
Bell (Newman)	Cu, Au	93M/1E	11 800	O	Noranda Mines Ltd. (Bell Copper Div.)	1050 Davie St., Vancouver V6B 3W7	Box 2000, Granisle
Tasu	Fe, Cu	103C/16E	7 300	O	Westrob Mines Ltd. (Tasu)	603, 1112 W. Pender St., Vancouver V6E 2S3	Tasu
Granduc	Cu, Ag, Au	104B/1W	7 270	U	Granduc Operating Co.	520, 830 W. Pender St., Vancouver V6C 1K3	Box 69, Stewart
Industrial Mineral Open Pits and Quarry							
Western Gypsum	Gypsum	82J/5W	2 450	O	Westroc Industries Ltd.	Box 5638, Postal Station A, Calgary, Alta. T2H 1Y1	Box 217, Invermere
Mineral King	Barite	82K/8W	Small	O	Mountain Minerals Ltd.	Box 700, Lethbridge, Alta.	Box 603, Invermere
Brice	Barite	82K/15W	-----	U	Mountain Minerals Ltd.	2000, 1035 W. Hastings St., Vancouver V6E 3V3	Box 603, Invermere
Cassiar	Asbestos	104F/5W	2 630	O	Cassiar Asbestos Corp. Ltd.	-----	Cassiar V0C 1E0
Coal Mines							
Byron Creek (Corbin)	Coal	82G/10E	1 700	O	Byron Creek Collieries Ltd.	Box 270, Blairmore, Alta.	Box 270, Blairmore, Alta.
Kaiser (Harmer Ridge; Balmer North and Hydraulic)	Coal	82G/10, 15	28 000	O, U	Kaiser Resources Ltd.	2690, 1177 W. Hastings St., Vancouver V6E 2L1	Box 2000, Sparwood
Fording (Cloud Creek and Grasmith)	Coal	82J/2W	17 000	O	Fording Coal Ltd.	206, 205 Ninth Ave. S.E., Calgary, Alta. T2G 0R4	Box 100, Elkford
Coleman (Tent Mountain)	Coal	82G/10W	-----	O	Coleman Collieries Ltd.	Box 640, Coleman, Alta.	Tent Mountain T0K 0M0

1 O—Open pit. U—Underground.

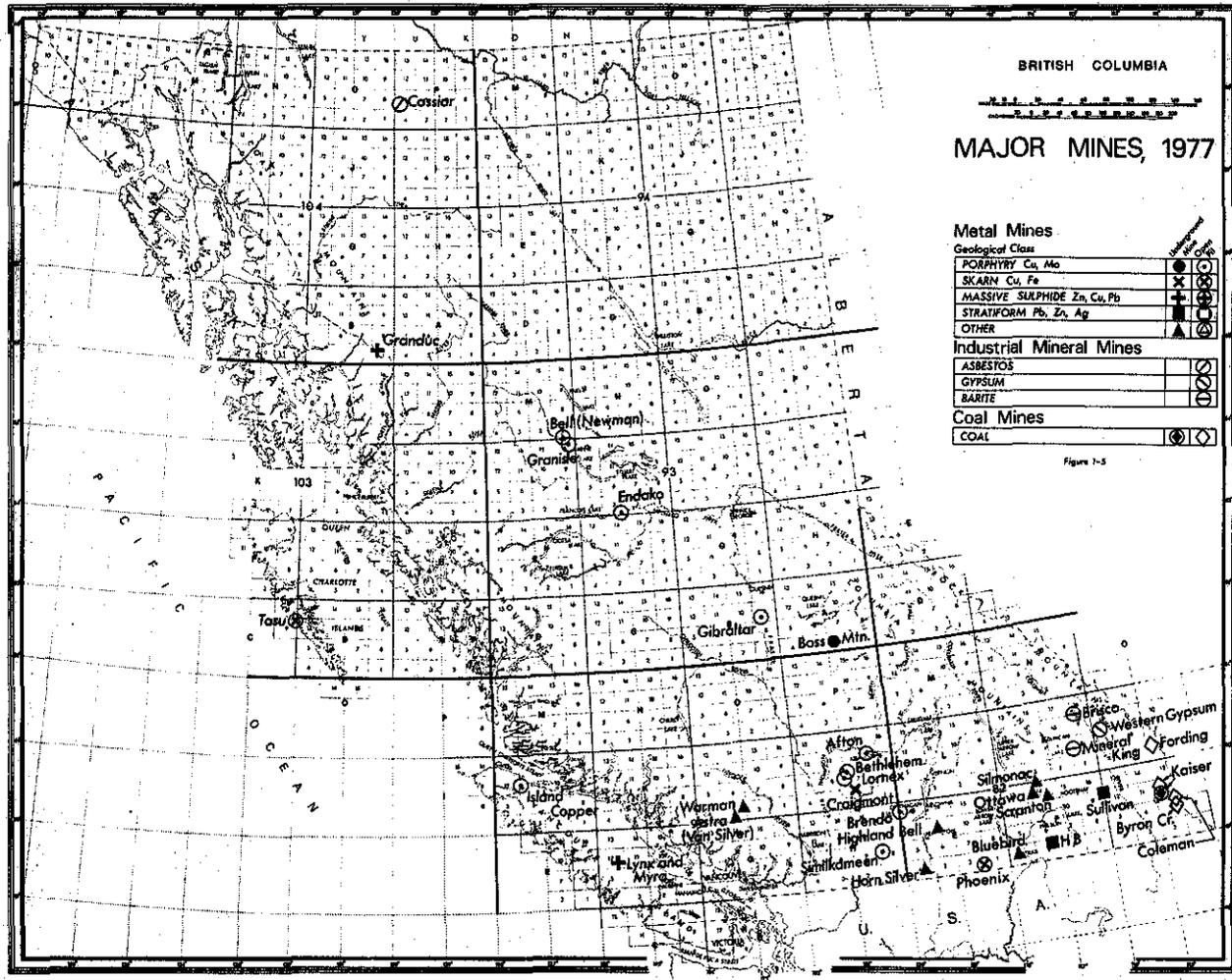


Figure 1-5—Major mines, 1977 (greater than 1 000 tonnes of ore).

(0.7 per cent) with value at \$37.9 million (up 16.6 per cent). Gold (lode) was up (9.6 per cent) with value at \$31.3 million (up 43.8 per cent).

Iron concentrates continued as the seventh metal commodity, but production was down significantly as a result of the exhaustion of the Texada mine and decreased production from Tasu (Wesfrob). The value was down to \$7.3 million.

Of the minor metals, tin had the greatest growth in quantity (up 83 per cent to 187 478 kilograms) and value (up 168 per cent to \$1.9 million) as a result of selective mining at the Sullivan mine.

COAL

Coal ranked third in value after natural gas and copper. Coal production returned to normal following the lengthy strikes in two major mines in 1976. Production was 8.4 million tonnes and value was up 10.1 per cent to \$328.8 million.

INDUSTRIAL MINERALS

Production value was up 50 per cent in 1977 to total \$79 million, most of which is attributable to high production and increased price for asbestos. The value of asbestos production was \$69.7 million.

Both sulphur and gypsum production was up, but the value of production was down. Jade production was down significantly.

STRUCTURAL MATERIALS

Production and value of all structural materials was up in 1977 except for clay products. The total value at \$115.6 million was up 14.6 per cent. The two most important commodities, sand and gravel (\$54.8 million) and cement (\$42.7 million), were both up significantly in value and quantity produced.

PROVINCIAL REVENUE FROM MINING COMPANIES

Direct revenue to the Provincial Government in 1977, derived from the mining sector of the mineral industry, is shown in Table 1-2. The amount for mineral royalties shown is the amount collected after adjustments for 1976. For coal licences and rentals, the amount shown includes cash paid in lieu of work, some of which may be refundable. The rentals and royalties on industrial minerals and structural materials were collected by the Lands Service of the Ministry of the Environment. The total revenue is about \$40 million, down 43 per cent from 1976.

Table 1-2—Revenue for Mineral Resources

	\$
Claims	2 234 051.14
Coal licence fees and rentals collected	694 764.00
Coal royalties	3 347 551.80
Iron ore royalties	126 653.28
Mineral land taxes	8 307 272.87
Mineral resource taxes	9 655 342.29
Mineral royalties	2 507 896.90
Mining taxes	12 658 102.00
Rentals and royalties on industrial minerals and structural materials (Land Service)	656 321.23
Total	40 187 955.51

EXPENDITURES BY MINING COMPANIES

Major expenditures in 1977 by companies involved in exploration, development, and mining of metals, minerals, and coal are shown in Table 1-3. A major part of the capital and development cost was related to the Afton mine and plant and coal developments in the Crowsnest Coalfield. The total expenditures in 1977 were up 23.2 per cent over 1976.

Table 1-3—Expenditures (Mining Companies)

	\$	\$
Capital expenditures	106 774 208	
Exploration and development	133 332 291	
	—————	240 106 499
Mining operations (metals, minerals, coal)		444 698 727
Mining operations (structural materials)		57 609 865
Repair expenditures		161 564 375
		—————
Total		903 979 466

MINING AND TREATMENT

METAL MINES

Metal mining in 1977 continued to be subject to the economic stresses characteristic of recent years resulting from inflating costs of machinery, labour, fuel, and materials, without compensating rises in metal prices. The latter have not participated in the general inflation because of the slow economic recovery of the industrial nations that are buyers of our mineral products and also, a general over-supply of metals has contributed to a relative deterioration in prices. Molybdenum and lead, and to a lesser extent, gold and silver, were the only major metals produced in British Columbia that were exceptions to this trend. Compensating in part for the general deterioration was the decline in the Canadian dollar and some lessening of the impact of taxes. The balance of these and other factors resulted in a 10.5-per-cent increase in dollar value of metals produced, a new record of \$714 million.

In 1977, 41 mines produced an aggregate of 90 287 570 tonnes of ore which was concentrated or shipped directly to a smelter (*see* Tables 3-12 and 3-13). This contrasts with 59 mines in 1976 which produced 83 024 513 tonnes of ore. Fewer small mines were producing in 1977, but the aggregate tonnage increased 8.7 per cent. Of the 41 mines, 26 produced more than 1 000 tonnes and these are shown on Figure 1-5 classified as to product, geological type, and whether open pit or underground.

The same 13 large mines were in production in 1977 as in 1976. These mines, each of which produced over 1 million tonnes in aggregate, mined 87 996 263 tonnes or 97.5 per cent of the total production. Ten of these large mines are open pits which, in order of output, are: Lornex, Island Copper, Gibraltar, Brenda, Endako, Ingerbelle, Bethlehem, Granisle, Bell, and Tasu. The last is preparing for underground production. The three others, Sullivan, Craigmont, and Granduc, are underground mines. These three produced an aggregate tonnage of 5 330 919 tonnes or 5.9 per cent of the total tonnage for the Province. In regard to geological type, there are nine porphyry deposits, two skarn deposits (Tasu and Craigmont), one stratiform deposit (Sullivan), and one massive sulphide deposit (Granduc). There were five intermediate mines operating in 1977, each of which produced between 100 000 and 1 000 000 tonnes. Actually, one former producer in this

category (Texada) closed in December 1976 and a new major mine (Afton) opened but produced only enough at the end of the year to be included in this category. Of these five mines, two are porphyry deposits, one skarn, one stratiform, and one massive sulphide. Two are open pits, two underground, and one former underground mine (Boss Mountain) that is now partly open pit, a reversal of the usual trend. The aggregate tonnage produced by these intermediate mines is 2 104 700 tonnes or 2.3 per cent of the total. There were eight small mines with yearly tonnages between 1 000 and 100 000 tonnes. These are all underground vein deposits with principal values in precious metals but also producing concentrates of lead and zinc. Mines with principal value in gold include the Warman mine (Northair) and Scranton. Mines with principal value in silver are Highland Bell, Horn Silver (Dankoe), Silmonac, Astra (Van Silver), Bluebird, and Ottawa.

During 1977 the Afton mine began producing and stockpiling ore. The concentrator, rated at 6 300 tonnes per day, started production on December 9. The smelter was due to be blown early in 1978. The Afton deposit is unique. It is located only 13 kilometres west of Kamloops on the Trans-Canada Highway. It mines a copper porphyry deposit in the Iron Mask batholith, an alkaline intrusive body. It has a very deep oxidized (supergene) zone that provides the smelter with a low sulphur ore composed chiefly of native copper and chalcocite. It has the first copper smelter, and one of unique design, operational in the Province since the closure of Anyox in 1935.

One small mine opened in 1977, the Astra (Van Silver) property near the Warman mine. Also, production from the Bluebird again exceeded 1 000 tonnes in 1977.

Three small mines that opened or reopened in 1976 closed in 1977. These are the Atlin Ruffner near Atlin, Ruth Vermont near Golden, and Dusty Mac near Okanagan Falls. In addition, the Susie near Oliver closed.

With metal prices generally low in the year, many leasing and other very small operations did not produce, thus accounting for the drop in over-all number of producing mines from 59 to 41.

Concentrating

In 1977, 24 concentrators operated (*see* Table 3-12). Six treated copper ore, four copper-molybdenum ore, nine lead-zinc-(silver-gold) ores, two molybdenum ores, two copper-iron ores, and one copper-lead-zinc ores. One of the copper concentrators (Phoenix) was working chiefly on a low-grade stockpile after closure of the mine in 1976.

Smelting, Refining, and Destination of Concentrates

The only base-metal smelter in operation in the Province is the lead-zinc smelter owned and operated by Cominco Ltd. in Trail. Concentrates of other metals are mostly exported to smelters in diverse parts of the world, but mainly Japan and the United States. However, molybdenum concentrates at Endako are roasted to form molybdenum trioxide and are also processed to make ferro-molybdenum.

A second smelter was in advanced stages of construction at the Afton mine at the end of 1977. This is a rotary top blown converter adapted for the low sulphur copper ore common in this deposit.

The smelter at Trail received concentrates and scrap from a number of sources—company mines within the Province (Sullivan and HB), mines outside the

Province (Pine Point), and custom sources both inside and outside the Province. The smelter received 111 077 tonnes of lead concentrates and 171 945 tonnes of zinc concentrates from the Sullivan and HB mines, and 10 588 tonnes of lead concentrates and 13 792 tonnes of zinc concentrates from other British Columbia mines. The total value of concentrates, including byproduct metal, from British Columbia treated at Trail was \$125 587 697 or 17.6 per cent of metal production of the Province in 1976.

Endako shipped products containing 7 691 235 kilograms of molybdenum. Of this, 24 tonnes was molybdenum concentrates, 12 651 tonnes was molybdenum trioxide, and 228 tonnes was ferro-molybdenum.

The proportions of the total value of metal production going to the various destinations are not known accurately but are approximately as follows: smelted or treated in British Columbia, \$128.9 million (18.1 per cent); shipped to other parts of Canada, \$43.3 million (6.0 per cent); exported to Japan, \$379.4 million (53.1 per cent); exported to the United States, \$54.4 million (7.6 per cent); exported to Europe, \$97.7 million (13.7 per cent); other plus unattributed, \$10.3 million (1.5 per cent).

The destination of concentrates of the major metals is as discussed following and shown in Table 3-13.

Copper concentrates produced in British Columbia were shipped to the following destinations: Eastern Canada, 73 054 tonnes; the United States, 54 212 tonnes; Japan, 775 766 tonnes; Germany 52 423 tonnes; elsewhere, 31 736 tonnes.

Details of the disposition of molybdenum (15 521 995 kilograms valued at \$142 057 947) are not precisely ascertainable but, from known sales, almost half of the total was shipped to Europe and about one-third to Japan. The balance was disposed of to many other countries and eastern Canada.

Zinc concentrates, produced but not smelted in British Columbia, totalled 21 663 tonnes, of which 10 727 tonnes were shipped to the United States and the balance shipped to India.

Iron concentrates produced in British Columbia were sold to the following markets: Japan, 323 462 tonnes; the United States, 33 862 tonnes; Australia, 27 053 tonnes; Canada 60 940 tonnes.

Lead concentrates, produced but not smelted in British Columbia, totalled 2 489 tonnes and were shipped to the United States.

NON-METALLIC MINES

Industrial minerals in British Columbia with production value greater than \$1 million include asbestos, sulphur, gypsum, and granules (*see* Table 1-1). Asbestos is by far the most important, its production value of \$69.7 million representing 88 per cent of the total for all industrial mineral production. Asbestos production is entirely from the Cassiar mine (*see* Figure 1-5). Sulphur is produced entirely as a byproduct, chiefly from Cominco Ltd.'s roasting operations, but also from sour gas production in the Peace River. Gypsum is produced chiefly at the Windermere quarry at Westroc Industries Limited (653 126 tonnes). Granules are produced in many small quantities but production was dominated by the International Marble & Stone Company Ltd. with a plant at Sirdar near Creston. In 1977, jade production value dropped below \$1 million after a great rise in 1976. Production came from many sources but the main mines are working *in situ* nephrite at Mount Ogden (Continental Jade Ltd.), east of Dease Lake (Cry Lake Minerals Ltd. and Nephro-Jade Canada Ltd.), and at the Cassiar asbestos

mine. Barite, an important industrial mineral, not specifically listed in Table 1-1, was produced by Mountain Minerals Limited from two small underground mines near Brisco in the East Kootenays.

The dominant structural materials produced are sand and gravel, cement, limestone, clay products, and riprap, crushed rock, and building stone. Individual mines and quarries are not shown on Figure 1-5. Many of these products are produced at a large number of small quarries, some of which have very intermittent production. Limestone production is dominated by four mines (Ideal, Imperial, Vananda, and Domtar) on Texada Island. The Cobble Hill quarry (British Columbia Cement Company Limited) on Vancouver Island is being phased out. Significant operations are also located at Harper Ranch near Kamloops (Canada Cement Lafarge Ltd.), Ptarmigan Creek near Quesnel (Quesnel Redi-Mix Cement Co. Ltd.), and Pavilion Lake (Steel Brothers Canada Limited).

Clay and shale production in British Columbia is dominated by Clayburn Industries Ltd.'s pit and plant near Abbotsford, with lesser production by Haney Brick and Tile Limited, east of Haney.

COAL

Coal is the third most valuable mineral commodity to British Columbia, following natural gas and copper. Although coal is widely distributed in the Province, the major producing mines are at present concentrated in the Crowsnest Coalfield of southeast British Columbia. They are represented by five symbols on Figure 1-5 for (1) Fording Coal Limited's two open pits, (2) Kaiser Resources Ltd.'s open-pit complex (Harmer Ridge), (3) Kaiser's two underground mines (Balmer North and Hydraulic), (4) Coleman Collieries Limited's Tent Mountain open-pit mine and (5) Byron Creek Collieries Limited's open pit. The only other operating coal mine is Bulkley Valley Collieries Limited's mine at Telkwa, which was a very minor producer of thermal coal. Thermal coal was also produced for test purposes (*see* Plate on page 16) at the Hat Creek mine of British Columbia Hydro and Power Authority but is not shown on Table 3-8B. On this table, production for Kaiser's and Fording's mines is consolidated so that only five operations are shown. Kaiser Resources Ltd. and Fording Coal Limited produced 94 per cent of the coal mined in the Province in 1977.

Some salient facts of coal production in 1977 are as follows:

- (1) Coal production was 8 424 181 tonnes, up from 1976 but slightly lower than the record production of 1975.
- (2) Clean coal output was up 14.4 per cent to a normal output in a year unaffected by strikes.
- (3) The value of coal sold and used was \$328 846 883, up 10.1 per cent from 1976.
- (4) About 93.2 per cent of raw coal produced in 1977 comes from surface mining operations.
- (5) About 92.5 per cent of raw coal produced in 1977 was metallurgical coal.
- (6) The percentage of clean to raw coal remained at 74 per cent.

A highlight of 1977 was the diversification of markets. Coal sales to Japan were over 6.4 million tonnes and up 6.8 per cent over 1976. Nevertheless, they represented only 80 per cent of the total clean coal sold and used. Significant coal shipments were initiated to a number of countries for the first time. The following list shows major shipments: Korea, 307 370 tonnes; Denmark, 304 850 tonnes;

Brazil, 136 378 tonnes; Mexico, 128 478 tonnes; Belgium, 57 749 tonnes; Rumania, 51 746 tonnes; Argentina, 47 777 tonnes.

Shipments internally in Canada were also up some 6 per cent as follows: Ontario, 185 940 tonnes; Manitoba, 62 667 tonnes.

Use in British Columbia, however, was down. Coal used locally for coke production totalled 150 946 tonnes, a drop of 7 per cent. Other uses also dropped nearly 4 per cent and totalled only 64 608 tonnes.

MINE SAFETY

British Columbia continues to maintain leadership in promoting mine safety because of the progressive efforts of the Ministry and the co-operative spirit existing in the industry. Active safety programs were in effect at all times throughout the Province during 1977. Mine safety is controlled by the *Mines Regulation Act* and *Coal Mines Regulation Act*. These statutes are administered by the Ministry of Mines and Petroleum Resources, through its Inspection and Engineering Division, which is responsible for the observance of the Acts by all persons working at mines. The Inspection and Engineering Division maintains a Province-wide system of districts staffed by inspection and rescue personnel, including specialists. During the year additional staff have been obtained to assist specialists in their duties and additions of Senior and District Inspectors are scheduled for early 1978.

Certificates of competency, required of certain supervisors and managers of mines, were issued by the Board of Examiners. District Inspectors continued to examine for and issue miners' certificates and coal miners' certificates.

Monitoring of dust and ventilation conditions at mines continued, and a number of plants improved their dust control systems during the year. Noise control surveys indicate that most operations are now performing audiometric testing on employees. Monitoring of this testing procedure was continued to assure conformity.

MINE RESCUE

Mine-rescue stations fully supplied with rescue equipment are maintained at Fernie, Kamloops, Nanaimo, Nelson, Prince George, and Smithers. Mine-rescue co-ordinators are at each station and are fully qualified instructors in first-aid and rescue training. With the exception of Fernie, each station is established as a mobile unit to transport equipment anywhere in that area to be available for either rescue or training purposes. Each station is equipped with sufficient self-contained, oxygen-supplying, breathing equipment to maintain at least two rescue teams of six men each, should an emergency arise in the nearby mines. In addition to this equipment, some is on loan by the Ministry to supplement that owned by various mining companies.

In 1977, mine-rescue equipment owned by this Ministry included 59 Aerorlox three-hour liquid oxygen-breathing machines, 37 Draeger BG-174 and 52 McCaa two-hour high-pressure gaseous oxygen-breathing machines, and 57 Chemox one-hour chemical oxygen-producing machines. The equipment owned by industry was 37 Aerorlox, 44 Draeger BG-174, 36 McCaa, and 89 Chemox machines. Each station, as well as most mines, has additional auxiliary equipment such as Type N gas masks, self-rescuers, gas detectors, oxygen therapy units, and first-aid equipment.

The district co-ordinators of rescue training make periodic visits to the mine to give rescue training to open-pit and underground employees and to check the rescue equipment to ensure it is being maintained satisfactorily.

Both full and refresher courses in underground, survival, gravel pit, and surface mine-rescue training, as well as first aid, were presented by the district co-ordinators at various mines and centres throughout the Province. The instructors trained or assisted in the training of 368 persons obtaining St. John Ambulance first-aid certificates and 1 000 safety-oriented first-aid certificates. In addition, 129 men were trained in underground mine rescue, 413 men in surface mine rescue, 31 men in gravel-pit rescue, 263 men in mine-rescue survival, and 45 in industrial first aid. Five men received Surface Mine Rescue Instructors' certificates and four received Survival Mine Rescue Instructors' certificates.

Four mine safety associations have been established in different areas in the Province. These are sponsored by the Ministry of Mines and Petroleum Resources and the Workers' Compensation Board and are aided by mining company officials, safety supervisors, inspectors of mines, mine-rescue co-ordinators, and, in some areas, local industry. These organizations promote mine-rescue and first-aid training, as well as safety education in their various districts.

On May 28, the Vancouver Island Mine Safety Association held its 63rd annual mine-rescue and first-aid competitions in Nanaimo. In the surface mine-rescue event the Utah Mines' (Island Copper) team, captained by Marv Orosz, won the trophy.

On June 4, the West Kootenay Mine Safety Association held its 31st annual competition in Nelson. The Kaiser Resources' team from Sparwood, captained by Harry Eberts, won the underground mine-rescue event. On the same day and place, Kaiser Resources' team from Sparwood, captained by Alex Gallacher, won the surface mine-rescue trophy.

On June 11, the East Kootenay Mine Safety Association held its 56th annual mine-rescue and first-aid competitions in Fernie. In the underground mine-rescue event, Cominco's (Sullivan mine) team from Kimberley, captained by Curly Unruh, won the trophy.

On June 11, the Central British Columbia Mine Safety Association held its 29th annual mine-rescue and first-aid competitions in Kamloops. In the underground mine-rescue event the Western Mines' team, captained by Hal Uhrig, won the trophy and represented Vancouver Island in the Provincial. The Noranda Mines' Boss Mountain team, captained by John Howat, placed second and represented the Central British Columbia Mine Safety Association District in the Provincial.

These four underground teams, winning their association trophies, competed for the Provincial Trophy and the right to represent British Columbia at the Canadian Mine Rescue Competition held in Yellowknife, Northwest Territories, on June 25. In this later event the entries were from Alberta, British Columbia, Northwest Territories, Nova Scotia, Saskatchewan, and the Yukon. The Nova Scotia team, captained by S. White, won the trophy, while the team from British Columbia, captained by Hal Uhrig, placed second.

In 1977 the open-pit mine-rescue competitions were held in three districts—the Northern, Central, and Southern Divisions. The competition for the Northern Division was held in Smithers on May 27 where the Noranda Mines' (Bell Copper Division) team, captained by Rick Tait, was first. At the Central Division competition held in Nanaimo on May 28, the winning team was the entry from Utah Mines (Island Copper), captained by Marv Orosz. On June 4, the Southern British Columbia Zone Competition was held in Nelson. The winning team, Kaiser Resources from Sparwood, captained by Alex Gallacher, won the trophy.

These three surface teams winning their district events competed for the Provincial Trophy in Kamloops, on June 18. The winning team was from Kaiser Resources, captained by Alex Gallacher.

The interest in the three-persons' Miners' First Aid Competition is increasing and it is hoped that, by 1978, a Provincial competition will be started. The winners in this event were as follows:

On May 27 at Smithers, the Endako mine's team, captained by Nick Marceniuk, placed first.

On May 27 at Nanaimo, the team from Gibraltar Mines, captained by D. Fossen, placed first.

On June 4 at Nelson, the team from Similkameen Mining, captained by Jack Cunliffe, won the trophy.

On June 11 at Kamloops, the team from Wesfrob Mines (Tasu mine), captained by B. Makar, placed first.

SAFETY OF MECHANICAL/ELECTRICAL EQUIPMENT

During 1977 the impetus given by the Inspection and Engineering Division to the improvement of braking systems on large mining trucks continued to have effect. Several manufacturers of large vehicles have organized special brake tests to demonstrate that the new tough British Columbia standards can now be met. These tests, which are carried out on trucks ranging in size from 85-ton capacity to 335-ton capacity, are conducted on downgrade slopes up to 10 per cent and speeds up to 35 m.p.h. with the vehicle loaded to its full capacity. All large trucks coming into service at British Columbia mines in future will have to demonstrate that they can be stopped by the service brakes alone from an initial speed of 35 m.p.h. When the Inspection and Engineering Division started its investigation into braking systems some eight or nine years ago, no large truck could be stopped from an initial speed much in excess of 25 m.p.h., and the better brake design has resulted to the benefit of all.

British Columbia has also pioneered the use of fire-resistant hydraulic fluids in underground equipment in Canada. Large volumes of mineral oil are used in the hydraulic systems of diesel-powered equipment operating in underground workings and the potential for a serious fire is high. For several years the use of fire-resistant hydraulic fluids underground has been required by the Inspection and Engineering Division, and although manufacturers of equipment have been slow in modifying designs to accommodate these fluids, considerable progress has been made, and today over 90 per cent of equipment operating in underground coal mines uses fire-resistant fluids, and as do over 35 per cent of all other equipment in underground workings.

A survey has been conducted to assess the quantity of polychlorinated biphenyls used as dielectric coolants in transformers and capacitors, and their management procedures reviewed, with a recommendation issued that no new equipment using PCB fluids be installed at a mine.

Guidelines are being prepared to establish recommended levels of maintained illumination for the mining industry. The latest innovation to be tried at the new hydraulic mine of Kaiser Resources Ltd. in the East Kootenays is the introduction of a suspended mono-rail diesel locomotive, presently undergoing trials for the transportation of men and material to the underground work areas.

MINING ROADS

The Ministry of Mines and Petroleum Resources' road program has been carried out for many years under the authority of the *Ministry of Mines and Petroleum Resources Act*. The purpose of the program is to encourage and assist in the discovery and development of mineral resources of the Province.

During 1977 an expenditure of \$113 000 was made by way of assistance (up to a maximum of half cost) to build or upgrade access to mineral and petroleum development areas.

About \$170 000 was spent in the Takla Lake area building a new road that will eventually become part of a forest access road system in that area.

Approximately \$374 000 was spent on construction and maintenance of the Omineca road which services a large mineral-rich portion of northern British Columbia.

About \$100 000 was spent building and upgrading airstrips, in northern British Columbia. These strips encourage and assist in mineral discovery and development in areas where access by other means is either very expensive or damaging to the environment.

RECLAMATION

The objective of reclamation is to restore lands used in mining, waste disposal, and exploration to useful purposes compatible with the surrounding countryside. Reclamation is administered by the Inspection and Engineering Division under authority of section 11 of the *Mines Regulation Act* and section 8 of the *Coal Mines Regulation Act*. The Chief Inspector is Chairman of the Reclamation Committee, which is composed of representatives of the various Government resource ministries. This committee reviews all reclamation proposals before permits are submitted to the Cabinet for approval. The only major permit issued in 1977 for new mines was to Afton Mines Ltd. The Reclamation Section of Inspection and Engineering Division monitors, conducts, and encourages research on reclamation by mines and in exploration techniques. In 1977 coal exploration was a focus of major activity of the Section as all coal exploration must go through the Advisory Committee on Reclamation.

The first Reclamation Symposium was held in March 1977 sponsored by the Ministry of Mines and Petroleum Resources, the Mining Association of British Columbia, The University of British Columbia, and the University of Victoria. This has provided a valuable exchange of information and communication between Governmental agencies, industry, and universities.

The research program on tailings, short and long-term effects, and revegetation problems was continued during the year and reports have been submitted for publications. A bibliography on *Reclamation of Lands Disturbed by Mining in Mountainous Areas* was published. The staff have prepared reports on vegetation and reclamation of mines in southern British Columbia. From field studies on reclamation and vegetation in the Northeast Coal Block a report has been submitted.

EXPLORATION

Most indices document an over-all increase in the mineral exploration effort during 1977. This continued the upward trend set in 1976, after six years of over-all decline. The current programs are different from those of late 1960's and early 1970's and so are the performers. Major oil companies have increased their role

in the search for metallic as well as energy minerals. The exploration activities of American and Japanese mining companies and their subsidiaries have decreased, while European companies, particularly German ones, have recently initiated significant exploration programs. The Canadian mining companies' contribution has remained constant.

The objectives of exploration have changed as well. For example, exploration of the large low-grade copper/molybdenum porphyry deposits which peaked over the period 1969-72, dropped off sharply in subsequent years but has stabilized at a fairly high level principally due to molybdenum price and markets. Coal exploration has increased steadily from the late 1960's to a broad peak in 1975-78 and is expected to stabilize at a more moderate level as programs are completed in the early 1980's. Uranium exploration has been increasing from very low levels due to significant price increases in the mid 1970's. In general, the exploration trends for lead and zinc have shown an increase resulting mainly from application of new geological concepts but also as a result of improving prices even if these are erratic. Exploration for precious metals has increased steadily in recent years driven by price increases and futures.

METALS

The indices of metal exploration are indicated on Table 1-4 compared to the three previous years. Most indices are up, many of them significantly, although it is notable that exploration expenditure dropped very slightly. The following indices are up significantly: geophysics (244 per cent), number of properties explored (30.2 per cent), claims recorded (28 per cent), drilling (13.4 per cent), and certificates of work (8.2 per cent).

The only indices that are down are numbers of free miners' certificates and a recent fairly steady annual decline in these seems to be ending. Three possible explanations of the anomaly of increased work and static expenditure are that a great increase in exploration effort took place in the southeastern part of the Province where logistics' costs are minimal, much of the geophysics was airborne radiometrics, and possibly some over-all increase in efficiency is to be expected in times of stringency of funds.

Table 1-4—Indices of Metal Exploration

	1974	1975	1976	1977
Exploration expenditure.....	\$25 400 000	\$22 100 000	\$27 183 927	\$26 177 389
Claims recorded.....	16 971	11 751*	28 970*	37 151*
Certificates of work.....	48 071	39 403	36 729	39 711
Free miners' certificates:				
Individual.....	9 998	8 484	7 826	7 566
Companies.....	700	562	555	520
Number of properties.....	464	409	433	564
Total drilling (metres).....	192 935	92 802	97 277	110 303.6
Total geophysical surveys (line-kilometres).....	6 989	4 835	4 267	14 623.5

* Unit modified grid system.

The release of Federal/Provincial Uranium Reconnaissance Program geochemical data in May 1977 had a significant and immediate effect on the numbers of claims recorded. The increased activity in grassroots prospecting continued throughout the year. However, the marked increase in drilling indicates that mature programs are also increasing.

Pattern

Location of major new claim-blocks indicate the orientation of new exploration programs. These areas in 1977 were broadly distributed in central and eastern belts of British Columbia with an over-all noticeable shift eastward compared to former years. The shift is related to intensive prospecting for uranium, shale-hosted lead-zinc deposits, and massive sulphide deposits in older rock sequences. Activity in the Chilko-Endako and Gataga River areas was particularly noticeable as these had not previously been subject to intensive prospecting.

The pattern of exploration for metals on properties indicates more mature programs. This pattern is grossly similar to former years but with observable differences. Exploration was up greatly in intensity in the southeast and particularly in the East Okanagan, Adams Plateau, and East Kootenays. The main objective of much of this work was uranium but also massive sulphides in the Adams Plateau and Goldstream areas, precious metals in the Slocan, and lead and zinc in the Kootenays. Activity continued relatively high in the Nicola belt from Kamloops to Princeton and was also up in the north in the Atlin area for uranium and tungsten, the Queen Charlotte Islands for gold, and the Gataga River area for shale-hosted lead-zinc. Activity on Vancouver Island was up as a result of freeing of lands in the east and north railway lands. General decreases occurred in central British Columbia.

Major Exploration Activity

Major exploration activity at properties not in production, defined as programs of greater than 3 000 metres of drilling or 300 metres of underground development, occurred at eight properties, up slightly from the previous two years, but the total drilling in programs classified as major was up about 20 per cent. Only one major underground program occurred.

The following programs exceeded the criteria:

- KETTLE (Tyee Lake Resources Ltd. and Noranda Exploration Company, Limited), 82E/14E—a basal-type uranium deposit in Tertiary sedimentary rocks, 6 945 metres of drilling.
- IRON MASK, DM, ETC. (Canadian Superior Exploration Limited), 92I/9W—Iron Mask batholith near Kamloops and the Afton mine, syenitic porphyry copper prospects, 6 368 metres of drilling.
- IDAHO (Carolin Mines Ltd.), 92H/11W—a disseminated gold deposit near Hope, 337 metres of underground development.
- NU, ELK (Denak Mines Ltd. and Canex Placer Limited), 93K/3E—west end of Endako molybdenum porphyry deposit, 7 572 metres.
- NIK (BP Minerals Limited), 94D/9E—a porphyry-like deposit in volcanic and basic intrusive rocks, near Johanson Lake, 3 700 metres of drilling.
- JEFF, BOW, KRIS, PY (Imperial Oil Limited), 104I/1W—Kutcho Creek, 130 kilometres east of Dease Lake, bedded, massive copper-zinc sulphide prospect, 4 335 metres of drilling.
- SMRB (Sumac Mines Ltd.), 104I/1W—Kutcho Creek, 130 kilometres east of Dease Lake and adjacent to Jeff, Bow, Kris, Py, 3 522 metres of drilling.
- JENNIE (Nu-Energy Development Corp. Ltd. and Erickson Gold Mining Corp.), 104P/4E—gold vein deposit near Cassiar, 3 235 metres.

Development and Feasibility Studies

Development during 1977 was limited to the Afton mine which completed preparation of the pit and stockpiled ore until the start up of the concentrator in December 1977. This is the first large mine to come on stream since Lornex in October 1972.

No new feasibility studies were initiated during the year but several studies were continued or decisions were delayed, notably the Sam Goosly silver-copper deposit, Chappelle gold vein deposit, Rexspar uranium deposit.

Non-metallic Commodities

Exploration related to non-metallic commodities expanded in 1977 by about 20 per cent over the previous year, measured by the number of properties explored. Considerable grassroots prospecting is also known to have taken place for a wide variety of minerals. The major activity was in the southeastern part of the Province related to phosphates, magnesite, limestone, gypsum, and silica. A modest amount of prospecting also occurred in the southwest related to jade, talc, and stone. Central British Columbia received some prospecting for perlite and opal. In the north, activity was limited to asbestos and jade. Cassiar Asbestos Corporation Limited reactivated exploration on their Letain Lake property in the Kutcho Creek area, and drilled six holes totalling 1 123 metres, the largest non-metallic program for the year.

COAL

Distribution of Coalfields

The principal coal resources of the Province occur in comparatively narrow linear belts within the Intermontane basins of the East Kootenay area (the Crowsnest Coalfield) and the Inner Foothills region or northeastern British Columbia (the Peace River Coalfield). These deposits of Late Jurassic to Early Cretaceous age contain major reserves of medium to low-volatile bituminous coal, generally suitable for the production of metallurgical coke.

In addition to the above-described mountain coals, local deposits of lignite, sub-bituminous, high-volatile bituminous, and semi-anthracite coals, of Late Cretaceous and Tertiary age, occur in widely scattered areas of British Columbia. Size and economic potential of most of these, including possible reserves in the former coal-mining areas of Vancouver Island, are comparatively small, although they are of potential value for power development as energy costs continue to increase. An exception to the foregoing is the Hat Creek property, which is a Tertiary lignite of limited areal extent but of remarkable thickness.

Coal Exploration

Exploration for coal continued to increase, up 50 per cent to \$19 539 213 in 1977. This occurred as a result of greatly expanded programs in the Peace River and in the Interior basins while those in the Crowsnest decreased sharply owing to the completion of drilling, prior to feasibility studies. Meanwhile, environmental studies and search for markets went on. More emphasis on thermal coals was indicated by the increase in activity in the Interior basins and Vancouver Island. Exploration programs, in the Peace River in particular, were stimulated by infusion of new capital from diverse sources but notably oil companies and foreign trading companies. They were also stimulated by the intention to use existing infrastructure to go into small-scale production and establish markets rather than

waiting for major new infrastructure. Also the policy on issuance of coal licences was modified to permit present licence-holders and freeholders to acquire, for good reason, coal land adjacent to their present licences. This resulted in 48 new licences being issued. At the end of the year the total number of licences held was 1 067 covering an area of 243 116 hectares, together with two leases covering 3 257 hectares.

The following major programs were carried out in 1977:

Crowsnest Coalfield

1. Sage Creek Coal Limited carried out 3 000 metres of fill-in drilling on its properties.
2. Kaiser Resources Ltd. drilled more than 30 holes at Michel Head.
3. Elco Mining Ltd. completed a winter program of about 18 holes.

Peace River Coalfield (from south to north)

4. SAXON PROJECT (Denison Coal Limited), 7 500 metres of drilling.
5. MONKMAN (Pacific Petroleums Limited), eight drill holes.
6. DUKE MOUNTAIN (Pacific Petroleums Limited), minor programs.
7. QUINTETTE PROJECT (Denison Coal Limited), 7 500 metres of drilling.
8. MOUNT SPIEKER (Nichimen Resources Limited), 1 800 metres of drilling.
9. BULLMOOSE CREEK (Teck Corporation Ltd.), 57 drill holes.
10. SUKUNKA-BULLMOOSE (BP Minerals Limited), 15 000 metres of drilling.
11. BURNT RIVER (Teck Corporation Ltd.), three drill holes.
12. EAST MOUNT GETHING (Utah Mines Ltd.), four drill holes.

In the remainder of the Province there were major programs at the following:

13. BOWRON RIVER (Norco Resources Ltd.), 7 500 metres of drilling.
14. HAT CREEK PROJECT (British Columbia Hydro and Power Authority), extensive bulk sampling and test pitting.
15. COMOX (Weldwood of Canada Limited), 7 500 metres of drilling.
16. TULAMBEN (Cyprus Anvil Mining Corporation), 15 drill holes.



THE PETROLEUM INDUSTRY IN 1977

BY A. G. T. WEAVER AND W. L. INGRAM

Recovery in the drilling activity in the Province, evident in 1976, continued at a greatly increased rate during 1977. Total footage drilled reached an all-time annual high of 1 620 274 feet, exceeding the previous high in 1962 when the large Boundary Lake oil field was under active development.

Oil production declined 7 per cent compared to 1976 as production from new oil wells was insufficient to offset natural decline from existing fields. Gas production recorded a moderate gain of 2 per cent due to new production from field extensions exceeding natural decline. No new fields were tied into the main gas pipeline system during the year.

DRILLING

Over-all footage drilled, but particularly of the development and exploratory-outpost type, increased by 74 per cent over 1976 while the number of wells spudded was up 83 per cent from 178 to 326. Compared to previous years, the increase in activity was very pronounced after the month of June, as operators were successful in spreading the drilling operations throughout the year and not just confining their drilling operations to the winter months. This activity would have been even greater except for the shortage of available drilling rigs in the Province.

The number of oil wells made the greatest gain, 192 per cent over 1976, while gas wells and abandonments were up 74 and 66 per cent respectively. All of this activity, limited to the northeastern corner of the Province, was accomplished by 65 individual drilling rigs that were owned by 27 drilling contractor firms and were employed by 66 different oil companies.

In 1977, two incidents occurred at drilling sites. The derrick on Baltic Rig 14 collapsed while pulling the drill pipe after a drill stem test. The derrick man fortunately sustained only minor injuries after riding the derrick down to the ground. A new derrick was installed and the well was completed without further incident.

The second incident was at a well in a-3-H/94-B-8. Here, while tripping out the hole, the well was swabbed in and blowout conditions were imminent. While attempting to control the well a minor fire resulted. However, it was quickly extinguished and the well was eventually brought under control. During the period required to control the well, Provincial Government personnel continually monitored events at the well site.

Throughout 1977, industry was reminded of the changes to the Drilling and Production Regulations, which became effective January 1, 1977. General acceptance and compliance with these changes to the regulations had taken place during the year. However, due to the large volume of new drilling rigs entering the Province, some sections of the Blowout Prevention Regulations, such as trip tanks and mud level indicators, were slow to be attained. By year-end conditions were generally satisfactory both in drilling and production standards.

During the year, three major oil spills occurred; two on the Westcoast Petroleum's main line, some 60 miles upstream on the Pine River from Taylor. Both of these breaks were attributable to landslides which put severe stress on the line. After the second break, Westcoast Petroleum rerouted this section of the line around the slide area. The Branch field office was involved through the oil spill co-operative in some of the contact work and clean-up operations.

The third major spill occurred on the Blueberry Taylor pipeline, just downstream of the well, Pacific Blueberry b-24-D/94-A-13. Production accounting indicated the spill magnitude to be in the order of 3 200 barrels crude oil. Due to the danger of the oil migrating into various streams and rivers, salvage was not attempted, and the oil was burned. Clean-up operations were generally satisfactory.

PRODUCTION

Annual oil production, which recorded an increase in 1976 because of the comparison to the low year of 1975, was down by 7 per cent and returned to the steady decline rate of previous years. The 1977 production was 13 839 488 barrels with a daily rate below 40 000 barrels after the month of March.

The largest oil-producing fields were: Boundary Lake, 6 697 245 barrels; Peejay, 1 472 994 barrels; Inga, 1 495 067 barrels; and Weasel, 823 376 barrels. Weasel became the fourth largest producer in the Province in 1977, surpassing Milligan Creek. The Eagle field, 341 990 barrels, made a significant increase and was the most active area for oil development.

Gas production showed a slight gain over 1976. The nonassociated raw gas production was 379 599 825 MCF, compared to 372 565 267 MCF in 1976, giving a daily average of 1 039 999 MCF. This increase was due to the fact that additional off-take from field extension wells exceeded the regular annual decline experienced since 1973.

Production from the Yoyo field exceeded that from Clarke Lake and became the Province's greatest gas producer with 67 217 310 MCF. Clarke Lake produced 58 809 094 MCF followed by Sierra, 35 848 450 MCF and Laprise Creek, 26 214 476 MCF. The Helmet field nearly doubled the 1976 production to 21 959 106 MCF while other increases of importance were reported from Rigel, Jedney, Fireweed, and Roger.

Two operational procedures involving water continued throughout the year. Waterflood operations, to aid the efficiency of oil recovery, were used in 10 producing pools in the Province. A total of 30 654 945 barrels, including both fresh and formation water, was injected into 132 water-injection wells. Disposal of salt water produced with petroleum and natural gas was accomplished by injection into subsurface formations, preferably the formation from which the water originated. During 1977, there were 9 348 474 barrels injected into 38 disposal wells and 46 990 barrels put into evaporation pits. Two applications to convert wells to salt-water disposal service were approved in the Clarke Lake and Wolf fields.

Seven applications for Good Engineering Practice were received. Five of these were approved for the following pools: Eagle 6-34-84-18, Fort St. John Charlie Lake Unit No. 1, Kotcho Lake East Bluesky B Pool, West Milligan d-28-G/94-H-2, and Osprey Halfway Pacific Project. One application was rejected and one from the Sierra Pine Point A and B pools was under consideration at year-end. All approvals involving oil pools were conditional on conservation of gas production except where such a scheme was already in place.

Two applications for concurrent production of oil and gas were received. One for the Nettle Gething oil pool was approved conditional on conservation of gas production. The application for the Buick Doig pool was held up pending completion of an offsetting well. In the same vein, an application to reclassify the Cecil Lake North Pine A pool from oil to gas in order that the gas cap could be produced as a gas field was rejected by the Branch when the operator in the oil leg objected.

Based on concepts of good conservation, an application for determining the GOR on a net basis by crediting gas gathered and sold against gas production was rejected by the Branch; net GOR's are only acceptable when reservoir voidage caused by excess gas production is replaced by the injection of gas, water, or other fluid. Similarly, an application for an annual oil allowable for a well, and permission to produce during the winter months only due to accessibility problems, was rejected as the pool was not delineated.

EXPLORATION AND DEVELOPMENT

An aggressive exploratory and development drilling activity, started in 1976, registered a significant increase with a total of 304 wells compared to 173 wells drilled in the previous corresponding period. The over-all drilling program was slightly weighted in favour of development over exploratory activity with 167 and 137 assigned to each classification respectively.

Exploratory drilling carried out in all areas of the northeastern sector of the Province, with exception of the Liard Plateau, resulted in 11 New Pool oil discoveries inclusive of one recompletion and 51 New Pool gas discoveries, for an over-all success ratio of 45 per cent. The significance of these discoveries in terms of new reserves cannot be appraised fully at this time for reasons of confidentiality and the pending results of subsequent development drilling.

Approximately 80 per cent of all New Pool discoveries were made in the Mesozoic and Paleozoic rock sequences of the Forst St. John area. The predominance of activity in this area is based on accessibility, multiple oil and gas objectives, and the proximity of available and proposed transmission facilities.

A considerable amount of exploratory drilling activity was carried out during the year to the west of Fort St. John, as a result of the 1976 Belloy oil discovery made by the Scurry CEGO Eagle 6-36-84-19 well. This discovery, which has developed a considerable reserve, is the largest single oil find since the discovery of the Inga oil pool in 1967. In addition to the Eagle West play the drill was successful in discovering 11 New Oil pools, most of which appear to be insignificant in terms of new reserve potential.

For the most part, New Pool gas discoveries were confined to relatively small stratigraphic sand developments of the Lower Cretaceous and Triassic rock sequences within the Fort St. John area. Several gas accumulations encountered in the Triassic and Mississippian structural Foothills Belt to the west of Fort St.

Oil Discoveries, 1977

Well Authorization No.	Well Name	Location	Total Depth (Feet)	Productive Horizon
2814	Woods W Stoddart 11-7-86-20	11-7-86-20	6 690	Belloy.
3921	Petromark Canhunter E Osborn d-51-J	d-51-J/94-A-9	5 105	Gething.
3975	Pacific Prov Fox d-60-D	d-60-D/94-A-16	4 060	Baldoannel.
3980	Coseka Wescent W Buick d-17-E	d-17-E/94-A-14	4 720	Dunlevy.
3997	Focus et al Airport 10-32-83-17	10-32-83-17	5 136	North Pine.
4008	Huber W Stoddart 7-21-87-20	7-21-87-20	6 431	Confidential.
4009	Woods et al Wilder 6-22-83-20	6-22-83-20	4 457	Confidential.
4013	Ipex et al N Pine 6-22-85-18	6-22-85-18	6 004	Confidential.
4063	Texex et al Buick c-56-J	c-56-J/94-A-11	5 060	Confidential.
4087	Imp et al Mica 6-34-81-14	6-34-81-14	5 115	Confidential.
4105	Gulf W Nig b-66-D	b-66-D/94-H-4	5 535	Confidential.

John would appear to offer a more extensive type of reserve with additional follow-up drilling. Exploratory drilling to the south of Fort Nelson within the Klua Shale Embayment as well as along established Middle Devonian reefal trends resulted in a minor amount of success.

Development drilling activity resulted in 98 completions out of a total 167 wells drilled, for a success ratio of 59 per cent. Most of the development drilling took place within the general Fort St. John area with successful oil and gas extensions to a number of established pools. The most significant development activity centred around the Scurry CEGO Eagle 6-36-84-19 Belloy oil discovery of 1976. The limits of the oil pool substantially extended in areal extent are as yet undefined in two directions.

Gas Discoveries, 1977

Well Authorization No.	Well Name	Location	Total Depth (Feet)	Productive Horizon
3476	CZAR et al Birch b-64-I	b-64-I/94-A-13	5 020	Confidential.
3759	ATAPCO et al Janis d-98-G	d-98-G/94-J-9	8 512	Pine Point.
3766	Pacific Norcen Horn a-26-A	a-26-A/94-G-9	11 282	Confidential.
3830	Cdn Res et al Tenaka b-86-K	b-86-K/94-J-2	8 255	Pine Point.
3837	Gulf Trutch b-65-J	b-65-J/94-G-10	6 000	Debolt.
3844	Chevron N Cabin d-74-F	d-74-F/94-P-5	7 346	Slave Point.
3858	Mobil Sahtaneh a-45-I	a-45-I/94-I-12	6 702	Slave Point.
3860	Exalta Canhunter N Dahl a-21-H	a-21-H/94-H-10	3 150	Bluesky.
3874	SOC et al Graham c-32-D	c-32-D/94-B-9	3 400	Dunlevy.
3878	Canhunter Dogrib b-22-L	b-22-L/94-G-1	5 878	Dunlevy.
3883	AEG et al Strip b-82-D	b-82-D/94-I-6	5 272	Jean Marie.
3884	Chaut Dunbar Pt St John 6-13-84-19	6-13-84-19	6 353	Mississippian.
3888	CDCOG Union Mel c-57-J	c-57-J/94-P-4	8 090	Confidential.
3892	ATAPCO Klua d-51-F	d-51-F/94-J-9	7 587	Debolt.
3894	Quintana Klua d-74-C	d-74-C/94-J-9	6 765	Slave Point.
3897	Cdn Res Suhm b-45-A	b-45-A/94-P-14	6 089	Slave Point.
3898	Dome et al Velma d-93-A	d-93-A/94-H-7	3 773	Gething.
3903	Quasar Union Klouee d-19-E	d-19-E/94-J-10	7 230	Confidential.
3905	Pacific Kestrel d-31-K	d-31-K/94-A-15	3 435	Bluesky.
3914	AEG et al Niteal a-23-I	a-23-I/94-I-4	5 430	Debolt.
3916	Canhunter GIM Prespatou a-63-B	a-63-B/94-H-3	2 900	Notikewin.
3919	Pacific et al Suhm d-15-D	d-15-D/94-P-15	1 419	Mississippian.
3930	HB Fina PanCanadian July b-7-A	b-7-A/94-P-15	6 900	Pine Point.
3931	Pembina Pickell c-94-J	c-94-J/94-H-3	4 167	Halfway.
3933	Chevron Amoco Ekwan b-6-L	b-6-L/94-I-10	5 899	Slave Point.
3955	Canhunter et al S Julienne b-A82-L	b-82-L/94-B-16	7 905	Confidential.
3962	Canhunter et al W Kobes b-30-A	b-30-A/94-B-9	8 650	Confidential.
3964	Canso BP Silver b-6-D	b-6-D/94-H-11	3 700	Halfway.
3965	Cdn Res et al Hoss a-23-J	a-23-J/94-P-14	6 615	Slave Point.
3977	Ashland et al Buick b-10-L	b-10-L/94-A-14	4 146	Baldonnet.
3980	Coseka Wescent W Buick d-17-E	d-17-E/94-A-14	4 720	Bluesky.
3983	Canhunter et al N Townsend a-A1-J	a-1-J/94-B-9	7 910	Coplin.
3997	Focus et al Airport 10-32-83-17	10-32-83-17	5 136	Dunlevy.
4007	Pacific WP Airport 6-34-83-17	6-34-83-17	3 296	Bluesky.
4025	Canhunter Townsend c-20-H	c-20-H/94-B-9	5 120	Confidential.
4030	Canhunter Bernadet 11-31-87-24	11-31-87-24	5 778	Confidential.
4032	Pangaea et al Maple c-18-E	c-18-E/94-A-15	4 273	Confidential.
4053	Gulf et al Parkland 10-35-81-15	10-35-81-15	12 420	Confidential.
4957	Canhunter Cutbank d-93-A	d-93-A/93-P-8	8 022	Confidential.
4079	CZAR et al Flatrock 6-21-85-15	6-21-85-15	4 828	Confidential.
4080	Canhunter S Julienne d-33-L	d-33-L/94-B-16	8 776	Confidential.
4083	Coseka et al W Gundy b-13-B	b-13-B/94-B-16	6 915	Confidential.
4084	Murphy Dede b-86-J	b-86-J/94-A-15	4 025	Confidential.
4090	Coseka et al E Nig d-78-L	d-78-L/94-A-14	6 220	Confidential.
4097	Sabre Canhunter Sojer a-47-D	a-47-D/94-H-5	5 024	Confidential.
4098	CZAR et al Birch c-14-I	c-14-I/94-A-13	4 225	Confidential.
4112	Petronep W Stoddart A10-28-86-20	10-28-86-20	4 596	Confidential.
4125	CZAR et al Birch b-66-I	b-66-I/94-A-13	4 930	Confidential.
4137	Turbo Ranger Gopher b-25-85-16	b-25-85-16	6 053	Confidential.
4145	Canhunter et al Nig b-30-A	b-30-A/94-H-4	4 305	Confidential.
4180	Focus et al Boundary 16-5-84-13	16-5-84-13	4 540	Confidential.

Successful extensions to established gas reserves were made to the Monias Halfway and the Bullmoose Triassic gas pools located south of the Peace River. In addition, successful development drilling was carried out in shallow gas pools at Silver, Dahl, and Velma in anticipation of the completion in 1978 of a proposed pipeline.

The volume of geophysical field activity in 1977 was the highest recorded over the past 10 years. Crews equally concentrated their efforts in the Plains Area of Fort Nelson and Fort St. John, as well as the structural Foothills Belt both to the north and to the south of the Peace River. A total of 168 projects was approved during the year.

LAND DISPOSITIONS

The continuing increase in activity and interest shown by industry during 1977 resulted in revenue to the Crown for fees, rents, and bonuses of \$141 448 919. This represents an increase of 147 per cent over the figure of \$57 426 007 for 1976. The major portion of this increase is due to a 191-per-cent rise in Crown reserve disposition bonuses amounting to \$125 467 725 paid to explore and develop petroleum resources during 1977.



Activity of the Ministry

CHAPTER 2

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HISTORY AND FORMATION

The Department of Mines was created in 1874. Before that time, mining laws were administered by the Provincial Secretary's Department, to a great extent through Gold Commissioners, the first of whom was appointed in 1858. As the Province grew and mining increased in importance and diversity, the Bureau of Mines was formed as a technical division within the Department. Composed of professional men under the direction of a Provincial Mineralogist, the Bureau lasted from 1896 to 1934, when it was succeeded by the Mineralogical Branch. In 1953, the Department took over administration of the *Petroleum and Natural Gas Act* and the *Coal Act* from the Department of Lands. The Department of Mines became the Department of Mines and Petroleum Resources in 1960, and the Ministry of Mines and Petroleum Resources in October 1976.

The Ministry administers the laws and regulations governing the entire mineral and petroleum industries, second only to the forest industry in terms of gross value. The value of production was over \$1.8 billion, while that of the forest industry was \$5.2 billion.

The Ministry provides technical services that aid in the orderly development of the Province's natural resources of metals, minerals, coal, petroleum, and natural gas. These services include geological mapping and related research; aid to prospectors; financial aid in the construction of mining roads; advice to small operators; information to the public; identification of rocks and minerals; promotion of safety in all operations; general betterment of working conditions; encouragement of exploration, development, and conservation; and maintenance of records. These services are provided in order that new deposits and fields may be found to maintain the industry and in order that the known deposits and fields may be worked to the best advantage of the Province.

LEGISLATION

During 1977, four Acts were passed at the Session of the Legislature that directly affect the mineral industry.

Bill 15, the *Copper Smelting and Refining Incentive Act*, provides for payments of up to 5 cents per kilogram (2.27 cents per pound) for blister or refined copper produced in a smelter or refinery within the Province. Such payments are made under agreements approved by Cabinet between the Minister and the producer and are limited to 10 years and to a maximum of \$500 000 in any one year. The objective of the bill is to encourage present and future Provincial copper producers to develop a more integrated industry, ultimately involving smelting, refining, and fabricating.

Bill 38 amends the *Department of Mines and Petroleum Act* to clarify the role and authority of the Ministry and contains two important changes. Section 7 of the former Act which gave authority to the Minister to enter into the business of mining and petroleum resource development is repealed. The bill also reinstates a former program for the certification of assayers.

Bill 73, the *Mineral Act*, replaces the former Act which underwent many changes in recent years. The new Act makes a few important changes in principle of a technical nature, eliminates certain aspects of the former Legislation and clarifies the meaning of old or obscure sections.

Section 17 is a new section to allow for any forfeited claim, within the boundaries of a modified grid claim, to be included as part of the modified grid claim, provided the ownership is the same. This is designed to prevent unnecessary staking and to maintain secure title for the present owner.

Section 22 removes rental from mineral claims and is replaced by a "fee" to record work. When implemented, this will eliminate any question of forfeiture of mineral claims where work is recorded in advance.

Section 41 provides for "limited" production on a mineral claim without the requirement for the former "limited production permit" and allows for "full production" after legal survey has been performed.

Certain technical reports formerly required to be submitted to the Chief Gold Commissioner are to be submitted to the Chief Inspector of Mines as the *Mineral Act* is now solely concerned with title to mineral rights and former controls over mining operations have been transferred to the *Mines Regulation Act*.

Section 45 allows a free miner other than a company to locate up to eight "2-post" claims in a calendar year. This is designed primarily for prospectors who might prefer to use the 2-post method on a limited basis.

Section 60 is a new section which sets out the requirements for advertising mining property for sale and has been designed to prevent any implication that mining property being sold can be advertised for other than mining purposes, such as for home-sites.

Bill 84, the *Mineral Land Tax Amendment Act, 1977* received Royal Assent on September 1, 1977. Under this bill ambiguities in certain definitions and their applications were corrected retroactively and a new procedure for the classification of agricultural land was introduced.

No new Acts were introduced directly affecting the petroleum industry.

ORGANIZATION

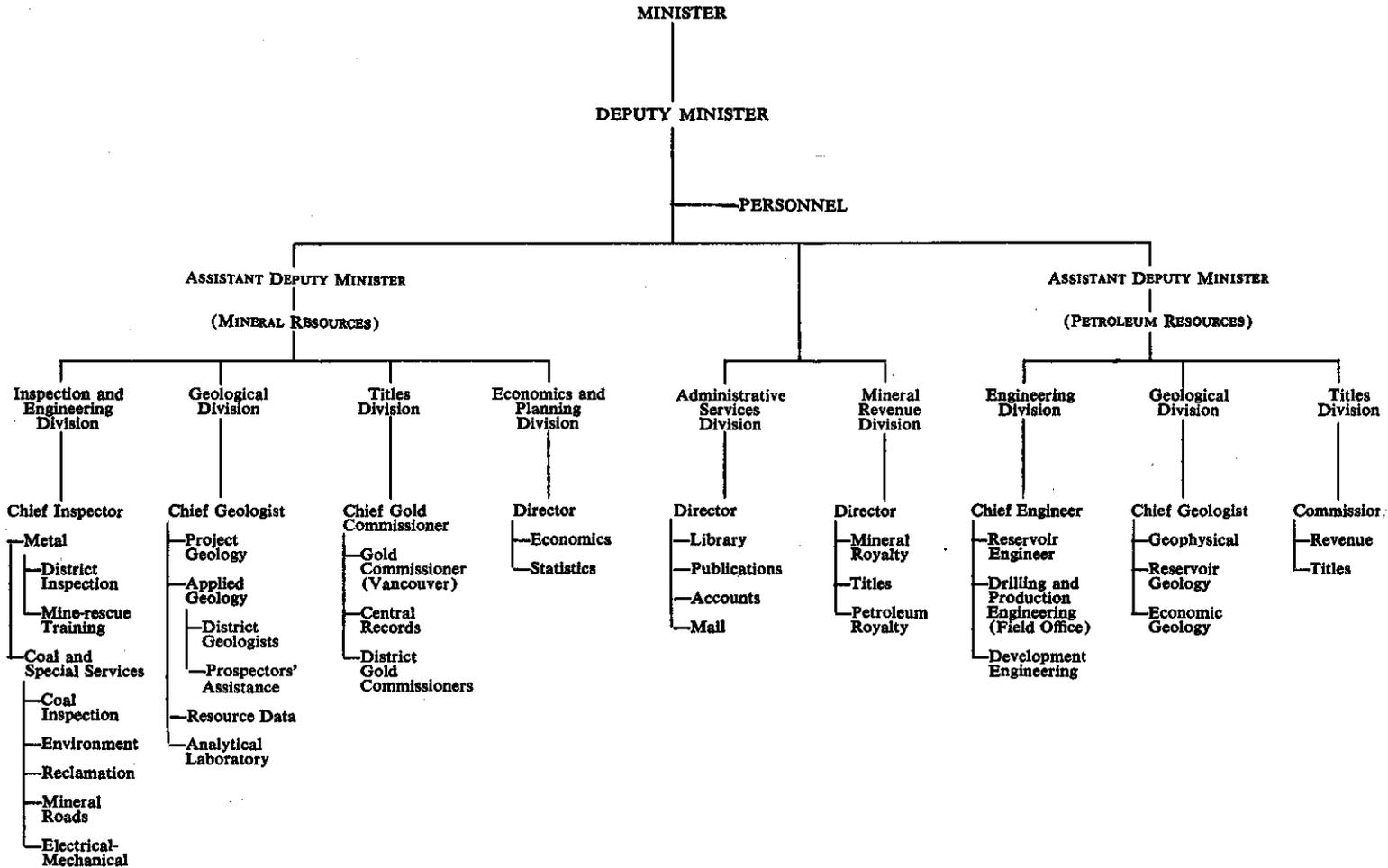
The organization of the Ministry was not changed significantly during 1977. The accompanying chart shows the organization applicable at the end of the year. A comparison with 1976 would show the following differences.

During 1977, E. R. Macgregor was appointed as Assistant Deputy Minister of the Mineral Resources Branch. In addition, Inspection and Engineering Division underwent an internal reorganization. Finally, Personnel was taken out of Administrative Services Division to report directly to the Deputy Minister as shown.

APPOINTMENTS AND RETIREMENTS

E. R. Macgregor, P.Eng., was appointed Assistant Deputy Minister on March 1, 1977. Mr. Macgregor received B.A.Sc. and M.A.Sc. in metallurgical engineering from The University of British Columbia, worked in numerous capacities with Union Carbide Canada Limited, including six years as plant manager at Welland, Ontario, and with the Ministry of Economic Development in Victoria. While in the latter role, he became Chairman of the Coal Task Force.

In the Inspection and Engineering Division, J. W. Peck retired as Chief Inspector of Mines after 31 years with the Division. A. R. C. James, Senior Coal Inspector retired after 27 years of service, and J. E. Merrett, Deputy Chief Inspector of Mines, retired after 23 years of service. Over the years, all these engineers had given devoted service of high technical quality to the Ministry and the Province.



In September, W. C. Robinson, P.Eng., who had been with the Division for 18 years, was appointed as Chief Inspector of Mines. Mr. Robinson is a graduate of The University of British Columbia in mining engineering and had worked at many of the mines and other engineering works prior to joining the Ministry. Since joining the Ministry, he had been Resident Engineer at Prince Rupert, Vancouver, and Nanaimo.

V. E. Dawson, P.Eng., Senior Inspector, Mechanical-Electrical, was appointed Chief Inspector for Coal and Special Services. Mr. Dawson is a graduate of the University of London and had worked with the National Coal Board of Great Britain and as an Inspector of Mines in Quebec before joining the Ministry. He had been with the Division for 11 years before his present appointment.

Miss D. Burton retired in December after approximately 43 years in the Public Service of the Province, the last 32 years as Secretary to the Deputy Minister.

BRANCH ACTIVITY

MINERAL RESOURCES BRANCH

The Mineral Resources Branch, under the direction of Assistant Deputy Minister, Edwin R. Macgregor, consists of four divisions—Inspection and Engineering, Geological, Titles, and Economics and Planning.

INSPECTION AND ENGINEERING DIVISION

Inspectors stationed at the following listed locations inspected coal mines, metal mines, and quarries. They also examined prospects, mining properties, roads and trails, and carried out special investigations under the *Mineral Act*. The Environmental Control Inspectors, supervised by S. Elias, conducted dust, ventilation, and noise surveys at all mines and quarries and, where necessary, made recommendations to improve environmental conditions. P. E. Olson supervised the roads and trails program. J. D. McDonald administered the reclamation sections of the *Coal Mines Regulation Act* and the *Mines Regulation Act*. A. R. C. James, Senior Inspector, Coal, had additional duties as mining adviser to the Securities Commission. Mine-rescue training is completed under the direction of the Co-ordinators, Rescue Training, for the areas in which their stations are located.

Staff

Inspectors and Resident Engineers

J. W. Peck, Chief Inspector of Mines	Victoria
J. E. Merrett, Deputy Chief Inspector of Mines	Victoria
A. R. C. James, Senior Inspector of Mines; Aid to Securities	Victoria
V. E. Dawson, Senior Inspector of Mines, Electrical-Mechanical	Victoria
J. Cartwright, Inspector of Mines, Electrical	Victoria
P. E. Olson, Senior Inspector, Mining Roads	Victoria
J. D. McDonald, Senior Inspector, Reclamation	Victoria
J. D. Errington, Inspector, Reclamation (Agriculturist)	Victoria
D. M. Galbraith, Inspector, Reclamation	Victoria
S. Elias, Senior Inspector, Environmental Control	Vancouver
D. J. Murray, Inspector, Environmental Control	Vancouver
N. D. Birkenhead, Technician, Environmental Control	Vancouver
J. W. Robinson, Inspector and Resident Engineer	Vancouver

Inspectors and Resident Engineers—Continued

W. H. Childress, Inspector, Technician	Vancouver
W. C. Robinson, Inspector and Resident Engineer	Nanaimo
H. A. Armour, Inspector, Technician	Nanaimo
B. Varkonyi, Inspector, Technician	Prince Rupert
J. F. Hutter, Inspector and Resident Engineer	Smithers
S. J. North, Inspector, Technician	Smithers
A. D. Tidsbury, Inspector and Resident Engineer	Prince George
L. H. Kocich, Inspector and Resident Engineer	Prince George
J. J. Sutherland, Inspector, Technician	Prince George
B. E. Warner, Technician, Reclamation	Prince George
K. G. Hughes, Inspector, Technician, Mechanical	Prince George
D. I. R. Henderson, Inspector and Resident Engineer	Fernie
D. Smith, Inspector and Resident Engineer	Kamloops
E. S. Sadar, Inspector and Resident Engineer	Kamloops
B. M. Dudas, Inspector and Resident Engineer	Kamloops
R. H. Heistad, Inspector, Technician, Mechanical	Kamloops
J. A. Thomson, Inspector, Technician	Kamloops
J. B. C. Lang, Inspector and Resident Engineer	Nelson
A. L. O'Bryan, Technician, Reclamation	Nelson

Co-ordinators, Mine-rescue Training

G. E. Lee, Senior Co-ordinator	Victoria
R. F. Brow	Nanaimo
J. E. A. Lovestrom	Smithers
R. J. Stevenson	Prince George
B. A. McConachie	Kamloops
E. C. Ingham	Nelson
A. Littler	Fernie

Staff Changes

In March, N. D. Birkenhead resigned from the staff of the Environmental Control Section, and L. H. Kocich resigned from the Inspection staff in May.

During the year, there were three retirements in the Inspection and Engineering Division. J. W. Peck, Chief Inspector of Mines retired in April after 31 years of service with the Ministry; A. R. C. James, Senior Inspector of Mines retired in June, after 27 years of service; and J. E. Merrett, Deputy Chief Inspector retired in September, after 23 years of service.

W. C. Robinson was appointed Chief Inspector of Mines in September. V. E. Dawson was appointed Deputy Chief Inspector of Mines, Coal and Special Services. Other appointments are pending for early in 1978.

T. H. Robertson retired in April, after 20 years of service as Co-ordinator, Mine-rescue Training in Nanaimo. In February of this year, he was replaced by R. F. Brow.

J. C. Errington joined the Ministry as Inspector, Reclamation (Agriculturist) in the Victoria office in April.

D. J. Murray joined the Ministry as Inspector, Environmental Control in the Vancouver office in July.

GEOLOGICAL DIVISION

Objectives and Organization

The objectives of the Geological Division are to provide accurate and current information on the quantity and distribution of mineral and coal deposits of the Province for Government and industry, to provide maps and other data, ideas, and interpretations useful in the search for these deposits, and to assist in the orderly exploration, development, and use of these resources. To carry out these objectives, the Division is organized into four sections—Project Geology, Applied Geology, Resource Data, and Analytical Laboratory.

Staff

The professional staff of the Division on December 31, 1977 were as follows:

A. Sutherland Brown, Ph.D., P.Eng. _____ Chief Geologist
Mrs. Rosalyn J. Moir _____ Assistant Editor

Project Geology

N. C. Carter, Ph.D., P.Eng. _____ Senior Geologist
P. A. Christopher, Ph.D., P.Eng. _____ Geologist
B. N. Church, Ph.D., P.Eng. _____ Geologist
G. E. P. Eastwood, Ph.D., P.Eng. _____ Geologist
R. D. Gilchrist, B.Sc. _____ Geologist
T. Höy, Ph.D., P.Eng. _____ Geologist
W. J. McMillan, Ph.D., P.Eng. _____ Geologist
A. Panteleyev, Ph.D., P.Eng. _____ Geologist
D. E. Pearson, Ph.D., P.Eng. _____ Geologist
V. A. Preto, Ph.D., P.Eng. _____ Geologist
J. L. Armitage _____ Chief Draughtsman
R. E. Player _____ Lapidary and Photographer

Applied Geology

E. W. Grove, Ph.D., P.Eng. _____ Senior Geologist
A. F. Shepherd, B.A.Sc., P.Eng. _____ Geologist
G. G. Addie, M.Sc., P.Eng. _____ Geologist
G. H. Klein, B.A.Sc., P.Eng. _____ District Geologist
T. G. Schroeter, M.Sc. _____ District Geologist
G. P. E. White, B.Sc., P.Eng. _____ District Geologist
Mrs. W. Proudlock, B.Sc. _____ Coal Technician

Resource Data

J. A. Garnett, Ph.D., P.Eng. _____ Senior Geologist
K. E. Northcote, Ph.D., P.Eng. _____ Geologist
Z. D. Hora, M.Sc. _____ Geologist
E. V. Jackson, B.Sc., P.Eng. _____ Geologist
G. L. James _____ Systems Analyst
J. E. Forester, B.A., M.A. _____ Research Officer
A. Matheson, B.Sc. _____ Research Officer

Analytical Laboratory

W. M. Johnson, Ph.D.	Chief Analyst
P. F. Ralph, L.R.I.C.	Deputy Chief Analyst
B. Bhagwanani, B.Sc.	Laboratory Scientist
R. J. Hibberson, B.Sc.	Laboratory Scientist
Y. T. J. Kwong, M.Sc.	Laboratory Scientist
Miss V. V. Vilkos, Ph.D.	Laboratory Scientist
M. A. Chaudhry	Laboratory Technician
F. F. Karpick	Assayer
L. E. Sheppard	Laboratory Technician

Staff Changes

During 1977, N. G. Colvin retired after 38 years of service in the Analytical Laboratory. Dr. W. D. McCartney died after a short illness. The following appointments took place: A. Matheson became Research Officer in charge of Coal Inventory and J. E. Forester became a Research Officer in the Mineral Inventory. Z. D. Hora was appointed at the end of the year to fill the vacant position of non-metallic specialist. Y. T. J. Kwong was appointed to take over X-ray Diffraction and related work. Dr. K. E. Northcote was appointed geologist responsible for Special Projects, which includes land use and mineral potential studies; Mrs. Wendy Proudlock was appointed as Coal Technician at Charlie Lake.

Review of Work in 1977

The geological mapping program, the core of the Division's work, continued unabated during 1977. The program is aimed at providing superior geological maps, information, and interpretations in response to an articulated need from industry to aid exploration for metals and coal resources. The total field costs were of the order of \$400 000 which supported over 20 projects, 11 project geologists, 4 district geologists, 20 summer-student geologists, and 6 graduate geologists on grant for Ministry-related projects. The preliminary results were published in the booklet, *Geological Fieldwork, 1977*, and major mapping projects carried out by the *Project Geology Section*, included the following:

P. A. Christopher completed studies of basal-type uranium deposits in the East Okanagan area.

B. N. Church studied Tertiary stratigraphy and its relation to uranium deposits in south central British Columbia.

G. E. P. Eastwood continued to study metallic prospects and started studying the coal deposits near Quinsam Lake.

W. J. McMillan continued the Nicola project by mapping south of Nicola Lake and the Promontory Hills.

K. E. Northcote completed the study of the Iron Mask batholith and related copper deposits.

V. A. Preto studied the Rexspar Uranium deposits as a prelude to mapping the Barriere Lakes area.

A. Panteleyev mapped the Granite Mountain pluton in the Cariboo District and the Gnat Pass porphyry deposit and the Kutcho Creek areas in northern British Columbia.

Coal Program

R. D. Gilchrist mapped the Mountain Spieker area of the Peace River Coalfield.

D. E. Pearson continued to map the Fernie basin of the Crownsnest Coalfield.

Prof. P. McL. D. Duff, under contract to the Ministry, continued correlation studies in the Peace River Coalfield.

In addition, the following thesis studies of direct interest to the Division were supported:

R. Cann—Genesis of magnetite deposits in the Iron Mask batholith.

T. Duncan—Structural geology of the Big Ledge area.

S. H. Evans—Tulameen Coal Basin.

J. H. Ladd—Cache Creek-Nicola Group contact in the Ashcroft area.

M. E. McMechan—Geology of the Purcell SuperGroup between Wildhorse and Bull Rivers.

J. H. Miller—Geology of the Callaghan Creek roof pendant near Warman mine (Northair Mines Ltd.).

Additional field projects were conducted in co-operation with the Geological Survey of Canada, The University of British Columbia, and other agencies, including regional geochemical surveys (URP), aeromagnetic surveys, and offshore surveys. The Uranium Reconnaissance Program, conducted with the GSC, surveyed the Nelson area (82F), Lardeau (82K), and Atlin (104N). In May 1977, survey data of 1976 surveys of Okanagan Lake (82E), Vernon (82L), and Shuswap Lake (82M) were released. This greatly stimulated exploration causing an immediate large increase in claim location in May. The Federal/Provincial aeromagnetic survey agreement was extended to fly Cry Lake area (104I) in 1977. Offshore surveys were partly funded by the Ministry to sample sedimentary rocks for metals in geothermal areas within the 200-mile limit. The surveys were conducted by The University of British Columbia and in co-operation with various Federal agencies.

Applied Geology—This section carried out the fundamental programs of field mapping and monitoring of exploration reported in part in *Geological Fieldwork, 1977*. In addition, the section conducted extensive prospector training, administration, and monitoring of Prospectors' Assistance Grants, and conducted the first two-week long field school for advanced prospectors in Castlegar. They also continued the program, begun in the fall of 1976, of collecting, curating, and storing of drill cores from the Peace River Coalfield. During the year and late 1976, they recovered most of the 170 000 feet drilled prior to 1977 and received 120 000 feet drilled in 1977. Some 40 per cent of the core has been reboxed, curated, and stored in the warehouse at Charlie Lake, where it will form the basis of studies by industry and the Ministry for future coal mines. Three temporary and two summer students helped in this work.

Resource Data—This section carried out its normal programs focused principally in producing the publication, *Exploration, 1976*, a comprehensive record of the industry. In addition, between November 1976 and February 1978 all reports received for assessment credit, since that program started 20 years ago, have been microfilmed and reader/printers are available at Ministry offices in Vancouver as well as in Victoria.

A system of Portable Assessment Credits was developed and is being administered by the Section in response to a request from industry for an equitable credit system for assessment work. The Section helped greatly in preparing the

Ministry Brief to the Royal Commission on the British Columbia Railway, of which a principal part was the Mineral Deposit/Land Use maps produced over the last five years by the Section. Eight summer students helped in all this work.

Publications—This section continued to be administered by the Geological Division during the year. In addition to the publications described following, the Annual Reports 1975 and 1976, Geology 1975, and many other publications and maps were produced or were at the Queen's Printers at the end of the year. Division staff were also actively participating in technical societies, publishing papers in outside journals, and talking to the public on subjects of geology and mineral resources.

Most of the work of the Division is made available to the interested public through a series of publications, maps, and also through open files. The most important publications include the following:

- (1) *Geology, Exploration and Mining in British Columbia* is the major yearly publication that summarizes and collates all known exploration and mining activity each year as well as reports on properties by Division geologists and by Mine Inspection Engineers. Since 1975 the publication is issued as three separate parts.
- (2) *Geological Fieldwork* is a smaller yearly publication that describes the work of project and district geologists in a preliminary manner as soon as possible after the completion of the field season and within the same calendar year.
- (3) *Bulletins* are produced at irregular intervals, usually one or two per year, and generally describe details of the geology and mineral deposits of various areas of mineral potential mapped by Division geologists. At the end of 1977, Bulletin No. 65, *Surficial Geology and Sand and Gravel Deposits of Sunshine Coast, Powell River, and Campbell River Areas*, by J. W. McCammon was released.
- (4) *Preliminary Maps*, issued as ozalid prints. In 1977, the following were issued:

Map 24—*Geology of Crowsnest Coafield, Northwest Part*, by D. E. Pearson, F. B. Gigliotti, D. A. Grieve with N. C. Ollerenshaw of the Geological Survey of Canada (NTS 82G/10 in part; scale—1:10 000; approximately 60 square kilometres).

Map 25—*Geology of the Goldstream River-Downie Creek Area, Southeastern British Columbia*, by R. L. Brown, T. Höy, and L. Lane (parts of NTS 82M/8 and 9; scale—1:50 000; approximately 670 square kilometres).

Map 26—*Geology of the Iron Mask Batholith*, by K. E. Northcote (parts of NTS 92I/9W and 10E; scale—4 inches to 1 mile or 1:15 840; approximately 140 square kilometres).

- (5) *Mineral Inventory Maps*, issued as ozalid prints, show locations and commodities of all known mineral deposits. These maps are regularly updated.
- (6) *Mineral Deposit/Land Use Maps* are interpretive maps that portray the varying mineral potential of terrain in a simple five-fold classification. In 1977, three new maps (93I and P, 94A) and four revised maps (93J and O, 94B and C) were issued at a scale of 1:250 000.

- (7) *Aeromagnetic Maps*—none were issued in 1977.
- (8) *Assessment Report Index Maps* are available which show the location and number of reports accepted for assessment credit by the Ministry. These maps, at various scales, cover the mineralized terrain of the Province. They are regularly updated.
- (9) *Open File Reports*—these unpublished reports will be made available where possible at user's expense. In 1977, two of a new numbered sequence were made available:

Open File 1—*Stratigraphy of the Placers in the Atlin Placer Mining Camp, British Columbia*, by P. J. and W. M. Proudlock (1976).

Open File 2—*Atlin Placer Camp*, by J. M. Black (1953).

During the year, the Division Lapidary and Photographer recorded many aspects of the work of the Ministry and the industry.

Analytical Laboratory—The Analytical Laboratory had a productive year in 1977, both in terms of method development and output.

Method Development—The method of trace element determinations in rock samples was refined and the U-Th method was developed, and is being used routinely for determinations of U and Th from concentrations of 3 ppm and 7 ppm respectively up to ore grade levels. The method was developed jointly by John Davies, here on contract for four months (January to April, inclusive), and P. F. Ralph and W. M. Johnson.

Output—Wet Chemical Laboratory: There were 256 results reported on 100 samples submitted by general prospectors, 3 782 results on 1 019 samples from Prospectors' Assistance Grantees, and 16 643 results on 2 641 samples from the Ministry and other Governmental personnel. This represents a total of 20 681 results on 3 760 samples. These include trace analytical results on rock, soil, and silt samples, base metal results on general ore samples, whole rock analysis on nearly 300 samples, as well as numerous special analyses.

Emission Spectrographic Laboratory: There were 33 120 semi-quantitative determinations made on 1 107 samples and 5 138 results on 1 069 samples during 1977.

X-ray Diffraction Laboratory: There were 258 mineral diffractions reported, 23 quartz determinations, and extensive work done on 150 samples in a study of British Columbia coals subsequent to low temperature plasma ashing. This latter work was done in co-operation with Dr. D. E. Pearson.

Sample Comminution: A total of 2 273 samples was received, recorded, and prepared for subsequent analytical work.

Mineral Separation: A total of 26 mineral separations was made in preparation for age-dating purposes.

A two-day workshop on trace element analysis, held under the auspices of the Spectroscopy Society of Canada and the University of Victoria, was organized by W. M. Johnson in February.

The examination for the certification of assayers was reinstated and examinations were held in July and December.

A paper describing the U-Th method was given by W. M. Johnson to the annual meeting of the Spectroscopy Society of Canada held in Ottawa, October

Table 2-1—Gold Commissioner's and Mining Recorder's Office Statistics, 1977

Mining Division	Free Miners' Certificates		Lode Mining							Placer Mining					Revenue			
	Individual	Company	Mineral Claims	Work Record	Cash in Lieu	Rental	Bills of Sale, Etc.	Production		Mineral Lease Rental	Lease Issued	Work Numbers	Cash in Lieu	Bills of Sale, Etc.	Extensions	Free Miners' Certificates	Mining Receipts	Total
								Lease	Percentage									
			(Units)	(Years)	\$	\$			\$			\$			\$	\$	\$	
Alberni.....	67	1	240	462	4 800	13 120	4	---	2 564	---	4	---	---	---	1 090	15 665.00	16 755.00	
Atlin.....	119	2	1 035	1 763	10 800	36 655	21	---	366	19	104	1 400	8	2	1 175	48 237.75	48 249.50	
Cariboo.....	937	5	2 433	1 170	29 100	22 620	25	---	11 448	70	359	5 750	61	24	5 333	102 422.15	107 755.15	
Clinton.....	25	1	841	257	1 700	11 735	5	---	460	---	47	300	2	---	505	16 325.00	16 830.00	
Fort Steele.....	216	8	3 135	2 443	12 400	46 245	23	---	2 974	3	43	1 200	2	9	3 782	67 114.14	70 896.14	
Golden.....	121	6	715	1 063	6 600	17 615	22	---	1 028	---	4	---	---	---	2 595	28 128.50	30 723.50	
Greenwood.....	126	3	2 447	3 184	34 000	53 605	122	---	7 166	2	20	700	1	1	1 715	103 469.50	105 184.50	
Kamloops.....	440	11	4 530	4 206	24 600	98 050	94	---	16 248	5	21	1 200	1	---	5 964	158 975.75	164 939.75	
Liard.....	211	---	4 014	6 245	63 600	97 860	40	---	3 574	6	31	7 850	3	2	960	18 081.50	19 041.50	
Lillooet.....	103	3	483	647	8 700	10 755	8	---	2 100	10	43	300	1	---	1 215	20 203.43	21 418.43	
Nanaimo.....	262	2	278	1 071	10 600	21 480	17	---	7 950	---	3	---	1	---	1 739	50 306.40	52 045.40	
Nelson.....	263	3	1 031	742	7 600	14 060	14	---	974	---	6	---	---	---	1 885	23 690.50	25 575.50	
New Westminster.....	603	11	628	1 263	4 400	21 900	35	---	2 692	5	44	---	3	4	5 715	38 579.50	44 294.50	
Nicola.....	65	---	1 224	816	3 600	16 190	19	---	1 850	---	---	---	---	---	280	22 199.50	22 479.50	
Omineca.....	316	3	4 355	5 403	38 500	109 445	74	---	19 008	---	75	400	4	4	2 658	193 399.70	196 057.70	
									632 ¹									
Osoyoos.....	236	6	1 795	1 116	29 400	24 775	70	1	7 580	---	---	---	---	---	2 885	65 192.70	68 077.70	
Revelstoke.....	93	2	1 022	1 928	5 900	27 560	44	---	502	3	8	1 200	2	1	822	38 139.50	38 961.50	
Similkameen.....	155	2	597	452	16 200	13 025	15	---	4 468	19	84	700	5	3	1 465	44 863.00	46 328.00	
Skeena.....	221	1	711	1 551	50 100	30 095	13	---	3 914	1	3	900	1	---	1 165	105 074.69	106 239.69	
Slocan.....	127	5	797	515	13 700	12 145	25	---	5 652	---	6	---	---	---	1 925	32 543.07	34 468.07	
Trail Creek.....	68	4	1 140	76	---	7 040	11	---	524	---	---	---	---	---	1 860	7 640.00	9 500.00	
Vancouver.....	1 872	345	727	1 067	5 800	16 775	18	---	1 004	---	---	---	---	---	136 208	765 577.88	901 785.88	
Vernon.....	430	5	2 517	1 997	400	32 765	57	---	654	1	12	---	4	---	3 670	41 003.75	44 673.75	
Victoria.....	490	91	387	274	2 000	5 645	6	---	80	2	11	300	3	---	34 935	6 835.48	41 770.48	
Totals, 1977....	7 566	520	37 151	39 711	384 500	761 160	782	1	105 412	146	928	31 325	102	50	221 546	2 013 668.39	2 234 051.14	
Totals, 1976....	7 826	555	28 970	36 729	387 500	708 690	1 118	3	103 788	289	935	32 030	153	214	233 895	1 384 130.16	1 618 025.16	

¹ Prod.
² S.P.M.L.

1977. P. F. Ralph attended the same meeting to deliver a paper on the long-term evaluation of the atomic absorption method used in this laboratory for major element analysis. A paper co-authored by L. E. Sheppard and W. M. Johnson, and D. Beaton of the Ministry of Highways and Public Works, describing the down-draught fume hood used for mineral separations, appeared in the October 1977 issue of the *Canadian Journal of Earth Sciences*.

TITLES DIVISION

Staff

E. J. Bowles..... Chief Gold Commissioner
 R. Rutherford..... Deputy Chief Gold Commissioner
 D. Doyle..... Gold Commissioner, Vancouver

The Titles Division of the Mineral Resources Branch is under the administration of the Provincial laws relating to the acquisition of minerals and coal.

Gold Commissioners and Sub-recorders are appointed for the 24 Mining Divisions throughout the Province and their duties are specified in writing by the Chief Gold Commissioner.

The recording of locations and of work on mineral claims as required pursuant to the provisions of the *Mineral Act*, and the recording of work on placer leases as required under the *Placer Mining Act*, must be made at the office of the Gold Commissioner for the Mining Division in which the claim or lease is located.

Table 2-2—List of Gold Commissioners and Mining Recorders

Mining Division	Location of Office	Gold Commissioner	Mining Recorder
Alberni	Port Alberni	W. G. Mundell	W. G. Mundell.
Atlin	Atlin	R. E. Hall	R. E. Hall.
Cariboo	Quesnel	S. W. Minifie	S. W. Minifie.
Clinton	Clinton	W. R. Anderson	W. R. Anderson.
Fort Steele	Cranbrook	W. L. Draper	W. L. Draper.
Golden	Golden	J. Olson	J. Olson.
Greenwood	Grand Forks	S. Matsuo	S. Matsuo.
Kamloops	Kamloops	N. R. Blake	N. R. Blake.
Liard	Victoria	E. A. H. Mitchell	E. A. H. Mitchell.
Lillooet	Lillooet	M. Sakakibara	M. Sakakibara.
Nanaimo	Nanaimo	R. H. Archibald	R. H. Archibald.
Nelson	Nelson	H. S. Tatchell	H. S. Tatchell.
New Westminster	New Westminster	F. E. Hughes	J. Hoem.
Nicola	Merritt	L. P. Lean	L. P. Lean.
Omineca	Smithers	A. W. Milton	A. W. Milton.
Osoyoos	Penticton	I. D. Sands	I. D. Sands.
Revelstoke	Revelstoke	D. G. B. Roberts	D. G. B. Roberts.
Similkameen	Princeton	W. L. Marshall	W. L. Marshall.
Skeena	Prince Rupert	T. H. W. Harding	T. H. W. Harding.
Slocan	Kaslo	T. P. McKinnon	T. P. McKinnon.
Trail Creek	Rossland	A. Sherwood	A. Sherwood.
Vancouver	Vancouver	D. Doyle	D. Doyle.
Vernon	Vernon	N. A. Nelson	N. A. Nelson.
Victoria	Victoria	E. A. H. Mitchell	E. A. H. Mitchell.

Central Records Office (Victoria and Vancouver)

Copies of records of mineral claims and 2-post claims recorded in the offices of the Gold Commissioners are forwarded daily to the office of the Chief Gold Commissioner, while transcripts of all other recording in the offices of the Gold Commissioners are sent twice monthly and serve to update the records held in the Central Records offices.

Information concerning claims and leases and the ownership and standing of claims and leases in any Mining Division may be obtained from the Gold Commissioner for the Mining Division in which the property is situated or from the Ministry's offices, Room 411, Douglas Building, Victoria, and 800 Hornby Street, Vancouver, the office of the Gold Commissioner.

The records and maps showing the approximate positions of mineral claims held by record and of placer leases, may be viewed by the public during regular office hours in Victoria and at the office of the Gold Commissioner in Vancouver. The position of mineral claims held by record and of placer leases is plotted from details supplied by the locators. Prints of mineral and placer titles reference maps at a scale of 1:50 000 may be obtained from the Victoria and Vancouver offices.

Appointed officials in the office of the Gold Commissioner at Victoria and the Gold Commissioner at Vancouver act as Sub-Recorders for all Mining Divisions.

Mineral and Placer Title Maps

The initial program of redrawing mineral titles reference maps which are produced for the public on a scale of 1:50 000 was completed in 1977 and maps of the entire Province are now available at this scale. A new mapping program on the same scale using superior Ottawa base maps has been commenced. These maps will show contours and should be of great assistance to the prospector.

During 1977, 299 new mineral titles reference maps were drawn. Three hundred and sixty-seven applications were received for placer leases under a new system, established in 1975 with the proclamation of a new *Placer Mining Act*, of only accepting applications for leases in designated placer areas.

Mineral Claims Inspectors are based at Kamloops, Smithers, Vancouver, and Quesnel. Their duties include checking the locations of mineral claims to correlate them with the plotted position of the claims, determining the validity of the staking under the *Mineral Act* and *Placer Mining Act* and regulations, investigation of possible misuse of mineral claims, and investigations of disputes. In order to fulfil the objectives of providing claim holders with firm titles and maintaining accurate and up-to-date records, the activities of the inspectors have increased with the use of the modified grid system.

During 1977, as a result of 18 complaints under section 80 of the *Mineral Act*, 17 mineral claims were cancelled. Three complaints were dismissed.

The Gold Commissioner's office in Vancouver is now equipped with a micro-film reader/printer which will allow the general public to view and reproduce technical reports at a nominal cost. The Vancouver office should thus become a greater source of information for the mining community than previously.

Coal

The Coal Administrator is responsible to the Chief Gold Commissioner for the daily administration of the *Coal Act*. This involves reviewing applications for coal licences and leases and maintenance of records of title.

Maps showing the location of coal licences under the *Coal Act* may be seen at the Titles Division, Mineral Resources Branch, Room 411, Douglas Building,

Victoria. An index of coal reference maps is obtainable from the Chief Gold Commissioner at the above address.

During 1977, 48 licences were issued involving three applicants. As at December 31, 1977, a total of 1 090 coal licences, amounting to 248 987 hectares, was held in good standing.

Table 2-3—Coal Revenue From Licences

	1976	1977
	\$	\$
Fees _____	8 830	6 950
Rentals _____	560 546	687 814

ECONOMICS AND PLANNING DIVISION

Objectives

The Economics and Planning Division collects, analyses, and disseminates statistical information to the mining industry, Government, and the general public; provides economic and policy planning services to other areas of the Ministry and the Government.

Staff

The Divisional professional staff as at December 31, 1977 were as follows:

J. S. Poyen _____	Director
F. C. Basham _____	Assistant Director
J. F. Clancy _____	Economist
W. P. Wilson _____	Statistician
G. M. Limo _____	Mineral Economist

There were two staff changes during the year. G. M. Limo was hired to fill the position of Mineral Economist in the Division: J. Rohwedder, Analyst, resigned from his position after three years with the Ministry.

Review of Activities in 1977

In 1977 the Report on Coal Resource Evaluation for the Northeast Coal Study was published. In addition, the computerized Coal Cost Model that was developed in conjunction with these studies was finalized and the *Documentation and User Manual* was published. Fieldwork continued during 1977 in expanding and updating the work begun in the earlier years of this study.

The Division participated in analytical evaluations of certain aspects of coal policy, most notably those areas of land tenure and taxation, and in manpower-related studies. In addition, the Division continued analyses in commodity studies, mineral and coal price forecasting, mineral resource taxation, mineral policy review, studies and queries under the *Foreign Investment Review Act*, and in the development of portions of the Guidelines for Benefit-Cost Analysis produced in June 1978. The Division was actively involved through representation on the Steering Committee concerning the Guidelines for Coal Development, the Committee on Linear Development, and the Alcan Gas Project.

The ongoing statistical work included the Annual Census of Mining, mail out, compilation, and organization of mineral statistics for the Annual Report, and monthly mineral statistics for intergovernmental use (under review). The section

is currently involved in a number of committees relevant to mineral statistics, including Mines Ministers' Subcommittee on Mineral Statistics, Consultative Council for Mineral Statistics, Coal Statistics, and Statistics Canada, and represents the Government of British Columbia on such committees. The Task Force on Mineral Valuation established at the Mines Ministers' Conference and charged with evaluating and, if necessary, redesigning the statistical forms currently in use throughout Canada, has worked to this end, and significant progress has been made. In 1977, an internal project was initiated which ultimately will computerize all the data received from the Monthly and Annual Survey of Mines.

PETROLEUM RESOURCES BRANCH

ORGANIZATION

The Petroleum Resources Branch, under the general direction of Assistant Deputy Minister J. D. Lineham, Chief of the Branch, administers the *Petroleum and Natural Gas Act*, and the regulations made thereunder, including the Drilling and Production Regulations, the Geophysical Regulations, the Drilling Reservation Regulations, and the Development Road Regulations. It also administers the *Underground Storage Act, 1964*. Therefore, the Branch is responsible for all matters related to the disposition of Crown-owned petroleum and natural gas rights as well as the regulation of the exploration, development, and production phases of the oil and gas industry.

The Branch is divided into three Divisions, namely, the Engineering Division, the Geological Division, and the Titles Division.

Engineering Division

The Engineering Division, under the direction of Chief Engineer A. G. T. Weaver, is responsible for all engineering activities of the Petroleum Resources Branch.

There are three main functions:

- (1) Enforcement of the Drilling and Production Regulations under the *Petroleum and Natural Gas Act*, together with provision of advice to the Minister with respect to applications made by industry under the Act.
- (2) Collection, filing for Branch and public use, and publication of drilling and production statistics, production and disposition data, reservoir and pool performance data.
- (3) Reservoir analysis of all oil and gas pools in the Province, including maintenance of current production rate forecasts together with data concerning reserves discovered to date and estimates of potential reserves growth.

The Development Engineering Section, under the supervision of Senior Development Engineer W. L. Ingram, licenses drilling and service rigs, issues well authorizations, and maintains detailed records pertaining to all drilling and production operations.

The Reservoir Engineering Section, under the Senior Reservoir Engineer B. T. Barber, is concerned with all reservoir engineering aspects of the Division's activities. The Section is responsible for determination of reservoir and production characteristics of oil and gas pools in the Province. This involves interpretation of reservoir pressure, rock and fluid properties, and production data. These para-



meters are used to forecast ultimate recoveries obtainable from oil and gas accumulations in the Province, and the rates at which these volumes will be produced. Oil and gas allowable rates are set by the Section, and recommendations concerning proposed improved recovery and produced fluid disposition schemes are made.

The Drilling and Production Engineering Section, under the supervision of District Engineer D. L. Johnson, is located at the field office at Charlie Lake and is primarily responsible for enforcement of the Drilling and Production Regulations in the field. It also collects reservoir and other data as required, acts in a liaison capacity with industry at the field level, and maintains core and drill sample storage and examination facilities.

Geological Division

The Geological Division, under the direction of Chief Geologist W. M. Young, consists of three Sections and is responsible for all geological and geophysical activities of the Petroleum Resources Branch.

Data resulting from the drilling of wells, geophysical surveys, and other related sources in the Province in the search for and development of accumulations of oil and gas are supplied to the Branch. These data are used by staff geologists and geophysicists as a basis for reports on, and maps and cross-sections of, the economically important sedimentary rocks of the Province. The Division is responsible for providing data and opinions to attract, assist, and encourage the exploration and development of the petroleum resources of the Province. The Division also directs and provides all draughting services required by the Geological and Engineering Divisions.

The Economic Geology Section, under J. A. Hudson, is primarily concerned with those matters related to exploration and economic geology.

The Reservoir Geology Section, under R. Stewart, is primarily concerned with the detailed knowledge of the geology of oil and gas wells and reservoirs. This is required to assist in reserve estimations and in the framing of procedures that ensures the best returns from the reservoirs.

Titles Division

The Titles Division consists of two Sections, under the direction of Commissioner R. E. Moss, and is responsible for administering those parts of the *Petroleum and Natural Gas Act*, relating to and affecting title to Crown petroleum and natural gas rights.

The Division administers the disposition of Crown petroleum and natural gas rights and, in consultation with the Engineering and Geological Divisions, approves and selects parcels for posting, and accepts or rejects the tenders received.

The Titles Section is responsible for all transactions involving petroleum and natural gas permits, all leases, natural gas licences, drilling reservations, geophysical licences, notices of commencement of exploratory work, affidavits of work, unit agreements, and miscellaneous recordings.

The Revenue Section, under W. J. Quinn, is responsible for the collection of all petroleum and natural gas revenue, except royalty, payable to the Crown under the provisions of the Act.

Staff

On December 31, 1977, the professional and senior staff included the following:

Assistant Deputy Minister, J. D. Lincham, P.Eng. -----Chief of Branch

Engineering Division

A. G. T. Weaver, P.Eng.	Chief Engineer
W. L. Ingram, P.Eng.	Senior Development Engineer
M. B. Hamersley, C.E.T.	Development Technician
B. T. Barber, P.Eng.	Senior Reservoir Engineer
P. S. Attariwala, P.Eng.	Reservoir Engineer
L. Pepperdine, P.Eng.	Reservoir Engineer
P. K. Huus	Reservoir Technician
J. H. Burt	Reservoir Technician
D. L. Johnson, P.Eng.	District Engineer
D. A. Selby	Field Technician
G. T. Mohler	Field Technician
J. L. Withers	Field Technician
B. Baraniski	Field Technician
G. L. Holland	Field Technician
G. German	Geophysical Technician

Geological Division

W. M. Young, P.Eng.	Chief Geologist
R. Stewart, P.Eng.	Senior Reservoir Geologist
T. B. Ramsay, P.Eng.	Reservoir Geologist
K. A. McAdam	Reservoir Geologist
J. A. Hudson, P.Eng.	Senior Economic Geologist
D. W. Dewar	Economic Geologist

Titles Division

R. E. Moss	Commissioner
W. J. Quinn	Assistant Commissioner

HIGHLIGHTS OF PETROLEUM RESOURCES BRANCH ACTIVITIES

This section describes both the technical and administrative work carried out by the various parts of the Branch during 1977.

Legislation

No amendment was made to either the *Petroleum and Natural Gas Act*, or the *Underground Storage Act, 1964* during 1977. However, proposals for updating both of these Acts were drafted in preparation for the 1978 session of the Legislature.

Amendments of a housekeeping nature to the Drilling and Production Regulations were approved by Order in Council. These included revisions of the definition of an oil well and a gas well and clarification of the regulations pertaining to "good engineering practice" in oil and gas pools and to oil well spacing. In addition, a Procedural Handbook was issued to accompany the regulations. This has proved to be of considerable help to industry in their dealings with the Branch.

An important Order in Council, presented by Mineral Revenue Division, was approved to amend oil and gas royalty schedules. The two main features were

the elimination of the "credit" system as part of the oil royalty schedule and the provision for applying the "new" oil royalty schedule to additional oil produced because of new or upgraded secondary recovery schemes. The latter feature is intended as an economic incentive for industry to improve the recovery efficiency of oil from existing and new oil fields. In addition, gas royalty schedules were modified to bring them into line with the equivalent royalty rates collected by the British Columbia Petroleum Corporation.

Publications

An important new publication was made available to industry during 1977. This is the Geological and Engineering Reference Book, which is a compilation of technical data for all oil and gas pools in the Province as interpreted by this Branch. The book contains reservoir parameters and pool maps used in estimating reserves for publication in the Annual Reserve Report. Updated pages will be issued to all subscribers from time to time.

Mediation and Arbitration Board

CHAIRMAN: Glen B. Pomeroy

VICE-CHAIRMAN: Cecil Ruddell

MEMBER: John Martin

The Mediation and Arbitration Board, established under the authority of the *Petroleum and Natural Gas Act*, grants rights of entry to oil and gas companies over alienated lands, and determines conditions of entry and compensation therefore. The Act now provides for a process of mediation by the Chairman of the Board. Failing satisfactory agreement between the parties upon mediation, the Act provides for final disposition by the Board of entry conditions and compensation. The Board is also charged with the responsibility to review and set compensation on leases and previous Board orders of more than five years' duration, and to terminate rights of entry when an operator has ceased to use occupied lands.

In 1977, 33 field inspections were carried out by the Board. The Board made 28 entry orders, and held four arbitration hearings to set compensation. The Board met 82 times during the year to deal with general Board matters and specific concerns of the public.

Engineering Division

In addition to its more routine functions described under Branch Organization, the Engineering Division also continued to provide an important technical and administrative service for other Crown agencies. This involved numerous meetings and attendance at hearings before the British Columbia Energy Commission, the British Columbia Rail Inquiry, and the National Energy Board.

Important objectives for 1977 achieved by the Division included the encouragement of drilling outside the winter season, a study of water-driven gas field performance, provision of incentives to industry for increasing recovery from oil fields, and the publication of an Engineering and Geological Reference Book. These are described more fully elsewhere in this report.

Highlights of the work carried out by the three sections in the Division are summarized below.

Development Engineering—The Development Engineering Section is responsible for the administration of all matters related to the location, drilling, completion, and abandonment of wells in the Province. This involves the assurance that

operators of all wells located, drilled, and produced conform with the Drilling and Production Regulations and submit the required applications, reports, and information to the Branch.

Approval of well authorizations to drill proposed well locations is granted by the Section after review and reference to the Titles and Geological Divisions. In 1977 there were 376 well authorizations issued, an increase of 93 per cent over 1976. Throughout the life of a well, the status, well name, and classification may be changed as circumstances require. During the year statuses were changed on 137 occasions, well names on 253, and well classifications on 35.

In addition to comprehensive well data records, all geological and geophysical reports submitted for work credits as well as the Branch correspondence files are maintained by the Section. In 1977, all files previously retained by the Titles Division were transferred to this Section so that all Branch files are now located in the Branch File Room. A program was initiated to film all significant full-sized documents for security purposes and to establish a library in microfiche format. This scheme will be employed for records a few years old but the later documents will be retained in the full size as submitted from industry.

Further preparations were made for the conversion of measurement units to the metric system. Legislation has been prepared and all Ministry forms related to the drilling operations are scheduled for metric conversion on July 1, 1978, while production operations and related functions will be converted on January 1, 1979. Arrangements were under study for conversion of the computer applications that are used in compiling production data.

Each drilling and service rig operating in the Province must have a valid Rig Licence. During 1977, 73 licences were renewed while 32 new ones were issued.

Drilling and Production Engineering—During 1977, over 136 000 miles were driven by field staff of this Section in the course of enforcement at the field level of the Drilling and Production Regulations made under the *Petroleum and Natural Gas Act*. This figure is reduced from 1976; however, it is worthy of comment that this reduction was due to the fact that the Section was two men short for eight months of the year and three men below staff for another 1.5 months of the year. At year-end 1977 the field inspectional staff totalled seven men, which includes one auxiliary employee.

During the year oil production facilities were inspected on about 200 occasions, and 18 oil production tests were witnessed. Gas production was monitored throughout the year, with fast meter checks being made on gas installations on 600 different occasions and 495 complete gas meter checks were done. To augment data received by our Victoria Reservoir Engineering Section, 136 static pressure gradients were run, and 29 gas well flow tests were witnessed. To further ensure the reliability of data received, 1 212 pressure bomb elements were calibrated. Some 64 man-days were spent on geophysical inspections ensuring adherence to the Geophysical Regulations.

Drilling activity increased considerably during 1977 over previous years, with a total of 326 wells spudded during the year. This high level of activity may be partially attributed to a series of maps which this section developed, indicating areas of northeastern British Columbia which are accessible for summer drilling operations. In any case, due to the concentrated drilling, inspections were performed at 619 active drilling sites, and on 2 450 different occasions, inspections were made on production and abandoned well sites. Also, inspections of salt-water disposal systems and witnessing of segregation tests were again emphasized during 1977.

During 1977, this Section continued its involvement with the British Columbia Oil Spill Contingency Plan, taking an active role in all its meetings and training exercises.

Reservoir Engineering—Table 4-2 is a summary of the hydrocarbon and by-products reserves in the Province at December 31, 1977, and indicates the following:

Oil, established	166 810 MSTB
Natural gas, established—	
Raw	8 270 BSCF
Residue	7 073 BSCF
Residue (1 000 Btu/SCF)	7 352 BSCF
Natural gas liquids—	
Propane	7 891 MSTB
Butanes	11 956 MSTB
Pentanes plus	23 038 MSTB
Sulphur	7 256 MLT

It may be observed from Table 4-2 that the oil reserves have increased 11.8 MMSTB from last year. Additions due to drilling were 26.1 MMSTB. Revisions and production reduced the reserves by 0.5 and 13.8 MMSTB respectively. Raw gas reserves at the end of 1977 have decreased 0.25 TSCF from last year. Additions due to drilling were 0.65 TSCF. Revisions and production reduced the reserves by 0.5 TSCF and 0.4 TSCF respectively.

The Branch is planning to publish the December 31, 1978, Reserve Report in SI units and has been working with the British Columbia Services Corporation to achieve this objective. It is hoped that in June 1979 the Engineering and Geological Reference Book will also be available in SI units.

A submission which showed the effect on reserves and deliverability of drilling from May 1974 to April 1975, from May 1975 to April 1976, and from May 1976 to April 1977 was prepared and presented to the British Columbia Energy Commission at a hearing in Vancouver commencing on June 20, 1977. An estimate of oil, gas, and by-products reserves and production rates based on known pools and future discoveries was also presented. In summary, based on an annual discovery rate of 340 BSCF of raw gas, the annual production rate was forecast to rise from 370 BSCF in 1977 to about 450 BSCF in 1982; from 1982 to 1995 the annual rate would remain essentially constant in the 430 to 440 BSCF range; and after 1995 the rate would decline rapidly to 370 BSCF in 2001. Oil production was forecast to decline from 34 MSTBD in 1977 to 4 MSTBD in 2001. Also a forecast of sulphur production was included in a Ministry submission to the hearing on the British Columbia Railway in Vancouver on June 27.

During the year a reservoir simulation study was performed on a portion of the Clarke Lake gas reservoir in order to gain insight into the producing mechanism and to investigate the effect, if any, of rate of production on ultimate recovery. The Branch has drawn the following conclusions from its analysis of the results of this study:

- (1) Although water is coned into the wells, the major cause of the water production is the general rise of the water table.
- (2) Recovery of gas from a water-drive reservoir is lower than from a volumetric reservoir due to the residual gas trapped at high pressure in the pore space invaded by water.

- (3) Higher gas recovery is obtained when high gas production rates are in effect because a greater depletion effect is generated. However, this results in a decrease in the volume of the reservoir swept by water and, consequently, less gas production due to water drive. Nevertheless, the overall result is higher recovery.
- (4) The sweep efficiency can be improved by infill drilling and reservoir modelling can be of assistance in locating infill locations if adequate rock property data are available and production history can be properly matched.

It should be emphasized that these conclusions are based on the modelling of a thick (350-foot) porous section and it is possible that results from a thinner porous section would modify the conclusions.

During the review of the simulation study results, the Branch developed a method of estimating ultimate recovery from water-driven gas reservoirs involving only two assumptions, and this will be included in a paper *The Recognition and Evaluation of Water Driven Gas Reservoirs*, to be presented at the Canadian Institute of Mining and Metallurgy meeting, June 13 to 16, 1978, in Calgary.

Geological Division

Economic Geology—A number of regional subsurface mapping projects which had been planned for the year could not be initiated because of the transfer of experienced personnel to the Reservoir Geology Section in order to handle the results of a marked increase in drilling activity.

All of the published subsurface mapping series of the northeastern sedimentary area were updated and revised to include available released information as of April 30, 1977. This subsurface coverage which includes most of the major producing horizons is available on both a 1:100 000 and 1:250 000 mapping scale. The latter scale is a composite of eight map sheets and therefore provides a broad regional perspective of the mapped horizon.

A new 1:100 000 base for the drillstem test and penetration compilation map series was initiated although not completed. These maps, which have been updated as of April 30, 1977, show for all wells outside designated field boundaries the deepest geological formation penetrated, all formation drillstem tests, and the zone(s) in which gas and oil wells are completed. In addition to the latter information and within the designated field limit the penetration map will show drillstem tests in horizons other than that productive in the field as well as the formation at total depth for wells which have penetrated below the lowest productive horizon within the field.

The Section was relatively active in assisting other Divisions and Ministries of the Government and Crown agencies in matters concerning petroleum geology. Frequent meetings were held with various industry representatives to discuss various aspects of geology, geophysics, and the exploration for oil and natural gas.

Geophysical—The procedure of integrating released, usable geophysical data into the regional subsurface mapping series was continued with the year's updating program. The data received by the Ministry in support of applications to record geophysical work are converted to depth and integrated into the appropriate regional subsurface map. This work continues to provide significant control at the Middle Devonian level within the Plains area and at the Mississippian and Triassic levels within the structural Foothills Belt.

Reservoir Geology—Throughout a most active year the reservoir geology group continued with its vigorous program of assessment and mapping in detail all oil and gas accumulations encountered by the drill. Structural, stratigraphic, and reservoir geologic data made available through drilling were used as the basis for new and revision-type map work, reservoir studies, evaluation of reserves, and the control of remedial work, cycling, repressuring, and secondary recovery projects.

Significant map changes resulted from new drilling and studies in the following pools and corresponding hydrocarbon-bearing rock unit(s): Airport—Bluesky, Buick Creek—Doig, Buick Creek North—Bluesky and Dunlevy, Bullmoose—Baldonnel, Cache Creek—Coplin and Halfway, Drake—A Marker and Halfway, Fireweed—Dunlevy, Eagle West—Belloy, Helmet—Slave Point, Inga—Dunlevy, Monias—Halfway, Mica—Charlie Lake, Nettle—Gething, Nig Creek—Baldonnel, North Pine—North Pine, Osprey—Bluesky and Halfway, Tsea—Slave Point, and Two Rivers—Halfway.

In conjunction with the above work the Branch typewritten pool listings were changed to plat form. Appropriate pool plats were initiated and revised as required on a quarterly basis and made available to public and industry subscribers through publications.

The most significant change as a result of development drilling took place in the Eagle West Belloy oil pool. This pool, discovered late in 1976, was primarily extended in two directions to include an approximate areal extent of 6,400 acres. Other significant extensions involved the Bullmoose Baldonnel gas pool and the Monias Halfway gas pool.

A considerable amount of time was expended in assessing the reserve potential of gas wells as a means of determining unadjusted daily gas allowables. This work, in co-ordination with the reservoir engineering group, is a replacement of the previous system used in calculating daily allowables based on a fixed percentage of open flow potential.

The Section initiated and completed special studies concerned with the possible communication of Dunlevy and overlying Gething stratigraphic sand reservoirs within the Rigel field; a concurrent gas and oil production scheme at Nettle; apparent small discrete oil accumulations in the southeast sector of the Nig Creek Baldonnel gas pool; the apparent lateral communication between two Parkland Belloy gas pools across associated normal faulting; and a pronounced change in level of the gas/water interface of the Sierra Pine Point gas pool.

Routine assistance was provided in advising other Branch Divisions with geological evaluations and assessments of Crown lands posted for disposal of petroleum and natural gas rights; the reclassification of wells for the purpose of confidentiality of information and discovery status; maintaining current oil and gas pool boundary designations and related geological appraisals concerning industry production schemes; and the disposal of water production.

Titles Division

There were five dispositions of Crown reserve petroleum and natural gas rights held during 1977. These resulted in tender bonus bids amounting to a record total of \$125 467 725.50, an increase of \$82 241 283.57 from the previous year. The total bonus figure for each sale was higher than any previous comparative sale with the August sale totalling \$54 192 014.47. A total of 786 parcels was offered, an increase of 353 over 1976, with bids acceptable on 607 parcels, an increase of 303 over 1976, covering 2 336 194 acres, a decrease of 89 608 acres.

The average price per acre was \$54.70, which is an increase of \$35.89 per acre over 1976. The average bonus price per acre was respectively: permits, \$38.23, an increase of \$24.42; leases, \$124.25, an increase of \$34.22; and drilling reservations, \$63, an increase of \$44.04. Total revenue collected by the Division in 1977 was \$141 513 501.79.

During the year, 22 geophysical licences were issued or renewed, a decrease of six from 1976. Four unit agreements were approved.

A total of 164 notices of commencement of exploratory work was recorded, an increase of 50 from the previous year. These notices are required prior to the commencement of any geological or geophysical exploration for petroleum and natural gas.

During the year the Mapping Section continued with the ongoing program of updating and converting base maps to 1:50 000 scale. Of particular interest are the seismic road and trail maps which are updated on a daily basis using a base with the topography screened so these maps become very useful in the field when determining the location of lines for new seismic programs.

In addition to its normal activities the Division spent considerable time assisting in special projects with other ministries in matters relating to petroleum tenure rights and lands. Very frequent meetings were held with various industry representatives concerning tenure to petroleum and natural gas rights, Crown sales, and their administration under the terms of the *Petroleum and Natural Gas Act*, and regulations.

As of December 31, 1977, 21 011 134 acres of approximately 32 830 square miles, an increase of 820 170 acres over the 1976 total of Crown petroleum and natural gas rights issued under the *Petroleum and Natural Gas Act*, were held in good standing by operators ranging from small independent companies to major international ones. The form of title held, total number issued, and acreage of each case were as follows:

Form of Title	Number	Acreage
Permits	426	12 929 825
Natural gas licences	1	36 374
Drilling reservations	89	836 870
Leases (all types)	4 155	7 208 065
Total		<u>21 011 134</u>

During 1977 the following transactions were completed:

1. PERMITS—

Issued	63
Renewed	288
Converted to lease	49
Cancelled	55
Transferred (assigned)	92

2. DRILLING RESERVATIONS—

Issued	57
Renewed	17
Converted to lease	18
Cancelled	22
Transferred (assigned)	14

3. LEASES—		
Issued		738
Annual rental paid		3 094
Renewed for 10-year term		37
Extended under penalty		139
Extended NOT under penalty		249
Cancelled		95
Transferred (assigned)		339
4. NATURAL GAS LICENCES—		
Issued		1
Renewed		Nil
Converted to lease		1
Cancelled		1
Transferred (assigned)		Nil
5. CROWN SALES—		
	Number Advertised	Number Sold
Permits	69	62
Drilling reservations	66	57
Leases	651	488
Total	<u>786</u>	<u>607</u>
6. GEOPHYSICAL LICENCES—Issued		
		22
7. NOTICE OF COMMENCEMENT OF EXPLORATORY WORK—		
Approved		164
8. AFFIDAVITS OF WORK—Approved		
Permits		100
Leases		13
9. MISCELLANEOUS RECORDINGS (mergers, grouping notices, etc.)—Approved		
		715
10. UNIT AGREEMENTS—Approved		
		4

MINERAL REVENUE DIVISION

The Mineral Revenue Division, under the direction of W. W. Ross, is responsible for the assessment and collection of mineral and petroleum resource taxes and royalties imposed under the *Coal Act*, *Mineral Land Tax Act*, *Mineral Resource Tax Act*, *Mineral Royalties Act* (which was repealed effective January 1, 1977), *Iron Ore Royalty Agreements*, and the *Petroleum and Natural Gas Act*. To fulfil its responsibilities, the Division has a staff of 21, which is organized into four functional sections. The Mineral and Petroleum Accounting sections which are responsible for the revenue collection and accounting processes are under the direct supervision of B. A. Garrison, the Assistant Director. The Mineral Titles Section, which is responsible for determining the ownership of mineral rights, is under the direct supervision of N. D. Smith, the Chief Titles Officer. The External Audit Section, which is responsible for the auditing of corporate records for purposes of verifying tax and royalty assessments, is under the direct supervision of A. R. Lockwood. Most of the Division's staff is located in the headquarters office in Victoria, but district titles offices are maintained at New Westminster, Nelson, and Kamloops to facilitate searches of land registry records in those districts.

A synopsis of the Division's work during the past year follows by way of statutory and regulatory responsibilities.

COAL ROYALTY REGULATIONS UNDER THE COAL ACT

The *Coal Act* and royalty regulations apply to the production of coal, the rights to which are vested in the Province. Coal is classified as either metallurgical or thermal and is subject to a royalty of \$1.50 per long wet ton of metallurgical coal, or 75 cents per long wet ton of thermal coal shipped from the mine. During 1977, 2 231 697.92 long tons of metallurgical coal were reported as shipped with a royalty value of \$3 347 551.80.

IRON ORE ROYALTY AGREEMENTS UNDER THE MINERAL ACT

Under these agreements, the producers of iron ore are subject to a royalty of \$1 per long dry ton of contained iron in the iron concentrate produced and sold. Iron concentrates are deemed to have a 50-per-cent iron content, and royalty can be reduced by 50 per cent through the application of exploration credits. This results in an effective royalty of 25 cents per long dry ton of iron concentrate shipped and sold. During 1977, two producers reported shipments of 506 613.133 long dry tons of iron concentrate which yielded a royalty payment of \$126 653.28.

MINERAL LAND TAX ACT

Mineral rights held in freehold are subject to taxation under the provisions of the *Mineral Land Tax Act*, which has a three-tier tax structure consisting of a basic acreage tax on undesignated mineral lands, a basic acreage tax on mineral lands designated as production areas, or tracts, and a mill rate assessment on the assessed value of a production tract. The basic acreage tax on undesignated mineral lands ranges from 25 cents per acre to \$1 per acre dependent upon the total acreage held by an owner. The basic acreage tax on any designated production area or tract is \$2 per acre, which is in lieu of the acreage tax on undesignated mineral lands. The assessed values of production tracts are determined annually in accordance with Assessment Regulations, and are basically a function of revenue and production from the preceding year. The mill rate applicable during 1977 was 12½ mills.

Under current policy, production tracts are only established for the designated mineral coal, petroleum, and natural gas. Also, if any mineral land other than a "Crown Granted Mineral Claim" is used solely for agricultural purposes, then such land is exempt from the payment of mineral land tax.

Mineral Land Tax Assessment Notices for 1977 were issued on May 1, covering a total of 1 229 362.83 acres of mineral land under 4 912 tax folios. This represents a net increase of 1 653 folios and 190 259.16 acres over the 1976 mineral land tax assessment roll. A summary of the 1977 mineral land tax assessment roll and the related tax assessments and collections are reflected in the following table:

Table 2-4—Mineral Land Tax Assessment Roll

Classification of Mineral Land	Number of Folios	Acreage	Tax Assessed	Taxes Forgiven on Agricultural Land	Tax Collected
Non-designated.....	4 863	1 188 032.50	\$ 392 972.05	\$ 67 911.78	\$ 433 480.24
Production areas.....	45	33 781.33	67 562.66	-----	70 727.60
Production tracts.....	34	7 549.00	7 805 639.75	-----	7 803 065.03
Interest.....	-----	-----	6 496.90	-----	(1)
Delinquent taxes.....	-----	-----	72 286.22	-----	(1)
Totals.....	4 942	1 229 362.83	8 344 957.58	67 911.78	8 307 272.87

¹ Interest and delinquent tax collections included in tax collected for each classification.

Table 2-5—Mineral Revenue Division—Revenue Collections, 1977

Month	Petroleum and Natural Gas Royalties					Mineral Resource Royalties and Taxes							
	Gas	Oil	Products	Penalties	Total	Iron Ore Royalty Agreements	Coal Act Royalties	Mineral Royalties Act	Total Royalties	Mineral Land Tax Act	Mineral Resource Tax Act	Total Mineral Royalties and Taxes	Total Divisional Revenue
January.....	\$ 19 250.99	\$ 4 374 355.22	\$ 74 860.52		\$ 4 468 466.73	\$ 22 504.51	\$ 371 984.87	\$ 1 373 347.80	\$ 1 767 837.18	\$ 249 575.34		\$ 2 017 412.52	\$ 6 485 879.25
February.....	50 044.77	3 473 805.24	82 499.07	190.00	3 606 539.08	11 959.52	215 842.97	83 741.30	311 543.79	(53 637.37)		257 906.42	3 864 445.50
March.....	33 390.68	3 724 704.42	67 908.83		3 826 003.93	3 996.52	188 884.05	25 198.83	218 079.40	28 006.90		246 086.30	4 072 090.23
April.....	(31 332.98)	3 821 627.02	76 749.82		3 867 043.86	10 643.60	315 039.66	12 000.00	337 683.26	23.00		337 706.26	4 204 750.12
May.....	13 162.43	3 460 745.93	55 500.13		3 529 408.49	13 318.15	247 241.00	12 000.00	272 559.15	24 777.08		297 336.23	3 826 744.72
June.....	11 281.75	3 405 889.92	98 069.80		3 515 241.47	9 605.36	352 372.00	35 631.93	397 609.29	32 077.29	6 498 612.00	6 928 298.58	10 443 540.05
July.....	7 823.65	2 345 070.62	52 948.63	320.00	2 406 162.90	13 234.21	289 477.00	16 043.50	318 754.71	7 512 594.61	663 468.83	8 494 818.15	10 900 981.05
August.....	12 362.90	3 812 794.72	93 794.11		3 918 951.73	7 227.90	230 640.00	398 774.60	636 642.50	571 900.87	504 573.50	1 713 116.87	5 632 068.60
September.....	16 476.68	3 945 200.02	81 623.27	380.00	4 043 679.97	8 872.97	288 470.00	12 684.43	310 027.40	2 258.34	574 599.72	886 885.46	4 930 565.43
October.....	18 588.72	3 350 023.82	95 189.40		3 463 801.94	12 858.64	373 065.00	12 000.00	397 923.64	3 314.14	529 500.00	930 737.78	4 394 539.72
November.....	29 891.78	3 848 559.84	108 764.08		3 987 215.70	409.76	242 207.00	17 272.53	259 889.29	(66 105.30)	560 158.74	753 942.73	4 741 158.43
December.....	10.13	1 452 693.68			1 452 703.81	12 022.14	232 328.25	509 201.98	753 552.37	2 487.97	324 429.50	1 080 469.84	2 533 173.65
1977 totals.....	180 951.50	41 015 470.45	887 907.66	890.00	42 085 219.61	126 653.28	3 347 551.80	2 507 896.90	5 982 101.98	8 307 272.87	9 655 342.29	23 944 717.14	66 029 936.75
1976 totals.....	323 750.43	43 732 456.11	716 447.65	550.00	44 773 204.19	182 314.48	2 502 201.78	11 409 767.74	14 094 284.00	22 428 217.32		36 522 501.32	81 295 705.51
1975 totals.....	2 848 929.60	44 782 489.47	569 521.01	800.00	48 201 740.08	185 283.60	3 644 267.91	5 016 838.24	8 846 389.75	15 416 461.09		24 262 850.84	72 464 590.92
1974 totals.....	3 288 296.85	45 300 184.21	51 181.21	649.20	48 640 311.47	155 925.04	1 361 081.25	12 979 098.52	14 496 104.81	2 640 022.84		17 136 127.65	65 776 439.12
Cumulative totals.....	6 641 928.38	174 830 600.24	2 225 057.53	2 889.20	183 700 475.35	650 176.40	10 855 102.74	31 913 601.40	43 418 880.54	48 791 974.12	9 655 342.29	101 866 196.95	285 566 672.30

Much of the administrative effort under the *Mineral Land Tax Act* involves roll maintenance and embraces the forfeiture and surrender provisions of the Act together with procedures under the *Escheats Act*. During 1977 the Mineral Titles Section carried out 40 843 title searches, which resulted in 1 647 parcels covering 180 546.31 acres being added to the roll, and processed 12 surrenders covering 18 268.857 acres. Also, after considerable delay due to technical reasons, the surrenders covering mineral rights to a substantial portion of the Esquimalt and Nanaimo Railway Belt lands were registered with the Victoria Land Registry Office Under Charge F60387 against Title 7434A. The Division also processed forfeitures on 127 folios covering 341 lots for a total of 19 817.86 acres, and escheatments on 20 folios covering 105 lots for a total of 4 462.45 acres.

The External Audit Section completed five audits of companies subject to the *Mineral Land Tax Act* during the year, which resulted in revised mineral land tax assessments of \$2 157 577.67 compared to the original assessment of \$2 219 302.46 giving rise to a net tax credit of \$61 724.79.

Eight companies filed appeals with the Mineral Land Tax Review Board, but due to the lack of a full board for much of 1977, only one appeal was heard by the Board. Gordon H. McDougall and Norman G. Randall resigned from the Board, and were replaced by Prof. John Bedford Evans, the new Chairman, and William Sek Fong Eng. Because of a consolidated action in the Supreme Court involving points of law with respect to the *Mineral Land Tax Act*, only one appeal has been scheduled for hearing in 1978, with the others being held in abeyance until the results of the court action are known.

MINERAL ROYALTIES ACT

The *Mineral Royalties Act*, which imposed a royalty on minerals produced from Crown lands, was repealed as of January 1, 1977; however, the provisions of the Act were still in effect with respect to liabilities incurred prior to January 1, 1977. Annual returns for 1976, and audit of company records, yielded revenues totalling \$2 507 896.90 during 1977. Fourteen audits were completed in the year, which resulted in revised assessments of \$8 956 230.99 compared to the original returns of \$8 423 997.35 giving rise to an additional charge of \$532 233.64.

MINERAL RESOURCE TAX ACT

Under this Act, the profits of individual mines which produce minerals as defined under the *Mineral Act*, are subject to a 17½-per-cent tax on mining income. The determination of income generally follows the rules applicable for Federal Income Tax purposes, with modification regarding to capital cost allowances, exploration and development expenditures, earned depletion, and processing allowances. As there were no monthly instalments payable for the 1976 fiscal year, the revenues of \$9 655 342.29 collected during 1977 represent the tax payable for the 1976 corporate fiscal year plus instalments for the 1977 fiscal year.

PETROLEUM AND NATURAL GAS ROYALTIES

Production of petroleum and natural gas, together with associated byproducts which are produced from Crown lands held under the terms of the *Petroleum and Natural Gas Act*, is subject to the payment of royalty as provided for under the Petroleum and Natural Gas Royalty Regulations. The regulations specifically exempt any gas sold to the British Columbia Petroleum Corporation from the imposition of royalty. Petroleum is classified as either old oil or new oil, with each class being subject to a different royalty-rate schedule as reflected in the 1976 report. Revenue collections for the year from the source were as follows:

	\$
Natural gas royalties	180 951.50
Crude petroleum royalties	41 015 470.45
Natural gas byproduct royalties	887 907.66
Penalties	890.00
	<hr/>
Total	42 085 219.61
	<hr/> <hr/>

The royalty regulations also provide for the establishment of one oil credit for each barrel of old oil produced as an incentive for increased exploration and development of petroleum and natural gas resources within the Province. Each credit carries a value of 75 cents, and may be redeemed through the performance of \$1's worth of satisfactory work., Oil credit transactions for the year are reflected in the following statements:

	Credit Units	Value \$
Balance brought forward from 1976	12 928 875	9 696 655.98
Credit established during the year	13 087 764	9 815 823.27
Credits redeemed during the year	(16 317 547)	(12 238 160.25)
Credits expired during the year	<hr/>	<hr/>
	<hr/>	<hr/>
Balance remaining as at December 31	9 699 092	7 274 319.00
	<hr/> <hr/>	<hr/> <hr/>

ADMINISTRATIVE SERVICES DIVISION

This Division was not fully implemented during 1977 as a Director was not appointed. The Personnel and Accounts Sections reported directly to the Deputy Minister, or to him through a committee in the case of Publications Section, or through the Assistant Deputy for Mineral Resources in the case of the Library.

PERSONNEL

Neil K. Gillespie became the Ministry Personnel Officer in 1977, taking over from R. E. Moss, who had held the position simultaneously with his responsibilities as Chief Petroleum Commissioner over the past five years. Cathie Green became Personnel Clerk, replacing Pennie Hepworth, who became Executive Secretary to the Assistant Deputy Minister, Mineral Resources.

Ministry personnel statistics for 1977 are as follows:

Permanent employees	255
Appointments	31
Resignations	16
Retirements	6
In-service transfers	6
Promotions and reclassifications	19
Temporary employees	18
Temporary employees under WIG 1977	12
Temporary employees under summer field program	43

The Personnel Office was also involved in commencing a new Management Compensation and Classification Plan (Hay Plan) in the fall of 1977.

ACCOUNTS SECTION

This Section was under the control of Mrs. Sharon Bone until her resignation in September, at which time Mrs. Maureen Lundquist assumed temporary responsibility of the Section. The several functions of this Section are the preparation and control of Ministry estimates, payroll administration, the costing and facilitating of Ministry purchases, and the acquisition and maintenance of motor-vehicles and equipment.

LIBRARY

The Ministry Library, located at Room 430, Douglas Building, Victoria, is administered by the Assistant Deputy Minister for Mineral Resources and is supervised by Sharon Ferris. The Library provides geological and technical information for the staff, other ministries, the mining industry, and the public.

The Library is the depository for all publications of the Ministry. Other holdings include reports of the geological surveys and mines' branches of Canada, the United States, and other foreign nations. There are approximately 15 000 geological and other Governmental reports and maps. Texts and reference books total over 1 700 in number. Special collections consists of proceedings and guide-books from international geological congresses, annual reports of the British Columbia mining and petroleum companies.

It is estimated that the Library dealt with over 2 000 requests for information during 1977. The Library reorganization and cleaning of material was completed during the year and an indexing of Government serial publications was begun.

PUBLICATIONS SECTION

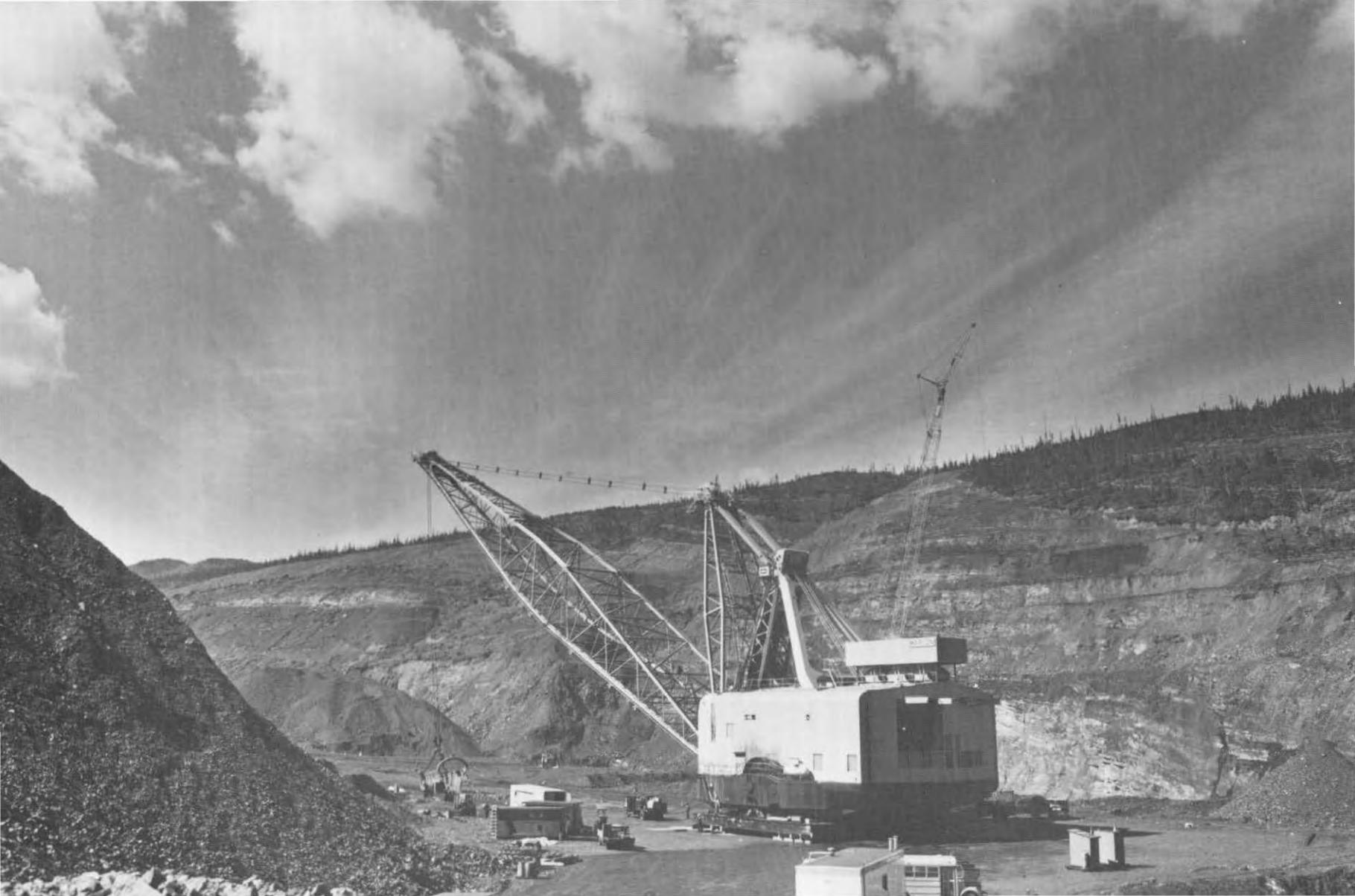
Publications Section includes publication preparation and dispatch and consists of Mrs. Rosalyn J. Moir, Assistant Editor, and three assistants. The Section personnel are technically part of the Geological Division, which originates most of the manuscripts for publication. Chairman of the Publication Committee is Dr. A. Sutherland Brown.

Separate lists of publications for both the Branches of the Ministry are available on request to the Publications Section, Ministry of Mines and Petroleum Resources, Douglas Building, Victoria V8V 1X4.

Publications that are in print may be obtained from the Ministry of Mines and Petroleum Resources in Victoria and from the Geological Survey of Canada, 100 West Pender Street, Vancouver. Current publications may also be obtained from the Gold Commissioner's office, British Columbia Building, 800 Hornby Street, Vancouver V6Z 2C5.

Publications are available for reference use in the Ministry Library, Room 430, Douglas Building, Victoria; in the reading room of the Geological Survey of Canada, 100 West Pender Street, Vancouver; in the offices of the Inspector of Mines in Nelson and Prince Rupert; as well as in some public libraries.

Rock and mineral sets are available for sale in small numbers for schools or prospecting courses. Information regarding these may be obtained from the Publications Section, Ministry of Mines and Petroleum Resources, Douglas Building, Victoria V8V 1X4.



Mineral Resource Statistics

CHAPTER 3

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INTRODUCTION

The statistics of the mineral industry are collected, compiled, and tabulated for this Report by the Economics and Planning Division of the Mineral Resources Branch.

In the interests of uniformity and to avoid duplication of effort, beginning with the statistics for 1925, Statistics Canada and the Provincial ministries have co-operated in collecting and processing mineral statistics.

Producers of metals, industrial minerals, structural materials, coal, and petroleum and natural gas are requested to submit returns in duplicate on forms prepared for use by the Province and by Statistics Canada.

As far as possible, both organizations follow the same practice in processing the data. The final compilation by Statistics Canada is usually published considerably later than the *Annual Report of the Minister of Mines and Petroleum Resources* for British Columbia. Differences between the values of production published by the two organizations arise mainly because Statistics Canada uses average prices considered applicable to the total Canadian production, whereas the British Columbia mining statistician uses prices considered applicable to British Columbia production.

Peat, classified as a fuel by Statistics Canada, is not included in the British Columbia statistics of mineral production, being regarded as neither a fuel nor a mineral.

The statistics of the petroleum industry are collected, compiled, and tabulated for this Report by the Petroleum Resources Branch.

METHODS OF COMPUTING PRODUCTION

The tabulated statistics are arranged so as to facilitate comparison of the production records for the various mining divisions, and from year to year. From time to time, revisions have been made to figures published in earlier reports as additional data became available or errors became known.

Data are obtained from the certified returns made by the producers of metals, industrial minerals and structural materials, and coal, and are augmented by data obtained from custom smelters. For petroleum, natural gas, and liquid by-products, production figures supplied by the Petroleum Resources Branch of the Ministry of Mines and Petroleum Resources are compiled from the monthly disposition reports and the Crown royalty statement filed with the Ministry by the producers.

Values are in Canadian funds. Metric weights are used throughout.

AVERAGE PRICES

METALS

The prices used in the valuation of current and past production of gold, silver, copper, lead, and zinc are shown in the table on page 88.

Prior to 1974 the price of gold used was the average Canadian Mint buying-price for fine gold.

The price used for placer gold originally was established arbitrarily at \$17 per ounce, when the price of fine gold was \$20.67 per ounce. Between 1931 and 1962 the price was proportionately increased with the continuously changing price of fine gold. Since 1962, Canadian Mint reports giving the fine-gold content have been available for all but a very small part of the placer gold produced, and until 1973 the average price listed is derived by dividing ounces of placer gold into total amount received. Starting in 1974 the price used for the valuation of gold, lode and placer, is the amount received by the producer.

Prior to 1949 the prices used for silver, copper, lead, and zinc were the average prices at the markets indicated in the table on page 88, converted into Canadian funds. The abbreviations in the table are Mont.—Montreal; N.Y.—New York; Lon.—London; E. St. L.—East St. Louis; and U.S.—United States.

Starting in 1949 the price of silver, copper, lead, and zinc were average United States prices converted into Canadian funds. Average monthly prices were supplied by Statistics Canada from figures published in the Metal Markets section of *Metals Week*. Specifically, for silver it was the New York price; for lead it was the New York price; for zinc it was the price at East St. Louis of Prime Western; for copper it was the United States export refinery price. Commencing in 1970 the copper price is the average of prices received by the various British Columbia shippers and since 1974 this applies also to gold, silver, lead, zinc, and cadmium.

For antimony and bismuth the average producers' price to consumers is used. For nickel the price used is the Canadian price set by the International Nickel Company of Canada Limited. The value per tonne of the iron ore used in making pig iron at Kimberley was an arbitrary figure, being the average of several ores of comparable grade at their points of export from British Columbia.

GROSS AND NET CONTENT

The gross content of a metal in ore, concentrate, or bullion is the amount of the metal calculated from an assay of the material, and the gross metal contents are the sum of individual metal assay contents. The net contents are the gross contents less smelter and refinery losses.

In past years there have been different methods used in calculating net contents, particularly in the case of one metal contained in the concentrate of another. The method established in 1963 is outlined in the following table. For example, the net content of silver in copper concentrates is 98 per cent of the gross content, of cadmium in zinc concentrates is 70 per cent of the gross content, etc. Commencing in 1974 the quantities represent the actual net quantities or metals paid for.

	Lead Concentrates	Zinc Concentrates	Copper Concentrates	Copper-Nickel Concentrates	Copper Matte
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Silver.....	98	98	98	---	98
Copper.....	Less 26 lb./ton	---	Less 10 lb./ton	85	Less 10 lb./ton
Lead.....	98	50	---	---	50
Zinc.....	50	90	---	---	---
Cadmium.....	---	70	---	---	---
Nickel.....	---	---	---	88	---

VALUE OF PRODUCTION

For indium, iron concentrate, mercury, molybdenum, rhenium, and tin the value of production is the amount received by the shippers.

For gold, silver, copper, lead, zinc, antimony, bismuth, cadmium, some iron concentrate, and nickel the value of production was calculated from the assay content of the ore, concentrate, or bullion less appropriate smelter losses, and an average price per unit of weight. The 1974 values represent the settlement values received by the producers for the respective metals.

Prior to 1925 the value of gold and copper produced was calculated by using their true average prices and, in addition, for copper the smelter loss was taken into account.

The value of other metals was calculated from the gross metal content of ores or concentrates by using a metal price which was an arbitrary percentage of the

average price, as follows: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent.

It is these percentages of the average price that are listed in the table on page 88.

For 1925 to 1973 the values had been calculated by using the true average price (see page 88) and the net metal contents in accordance with the procedures adopted by Statistics Canada and the Ministry of Mines and Petroleum Resources.

Since 1974 the total quantity and value of metal production include the quantities paid for to the mines, and the smelter and refinery production that can be attributed to the mines but is not paid for. The quantity and value paid for to the mines, excluding outward transportation costs, smelting and refining costs, penalties and deductions, are shown separately for comparative purposes.

INDUSTRIAL MINERALS AND STRUCTURAL MATERIALS

The values of production of industrial minerals and structural materials are approximately the amounts received at the point of origin.

COAL

The value of production of coal is calculated using a price per tonne which is the weighted average of the f.o.b. prices at the mine for the coal sold.

PETROLEUM AND NATURAL GAS

The values of production of natural gas, natural gas liquid by-products, and petroleum including condensate/pentanes plus are the amounts received for the products at the well-head.

NOTES OF PRODUCTS LISTED IN THE TABLES

Antimony—Antimony metal was produced at the Trail smelter from 1939 to 1944; since 1944 it has been marketed alloyed with lead. The antimony is a by-product of silver-lead ores. In 1907 the first recorded antimonial ore mined in British Columbia was shipped from the Slocan area to England. Since then other out-of-Province shipments have originated in the Bridge River, North Lardeau, Slocan, Spillimacheen, and Stuart Lake areas. In Table 3-7C the antimony assigned to individual mining divisions is the reported content of ore exported to foreign smelters; the antimony "not assigned" is that recovered at the Trail smelter from various ores received there. See Tables 3-1, 3-3, and 3-7C.

Arsenious oxide—Arsenious oxide was recovered at foreign smelters from arsenical gold ores from Hedley between 1917 and 1931, and in 1942, and from the Victoria property on Rocher Déboulé Mountain in 1928. No production has been recorded since 1942. See Tables 3-1 and 3-7D.

Asbestos—British Columbia has produced asbestos since 1952 when the Cassiar mine was opened. All British Columbia production consists of chrysotile from the Cassiar mine near the Yukon boundary. This deposit is noted for its high percentage of valuable long fibre and for the low iron content of the fibre. The original claims were located at Cassiar in 1950, and the first fibre was shipped two years later. The fibre is milled from the ore at Cassiar and now most is shipped by truck to Stewart. From 1953 to 1961 the fibre was valued at the shipping point in North Vancouver, but beginning in 1962 it has been valued at the mine, and values for the preceding years have been recalculated on that basis. See Tables 3-1, 3-3, and 3-7D.

Barite—Barite production began in 1940 and has been continuous since then, coming from several operations in the upper Columbia River valley. Some barite has been mined from lode deposits and the rest recovered from the mill-tailings ponds of the former Silver Giant and Mineral King silver-lead-zinc mines. See Table 3-7D.

Bentonite—Small amounts of bentonite were produced between 1926 and 1944 from deposits in the coal measures near Princeton. There has been no production since 1944. See Tables 3-1 and 3-7D.

Bismuth—Since 1929 the Trail smelter has produced bismuth. It is a by-product of lead refining and thus the production cannot be assigned to specific properties or mining divisions. See Tables 3-1, 3-3, and 3-7C.

Brick—See Clay and shale products.

Building-stone—Dimensional stone for building purposes is quarried when required from a granite deposit on Nelson Island and an andesite deposit on Haddington Island. Other stone close to local markets is quarried periodically or as needed for special building projects. See Tables 3-1, 3-3, and 3-7E.

Butane—Butane is recovered as a by-product at the gas-processing plant at Taylor and at oil refineries. See Tables 3-1, 3-3, 3-7A, and 4-16.

Cadmium—Cadmium has been recovered as a by-product at the Trail zinc refinery since 1928. It occurs in variable amounts in the sphalerite of most British Columbia silver-lead-zinc ores. In Table 3-7C the cadmium assigned to individual mining divisions is the reported content of custom shipments to the Trail and foreign smelters; that "not assigned" is the remainder of the reported estimated recovery at the Trail smelter from British Columbia concentrates. See Tables 3-1, 3-3, and 3-7C.

Cement—Cement is manufactured from carefully proportioned mixtures of limestone, gypsum, and other mineral materials. It has been produced in British Columbia since 1905. Present producers are British Columbia Cement Company Limited, with a 490 000 tonnes-per-year plant at Bamberton, and Canada Cement Lafarge Ltd., with a 476 000 tonnes-per-year plant on Lulu Island and a 191 000 tonnes-per-year plant at Kamloops. See Tables 3-1, 3-3, and 3-7E.

Chromite—Two shipments of chromite are on record, 608 tonnes from Cascade in 1918 and 114 tonnes from Scottie Creek in 1929. See Tables 3-1 and 3-7C.

Clay and shale products—These include brick, blocks, tile, pipe, pottery, lightweight aggregate, and pozzolan manufactured from British Columbia clays and shales. Common red-burning clays and shales are widespread in the Province, but better grade clays are rare. The first recorded production was of bricks at Craighflower in 1853 and since then plants have operated in most towns and cities for short periods. Local surface clay is used at Haney to make common red brick, tile, and flower pots. Shale and fireclay from Abbotsford Mountain are used to make firebrick, facebrick, sewer pipe, flue lining, and special fireclay shapes in plants at Kilgard, Abbotsford, and South Vancouver. A plant at Quesnel makes pozzolan from burnt shale quarried south of Quesnel. Several hobby and art potteries and a sanitary-ware plant are in operation, but these use mainly imported raw materials and their production is not included in the tables. See Tables 3-1, 3-3, and 3-7E.

Coal—Coal is almost as closely associated with British Columbia's earliest history as is placer gold. Coal was discovered at Suquash on Vancouver Island in 1835 and at Nanaimo in 1850. The yearly value of coal production passed that of placer gold in 1883 and contributed a major part of the total mineral wealth for the next 30 years.

First production, by mining divisions: Cariboo, 1942; Fort Steele, 1898; Kamloops, 1893; Liard, 1923; Nanaimo, 1836; Nicole, 1907; Omineca, 1918; Osoyoos, 1926; Similkameen, 1909; and Skeena, 1912.

The Nanaimo and Comox fields produced virtually all of the coal until production started from the Crowsnest field in 1898. The Crowsnest field contains coking-coal and prospered in the early years of smelting and railroad-building. Mining started in the Nicola-Princeton coalfield in 1907, at Telkwa in 1918, and on the Peace River in 1923. The Nanaimo field was exhausted in 1953 when the last large mines closed, and only small operations on remnants were left. The colliery at Merritt closed in 1945 and at Coalmont in 1940. The closing of the large mine at Tsable River in 1966, and the last small one, near Wellington in 1968, marked the end of continuous production from the important Vancouver Island deposits. Recent exploration indicates the possibility of renewed coal mining on the island.

Undeveloped fields include basins in the foothills of the Rocky Mountains south of the Peace River, the Groundhog basin in north central British Columbia, the Hat Creek basin west of Ashcroft, and Sage Creek basin southeast of Fernie.

The enormous requirements for coking-coal in Japan created intense exploration in various areas of British Columbia since 1968. The signing of large contracts with the Japanese resulted in preparations for production at several deposits in the East Kootenays. First shipments to Japan via special port facilities at North Vancouver and Roberts Bank began in 1970.

All the coal produced, including that used in making coke, is shown as primary mine production. Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. From 1910 the quantity is the amount sold and used, which includes sales to retail and wholesale dealers, industrial users, and company employees; coal used under company boilers, including steam locomotives; and coal used in making coke. See Tables 3-1, 3-3, 3-7A, 3-8A, and 3-8B.

Cobalt—In 1928 a recovery of 1,730 pounds of cobalt was made from a shipment of arsenical gold ore from the Victoria mine on Rocher Déboulé Mountain. From 1971 to 1973, cobalt was shipped from the Pride of Emory mine at Hope. See Tables 3-1 and 3-7C.

Coke—Coke is made from special types of coal. It has been produced in British Columbia since 1895. Being a manufactured product, its value does not contribute to the total mineral production as shown in Table 3-1. Up to 1966, coke statistics had been included in the Annual Report as Table 3-9, but this table has been discontinued. The coal used in making coke is still recorded in Table 3-8B.

Condensate—(a) *Field*—Field condensate is the liquid hydrocarbons separated and recovered from natural gas in the field before gas processing. (b) *Plant*—Plant condensate is the hydrocarbon liquid extracted from natural gas at gas-processing plants. See Tables 3-1, 3-3, 3-7A, and 4-16.

Copper—Most of the copper concentrates are shipped to Japanese, Eastern Canadian, and American smelters because no copper smelter has operated in British Columbia since 1935. Small amounts of gold and silver are commonly present and add value to the ore. Most of the smelting in British Columbia in early years was done on ore shipped directly from the mines without concentration, but modern practice is to concentrate the ore first.

Ore was smelted in British Columbia first in 1896 at Nelson (from Silver King mine) and at Trail (from Rossland mines), and four and five years later at Grand Forks (from Phoenix mine) and Greenwood (from Mother Lode mine). Later,

small smelters were built in the Boundary district and on Vancouver and Texada Islands, and in 1914 the Anyox smelter was blown in. Copper-smelting ceased in the Boundary district in 1919, at Trail in 1929, and at Anyox in 1935. British Columbia copper concentrates were then smelted mainly at Tacoma, and since 1961 have gone chiefly to Japan.

Most of the production has come from southern British Columbia—from Britannia, Copper Mountain, Greenwood, Highland Valley, Merritt, Nelson, Rossland, Texada Island, and Vancouver Island, although a sizeable amount came from Anyox and some from Tulsequah. During the 1960's, exploration for copper became intense, interest being especially directed toward finding very large, low-grade deposits suitable for open-pit mining. This activity has resulted in the establishment of operating mines at Merritt (Craigmont) in 1961, in Highland Valley (Bethlehem) in 1962, on Babine Lake (Granisle) in 1966, near Peachland (Brenda) in 1970, Stewart (Granduc) and near Port Hardy (Island Copper) in 1971, near Babine Lake (Bell), McLeese Lake (Gibraltar), Highland Valley (Lornex), Princeton (Ingerbelle) in 1972, and near Kamloops (Afton) in 1977. See Table 3-12 for a complete list of copper producers.

Some of these mines produce molybdenum as a by-product, for example, Brenda, Lornex, Gibraltar, and Island Copper. Copper is also produced as a by-product of iron mining at Tasu Sound, Queen Charlotte Islands (Wesfrob), and with ores containing zinc, gold, silver, and lead at Buttle Lake (Lynx and Myra, Western Mines).

Copper has been the most valuable single commodity of the industry since 1966 until 1977 when it was surpassed marginally by natural gas. See Tables 3-1, 3-3, 3-6, and 3-7B.

Crude oil—Production of crude oil in British Columbia began in 1955 from the Fort St. John field, but was not significant until late in 1961, when the oil pipeline was built to connect the oil-gathering terminal at Taylor to the Trans Mountain Oil Pipe Line Company pipeline near Kamloops. In 1977, oil was produced from 35 separate fields, of which the Boundary Lake, Peejay, Milligan Creek, Inga, and Weasel fields were the most productive.

In Tables 3-1, 3-3, and 3-7A, quantities given prior to 1962 under "petroleum, crude" are total sales, but since 1962 the field and plant condensates are listed separately. Table 4-16 incorporates all revisions since the commencement of production.

Diatomite—Relatively large deposits of diatomite are found near the Fraser River in the Quesnel area, and small deposits are widespread throughout the Province. Small amounts of diatomite have been shipped from Quesnel periodically since 1928. A plant to process the material is located in Quesnel. See Table 3-7D.

Fluorite (fluorspar)—Between 1918 and 1929, fluorite was mined at the Rock Candy mine north of Grand Forks for use in the Trail lead refinery. From 1958 to 1968, small quantities were produced as a by-product at the Oliver silica quarry. See Table 3-7D.

Flux—Silica and limestone are added to smelter furnaces as flux to combine with impurities in the ore and from a slag which separates from the valuable metal. In the past, silica was shipped from Grand Forks, Oliver, and the Sheep Creek area. Today, silica from near Kamloops and limestone, chiefly from Texada Island, are produced for flux. Quantities have been recorded since 1911. See Tables 3-1, 3-3, and 3-7D.

Gold, lode—Gold has played an important part in mining in the Province. The first discovery of lode gold was on Morseby Island in 1852, when some gold

was recovered from a small quartz vein. The first stamp mill was built in the Cariboo in 1876, and it seems certain that some arrastras (primitive grinding-mills) were built even earlier. These and other early attempts were short-lived, and the successful milling of gold ores began about 1890 in the southern part of the Province. By 1900 the value of gold production was second only to that of coal. At the start of World War II, gold-mining attained a peak yearly value of more than \$22 million, but since the war it has dwindled until developments in the 1970's.

In the early years, lode gold came mostly from the camps of Rossland, Nelson, McKinney, Fairview, Hedley, and also from the copper and other ores of the Boundary district. A somewhat later major producer was the Premier mine at Stewart. In the 1930's the price of gold increased and the value of production soared, new discoveries were made and old mines were revived. The principal gold camps, in order of output of gold, have been Bridge River, Rossland, Portland Canal, Hedley, Wells, and Sheep Creek. In 1971 the Bralorne mine in Bridge River closed.

With the closing of the Bralorne mine, most of the lode gold is produced as a by-product of copper, copper-zinc-silver, and other base metal mining. Because of the volume of this production the amount of gold produced is still at a fairly high level, and with the significant rise in the price of gold in the 1970's the value of production has exceeded the peaks reached during the era of gold mines in the 1930's. See Table 3-1, 3-3, 3-6, and 3-7B. See Table 3-12 for a complete list of current producers.

Gold, placer—The early explorations and settlement of the Province followed rapidly on the discovery of gold-bearing placer creeks throughout the country. The first placer-miners came in 1858 to mine the lower Fraser River bars upstream from Yale.

The year of greatest placer-gold production was 1863, shortly after the discovery of the placer in the Cariboo. Another peak year in 1875 marked the discovery of placer on creeks in the Cassiar. A minor peak year was occasioned by the discovery of placer gold in the Granite Creek in the Tulameen in 1885. A high level of production ensued after 1899, when the Atlin placers reached their peak output. Other important placer-gold camps were established at Goldstream, Fort Steele, Rock Creek, Omineca River, and Quesnel River. The last important strike was made on Cedar Creek in 1921, and coarse gold was found on Squaw Creek in 1927 and on Wheaton Creek in 1932.

Mining in the old placer camps revived during the 1930's under the stimulus of an increase in the price of fine gold from \$20.67 per ounce to \$35 per ounce in United States funds. Since World War II, placer-mining declined under conditions of steadily rising costs and a fixed price for gold but is showing signs of revival in response to a freely floating gold price since 1972. Since 1858, more than 163 114-000 grams valued at \$98.1 million has been recovered.

A substantial part of the production, including much of the gold recovered from the Fraser River upstream from Yale (in the present New Westminster, Kamloops, and Lillooet Mining Divisions) and much of the early Cariboo production, was mined before the original organization of the Department of Mines in 1874. Consequently, the amounts recorded are based on early estimates and cannot be accurately assigned to individual mining divisions.

The first year of production for major placer-producing mining divisions was Atlin, 1898; Cariboo, 1859; Liard, 1873; Lillooet, 1858; Omineca, 1869.

In 1965, changes were made in the allocation of placer gold in the New Westminster and Similkameen Mining Divisions and "not assigned," to reconcile those

figures with data incorporated in Bulletin 28, *Placer Gold Production of British Columbia*. See Tables 3-1, 3-3, 3-6, and 3-7A.

Granules—Rock chips used for bird grits, exposed aggregate, roofing, stucco, dash, terrazzo, etc., have been produced in constantly increasing quantities since 1930. Plants operate in Burnaby and near Grand Forks, Sirdar, Vananda, and Armstrong. See Tables 3-1, 3-3, and 3-7D.

Gypsum and gypsite—Production of gypsum and gypsite has been recorded since 1911. Between 1925 and 1956, more than 907 000 tonnes were shipped from Falkland and some was quarried near Cranbrook and Windermere. Since 1956, nearly all production has come from Windermere. See Tables 3-1, 3-3, and 3-7D.

Hydromagnesite—Small shipments of hydromagnesite were made from Atlin between 1904 and 1916 and from Clinton in 1921. See Tables 3-1 and 3-7D.

Indium—Production of indium as a by-product of zinc-refining at the Trail smelter began in 1942. Production figures have not been disclosed since 1958.

Iron—Iron ore was produced in small quantities as early as 1885, commonly under special circumstances or as test shipment. Steady production started in 1951 with shipments of magnetite concentrates to Japan from Vancouver and Texada Islands.

Most of the known iron-ore deposits are magnetite, and occur in the coastal area. On the average they are low in grade and need to be concentrated. Producing mines have operated on Texada Island, at Benson Lake and Zeballos on Vancouver Island, and at Tasu and Jedway on Morseby Island. At Texada Island copper was a by-product of iron-mining, and in the Coast Copper mine at Benson Lake iron was a by-product of copper-mining. The latest operation, and to date the largest, is that of Wesfrob Mines Limited at Tasu, begun at the end of 1967; copper is produced as a by-product.

From January 1961 to August 1972, calcined iron sulphide from the tailings of the Sullivan mine was used for making pig iron at Kimberley. This was the first manufacture of pig iron in British Columbia. The iron occurs as pyrrhotite and pyrite in the lead-zinc ore of the Sullivan mine. In the process of milling, the lead and zinc minerals are separated for shipment to the Trail smelter, and the iron sulphides are separated from the waste rock. Over the years a stockpile has been built containing a reserve of about 18 million tonnes of iron ore.

The sulphur was removed in making pig iron and was converted to sulphuric acid, which was used in making fertilizer. A plant built at Kimberley converted the pig iron to steel, and a fabricating plant was acquired in Vancouver. The iron smelter at Kimberley closed in August 1972. The entire production, credited to the Fort Steele Mining Division in Table 3-7C, is of calcine. See Tables 3-1, 3-3, 3-6, and 3-7C.

Iron oxide—Iron oxide, ochre, and bog iron were mined as early as 1918 from several occurrences, but mainly from limonite deposits north of Squamish. None has been produced since 1950. See Tables 3-1 and 3-7D.

Jade (nephrite)—Production of jade (nephrite) has been recorded only since 1959 despite there being several years of significant production prior to that date. The jade is recovered from bedrock occurrences on Mount Ogden and near Dease Lake and as alluvial boulders from the Fraser River; the Bridge River and its tributaries, Marshall, Hell, and Cadwallader Creeks; O'Ne-ell, Ogden, Kwanika, and Wheaton Creeks. See Tables 3-1, 3-3, and 3-7D.

Lead—Lead was the most valuable single commodity for many years, but it was surpassed in value of annual production by zinc in 1950, by copper in 1966, by molybdenum in 1969, and in total production by zinc in 1966. Lead and zinc

usually occur together in nature although not necessarily in equal amounts in a single deposit. Zinc is the more abundant metal, but lead ore usually is more valuable than zinc ore because it contains more silver as a by-product. For a long time British Columbia produced almost all of Canada's lead, but now produces about 28 per cent of the total. Most of the concentrated ore is smelted and the metal refined at Trail, but some concentrate is shipped to American smelters.

Almost all of British Columbia's lead comes from the southeastern part of the Province. The Sullivan mine at Kimberley is now producing about 87 per cent of the Province's lead and has produced about 86 per cent of the grand total. This is one of the largest mines in the world and supports the great metallurgical works at Trail. Other mines are at Pend-d'Oreille River, North Kootenay Lake, Slokan, southwestern British Columbia, and Vancouver Island. In northwestern British Columbia less important parts of the total output have come from Tulsequah, the Premier mine, and several small mines in the general region of Hazelton. See Table 3-12 for the current lead producers.

A small amount of high-grade lead ore is shipped directly to the smelter, but most of the ore is concentrated by flotation and the zinc content is separated from the lead. All output from the Sullivan and other mines in British Columbia owned by Cominco Ltd. goes to the Trail smelter, but part of the output of other mines goes to American smelters. Lead was first produced in 1887, and the total production amounts to approximately 7.8 million tonnes.

In 1958, revisions were made in some yearly totals for lead to adjust them for recovery of lead from slag treated at the Trail smelter. See Tables 3-1, 3-3, 3-6, and 3-7B.

Limestone—Besides being used for flux and granules (where it is recorded separately), limestone is used in agriculture, cement manufacture, the pulp and paper industry, and for making lime. It has been produced since 1886. Quarries now operate at Cobble Hill, near Prince George, at Kamloops, and on the north end of Texada Island. See Tables 3-1, 3-3, and 3-7E.

Magnesium—In 1941 and 1942, Cominco Ltd. produced magnesium from magnesite mined from a large deposit at Marysville. See Tables 3-1 and 3-7C.

Magnesium sulphate—Magnesium sulphate was recovered in minor amounts at various times between 1915 and 1942 from small alkali lakes near Basque, Clinton, and Osoyoos. See Tables 3-1 and 3-7D.

Manganese—From 1918 to 1920, manganese ore was shipped from a bog deposit near Kaslo and from Hill 60 near Cowichan Lake, and in 1956 a test shipment was made from Olalla. See Tables 3-1 and 3-7C.

Mercury—Mercury was first produced near Savona in 1895. Since then small amounts have been recovered from the same area and from the Bridge River district. The main production to date was between 1940 and 1944 from the Pinchi Lake and Takla mines near Fort St. James. In 1968 the Pinchi Lake mine reopened and continued in operation until 1975 when it closed because of market situations. See Tables 3-1 and 3-7C.

Mica—No sheet mica has been produced commercially in British Columbia. Between 1932 and 1961, small amounts of mica schist for grinding were mined near Albreda, Armstrong, Oliver, Prince Rupert, and Sicamous. See Tables 3-1 and 3-7D.

Molybdenum—Molybdenum ore in small amounts was produced from high-grade deposits between 1914 and 1918. Recently, mining of large low-grade molybdenum and copper-molybdenum deposits has increased production to the

point that molybdenum now ranks second in importance in annual value of metals produced in British Columbia. The upswing began when the Bethlehem mine recovered by-product molybdenum from 1964 and 1966. In 1965 the Endako and Boss Mountain mines, followed by the Coxey in 1966, and British Columbia Molybdenum mine in 1967, all began operations as straight molybdenum producers. The Boss Mountain mine closed in 1971 and reopened late in 1973. The Coxey and British Columbia Molybdenum mines closed in 1971 and 1972 respectively. In 1970 the Brenda Mine, a combined copper-molybdenum producer, started operating, and Island Copper in 1971, and Lornex in 1972, while Gibraltar ceased molybdenum production in 1975 but re-commenced in 1977. See Tables 3-1, 3-3, 3-6, and 3-7C.

Natro-alunite—In 1912 and 1913, 363 tonnes of natro-alunite were mined from a small low-grade deposit at Kyuquot Sound. There has been no subsequent production. See Tables 3-1 and 3-7D.

Natural gas—Commercial production of natural gas began in 1954 to supply the community of Fort St. John. In 1957 the gas plant at Taylor and the pipeline to serve British Columbia and the northwestern United States was completed. The daily average volume of production in 1975 was 1.14 billion cubic feet. In 1976 there were 73 gas-fields producing both associated and non-associated gas, of which the Yoyo, Clarke Lake, and Sierra were the most productive.

The production shown in Tables 3-1, 3-3, 3-7A, and 4-16, is the total amount sold of residential gas from processing plants plus dry and associated gas from the gas-gathering system; that is, the quantity delivered to the main transmission-line. The quantity is net after deducting gas used on leases, metering difference, and gas used or lost in the cleaning plant. The quantity is reported as millions of cubic metres at standard conditions (99.2 kPa, (kilopascals) pressure, 15°C temperature, up to and including the year 1960, and thereafter 101.3 kPa pressure, 15°C temperature).

Full details of gross well output, other production, delivery, and sales are given in the tables in chapter 4.

Nickel—One mine, the Pride of Emory near Hope, shipped nickel ore in 1936 and 1937 and began continuous production in 1958. From 1960 to 1974, bulk copper and nickel concentrates have been shipped to Japan and Alberta respectively for smelting. The mine closed in August 1974. See Tables 3-1, 3-3, and 3-7C.

Palladium—Palladium was recovered in 1928, 1929, and 1930 as a by-product of the Trail refinery and is presumed to have originated in copper concentrates shipped to the smelter from the Copper Mountain mine. See Tables 3-1 and 3-7C.

Perlite—In 1953 a test shipment of 1 009 tonnes was made from a quarry on François Lake. There has been no further production. See Tables 3-1 and 3-7D.

Petroleum, crude—See Crude oil.

Phosphate rock—Between 1927 and 1933, Cominco Ltd. produced 3 485 tonnes of phosphate rock for test purposes, but the grade proved to be too low for commercial use. More test shipments were made in 1964, but there has been no commercial production. See Tables 3-1 and 3-7D.

Platinum—Platinum has been produced intermittently from placer streams in small amounts since 1887, mostly from the Tulameen and Similkameen Rivers. Placer platinum also has been recovered from Pine, Thibert, McConnell, Rainbow, Tranquille, Rock, and Government Creeks; from Quesnel, Fraser, Cottonwood,

Peace, and Coquihalla Rivers; and from beach placers on Graham Island. Some platinum recovered between 1928 and 1930 as a by-product at the Trail refinery is presumed to have originated in copper concentrates shipped to the smelter from the Copper Mountain mine. See Tables 3-1, 3-3, and 3-7C.

Propane—Propane is recovered from gas-processing plants at Taylor and Boundary Lake, and at oil refineries. See Tables 3-1, 3-3, 3-7A, and 4-16.

Rhenium—Rhenium occurs in significant quantities only with molybdenite associated with porphyry copper deposits. It was first produced in 1972 by the Island Copper Mine and is extracted as rhenium oxide from fumes produced during roasting of the molybdenite concentrate.

Rock—Production of rubble, riprap, and crushed rock has been recorded since 1909. See Tables 3-1, 3-3, and 3-7E.

Sand and gravel—Sand and gravel are used as aggregate in concrete work. The output varies from year to year according to the level of activity in the construction industry. See Tables 3-1, 3-3, and 3-7E.

Selenium—The only recorded production of selenium, 332 kilograms, was in 1931 from the refining of blister copper from the Anyox smelter. See Tables 3-1 and 3-7C.

Silver—Silver is recovered from silver ores or as a by-product of other ores. Most of it is refined in Trail, and some is exported in concentrated ores of copper, lead, and zinc to American and Japanese smelters. Silver bullion was produced by the Torbrit mine from 1949 to 1959.

Invariably some silver is associated with galena, so that even low-grade lead ores, if mined in quantity, produce a significant amount of silver. Some silver is recovered from gold-ores and some from copper ores, and although the silver in such ores is usually no more than a fraction of an ounce per ton, even that amount is important in a large-tonnage operation.

Production of silver began in 1887 from silver-copper and silver-lead ores in the Kootenays and has continued in this area to the present. Now, most of the silver is a by-product of lead-zinc ores and nearly all is refined at Trail, although some is exported with concentrates to American and Japanese smelters. Today the greatest single source of silver is the Sullivan mine, which has been in production since 1900. By 1974 the Sullivan mine has accounted for 47 per cent of the total silver production of the Province. A significant total amount is contributed by the Lynx, Lornex, Warman, Island Copper, Horn Silver, Silmonac and Granduc mines. Table 3-12 details the current silver production. The only steady producer that is strictly a silver mine is the Highland Bell mine at Beaverdell, in operation since 1922. A former important mine, the Premier near Stewart, produced more than 1.3 million kilograms of silver between 1918 and 1968. See Tables 3-1, 3-3, 3-6, and 3-7B.

Sodium carbonate—Sodium carbonate was recovered between 1921 and 1949 from alkali lakes in the Clinton area and around Kamloops. There has been no further production. See Tables 3-1 and 3-7D.

Stone (see Building-stone)—Cut stone for building purposes is prepared from rock produced at quarries in various parts of the Province when required. Two of the most productive quarries have operated on Haddington and Nelson Islands. See Tables 3-1, 3-3, and 3-7E.

Structural materials—In Table 3-7E the value of \$5,972,171 for unclassified materials is the total for structural materials in the period 1886–1919 that cannot be allotted to particular classes of structural materials or assigned to mining divisions, and includes \$726,323 shown against 1896 in Table 3-2 that includes unclas-

sified structural materials in that and previous years not assignable to particular years. The figure \$3,180,828 in Table 3-7E under "Other Clay Products" is the value in the period 1886-1910 that cannot be allotted to particular clay products or assigned to mining divisions. See Tables 3-1, 3-2, 3-3, 3-7A, and 3-7E.

Sulphur—The production of sulphur has been recorded since 1916. From 1916 to 1927 the amounts include the sulphur content of pyrite shipped. From 1928 the amounts include the estimated sulphur content of pyrite shipped, plus the sulphur contained in sulphuric acid made from waste smelter gases. The sulphur content of pyrrhotite roasted at the Kimberley fertilizer plant is included since 1953. Since 1958, elemental sulphur recovered from the Canadian Occidental Petroleum Ltd. plant at Taylor has been included. See Tables 3-1, 3-3, and 3-7D.

Talc—Between 1916 and 1936, talc was quarried at Leech River and at Anderson Lake to make dust for asphalt roofing. There has been no production since 1936. See Tables 3-1 and 3-7G.

Tin—Tin, as cassiterite, is a by-product of the Sullivan mine, where it has been produced since 1941. Tin is also produced in a lead-tin alloy at the Trail smelter. See Tables 3-1, 3-3, and 3-7C.

Tungsten—Tungsten, very largely as scheelite concentrates, was produced from 1937 to 1958, first from the Columbia Tungstens (Hardscrabble) mine in the Cariboo in 1937 and during World War II from the Red Rose mine near Hazelton and the Emerald mine near Salmo. The Red Rose closed in 1954 and the Emerald in 1958. Small amounts of scheelite have been produced from the Bridge River, Revelstoke, and other areas where demand was high. In 1970, production began from the Invincible mine near Salmo, which closed in 1973.

A very small amount of wolframite came from Boulder Creek near Atlin. See Tables 3-1, 3-3, and 3-7C.

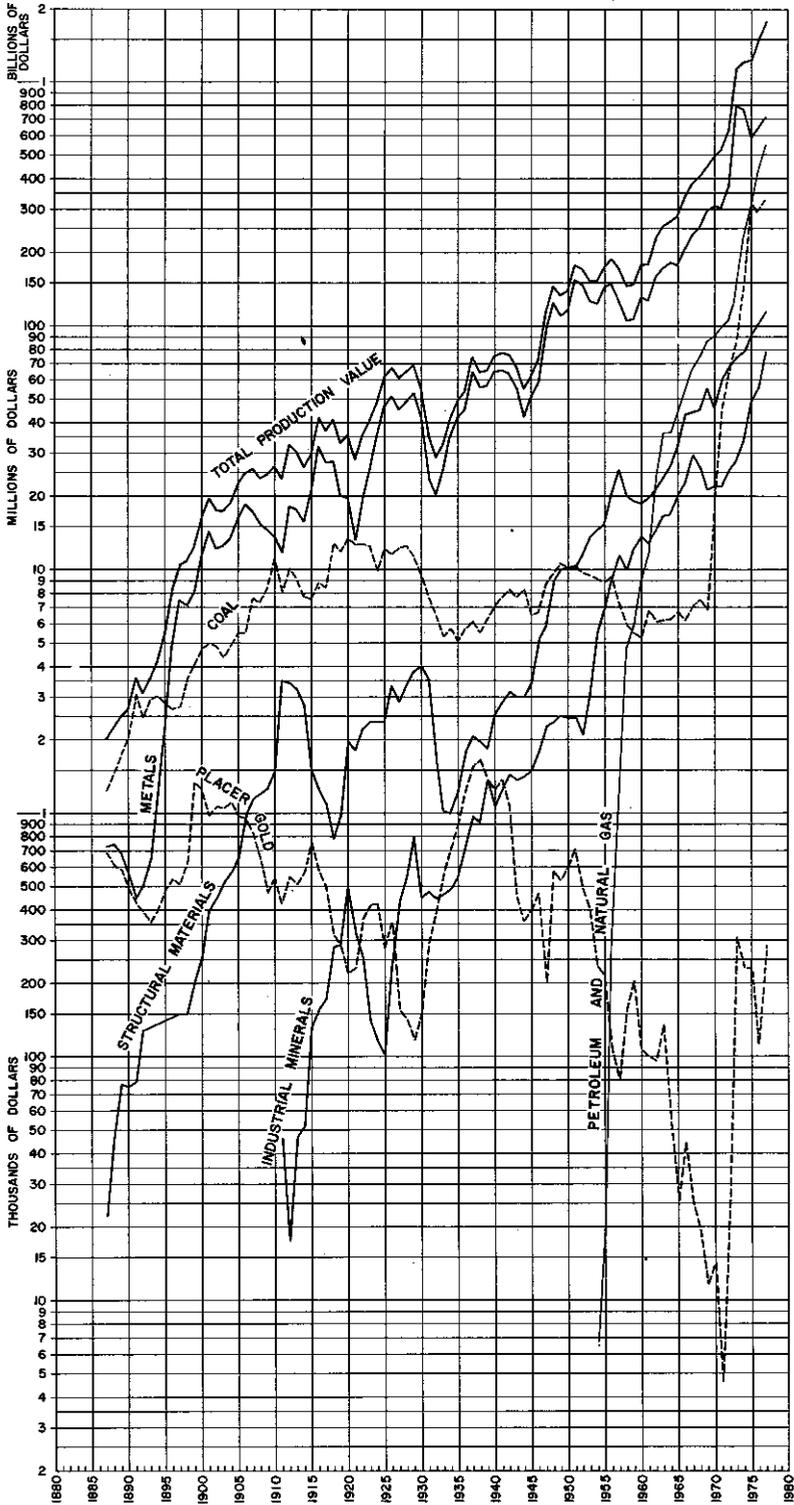
Volcanic ash—The only recorded production of volcanic ash is 27 tonnes from the Cariboo Mining Division in 1954. See Table 3-7D.

Zinc—Zinc was first produced in 1905. For many years lead was the most valuable single metal, but in 1950 the annual value of production of zinc surpassed that of lead and in 1966 the total value of copper production exceeded that of zinc. In 1977 the production of zinc is exceeded by that of copper, molybdenum, asbestos, coal, crude oil, and natural gas. Zinc is invariably associated with lead, and most ores are mined for their combined values in zinc, lead, and silver, and rarely for their zinc content alone. Some zinc ores contain a valuable amount of gold, and zinc is associated with copper at Lynx mine. Modern practice is to concentrate and separate the zinc mineral (sphalerite) from the lead mineral (galena). Most of the zinc concentrates go to the zinc-recovery plant at Trail, are roasted, and are converted electronically to refined metal. Usually some concentrates are shipped to American or Japanese smelters.

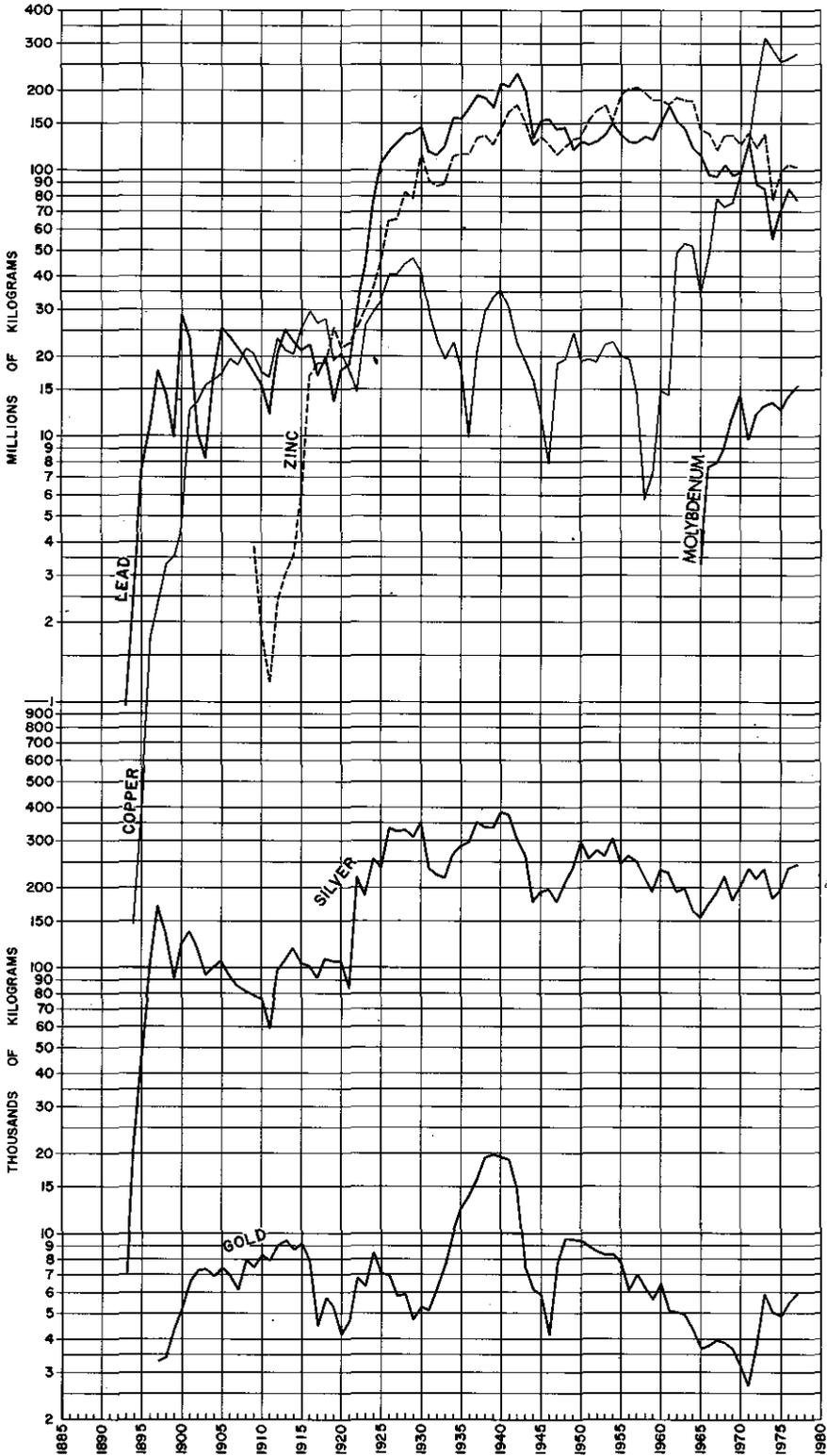
About 85 per cent of the zinc that has been mined in British Columbia has originated in southeastern British Columbia, at the Sullivan mine, and at mines near Ainsworth, Invermere, Moyie Lake, Riondel, Salmo, Slokan, and Spillimacheen. Other production has come from mines at Portland Canal and Tulsequah and is coming from Buttle Lake and Callaghan Creek. The greatest zinc mine is the Sullivan, which has contributed about 73 per cent of the total zinc production of the Province. See Table 3-12 for details of current zinc producers.

Records for the period 1905 to 1908 show shipments totalling 17 096 tonnes of zinc ore and zinc concentrates of unstated zinc content. In 1918, revisions were made to some yearly totals for zinc to adjust them for recovery of zinc from slag treated at the Trail smelter. See Tables 3-1, 3-3, 3-6, and 3-7B.

MINES AND PETROLEUM RESOURCES REPORT, 1977



MINERAL RESOURCE STATISTICS



*Prices¹ Used in Valuing Production of Gold, Silver, Copper,
Lead, Zinc, and Coal*

Year	Gold, Fine	Silver, Fine	Copper	Lead	Zinc	Coal
	\$/g	\$/g	\$/kg	\$/kg	\$/kg	\$/t
1901	0.66457	0.01801 N.Y.	0.355 N.Y.	0.057 N.Y.		2.92
1902	"	.01593 "	.258 "	.081 "		2.90
1903	"	.01633 "	.292 "	.084 "		2.94
1904	"	.01716 "	.283 "	.086 "		2.89
1905	"	.01650 "	.344 "	.094 "		2.98
1906	"	.02040 "	.425 "	.106 "		2.88
1907	"	.01995 "	.441 "	.106 "		3.38
1908	"	.01615 "	.291 "	.083 "		3.43
1909	"	.01573 "	.286 "	.085 "		3.52
1910	"	.01634 "	.281 "	.088 "	0.101 E. St. L.	3.69
1911	"	.01628 "	.273 "	.088 "	.108 "	3.51
1912	"	.01858 "	.360 "	.089 "	.130 "	3.70
1913	"	.01826 "	.337 "	.087 "	.106 "	3.74
1914	"	.01675 "	.300 "	.077 "	.097 "	3.69
1915	"	.01518 "	.381 "	.092 "	.248 "	3.78
1916	"	.02006 "	.600 "	.136 "	.240 "	3.80
1917	"	.02487 "	.599 "	.174 "	.167 "	3.84
1918	"	.02956 "	.543 "	.147 "	.153 "	5.50
1919	"	.03394 "	.412 "	.114 "	.138 "	5.42
1920	"	.03080 "	.385 "	.158 "	.144 "	5.20
1921	"	.01914 "	.276 "	.090 "	.087 "	5.30
1922	"	.02062 "	.295 "	.114 "	.107 "	5.20
1923	"	.01981 "	.318 "	.144 "	.124 "	5.30
1924	"	.02040 "	.287 "	.161 "	.119 "	5.39
1925	"	.02221 "	.310 "	.173 Lond.	.174 Lond.	5.28
1926	"	.01997 "	.304 "	.149 "	.163 "	5.34
1927	"	.01812 "	.285 "	.116 "	.137 "	5.30
1928	"	.01870 "	.321 "	.101 "	.121 "	5.19
1929	"	.01704 "	.399 "	.111 "	.119 "	5.22
1930	"	.01227 "	.286 "	.087 "	.079 "	5.21
1931	"	.00923 "	.179 "	.060 "	.056 "	4.80
1932	.75459	.01018 "	.141 Lond.	.047 "	.053 "	4.45
1933	.91953	.01216 "	.164 "	.053 "	.071 "	4.30
1934	1.10922	.01526 "	.164 "	.054 "	.067 "	4.41
1935	1.13140	.02083 "	.172 "	.069 "	.068 "	4.35
1936	1.12626	.01451 "	.209 "	.086 "	.073 "	4.66
1937	1.12497	.01443 "	.288 "	.113 "	.108 "	4.68
1938	1.13108	.01398 "	.220 "	.074 "	.068 "	4.42
1939	1.16195	.01302 "	.223 "	.070 "	.068 "	4.43
1940	1.23782	.01230 "	.222 "	.074 "	.075 "	4.70
1941	1.23782	.01230 "	.222 "	.074 "	.075 "	4.57
1942	1.23782	.01324 "	.222 "	.074 "	.075 "	4.55
1943	1.23782	.01455 "	.259 "	.083 "	.088 "	4.60
1944	1.23782	.01383 "	.265 "	.099 "	.095 "	4.68
1945	1.23782	.01511 "	.277 "	.110 "	.142 "	4.67
1946	1.18156	.02689 "	.282 "	.149 "	.172 "	5.16
1947	1.12529	.02315 "	.450 "	.301 "	.248 "	5.64
1948	1.12529	.02411 Mont.	.493 U.S.	.398 "	.307 "	6.71
1949	1.15744	.02387 U.S.	.440 "	.348 U.S.	.292 U.S.	7.18
1950	1.22335	.02593 "	.517 "	.319 "	.332 "	7.09
1951	1.18477	.03040 "	.611 "	.406 "	.439 "	7.12
1952	1.10182	.02674 "	.685 "	.355 "	.350 "	7.65
1953	1.10665	.02693 "	.669 "	.292 "	.235 "	7.58
1954	1.09539	.02668 "	.642 "	.302 "	.230 "	7.72
1955	1.10986	.02825 "	.844 "	.329 "	.267 "	7.43
1956	1.10729	.02873 "	.877 "	.347 "	.293 "	7.26
1957	1.07867	.02799 "	.574 "	.310 "	.246 "	7.45
1958	1.09250	.02779 "	.516 "	.259 "	.221 "	8.21
1959	1.07932	.02812 "	.611 "	.257 "	.242 "	8.74
1960	1.09153	.02850 "	.639 "	.256 "	.277 "	7.32
1961	1.14008	.03012 "	.620 "	.243 "	.258 "	8.16
1962	1.20278	.03730 "	.672 "	.227 "	.274 "	8.19
1963	1.21371	.04436 "	.676 "	.265 "	.290 "	8.08
1964	1.21371	.04484 "	.737 "	.323 "	.323 "	7.65
1965	1.21307	.04481 "	.846 "	.380 "	.345 "	7.75
1966	1.21242	.04479 "	1.176 "	.359 "	.344 "	8.02
1967	1.21403	.05373 "	1.125 "	.333 "	.329 "	8.54
1968	1.21242	.07429 "	1.195 "	.321 "	.312 "	8.72
1969	1.21178	.06196 "	1.470 "	.354 "	.347 "	8.82
1970	1.17545	.05946 "	1.294 ² "	.360 "	.353 "	8.16
1971	1.13622	.05014 "	1.030 ² "	.308 "	.359 "	11.06
1972	1.84934	.05348 "	989 ² "	.328 "	.388 "	12.08
1973	3.13185	.08251 "	1.835 ² "	.359 "	.455 "	12.71
1974	5.34868 ²	.15533 ² "	1.884 ² "	.422 ² "	.767 ² "	19.93
1975	5.20466 ²	.15560 ² "	1.283 ² "	.346 ² "	.808 ² "	35.53
1976	4.03514 ²	.13571 ² "	1.438 ² "	.384 ² "	.615 ² "	39.63
1977	5.2997 ²	.15707 ² "	1.398 ² "	.541 ² "	.591 ² "	39.04

¹ See page 74 for detailed explanation.

² See page 75 for explanation.

Table 3-1—Mineral Production: Total to Date, Past Year, and Latest Year

Products ¹	Total Quantity to Date ²	Total Value to Date	Quantity, 1976	Value, 1976	Quantity, 1977	Value, 1977
<i>Metals</i>						
Antimony _____ kg	26 680 193	\$ 25,240,422	447 001	\$ 1,636,871	596 207	\$ 2,519,739
Bismuth _____ kg	3 233 079	15,833,233	20 261	226,462	18 540	187,612
Cadmium _____ kg	20 228 782	85,803,905	356 422	1,530,800	320 711	1,720,051
Chromite _____ t	722	32,295				
Cobalt _____ kg	114 484	376,661				
Copper _____ kg	3 673 755 747	3,672,412,883	263 618 197	378,984,941	275 224 115	384,736,661
Gold— placer _____ g	163 144 188	98,169,877	26 064	115,613	46 170	289,075
lode, fine _____ g	562 930 415	636,855,059	5 393 477	21,761,502	5 906 336	31,301,931
Iron concentrates _____ t	32 481 539	331,581,018	1 255 277	14,760,526	445 317	7,362,345
Lead _____ kg	7 754 868 350	1,564,922,386	85 407 582	32,796,533	78 172 646	42,316,293
Magnesium _____ kg	92 819	88,184				
Manganese _____ t	1 564	32,668				
Mercury ³ _____ kg	1 891 974	10,447,358				
Molybdenum _____ kg	147 123 656	704,628,422	14 088 686	94,109,138	15 521 970	142,057,947
Nickel _____ kg	23 337 783	51,698,754				
Palladium _____ g	23 296	30,462				
Platinum _____ g	43 762	135,008				
Selenium _____ kg	332	1,389				
Silver _____ kg	16 643 414 639	525,668,696	239 720 882	32,532,836	241 503 007	37,934,098
Tin _____ kg	9 156 739	21,668,095	102 262	712,912	187 478	1,912,300
Tungsten (WO ₃) _____ kg	9 090 002	48,068,016				
Zinc _____ kg	7 326 579 634	1,816,323,919	106 498 987	65,499,108	103 780 228	61,301,001
Others _____		57,688,222		2,083,161		397,654
Totals _____		9,667,706,932		646,750,403		714,036,707
<i>Industrial Minerals</i>						
Arsenious oxide _____ kg	9 986 428	273,201				
Asbestos _____ t	1 440 838	414,910,728	70 433	40,727,296	97 033	69,729,205
Bentonite _____ t	718	16,858				
Fluxes _____ t	3 910 452	8,349,544	11 378	33,263	28 624	95,461
Granules _____ t	570 711	12,772,836	31 476	1,219,884	29 551	1,238,485
Gypsum and gypsite _____ t	6 786 488	27,513,372	556 134	4,434,471	653 126	2,357,488
Hydromagnesite _____ t	2 044	27,536				
Iron oxide and ochre _____ t	16 427	155,050				
Jade _____ kg	1 391 494	4,063,317	483 796	1,535,030	266 621	825,523
Magnesium sulphate _____ t	12 604	254,352				
Mica _____ kg	5 815 954	185,818				
Natro-alumite _____ t	474	9,398				
Perlite _____ t	1 009	11,120				
Phosphate rock _____ t	3 485	16,894				
Sodium carbonate _____ t	9 518	118,983				
Sulphur _____ t	8 370 082	121,151,453	231 704	4,296,189	248 892	3,873,206
Talc _____ t	984	34,871				
Others _____		9,755,489		671,009		1,067,277
Totals _____		599,620,820		52,917,142		79,186,645
<i>Structural Materials</i>						
Cement _____ t	17 806 479	416,577,045	846 548	34,973,746	909 522	42,705,320
Clay products _____		119,641,440		6,995,917		4,909,799
Lime and limestone _____ t		83,854,353	2 173 831	5,610,063	2 231 166	5,861,614
Rubble, riprap, crushed rock _____ t		88,728,618	2 485 215	5,205,973	2 464 503	7,309,536
Sand and gravel _____ t		525,618,347	36 073 618	48,138,635	53 994 528	54,809,121
Building-stone _____ t	1 057 772	9,333,020	657	14,314	4 535	55,602
Not assigned _____		5,972,171				
Totals _____		1,249,724,994		100,938,648		115,650,992
<i>Coal</i>						
Coal—sold and used _____ t	180 799 139	1,935,327,745	7 537 695	298,683,679	8 424 181	328,846,883
<i>Petroleum and Natural Gas</i>						
Crude oil _____ m ³	46 332 056	995,544,542	2 367 450	116,595,050	2 200 303	132,859,085
Field condensate _____ m ³	193 296	5,523,980	18 309	901,711	24 465	1,477,248
Plant condensate _____ m ³	2 948 410	30,908,013	167 576	7,198,957	180 267	9,751,058
Natural gas to pipeline 10 ³ m ³	117 674 443	1,348,244,478	8 799 508	287,997,059	8 895 663	396,601,354
Butane _____ m ³	1 439 079	14,774,825	109 781	4,591,832	111 357	5,358,167
Propane _____ m ³	1 137 636	11,837,475	88 195	3,688,955	91 297	4,392,944
Totals _____		2,406,833,313		420,973,564		550,439,856
Grand totals _____		15,859,213,804		1,520,263,436		1,788,161,083

¹ See notes on individual products listed alphabetically on pages 76 to 85.² See page 12 for conversion table to old system.³ From 1968, excludes production which is confidential.

Table 3-2—Total Value of Mineral Production, 1836-1977

Year	Metals	Industrial Minerals	Structural Materials	Coal	Petroleum and Natural Gas	Total
	\$	\$	\$	\$	\$	\$
1836-86	52,808,750		43,630	10,758,565		63,610,965
1887	729,381		22,168	1,240,080		1,991,629
1888	745,794		46,432	1,467,903		2,260,129
1889	685,512		77,517	1,739,490		2,502,519
1890	572,884		75,201	2,034,420		2,682,505
1891	447,136		79,475	3,087,291		3,613,902
1892	511,075		129,234	2,479,005		3,119,314
1893	659,969			2,934,882		3,594,851
1894	1,191,728			3,038,859		4,230,587
1895	2,834,629			2,824,687		5,659,316
1896	4,973,769		726,323	2,693,961		8,394,053
1897	7,575,262		150,000	2,734,522		10,459,784
1898	7,176,870		150,000	3,582,595		10,909,465
1899	8,107,509		200,000	4,126,803		12,434,312
1900	11,360,546		250,000	4,744,530		16,355,076
1901	14,258,455		400,000	5,016,398		19,674,853
1902	12,163,561		450,000	4,832,257		17,445,818
1903	12,640,083		525,000	4,332,297		17,497,380
1904	13,424,755	2,400	575,000	4,953,024		18,955,179
1905	16,289,165		660,800	5,511,861		22,461,826
1906	18,449,602		982,900	5,548,044		24,980,546
1907	17,101,305		1,149,400	7,637,713		25,888,418
1908	15,227,991		1,200,000	7,356,866		23,784,857
1909	14,668,141		1,270,559	8,574,884		24,513,584
1910	13,768,731		1,500,000	11,108,335		26,377,066
1911	11,880,062	46,345	3,500,917	8,071,747		23,499,071
1912	18,218,266	17,500	3,436,222	10,786,812		32,458,800
1913	17,701,432	46,446	3,249,605	9,197,460		30,194,943
1914	15,790,727	51,810	2,794,107	7,745,847		26,382,491
1915	20,765,212	133,114	1,509,235	7,114,178		29,521,739
1916	32,092,648	150,718	1,247,912	8,900,675		42,391,953
1917	27,299,934	174,107	1,097,900	8,484,343		37,056,284
1918	27,957,302	281,131	783,280	12,833,994		41,855,707
1919	20,058,217	289,426	980,790	11,975,671		33,304,104
1920	19,687,532	508,601	1,962,824	13,450,169		35,609,126
1921	13,160,417	330,503	1,808,392	12,836,013		28,135,325
1922	19,605,401	251,922	2,469,967	12,880,060		35,207,350
1923	25,769,215	140,409	2,742,388	12,678,548		41,330,560
1924	33,959,566	116,932	2,764,013	9,911,935		48,752,446
1925	46,480,742	101,319	2,766,838	12,168,905		61,517,804
1926	51,867,792	223,748	3,335,885	11,650,180		67,077,605
1927	45,134,289	437,729	2,879,160	12,269,135		60,720,313
1928	48,640,158	544,192	3,409,142	12,633,510		65,227,002
1929	52,805,345	807,502	3,820,732	11,256,260		68,689,839
1930	41,785,380	457,225	4,085,105	9,435,650		55,763,360
1931	23,530,469	480,319	3,538,519	7,684,155		35,233,462
1932	20,129,869	447,495	1,705,708	6,523,644		28,806,716
1933	25,777,723	460,683	1,025,586	5,375,171		32,639,163
1934	35,177,224	486,554	1,018,719	5,725,133		42,407,630
1935	42,006,618	543,583	1,238,718	5,048,864		48,837,783
1936	45,889,944	724,362	1,796,677	5,722,502		54,133,485
1937	65,224,245	976,171	2,098,339	6,139,920		74,438,675
1938	55,959,713	916,841	1,974,976	5,565,069		64,416,599
1939	56,216,049	1,381,720	1,832,464	6,280,956		65,711,189
1940	64,332,166	1,073,023	2,534,840	7,088,265		75,028,294
1941	65,807,630	1,253,561	2,845,262	7,660,000		77,566,453
1942	63,626,140	1,434,382	3,173,635	8,237,172		76,471,329
1943	55,005,394	1,378,337	3,025,255	7,742,030		67,151,016
1944	42,095,013	1,419,248	3,010,088	8,217,966		54,742,315
1945	50,673,592	1,497,720	3,401,229	6,454,360		62,026,901
1946	58,834,747	1,783,010	5,199,563	6,732,470		72,549,790
1947	95,729,867	2,275,972	5,896,803	8,680,440		112,583,082
1948	124,091,753	2,358,877	8,968,222	9,765,395		145,184,247
1949	110,219,917	2,500,799	9,955,790	10,549,924		133,226,430
1950	117,166,836	2,462,340	10,246,939	10,119,303		139,995,418

Table 3-2—Total Value of Mineral Production, 1836–1977—Continued

Year	Metals	Industrial Minerals	Structural Materials	Coal	Petroleum and Natural Gas	Total
	\$	\$	\$	\$	\$	\$
1951	153,598,411	2,493,840	10,606,048	10,169,617	—	176,867,916
1952	147,857,523	2,181,464	11,596,961	9,729,739	—	171,365,687
1953	126,755,705	3,002,673	13,555,038	9,528,279	—	152,841,695
1954	123,834,286	5,504,114	14,395,174	9,154,544	6,545	152,894,663
1955	142,609,505	6,939,490	15,299,254	8,986,501	18,610	173,853,360
1956	149,441,246	9,172,792	20,573,631	9,346,518	319,465	188,853,652
1957	125,353,920	11,474,050	25,626,939	7,340,339	1,197,581	170,992,829
1958	104,251,112	9,958,768	19,999,576	5,937,860	4,806,233	144,953,549
1959	105,076,530	12,110,286	19,025,209	5,472,064	5,967,128	147,651,217
1960	130,304,373	13,762,102	18,829,989	5,242,223	9,226,646	177,365,333
1961	128,565,774	12,948,308	19,878,921	6,802,134	11,612,184	179,807,321
1962	159,627,293	14,304,214	21,366,265	6,133,986	27,939,726	229,371,484
1963	172,852,866	16,510,898	23,882,190	6,237,997	36,379,636	255,863,587
1964	180,926,329	16,989,469	26,428,939	6,327,678	36,466,753	267,139,168
1965	177,101,733	20,409,649	32,325,714	6,713,590	44,101,662	280,652,348
1966	208,664,003	22,865,324	43,780,272	6,196,219	54,274,187	335,780,005
1967	235,865,318	29,364,065	44,011,488	7,045,341	67,096,286	383,382,498
1968	250,912,026	26,056,782	45,189,476	7,588,989	75,281,215	405,028,488
1969	294,881,114	20,492,943	55,441,528	6,817,155	86,756,009	464,388,749
1970	309,981,470	22,020,359	46,104,071	19,559,669	90,974,467	488,640,036
1971	301,059,951	21,909,767	59,940,333	45,801,936	99,251,158	527,963,145
1972	372,032,770	25,764,120	66,745,698	66,030,210	105,644,978	636,217,776
1973	795,617,596	27,969,664	73,720,831	87,976,105	124,104,445	1,109,388,641
1974	764,599,451	33,676,214	78,088,393	154,593,643	233,275,505	1,264,233,206
1975	586,622,368	48,667,602	90,928,011	317,111,744	320,719,474	1,364,049,199
1976	646,750,403	52,917,142	100,938,648	298,683,679	420,973,564	1,520,263,436
1977	714,036,707	79,186,645	115,650,992	328,846,883	550,439,856	1,788,161,083
Totals	9,667,706,932	599,620,820	1,249,724,994	1,935,327,745	2,406,833,313	15,859,213,804

Table 3-3—Mineral Production for the 10 Years, 1968–1977

Description	1968		1969		1970		1971		1972							
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value						
<i>Metals</i>																
Antimony	kg	526 146	\$	614,779	371 999	\$	508,476	329 521	\$	1,104,040	146 748	\$	243,614	308 260	\$	419,042
Bismuth	kg	94 248		868,533	28 344		288,070	59 935		828,486	37 431		388,674	42 556		324,617
Cadmium	kg	608 462		3,823,095	517 607		4,016,788	426 062		3,343,944	470 243		2,011,223	315 540		1,759,995
Cobalt	kg										51 503		103,099	70 642		155,739
Copper	kg	73 024 968		87,284,148	75 937 956		111,592,416	96 329 694		124,657,958	127 286 040		131,037,918	211 832 288		209,403,822
Gold—placer	g	20 839		19,571	12 410		11,720	15 272		14,185	5 505		4,647	21 492		26,905
Iode, fine	g	3 853 537		4,672,242	3 654 012		4,427,506	3 135 462		3,685,476	2 668 046		3,031,844	3 782 871		6,995,448
Iron Concentrates	t	1 900 311		21,437,569	1 882 266		19,787,845	1 704 650		17,391,883	1 750 738		18,153,612	1 139 698		11,642,379
Lead	kg	105 063 971		32,782,257	95 286 815		33,693,539	97 448 607		35,096,021	112 865 575		34,711,408	88 109 663		28,896,566
Molybdenum	kg	8 980 988		32,552,722	12 064 350		47,999,442	14 186 706		52,561,796	9 926 694		36,954,846	12 719 391		43,260,349
Nickel	kg	1 504 631		3,372,225	1 351 304		3,396,208	1 545 927		4,703,320	1 153 742		3,497,420	1 469 851		4,601,486
Silver	kg	221 791 325		16,475,795	179 169 889		11,100,491	202 521 462		12,041,181	238 670 301		11,968,046	215 420 498		11,519,660
Tin	kg	162 472		497,885	130 828		470,136	119 619		421,946	144 695		421,079	159 230		473,908
Tungsten (WO ₃)	kg										605 909		3,012,540	577 509		2,167,663
Zinc	kg	135 803 161		43,550,181	134 565 200		46,639,024	125 005 208		44,111,055	138 549 629		49,745,789	121 719 968		47,172,894
Others				2,961,024			10,949,453			10,020,179			5,774,192			3,212,297
Totals				250,912,026			294,881,114			309,981,470			301,059,951			372,032,770
<i>Industrial Minerals</i>																
Asbestos	t	67 736		14,833,891	72 926		14,871,334	78 680		16,033,827	79 032		17,800,406	95 986		20,870,241
Fluxes (quartz, limestone)	t	38 337		157,679	20 268		81,917	28 690		106,533	24 258		98,426	28 667		59,246
Granules (quartz, limestone, granite)	t	27 430		436,928	31 521		654,701	20 275		526,491	26 524		519,192	33 709		757,924
Gypsum and gypsite	t	223 506		689,847	254 821		764,032	245 180		736,635	312 791		930,348	352 272		1,087,196
Jade	kg	22 233		105,670	11 944		42,635	119 114		250,256	76 094		196,332	110 551		235,218
Sulphur	t	290 770		9,650,285	316 717		3,824,593	305 194		3,957,542	261 691		2,147,778	270 074		2,306,933
Others				182,482			253,731			409,075			217,285			447,362
Totals				26,056,782			20,492,943			22,020,359			21,909,767			25,764,120
<i>Structural Materials</i>																
Cement	t	595 439		13,634,166	721 744		16,604,688	546 025		13,485,549	822 329		21,629,385	808 230		21,014,112
Clay products				4,388,505			4,550,546			4,714,368			5,981,785			5,263,749
Lime and limestone	t	1 829 684		3,337,277	1 734 420		3,237,032	1 694 237		3,204,076	1 650 658		3,037,222	1 838 227		3,357,927
Rubble, riprap, and crushed rock	t	3 071 450		3,524,439	3 407 875		4,456,211	2 442 384		3,018,242	3 327 758		3,670,583	3 013 438		4,032,548
Sand and gravel	t	20 562 107		20,271,723	26 428 476		26,553,699	21 006 650		21,679,387	26 598 612		25,612,396	31 593 921		33,076,196
Building-stone	t	1 500		33,366	1 975		39,352	159		2,449	2 057		8,962	176		1,166
Totals				45,189,476			55,441,528			46,104,071			59,940,333			66,745,698
<i>Coal</i>																
Sold and used	t	870 180		7,588,989	773 226		6,817,155	2 398 635		19,559,669	4 141 496		45,801,936	5 466 846		66,030,210
<i>Petroleum and Natural Gas</i>																
Crude oil	m ³	3 521 783		50,082,837	4 023 815		58,176,213	4 032 130		60,405,941	3 999 185		66,471,856	3 788 849		63,166,717
Field condensate	m ³	8 611		122,408	12 425		180,520	17 052		277,829	17 331		287,781	16 619		277,069
Plant condensate	m ³	152 670		247,455	150 104		263,278	159 489		253,009	177 137		293,287	161 854		327,820
Natural gas delivered to pipeline	10 ³ m ³	6 317 544		24,531,445	7 218 831		27,897,585	7 678 940		29,804,411	7 685 055		31,946,372	9 939 498		41,616,824
Butane	m ³	83 875		168,814	66 385		133,613	49 074		98,772	50 590		101,822	54 200		106,533
Propane	m ³	63 723		128,256	52 069		104,800	66 828		134,505	74 547		150,040	76 323		150,015
Totals				75,281,215			86,756,009			90,974,467			99,251,158			105,644,978
Grand totals				405,028,488			464,388,749			488,640,036			527,963,145			636,217,776

Table 3-3—Mineral Production for the 10 Years, 1968–1977—Continued

Description	1973		1974		1975		1976		1977			
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value		
Metals												
Antimony	kg	753 110		\$	221 238	879,897	364 045	1,467,928	447 001	1,636,871	596 207	2,519,739
Bismuth	kg	1 293	13,058	33 711	680,771	19 163	261,931	20 261	226,462	18 540	187,612	
Cadmium	kg	367 761	2,951,236	195 979	1,532,096	320 923	1,971,035	356 422	1,530,800	320 711	1,720,051	
Cobalt	kg	18 555	117,403									
Copper	kg	317 603 055	582,803,251	287 547 048	541,644,913	258 497 599	331,693,850	263 618 197	378,984,941	275 224 115	384,736,661	
Gold—placer	g	119 156	311,524	45 162	232,512	43 744	232,204	26 064	115,613	46 170	289,075	
Iode, fine	g	5 784 723	18,117,268	5 001 082	26,749,083	4 819 241	25,082,494	5 393 477	21,761,502	5 906 336	31,301,931	
Iron Concentrates	t	1 420 160	12,906,063	1 306 930	12,742,227	1 299 215	15,245,902	1 255 277	14,760,526	445 317	7,362,345	
Lead	kg	84 890 924	30 477,936	55 252 692	23,333,016	70 603 483	24,450,158	85 407 582	32,796,533	78 172 646	42,316,293	
Molybdenum	kg	13 785 264	51,851,509	13 789 825	60,791,552	13 026 627	71,201,391	14 088 686	94,109,138	15 521 970	142,057,947	
Nickel	kg	1 119 221	3,775,232		688,656		2,351,406					
Silver	g	236 987 318	19,552,997	181 695 950	28,440,365	196 305 885	30,545,947	239 720 882	32,532,836	241 503 007	37,934,098	
Tin	kg	138 221	597,265	143 816	1,150,722	32 511	200,669	102 262	712,912	187 478	1,912,300	
Tungsten (WO ₃)	kg	640 378	4,224,062									
Zinc	kg	137 380 768	62,564,751	77 733 732	59,582,753	99 668 230	80,572,872	106 498 987	65,499,108	103 780 228	61,301,001	
Others	kg		4,161,923		4,488,138		3,695,987		2,083,161		397,654	
Totals			795,617,596		764,599,451		586,622,368		646,750,403		714,036,707	
Industrial Minerals												
Asbestos	t	98 852	21,102,892	83 403	27,398,900	76 771	37,849,743	70 433	40,727,296	97 033	69,729,205	
Fluxes (quartz, limestone)	t	41 937	106,371	34 451	206,049	35 914	174,824	11 378	33,263	28 624	95,461	
Granules (quartz, limestone, granite)	t	31 135	857,643	31 546	1,025,615	33 316	1,144,968	31 476	1,219,884	29 551	1,238,485	
Gypsum and gypsite	t	331 347	1,114,009	400 338	1,412,157	474 387	1,751,799	556 134	4,434,471	653 126	2,357,488	
Jade	kg	69 967	306,808	3 510	18,613	110 437	414,123	483 796	1,535,030	266 621	825,523	
Sulphur	t	286 701	4,187,387	206 646	3,068,507	246 079	5,738,134	231 704	4,296,189	248 892	3,873,206	
Others			294,554		546,373		1,594,011		671,009		1,067,277	
Totals			27,969,664		33,676,214		48,667,602		52,917,142		79,186,645	
Structural Materials												
Cement	t	862 521	24,935,624	890 372	25,828,823	915 293	31,681,722	846 548	34,973,746	909 522	42,705,320	
Clay products			5,590,290		6,615,128		6,593,189		6,995,917		4,909,799	
Lime and limestone	t	1 954 008	3,633,870	2 097 909	4,297,547	1 976 415	4,349,800	2 173 831	5,610,063	2 231 166	5,861,614	
Rubble, riprap, and crushed rock	t	2 579 122	4,160,009	2 691 473	5,715,219	4 103 452	8,723,448	2 485 215	5,205,973	2 464 503	7,309,536	
Sand and gravel	t	30 811 402	35,379,590	31 440 908	35,611,346	28 945 523	39,575,457	36 073 618	48,138,635	53 994 528	54,809,121	
Building-stone	t	729	21,448	452	20,330	53	4,395	657	14,314	4 535	55,602	
Totals			73,720,831		78,088,393		90,928,011		100,938,648		115,650,992	
Coal												
Sold and used	t	6 924 733	87,976,105	7 757 440	154,593,643	8 924 816	317,111,744	7 537 695	298,683,679	8 424 181	328,846,883	
Petroleum and Natural Gas												
Crude oil	m ³	3 368 902	68,306,032	3 012 501	103,335,328	2 269 898	94,229,725	2 367 450	116,595,050	2 200 303	132,859,085	
Field condensate	m ³	20 114	407,807	16 561	568,075	16 094	668,092	18 309	901,711	24 465	1,477,248	
Plant condensate	m ³	180 088	222,463	178,534	924,549	185 272	6,525,837	167 576	7,198,957	180 267	9,751,058	
Natural gas delivered to pipeline 10 ³ m ³		10 789 269	54,762,105	9 016 996	128,018,726	9 236 489	214,733,528	8 799 508	287,997,059	8 895 663	396,601,354	
Butane	m ³	109 057	212,640	105 426	232,085	106 427	2,577,205	109 781	4,591,832	111 357	5,358,167	
Propane	m ³	99 188	193,398	89 373	196,742	81 975	1,985,087	88 195	3,688,955	91 297	4,392,944	
Totals			124,104,445		233,275,505		320,719,474		420,973,564		550,439,856	
Grand totals			1,109,388,641		1,264,233,206		1,364,049,199		1,520,263,436		1,788,161,083	

Table 3-4—Comparison of Total Quantity and Value of Production, and Quantity and Value of Production Paid for to Mines

Metals	1977 Total Production		1977 Production Paid for to Mines	
	Quantity	Value	Quantity	Value
		\$		\$
Antimony kg	596 207	2,519,739	-----	-----
Bismuth kg	18 540	187,612	-----	-----
Cadmium kg	320 711	1,720,051	70 540	248,684
Copper kg	275 224 115	384,736,661	274 943 822	262,762,303
Gold—placer g	46 170	289,075	46 170	289,075
lode, fine g	5 906 336	31,301,931	5 837 723	23,082,157
Iron Concentrates t	445 317	7,362,345	423 554	7,070,302
Lead kg	78 172 646	42,316,293	75 032 015	31,949,182
Molybdenum kg	15 521 970	142,057,947	15 521 970	140,979,668
Silver g	241 503 007	37,934,098	212 101 839	25,900,843
Tin kg	187 478	1,912,300	177 009	1,702,740
Zinc kg	103 780 228	61,301,001	90 226 070	38,677,945
Others		397,654		63,686
Totals		714,036,707		532,726,585

NOTE—For metals, the total quantity and value of production include the quantities paid for to the mines, and the smelter and refining production that can be attributed to the mines but is not paid for. The quantity and value paid for to the mines, excluding outward transportation costs, smelting and refining costs, penalties and deductions, are shown separately for comparative purposes.

Table 3-5—Exploration and Development Expenditures, 1974-1977

	Physical Work and Surveys	Administration, Overhead, Land Costs, Etc.	Construction, Machinery and Equipment, Other Capital Costs	Totals
A. Exploration on Undeclared Mines				
Metal mines—	\$	\$	\$	\$
1974	18,773,326	6,525,878	128,144	25,427,348
1975	16,366,152	5,298,367	442,327	22,106,846
1976	20,437,180	6,365,331	381,416	27,183,927
1977	19,097,099	6,974,231	106,059	26,177,389
Coal mines—				
1974	3,450,746	884,849	18,958	4,354,553
1975	9,955,507	3,057,843	—	13,013,350
1976	9,234,269	3,678,893	—	12,913,162
1977	14,741,425	4,797,788	—	19,539,213
Others—				
1974	42,706	11,134	—	53,840
1975	90,025	35,679	—	125,704
1976	73,453	47,760	—	121,213
1977	327,113	9,860	222,092	559,065
Totals—				
1974	22,266,778	7,421,861	147,102	29,835,741
1975	26,411,684	8,391,889	442,327	35,245,900
1976	29,744,902	10,091,984	318,416	40,218,302
1977	34,165,637	11,781,879	328,151	46,275,667
B. Exploration on Declared or Operating Mines				
Metal mines—				
1974	2,652,243	762,224	278,500	3,692,967
1975	2,792,378	3,090,135	—	5,882,513
1976	8,359,413	83,304	—	8,442,717
1977	2,988,366	2,020,259	—	5,008,625
Coal mines—				
1974	488,308	104,259	—	592,567
1975	1,000,000	—	—	1,000,000
1976	665,000	28,000	—	693,000
1977	5,978,043	25,115,000	—	31,093,043
Others—				
1974	4,236	—	—	4,236
1975	36,242	2,700	—	38,942
1976	214,081	30,000	—	244,081
1977	106,896	403,300	—	510,196
Totals—				
1974	3,144,787	866,483	278,500	4,289,770
1975	3,828,620	3,092,835	—	6,921,455
1976	9,238,494	141,304	—	9,379,798
1977	9,073,305	27,538,559	—	36,611,864
C. Development on Declared Mines				
Metal mines—				
1974	1,280,513	1,028,199	1,985,000	4,293,712
1975	—	57,166	840,344	897,510
1976	512,197	974,985	12,447,569	13,934,751
1977	380,419	1,132,316	33,672,153	35,184,888
Coal mines—				
1974	320,098	256,055	111,500	687,653
1975	—	—	—	—
1976	1,425,312	583,304	—	2,008,616
1977	1,725,484	247,313	—	1,972,797
Others—				
1974	23,242	37,988	2,883,584	2,944,814
1975	—	—	—	—
1976	—	3,155	18,001,500	18,004,655
1977	64,689	708	40,000	105,397
Totals—				
1974	1,623,853	1,322,242	4,980,084	7,926,179
1975	—	57,166	840,344	897,510
1976	1,937,509	1,561,444	30,449,069	33,948,022
1977	2,170,592	1,380,337	33,712,153	37,263,082
D. Development of Operating Mines				
Metal mines—				
1974	20,933,501	1,722,680	46,732,326	69,388,507
1975	9,013,375	5,804,924	24,548,602	39,366,901
1976	6,937,229	404,226	41,881,126	49,222,581
1977	14,491,378	1,722,479	45,859,006	62,072,863
Coal mines—				
1974	9,027,818	—	16,607,506	25,635,324
1975	3,300,000	—	59,000,000	62,300,000
1976	16,043,383	55,377	20,767,397	36,866,157
1977	30,466,894	—	25,943,377	56,410,271
Others—				
1974	6,198,552	146,182	16,606,229	22,950,963
1975	17,350,175	124,860	18,077,384	35,552,419
1976	58,980	79,300	1,389,956	1,528,236
1977	432,731	108,500	931,521	1,472,752
Totals—				
1974	36,159,871	1,868,862	79,946,061	117,974,794
1975	29,663,550	5,929,784	101,625,986	137,219,320
1976	23,039,592	538,903	64,038,479	87,616,974
1977	45,391,003	1,830,979	72,733,904	119,955,886

Table 3-6—Production of Gold, Silver, Copper, Lead, Zinc, Molybdenum, and Iron Concentrates, 1858-1977

Year	Gold (Placer)		Gold (Fine)		Silver		Copper	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1858-90	100 978 533	\$55,192,163			6 876 531	\$214,152		
1891-1900	11 703 748	6,397,183	19 682 165	12,858,353	700 977 829	13,561,194	16 064 375	4,365,210
1901-1910	15 787 261	8,628,660	72 224 836	47,998,179	971 114 910	16,973,507	172 344 737	56,384,783
1911	779 441	426,000	7 110 675	4,725,512	58 588 198	958,293	16 750 016	4,571,644
1912	1 016 446	555,500	8 008 898	5,322,442	97 417 955	1,810,045	23 340 171	8,408,513
1913	933 090	510,000	8 467 916	5,627,595	107 798 519	1,968,606	21 073 930	7,094,489
1914	1 033 864	565,000	7 687 729	5,109,008	112 038 605	1,876,736	20 415 949	6,121,319
1915	1 408 655	770,000	7 776 403	5,167,934	104 708 436	1,588,991	25 817 619	9,835,500
1916	1 062 167	580,500	6 902 751	4,587,333	102 699 711	2,059,739	29 655 426	17,784,494
1917	907 585	496,000	3 562 009	2,367,191	91 107 405	2,265,749	26 765 241	16,038,256
1918	585 358	320,000	5 121 855	3,403,811	108 803 644	3,215,870	27 888 416	15,143,449
1919	524 086	286,500	4 740 906	3,150,644	105 847 210	3,592,673	19 259 132	7,939,896
1920	405 583	221,600	3 733 853	2,481,392	105 061 237	3,235,980	20 360 601	7,832,899
1921	426 733	233,200	4 222 699	2,804,197	83 150 418	1,591,201	17 706 790	4,879,624
1922	674 624	368,800	6 153 915	4,089,684	220 872 076	4,554,781	14 678 125	4,329,754
1923	768 555	420,000	5 575 057	3,704,994	187 643 964	3,718,129	26 181 346	8,323,266
1924	769 799	420,750	7 704 711	5,120,535	259 454 010	5,292,184	29 413 222	8,442,870
1925	512 453	280,092	6 522 890	4,335,069	238 088 613	5,286,818	32 797 475	10,153,269
1926	650 426	355,503	6 264 984	4,163,859	334 312 337	6,675,606	40 523 625	12,324,421
1927	285 868	156,247	5 536 365	3,679,601	325 654 164	5,902,043	50 461 530	11,525,011
1928	262 012	143,208	5 619 130	3,734,609	330 536 775	6,182,461	44 410 233	14,265,242
1929	217 192	118,711	4 516 871	3,002,020	309 791 230	5,278,194	46 626 180	18,612,850
1930	278 527	152,235	5 002 482	3,324,975	352 342 964	4,322,185	41 894 588	11,990,466
1931	534 225	291,992	4 545 175	3,020,837	234 837 945	2,254,979	29 090 879	5,365,690
1932	634 501	395,542	5 649 891	4,263,389	222 406 822	2,264,729	22 955 299	3,228,892
1933	744 233	562,787	6 954 289	6,394,645	218 397 615	2,656,526	19 572 164	3,216,701
1934	783 205	714,431	9 244 309	10,253,952	267 920 527	4,088,280	22 521 530	3,683,662
1935	961 985	895,058	11 363 263	12,856,419	288 323 068	6,005,996	17 884 241	3,073,428
1936	1 349 528	1,249,940	12 583 590	14,172,367	296 944 198	4,308,330	9 830 071	2,053,828
1937	1 684 321	1,558,245	14 331 671	16,122,767	351 630 830	5,073,962	20 891 260	6,023,411
1938	1 796 478	1,671,015	17 340 607	19,613,624	337 827 661	4,722,288	29 832 572	6,558,575
1939	1 547 250	1,478,992	18 267 912	21,226,957	336 377 782	4,381,365	33 227 590	7,392,862
1940	1 215 101	1,236,928	18 149 347	22,461,516	383 436 046	4,715,315	35 371 049	7,865,085
1941	1 361 534	1,385,962	17 760 622	21,984,501	378 700 797	4,658,545	30 134 516	6,700,693
1942	1 023 413	1,041,772	13 825 843	17,113,943	301 011 133	4,080,775	22 723 823	5,052,856
1943	454 104	462,270	6 979 607	8,639,516	265 193 820	3,858,496	19 190 263	4,971,132
1944	355 601	361,977	5 804 815	7,185,332	177 453 003	2,453,293	16 465 584	4,356,070
1945	391 556	398,591	5 454 626	6,751,860	191 510 720	2,893,934	11 726 375	3,244,472
1946	489 219	475,361	3 658 086	4,322,241	197 994 264	5,324,959	7 938 069	2,240,070
1947	216 757	200,585	7 566 800	8,514,870	177 550 262	4,110,992	18 952 769	8,519,714
1948	632 386	585,200	8 902 612	10,018,050	209 016 328	5,040,101	19 515 886	9,616,171
1949	556 308	529,524	8 969 981	10,382,256	237 559 178	5,671,082	24 882 500	10,956,550
1950	595 125	598,717	8 832 723	10,805,553	295 772 610	7,667,950	19 147 001	9,889,458
1951	736 861	717,911	8 126 405	9,627,947	255 632 882	7,770,983	19 617 612	11,980,155
1952	545 982	494,756	7 955 805	8,765,889	274 042 530	7,326,804	19 053 280	13,054,893
1953	443 062	403,230	7 886 228	8,727,294	260 606 407	7,019,272	22 235 441	14,869,544
1954	270 098	238,967	8 036 642	8,803,279	305 630 613	8,154,145	22 747 578	14,599,693
1955	238 436	217,614	7 541 762	8,370,306	245 811 643	6,942,995	20 065 928	16,932,549
1956	120 213	109,450	5 963 782	6,603,628	261 423 017	7,511,866	19 667 923	17,251,872
1957	91 318	80,990	6 948 504	7,495,170	252 847 111	7,077,166	14 237 029	8,170,465
1958	175 732	157,871	6 044 992	6,604,149	218 998 027	6,086,854	5 741 837	2,964,529
1959	235 450	208,973	5 385 360	5,812,511	192 779 535	5,421,417	7 363 374	4,497,991
1960	119 653	107,418	6 394 155	6,979,441	231 612 937	6,600,183	14 997 694	9,583,724
1961	106 248	99,884	4 970 913	5,667,253	229 353 429	6,909,140	14 375 361	8,965,149
1962	103 106	96,697	4 940 712	5,942,101	192 521 474	7,181,907	49 431 850	33,209,215
1963	143 696	135,411	4 820 312	5,850,458	199 764 616	8,861,050	53 635 704	36,238,007
1964	57 292	55,191	4 307 361	5,227,884	163 901 675	7,348,938	52 414 456	38,609,136
1965	26 935	25,053	3 642 908	4,419,089	154 646 729	6,929,793	38 644 537	32,696,081
1966	47 743	44,632	3 717 057	4,506,646	172 594 622	7,729,939	47 990 080	56,438,255
1967	27 713	25,632	3 923 861	4,763,688	192 239 525	10,328,695	78 352 932	88,135,172
1968	20 839	19,571	3 853 537	4,672,242	221 791 325	16,475,795	73 024 968	87,284,148
1969	12 410	11,720	3 654 012	4,427,506	179 169 889	11,100,491	75 937 956	111,592,416
1970	15 272	14,185	3 135 462	3,685,476	202 521 462	12,041,181	96 329 694	124,657,958
1971	5 505	4,647	2 668 046	3,031,844	238 670 301	11,968,046	127 286 040	131,037,918
1972	21 492	26,905	2 882 871	6,995,448	215 420 498	11,519,660	211 832 288	209,403,822
1973	119 156	131,524	5 784 723	18,117,268	236 987 318	19,552,997	317 603 055	582,803,251
1974	45 162	32,512	5 001 082	26,749,083	181 695 950	28,440,365	287 547 048	541,644,913
1975	43 744	232,204	4 819 241	25,082,494	196 305 885	30,545,947	258,497 599	331,693,850
1976	26 064	115,613	5 393 477	21,761,502	239 720 882	32,532,836	263 618 197	378,984,941
1977	46 170	289,075	5 906 336	31,301,931	241 503 007	37,934,098	275 224 115	384,736,661
Totals...	163 144 188	98,169,877	562 930 415	636,855,059	16 643 414 639	525,668,696	3 673 755 747	33,672,412,883

MINERAL RESOURCE STATISTICS

Table 3-6—Production of Gold, Silver, Copper, Lead, Zinc, Molybdenum, and Iron Concentrates, 1858-1977—Continued

Year	Lead		Zinc		Molybdenum		Iron Concentrates	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	kg	\$	kg	\$	kg	\$	t	\$
1858-90	473 729	45,527					27 097	70,879
1891-1900	93 002 804	7,581,619					11 820	45,602
1901-1910	184 989 089	17,033,102	5 753 423	894,169			17 738	68,436
1911	12 189 051	1,069,521	1 195 003	129,092				
1912	20 353 243	1,805,627	2 430 462	316,135				
1913	25 112 864	2,175,832	3 065 710	324,425				
1914	22 963 016	1,771,877	3 568 151	346,125				
1915	21 093 563	1,939,200	5 888 705	1,460,524	901	662		
1916	22 102 314	3,007,462	16 859 478	4,043,985	1 641	2,000		
1917	16 922 293	2,951,020	18 982 067	3,166,255	5 598	20,560		
1918	19 912 447	2,928,107	18 947 777	2,899,040	3 167	11,636		
1919	13 370 004	1,526,855	25 735 631	3,540,429	436	1,840	907	5,000
1920	17 840 247	2,816,115	21 413 198	3,077,975			1 116	6,150
1921	18 779 664	1,693,354	22 416 133	1,952,066			1 335	7,360
1922	30 593 731	3,480,306	25 921 103	2,777,322			916	5,050
1923	43 845 439	6,321,770	26 464 465	3,278,903			1 089	3,600
1924	77 284 697	12,415,917	35 893 017	4,266,741			220	1,337
1925	107 908 698	18,670,329	44 568 438	7,754,450				
1926	119 305 027	17,757,535	64 807 554	10,586,610				
1927	128 364 347	14,874,292	65 872 809	8,996,135				
1928	138 408 812	13,961,412	82 445 946	9,984,613			18	
1929	139 705 336	15,555,189	78 061 406	9,268,797				
1930	145 966 952	12,638,198	113 614 910	9,017,005				
1931	118 796 232	7,097,812	91 657 703	5,160,911				
1932	114 308 115	5,326,432	87 143 752	4,621,641				
1933	123 235 512	6,497,719	88 887,198	6,291,416				
1934	157 562 183	8,461,859	113 013 038	7,584,195				
1935	156 156 723	10,785,930	116 227 650	7,940,860				
1936	171 444 146	14,790,028	115 475 574	8,439,373				
1937	190 107 902	21,417,049	132 081 905	14,274,245				
1938	187 323 227	13,810,024	135 395 388	9,172,827				
1939	171 794 338	12,002,390	126 283 585	8,544,375				
1940	211 758 089	15,695,467	141 529 456	10,643,026				
1941	207 218 262	15,358,976	166 861 962	12,548,031				
1942	230 060 714	17,052,054	175 646 590	13,208,636				
1943	199 196 604	16,485,902	152 474 485	13,446,018				
1944	132 866 893	13,181,530	126 126 765	11,956,725				
1945	152 849 156	16,848,823	133 714 538	18,984,581				
1946	156 879 853	23,345,731	124 406 109	21,420,484				
1947	142 306 192	42,887,313	114 761 068	28,412,597				
1948	145 165 821	57,734,770	122 610 001	37,654,211			616	3,735
1949	120 373 215	41,929,866	130 736 145	38,181,211			4 964	27,579
1950	128 830 683	41,052,905	131 697 238	43,769,392				
1951	124 037 181	50,316,015	153 091 761	67,164,754			102 997	790,000
1952	129 250 197	45,936,692	169 130 882	59,189,657			816 898	5,474,924
1953	135 004 129	39,481,244	173 407 848	40,810,618			899 240	6,763,105
1954	150 807 088	45,482,505	151 555 559	34,805,755			486 018	3,733,891
1955	137 241 656	45,161,245	194 680 177	52,048,909			554 223	3,228,756
1956	128 691 681	44,702,619	201 327 284	58,934,801			335 616	2,190,847
1957	127 732 462	39,568,086	203 787 462	50,206,681			324 174	2,200,637
1958	133 615 439	34,627,075	195 952 146	43,234,839			571 769	4,193,442
1959	130 372 360	33,542,306	182 498 693	44,169,198			770 421	6,363,848
1960	151 321 570	38,661,912	182 977 897	50,656,726	2 456	9,500	1 052 651	10,292,847
1961	174 307 617	42,313,569	175 970 780	45,370,891			1 211 147	12,082,540
1962	152 080 806	34,537,454	187 528 084	51,356,376			1 627 342	18,326,911
1963	142 869 197	37,834,714	182 734 698	53,069,163			1 869 009	20,746,424
1964	121 896 644	39,402,293	181 797 313	58,648,561	12 812	47,063	1 816 684	20,419,487
1965	113 480 794	43,149,171	141 179 547	48,666,933	3 306 274	12,405,344	1 964 410	21,498,581
1966	95 929 798	34,436,934	138 401 395	47,666,540	7 754 088	27,606,061	1 952 074	20,778,934
1967	94 406 546	31,432,079	119 217 472	39,248,539	7 945 782	31,183,064	1 954 468	20,820,765
1968	105 063 971	32,782,257	135 803 151	43,550,181	8 980 988	32,552,722	1 900 311	21,437,569
1969	95 286 815	33,693,539	134 565 199	46,639,024	12 064 350	47,999,442	1 882 266	19,787,845
1970	97 448 607	35,096,021	125 005 208	44,111,055	14 186 706	52,561,796	1 704 550	17,391,883
1971	112 865 575	34,711,408	138 549 629	49,745,789	9 926 694	36,954,846	1 750 738	18,153,612
1972	88 109 663	28,896,566	121 719 968	47,172,894	12 719 391	43,260,349	1 139 698	11,642,379
1973	84 890 924	30,477,936	137 380 766	62,564,751	13 785 264	51,851,509	1 920 311	12,906,063
1974	55 252 692	23,333,016	77 733 732	59,582,753	13 789 825	60,791,552	1 306 930	12,742,227
1975	70 603 483	24,500,158	99 668 230	80,572,872	13 026 627	71,201,391	1 299 215	15,245,902
1976	85 407 582	32,796,533	106 498 987	65,499,108	14 088 686	94,109,138	1 255 277	14,760,526
1977	78 172 646	42,316,293	103 780 228	61,301,001	15 521 970	142,057,947	445 317	7,362,345
Totals	7 754 868 350	1,564,922,386	7 326 579 634	1,816,323,919	147 123 656	704,628,422	32 481 539	331,581,018

Table 3-7A—Mineral Production by Mining

Division	Period	Placer Gold		Metals	Industrial Minerals	Structural Materials
		Quantity	Value			
		g	\$			
Alberni.....	1976			22,842,047		717,580
	1977			22,364,704		528,778
	To Date	50 294	33,253	257,807,252	9,398	6,831,545
Atlin.....	1976	8 367	39,381	68,694		3,275
	1977	28 039	189,278			22,281
	To Date	22 980 642	17,911,986	38,171,207	20,325	367,961
Cariboo.....	1976	14 058	62,162	42,521,291	182,159	4,738,135
	1977	10 775	66,818	66,680,425	49,595	7,608,803
	To Date	81 254 800	54,422,621	450,063,847	938,638	46,712,656
Clinton.....	1976					392,525
	1977					1,322,916
	To Date	316 349	243,069	848,377	162,427	6,106,075
Fort Steele.....	1976			73,762,108	1,138,853	770,686
	1977			86,408,253	1,113,988	1,431,994
	To Date	639 241	472,087	2,684,758,536	25,894,878	13,517,418
Golden.....	1976			1,596,901	4,434,471	285,114
	1977				2,357,488	235,703
	To Date	14 587	11,268	66,248,091	25,376,499	4,681,879
Greenwood.....	1976			9,449,384		182,679
	1977			7,433,120	900	433,332
	To Date	157 817	115,662	241,659,262	3,328,797	3,515,900
Kamloops.....	1976			137,311,394		10,138,452
	1977			135,399,441		12,195,844
	To Date	858 287	604,785	866,767,898	6,540,538	72,742,729
Liard.....	1976	187	763		42,875,298	1,650,024
	1977				71,131,574	2,025,368
	To Date	1 564 712	1,253,493	19,156,498	436,460,477	20,863,939
Lillooet.....	1976					226,208
	1977	1 884	9,407			258,442
	To Date	2 893 348	1,937,853	148,167,256	473,095	4,095,507
Nanaimo.....	1976			86,095,838	143,783	7,054,301
	1977			81,969,048	206,109	7,801,541
	To Date	26 935	19,300	697,956,925	2,782,090	101,272,577
Nelson.....	1976			7,004,795	1,058,002	1,108,418
	1977			7,020,324	1,099,488	1,344,182
	To Date	111 535	89,026	404,991,676	6,927,617	12,239,303
New Westminster.....	1976					19,086,386
	1977					18,932,498
	To Date	975 387	596,902	63,751,805	1,611,625	270,992,579
Nicola.....	1976			29,575,917		229,815
	1977			25,566,841		340,793
	To Date	7 278	4,764	378,376,166	10,050	2,939,679
Omineca.....	1976			79,361,774	226,580	1,268,285
	1977			124,587,817	116,095	1,228,568
	To Date	1 755 665	1,506,400	776,109,872	1,512,131	17,962,704
Ossoyoos.....	1976			51,451,067	14,212	753,952
	1977			62,327,867	25,577	836,846
	To Date	7 465	5,466	390,877,989	6,760,014	6,851,147
Revelstoke.....	1976			3,432		223,673
	1977					396,364
	To Date	235 823	164,477	15,500,414		4,354,052
Similkameen.....	1976			38,891,222		350,424
	1977			32,553,805		850,292
	To Date	1 415 404	878,204	299,188,226	18,558	5,069,165
Skeena.....	1976			38,839,143		1,467,349
	1977			29,939,818		2,597,402
	To Date	143 167	103,569	642,538,731	1,240,215	27,201,182
Slocan.....	1976			2,314,006		509,496
	1977			3,216,040		260,557
	To Date	11 384	9,397	284,307,915		3,196,322
Trail Creek.....	1976			89,631		145,381
	1977			132,717		299,452
	To Date	26 469	24,260	90,904,641		4,218,094
Vancouver.....	1976			3,359,121		15,652,054
	1977			8,860,795		20,828,514
	To Date	5 661	5,306	309,906,923	7,066,964	211,272,179
Vernon.....	1976			32,395	35,760	2,841,135
	1977					2,683,196
	To Date	85 058	73,349	371,554	225,341	17,485,962
Victoria.....	1976					25,562,105
	1977					27,602,612
	To Date	19 533	15,680	24,809,343	190,651	322,663,549
Not Assigned.....	1976	3 452	13,307	22,064,632	2,808,024	5,681,246
	1977	5 472	23,572	19,286,019	3,085,833	3,484,714
	To Date	47 587 347	17,665,790	416,276,645	73,070,492	61,970,891
Totals.....	1976	26 064	115,613	646,634,790	52,917,142	100,938,648
	1977	46 170	289,075	713,747,832	79,186,645	115,650,982
	To Date	163 144 188	98,169,877	9,569,537,055	599,620,820	1,249,724,994

MINERAL RESOURCE STATISTICS

Divisions, 1976 and 1977, and Total to Date

Coal		Petroleum and Natural Gas						Division Total
		Crude Oil and Condensates		Natural Gas Delivered to Pipeline		Butane and Propane		
Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
t	\$	m3	\$	103m3	\$	m3	\$	\$
								23,559,627
								22,893,482
								264,681,448
								111,350
								211,559
								50,471,479
								47,503,747
								74,405,641
								552,138,862
								392,525
								1,322,916
								7,359,948
								374,351,014
								417,796,016
								4,323,170,782
								6,316,486
								2,593,191
								96,317,737
								9,632,063
								7,867,352
								247,619,621
								147,449,846
								147,595,285
								946,715,715
								465,499,649
								623,596,798
								2,886,083,187
								226,208
								287,849
								154,673,711
								93,293,922
								90,076,696
								1,103,175,636
								9,171,215
								9,464,594
								424,247,622
								19,086,386
								18,932,498
								336,952,911
								29,805,732
								25,907,634
								392,411,495
								80,880,899
								125,937,680
								300,530,188
								52,219,231
								63,160,290
								404,499,624
								227,105
								396,364
								20,018,943
								39,241,646
								33,404,097
								325,307,878
								40,306,492
								32,537,220
								671,105,813
								2,823,502
								3,476,597
								287,513,634
								235,012
								432,169
								95,146,993
								19,011,175
								29,689,309
								528,251,378
								2,909,290
								2,683,196
								18,156,206
								25,562,105
								27,602,612
								347,679,223
								30,467,209
								25,880,138
								568,983,818
								1,520,263,436
								1,788,161,083
								15,859,213,804
7 537 695	298,683,679	2 553 335	124,695,718	8 799 508	287,997,059	197 976	8,280,787	1,520,263,436
8 423 950	328,846,883	2 405 035	144,087,391	8 895 663	396,601,364	202 654	9,751,111	1,788,161,083
180 799 139	1,935,327,745	49 473 762	1,031,976,535	117 674 443	1,348,244,478	2 576 715	26,612,300	15,859,213,804

Table 3-7B—Production of Lode Gold, Silver, Copper, Lead, and Zinc by Mining Divisions, 1976 and 1977, and Total to Date

Division	Period	Lode Gold		Silver		Copper		Lead		Zinc		Division Total
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
Alberni.....	1976	555 251	1,897,363	33 096 860	3,874,407	2 346 014	3,378,710	2 638 336	1,295,731	15 010 424	12,321,603	22,767,814
	1977	527 351	2,579,381	28 421 579	4,372,908	2 402 259	2,874,364	2 519 178	1,233,494	14 759 757	11,081,341	22,201,286
	To date	14 508 396	26,547,862	246 642 280	24,891,796	43 854 506	54,724,827	16 625 039	6,731,205	180 160 670	91,766,022	204,661,712
Atlin.....	1976	591	2,525	399 767	54,074	113	95	24 193	10,893	2 410	1,117	68,604
	1977	10 706 647	12,181,576	105 785 004	2,997,652	11 239 012	8,160,361	10 818 897	3,453,882	41 309 830	10,865,614	37,009,085
	To date	11 298 238	14,703,501	106 184 771	3,051,726	11 352 024	8,254,716	10 843 090	3,464,775	42 720 640	12,031,231	37,077,769
Cariboo.....	1976	3 008 842	396,246	3 008 842	396,246	25 075 472	35,077,468	.....	.....	.....	.....	35,473,714
	1977	2 979 170	526,163	2 979 170	526,163	33 595 779	55,337,221	.....	.....	.....	.....	56,369,384
	To date	87 393 813	43,347,296	19 422 260	2,457,964	227 610 312	344,761,999	11 890	8,993	230	20	390,571,272
Clinton.....	1976	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1977	727 499	827,328	982 419	14,237	26 103	5,905	88	7	.....	.....	847,477
	To date	74 321 893	10,077,491	74 321 893	10,077,491	.....	.....	70 544 712	26,762,684	63 182 263	36,263,963	73,104,138
Fort Steele.....	1976	79 114 182	12,145,935	79 114 182	12,145,935	.....	.....	68 300 790	36,866,630	62 812 003	35,298,445	84,310,770
	1977	390 707	749,363	7 038 617 505	226,738,029	7 163 855	12,534,149	6 516 745 656	1,277,202,228	4 963 863 996	1,122,056,202	2,039,279,971
	To date	2 706	10,440	4 650 261	620,163	.....	.....	853 128	338,550	1 093 821	602,870	1,581,023
Golden.....	1976	13 965	25,415	143 464 112	4,910,789	532 092	367,849	117 941 422	26,284,798	152 317 374	33,453,097	65,047,888
	1977	364 309	1,347,141	14 071 587	1,924,937	4 143 566	6,021,035	158 333	63,299	162 831	90,342	9,446,754
	To date	261 359	1,439,066	12 836 551	2,016,898	2 576 877	3,865,152	110 785	61,128	99 888	49,446	7,431,690
Kamloops.....	1976	43 498 562	40,206,525	1 386 334 145	43,177,230	272 771 401	152,643,807	11 728 264	2,747,983	11 522 185	2,676,309	241,451,854
	1977	74 274	297,546	19 824 243	2,876,764	88 452 124	126,378,343	5 100	2,024	1 219	672	129,555,349
	To date	106 807	581,202	24 614 634	3,996,954	87 318 138	118,518,238	59 366	32,731	33 349	16,174	123,145,299
Liard.....	1976	2 335 847	3,658,193	149 803 272	16,232,491	582 609 888	810,576,913	387 375	107,382	242 240	51,507	830,626,486
	1977	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	To date	3 546	4,120	33 809	1,416	13 570 392	19,147,861	7 428	2,736	804	286	19,156,419
Lillooet.....	1976	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1977	130 183 721	147,358,931	30 728 738	719,635	181	41	28 355	2,548	7	2	148,081,157
	To date	1 403 865	6,418,660	10 188 752	1,595,630	48 125 758	69,354,228	.....	.....	.....	.....	77,368,518
Nanaimo.....	1976	1 443 988	7,558,331	8 729 275	1,541,477	44 722 108	64,889,992	.....	.....	.....	.....	73,988,800
	1977	16 115 335	44,849,098	109 856 449	9,181,126	337 400 078	472,949,510	.....	.....	.....	.....	526,979,734
	To date	.....	.....	.....	.....	.....	.....	1 668 388	629,736	9 884 708	6,153,747	6,822,043
Nelson.....	1976	809	4,204	287 952	38,560	.....	.....	1 580 379	847,685	10 500 235	5,900,189	6,814,106
	1977	41 733 010	42,064,473	323 829 134	9,082,027	6 765 479	1,689,196	239 625 922	68,710,409	679 819 693	220,389,367	341,933,472
	To date	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New West- minster	1976	139 093	114,376	470 246	7,720	11 333 143	11,553,105	12 893	1,119	5 786	481	11,676,810
	1977	7 029	(8,485) 1	.....	.....	20 187 156	26,378,841	.....	.....	.....	.....	28,870,356
	To date	.....	.....	.....	.....	16 933 541	24,624,489	.....	.....	.....	.....	24,624,489
Omineca.....	1976	343 221	396,312	8 598 518	135,632	328 547 479	372,544,497	1 016 721	91,282	146 913	10,977	373,178,700
	1977	647 222	2,487,785	4 443 499	628,619	20 601 094	28,713,627	12 977	5,029	10 757	5,238	31,788,298
	To date	1 171 650	6,347,079	5 461 967	894,227	32 160 141	42,393,226	9 579	5,290	9 409	4,563	50,245,075
.....	1976	9 148 107	30,772,175	366 014 161	13,725,240	227 642 866	321,479,868	13 814 246	3,932,850	19 614 865	6,185,323	376,095,465
	1977	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	To date	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

1 Prior year adjustment.

Osoyoos.....	1976	457 090	1,912,757	18 267 289	2,559,957	18 942 134	19,711,264	10 120	4,317	12 867	5,682	24,193,977
	1977	107 399	550,029	15 253 595	2,429,781	15 490 255	22,170,354	11 602	6,489	15 990	6,168	25,162,321
	To date	53 205 694	56,465,274	182 000 424	16,044,675	116 535 054	159,555,857	286 385	85,347	161 817	59,702	232,810,855
Revelstoke.....	1976			16 111	2,176			806	320	1 698	936	3,432
	1977											
	To date	1 163 532	1,081,981	128 317 043	2,821,365	69 710	51,037	16 406 534	3,876,057	12 314 288	8,317,157	11,147,597
Similkameen....	1976	1 043 475	4,127,500	3 291 008	639,914	23 519 591	34,123,808					38,891,222
	1977	847 248	4,680,443	3 456 478	532,814	19 730 380	27,360,548					32,553,805
	To date	10 248 315	26,090,510	149 196 580	5,010,933	373 997 568	267,937,202	178 550	15,137	36 494	5,258	299,059,040
Skeena.....	1976	173 059	697,660	11 191 326	1,517,879	17 006 336	27,009,172	3 148	1,355	2 395	1,320	29,227,386
	1977	154 085	933,100	10 147 138	1,689,057	14 860 957	21,133,979	6 866	3,780	3 046	1,342	23,811,858
	To date	77 910 785	68,536,863	2 273 836 710	56,705,080	493 450 705	362,103,764	27 229 422	5,446,539	7 813 116	2,546,851	495,338,097
Slocan.....	1976	21 896	87,318	8 867 201	1,201,994	68	59	1 041 345	411,982	846 882	589,408	2,290,761
	1977	23 334	164,045	10 519 812	1,656,306	136	111	1 234 959	810,664	866 453	571,516	3,202,642
	To date	590 834	734,550	2 459 787 970	60,924,994	6 404	2,033	515 169 084	108,836,031	434 294 232	107,920,774	278,468,332
Trail Creek.....	1976	11 789	45,434	282 136	37,221			6 603	2,827	7 689	4,149	89,031
	1977	2 831	15,851	522 295	85,989			26 814	16,127	29 865	14,850	132,717
	To date	92 875 593	63,499,956	116 919 133	2,478,649	55 592 776	18,245,494	163 413	54,297	174 701	76,272	84,354,578
Vancouver.....	1976	604 984	2,387,104	3 666 048	485,839	85 156	128,862	302 807	145,324	346 024	209,239	3,350,368
	1977	1 185 864	6,070,222	9 848 057	1,433,890	53 251	80,943	1 171 697	673,342	1 099 020	802,798	8,860,795
	To date	17 356 242	24,807,263	187 957 824	6,487,635	506 952 912	242,917,505	9 897 633	2,702,682	109 552 115	31,785,768	308,700,853
Vernon.....	1976	124	480	187 583	25,331			11 890	4,719	3 333	1,865	82,395
	1977											
	To date	165 094	180,789	2 209 620	140,058	297	100	86 363	29,276	33 511	11,299	361,522
Victoria.....	1976											
	1977											
	To date	1 375 126	1,236,495	29 477 992	654,486	29 773 660	22,579,154	95 298	19,348	1 618 731	283,923	24,773,906
Not assigned....	1976	24 914	100,274	29 709 524	3,968,634	133 795	209,429	8 125 596	3,117,753	15 929 616	9,246,957	16,643,047
	1977	68 613	349,078	29 401 168	4,548,613	280 293	383,934	3 140 631	1,698,443	13 554 153	7,754,369	14,739,437
	To date	738 021	1,118,335	282 529 342	19,521,819	26 309 874	15,880,939	256 591 442	54,585,750	711 586 766	182,861,768	273,968,611
Total.....	1976	5 398 477	21,761,502	239 720 882	32,532,836	263 618 197	378,984,941	35 407 582	32,796,533	106 498 987	65,499,108	631,574,920
	1977	5 906 338	31,301,931	241 503 007	37,934,098	275 224 115	384,736,661	78 172 646	42,316,293	103 780 223	81,301,001	557,589,984
	To date	562 930 415	636,855,059	16 643 414 639	525,668,696	3 673 755 747	3,872,412,883	7 754 868 350	1,564,922,386	7 326 579 634	1,816,323,910	8,216,182,943

Table 3-7C—Production of Miscellaneous Metals by Mining Divisions, 1976 and 1977, and Total to Date

Division	Period	Antimony		Bismuth		Cadmium		Chromite		Iron Concentrates		Manganese		Mercury ¹	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		kg	\$	kg	\$	kg	\$	t	\$	t	\$	t	\$	kg	\$
Alberni.....	1976					24 676	74,233								
	1977					28 781	163,418								
	To date					533 129	3,510,820			4 293 517	40,634,711				
Atlin.....	1976														
	1977														
	To date					144 791	561,762								
Cariboo.....	1976														
	1977														
	To date														
Clinton.....	1976														
	1977														
	To date							114	900						
Fort Steele.....	1976									10 488	190,838				
	1977									21 763	292,043				
	To date					1 542 022	10,064,486			1 302 533	14,847,222				
Golden.....	1976					3 601	15,378								
	1977														
	To date	18 172	14,906			259 086	1,185,297								
Greenwood.....	1976					560	2,630								
	1977					259	1,430								
	To date					38 533	176,013	608	31,395						
Kamloops.....	1976														
	1977					45	270								
	To date					99	641			19 202	95,851			4 084	5,795
Liard.....	1976														
	1977														
	To date														
Lillooet.....	1976														
	1977														
	To date	6 108	4,321											4 187	41,304
Nanaimo.....	1976									368 412	4,252,870				
	1977														
	To date									15 872 978	152,633,981				
Nelson.....	1976					41 761	182,752								
	1977					38 949	206,818								
	To date					4 033 394	19,733,250								
New Westminster.....	1976														
	1977														
	To date														
Nicola.....	1976									32 564	705,561				
	1977									39 245	942,342				
	To date									256 721	5,107,466				
Omineca.....	1976														
	1977														
	To date	53 607	21,882			135 245	628,342							1 882 803	10,400,250

Table 3-7C—Production of Miscellaneous Metals by Mining Divisions, 1976 and 1977, and Total to Date—Continued

Division	Period	Molybdenum		Nickel		Palladium		Platinum		Tin		Tungsten (WO ₃)		Other, Value	Division Total
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value		
		kg	\$	kg	\$	kg	\$	g	\$	kg	\$	kg	\$	\$	\$
Alberni.....	1976														\$ 74,233
	1977														163,418
	To date														53,145,540
Atlin.....	1976														
	1977											132	360		562,122
	To date														7,047,577
Cariboo.....	1976	1 022 697	7,047,577												10,317,041
	1977	1 129 768	10,317,041												59,492,575
	To date	12 040 486	59,408,845					1 835	2,290			12 564	21,431		
Clinton.....	1976														
	1977														900
	To date														657,908
Fort Steele.....	1976									66 183	467,130				2,097,483
	1977									177 009	1,805,440				45,478,565
	To date									8 977 619	20,478,673			88,1841	15,878
Golden.....	1976														1,200,203
	1977														2,630
	To date														1,430
Greenwood.....	1976														207,408
	1977														7,756,045
	To date														12,264,142
Kamloops.....	1976	1 715 590	7,756,045												36,141,412
	1977	1 846 837	12,263,872												
	To date	8 354 046	36,039,125												
Liard.....	1976														
	1977														79
	To date							62	79						
Lillooet.....	1976														
	1977														
	To date	666	2,440					93	113			14 675	37,921		86,099
Nanaimo.....	1976	878 072	4,474,950												8,727,320
	1977	987 827	7,979,246												7,979,246
	To date	3 652 786	18,343,210												170,977,191
Nelson.....	1976														182,752
	1977														206,818
	To date	6 820	18,378									8 056 095	43,304,576		63,056,204
New Westminster.....	1976														
	1977														
	To date			23 337 783	51,698,754									376,2412	52,074,995
Nicola.....	1976														705,561
	1977														942,342
	To date														5,197,466
Omineca.....	1976	6 766 374	47,573,476												47,573,476
	1977	7 691 235	74,342,742												74,342,742
	To date	78 094 263	384,265,640					93	154			1 002 839	4,697,710	4202	400,014,407

Table 3-7D—Production of Industrial Minerals by

Division	Period	Asbestos		Barite ¹		Diatomite		Fluxes (Quartz and Limestone)		Granules (Quartz, Limestone, and Granite)	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		t	\$	t	\$	t	\$	t	\$	t	\$
Alberni.....	1976										
	1977										
	To date										
Atlin.....	1976										
	1977										
	To date										
Cariboo.....	1976					2 737	182,159				
	1977					1 239	49,595				
	To date					22 582	795,158			44	168
Clinton.....	1976										
	1977										
	To date										
Fort Steele.....	1976										
	1977										
	To date			7	80						
Golden.....	1976										
	1977										
	To date			398 388	4,489,227			2 956	12,612		
Greenwood.....	1976										
	1977										
	To date							1 624 308	1,540,819	41	900
Kamloops.....	1976									222	4,900
	1977										
	To date									567	12,230
Liard.....	1976	70 433	40,727,296								
	1977	97 033	69,729,205								
	To date	1 440 838	414,910,728								
Lillooet.....	1976										
	1977										
	To date										
Nanaimo.....	1976							11 878	33,263	2 856	110,520
	1977							28 624	95,461	2 733	110,648
	To date							999 783	2,004,941	31 596	777,149
Nelson.....	1976									26 720	1,058,002
	1977									25 836	1,099,488
	To date							6 895	8,174	202 498	6,863,542
New Westminster.....	1976										
	1977										
	To date									99 490	1,611,625
Nicola.....	1976										
	1977										
	To date										
Omineca.....	1976									18	1,390
	1977									24	1,872
	To date									103	8,061
Osoyoos.....	1976									576	14,212
	1977									917	25,577
	To date							728 113	3,699,031	193 422	2,728,512
Similkameen.....	1976										
	1977										
	To date										
Skeena.....	1976										
	1977										
	To date							545 232	1,050,722		
Vancouver.....	1976										
	1977										
	To date									26 936	418,606
Vernon.....	1976									1 306	35,760
	1977										
	To date							2 903	30,400	7 210	190,963
Victoria.....	1976										
	1977										
	To date							262	3,345	8 713	157,080
Not assigned.....	1976										
	1977										
	To date										
Totals.....	1976	70 433	40,727,296			2 787	182,159	11 378	33,263	31 476	1,219,884
	1977	97 033	69,729,205			1 239	49,595	28 624	95,461	29 551	1,238,485
	To date	1 440 838	414,910,728	398 395	4,489,307	22 582	795,158	3 010 452	8,349,544	570 711	12,772,836

¹ From 1972, excludes production which is confidential.

Other: See notes on individual minerals listed alphabetically on pages 76 to 85.

² Natro-alunite.
³ Hydromagnesite.

⁴ Volcanic ash.
⁵ Magnesium sulphate.

⁶ Sodium carbonate.
⁷ Phosphate rock.

Mining Divisions, 1976 and 1977, and Total to Date

Gypsum and Gypsite		Jade		Mica		Sulphur		Other, Value	Division Total
Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value		
t	\$	kg	\$	t	\$	t	\$	\$	\$
								9,398 ²	9,398
								20,325 ³	20,325
				4 542 160	143,012			3004	182,159
									49,595
									938,638
792	6,236							156,191 ^{3 5 6}	162,427
						64 978	1,138,853		1,138,853
						74 522	1,113,986		1,113,986
102 400	298,824					1 406 076	25,379,080	16,8947	25,894,878
556 134	4,434,471								4,434,471
653 126	2,357,488								2,357,488
5 549 706	20,873,384							1,2768 9	25,376,499
									900
								783,578 ¹⁰	2,328,797
									900
									900
1 131 179	6,323,178			192 640	2,075			203,055 ^{5 6}	6,540,538
		364 278	1,309,840			34 405	838,162		42,875,298
		228 337	711,300			35 950	691,069		71,131,574
		617 015	2,102,741			950 290	19,447,008		436,460,477
									473,095
		253 391	467,966					5,1299	143,753
									206,109
									2,782,090
									1,058,002
								55,901 ⁸	1,099,488
									6,927,617
									1,611,625
									10,050
2 184	10,050								226,580
		119 518	225,190						116,095
		38 284	114,223						1,512,131
		521 088	1,492,610					11,460 ^{11 12}	14,212
									25,577
				720 664	25,938			306,533 ^{5 10 11}	6,760,014
									18,558
227	1,700							16,858 ¹³	18,558
									1,240,215
				287 689	10,815	37 761	178,678		7,066,964
									35,760
						623 773	6,550,969	97,389 ³	7,066,964
									35,760
				72 601	3,978				225,341
									190,651
						132 321	2,319,174	30,226 ⁹	2,808,024
						138 360	2,068,151	488,850	3,065,833
						5 352 182	69,395,718	1,017,682	73,070,492
556 134	4,434,471	483 796	1,535,030			231 704	4,296,189	488,850	52,917,142
653 126	2,357,488	266 621	825,523			248 892	3,373,206	1,017,682	75,186,645
6 786 488	27,513,372	1 391 494	4,063,317	5 815 954	185,818	8 370 082	121,151,453	5,389,287	599,620,820

⁸ Iron oxide and ochre.
⁹ Talc.

¹⁰ Fluorspar.
¹¹ Arsenious oxide.

¹² Perlite.
¹³ Bentonite.

Table 3-7E—Production of Structural Materials by Mining Divisions, 1976 and 1977
and Total to Date

Division	Period	Cement	Lime and Lime- stone	Building- stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel	Clay Products	Unclassi- fied Material	Division Total
		\$	\$	\$	\$	\$	\$	\$	\$
Alberni	1976					717,580			717,580
	1977					528,778			528,778
	To date					1,246,358			1,246,358
Atlin	1976				346,659	6,484,886			6,831,545
	1977					3,275			3,275
	To date					22,281			22,281
Cariboo	1976		1,108		102,453	264,400			367,961
	1977		577,452		1,684,141	2,476,542			4,738,135
	To date		578,560		1,786,594	5,318,108			7,608,303
Clinton	1976		3,205,311		9,472,293	33,702,895	332,457		46,712,656
	1977				3,908	392,525			392,525
	To date				1,876,130	1,319,010			1,322,916
Fort Steele	1976					4,229,945			6,106,075
	1977					770,686			770,686
	To date		43,873	71,941	2,955,311	10,430,375	15,918		13,517,418
Golden	1976					285,114			285,114
	1977					235,703			235,703
	To date		1,000	50,840	255,923	4,245,957	128,159		4,681,879
Greenwood	1976					182,679			182,679
	1977					433,332			433,332
	To date		42,560	161,020	278,474	2,912,563	121,283		3,515,900
Kamloops	1976	7,286,060			906,620	1,945,772			10,138,452
	1977	8,136,745			2,167,475	1,891,624			12,195,844
	To date	36,131,691	25,067	19,800	15,675,896	20,817,896	72,379		72,742,729
Liard	1976					1,650,024			1,650,024
	1977					1,989,368			2,025,368
	To date					2,163,808			20,863,939
Lillooet	1976		216,139			2,595			226,208
	1977		246,677			11,770			258,442
	To date		623,930	2,000	1,122,318	2,346,759			4,095,507
Nanaimo	1976	3,860,294			461,499	2,732,508			7,054,301
	1977	4,282,416			595,568	3,023,557			7,901,541
	To date	69,694,382		3,450,735	5,901,908	21,046,310	1,178,992		101,272,577
Nelson	1976	549,724			2,770	555,924			1,108,418
	1977	670,922				673,260			1,344,182
	To date	3,047,817		437,138	589,571	8,142,803	21,974		12,239,303
New Westminster	1976	67,000			741,137	11,282,332	6,995,917		19,086,386
	1977	69,800			1,259,367	12,693,532	4,909,799		18,932,498
	To date	3,594,710		20,974	24,971,659	139,952,646	102,452,590		270,992,579
Nicola	1976					229,815			229,815
	1977					340,793			340,793
	To date			8,000	187,994	2,743,685			2,939,679
Omineca	1976	3,991		341	112,001	1,151,902			1,268,235
	1977	3,091		80	42,285	1,183,132			1,228,568
	To date	32,951		471	2,945,063	14,978,945	5,274		17,962,704
Osoyoos	1976					753,952			753,952
	1977					836,846			836,846
	To date		43,774	33,018	355,349	6,419,006			6,851,147
Revelstoke	1976					209,923			223,673
	1977					372,114			396,364
	To date		1,000	49,420	773,153	3,580,479			4,354,052
Similkameen	1976					350,424			350,424
	1977					850,292			850,292
	To date	10,500		24,000	712,341	4,897,398	13,355		5,669,165
Skeena	1976					1,304,120		13,355	1,487,349
	1977					722,001			2,537,402
	To date		1,645,300	144,000	5,005,247	20,393,886	13,249		27,201,182
Slocan	1976					509,496			509,496
	1977					280,557			280,557
	To date		1,000	115,143	157,323	2,922,856			3,196,322
Trail Creek	1976					145,381			145,381
	1977					299,452			299,452
	To date		32,500	82,520	381,393	3,718,681			4,218,094
Vancouver	1976	9,549,544				6,102,510			15,652,054
	1977	14,585,528				6,242,991			20,828,514
	To date	121,272,997		4,012,560	8,681,796	76,175,349	1,088,592		211,272,179
Vernon	1976		304,917		2,223	2,533,995			2,841,135
	1977				41,292	2,641,904			2,683,196
	To date		351,416	141,367	403,649	16,428,276	161,254		17,486,962
Victoria	1976	18,138,142	30,546		981	7,392,436			25,562,105
	1977	19,983,052	31,878			7,587,882			27,602,612
	To date	259,161,857	1,098,950	53	532,563	51,014,988	10,855,136		322,663,549
Not assigned	1976				1,129,000	4,452,246			5,581,246
	1977				739,274	2,745,440			3,484,714
	To date		315,498	505,018	2,879,844	49,117,532	8,180,828	5,972,171	61,970,891
Totals	1976	34,973,746	5,610,663	14,314	5,205,973	48,138,635	6,995,917		100,935,648
	1977	42,705,320	5,861,614	55,602	7,309,538	54,809,121	4,909,799		115,650,992
	To date	416,577,045	83,854,353	9,333,020	88,728,618	525,618,347	119,641,440	5,972,171	1,249,724,994

Table 3-8A—Production of Coal, 1836–1977

Year	Quantity ¹	Value	Year	Quantity ¹	Value
	tonnes	\$		tonnes	\$
1836-59	37 985	149,548	1919	2 207 659	11,975,671
1860	14 475	56,988	1920	2 587 763	13,450,169
1861	13 995	55,096	1921	2 422 455	12,836,013
1862	18 409	72,472	1922	2 473 692	12,880,060
1863	21 687	85,380	1923	2 391 998	12,678,548
1864	29 091	115,528	1924	1 839 619	9,911,935
1865	33 345	131,276	1925	2 305 337	12,168,905
1866	25 518	100,460	1926	2 182 760	11,650,180
1867	31 740	124,956	1927	2 316 408	12,269,135
1868	44 711	176,020	1928	2 431 794	12,633,510
1869	36 376	143,208	1929	2 154 607	11,256,260
1870	30 322	119,372	1930	1 809 364	9,435,650
1871	50 310	164,612	1931	1 601 600	7,684,155
1872	50 310	164,612	1932	1 464 759	6,523,644
1873	50 311	164,612	1933	1 249 347	5,375,171
1874	82 856	244,641	1934	1 297 306	5,725,133
1875	111 912	330,435	1935	1 159 721	5,048,864
1876	141 425	417,576	1936	1 226 780	5,722,502
1877	156 525	462,156	1937	1 312 003	6,139,920
1878	173 587	522,538	1938	1 259 626	5,565,069
1879	245 172	723,903	1939	1 416 184	6,280,956
1880	271 889	902,785	1940	1 507 758	7,088,265
1881	232 020	685,171	1941	1 673 516	7,660,000
1882	286 666	846,417	1942	1 810 731	8,237,172
1883	216 721	639,897	1943	1 682 591	7,742,030
1884	400 391	1,182,210	1944	1 752 626	8,217,966
1885	371 461	1,096,788	1945	1 381 654	6,454,360
1886	331 875	979,908	1946	1 305 516	6,732,470
1887	419 992	1,240,080	1947	1 538 895	8,680,440
1888	497 150	1,467,903	1948	1 455 552	9,765,395
1889	589 133	1,739,490	1949	1 470 782	10,549,924
1890	689 020	2,034,420	1950	1 427 907	10,119,303
1891	1 045 607	3,087,291	1951	1 427 513	10,169,617
1892	839 591	2,479,005	1952	1 272 150	9,729,739
1893	993 988	2,934,882	1953	1 255 662	9,528,279
1894	1 029 204	3,038,859	1954	1 186 849	9,154,544
1895	954 727	2,824,687	1955	1 209 157	8,986,501
1896	909 237	2,693,961	1956	1 285 664	9,346,518
1897	906 610	2,734,522	1957	984 886	7,340,339
1898	1 146 015	3,582,595	1958	722 490	5,937,860
1899	1 302 088	4,126,803	1959	625 964	5,472,064
1900	1 615 688	4,744,530	1960	715 455	5,242,223
1901	1 718 692	5,016,398	1961	833 827	6,802,134
1902	1 667 960	4,832,257	1962	748 731	6,133,986
1903	1 473 933	4,332,297	1963	771 594	6,237,997
1904	1 712 739	4,953,024	1964	826 737	6,327,678
1905	1 855 121	5,511,861	1965	862 513	6,713,590
1906	1 929 540	5,548,044	1966	771 848	6,196,219
1907	2 255 214	7,637,713	1967	824 436	7,045,341
1908	2 143 225	7,356,866	1968	870 180	7,588,989
1909	2 439 109	8,574,884	1969	773 226	6,817,155
1910	3 007 074	11,108,335	1970	2 398 635	19,559,669
1911	2 305 778	8,071,747	1971	4 141 496	45,801,936
1912	2 913 778	10,786,812	1972	5 466 846	66,030,210
1913	2 461 665	9,197,460	1973	6 924 733	87,976,105
1914	2 029 400	7,745,847	1974	7 757 440	154,593,643
1915	1 883 851	7,114,178	1975	8 924 816	317,111,744
1916	2 343 671	8,900,675	1976	7 537 695	298,683,679
1917	2 209 982	8,484,343	1977	8 424 181	328,846,883
1918	2 336 238	12,833,994			
			Totals	180,799,139	1,935,327,745

¹ Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. For 1910 and subsequent years the quantity is that sold and used.

Table 3-8B—Coal Production and Distribution by Collieries and by Mining Divisions, 1977

Mine	Raw Coal Production	Clean Coal Production	Coal Used		Sales						Total Coal Sold and Used	
			Under Companies' Boilers, Etc.	Making Coke	Canada		United States	Japan	Others	Total Sales	Amount	Value
					British Columbia	Other Provinces						
<i>Fort Steele Mining Division</i>	t	t	t	t	t	t	t	t	t	t	t	\$
Byron Creek Collieries Ltd.....	372 473	365 604	-----	-----	5 037	248 607	-----	61 357	-----	315 001	315 001	8,092,279
Coleman Collieries Ltd.....	258 335	153 190	-----	-----	-----	-----	-----	153 190	-----	153 190	153 190	6,490,896
Fording Coal Ltd.....	4 152 798	2 807 262	-----	-----	-----	-----	-----	2 325 649	22 782	2 348 431	2 348 431	99,008,279
Kaiser Resources Ltd.....	6 773 699	5 254 362	3 810	150 946	59 343	-----	1 783	4 325 110	1 066 336	5 452 572	5 607 328	215,250,329
<i>Omineca Mining Division</i>												
Bulkley Valley Coal Ltd.	285	231	3	-----	228	-----	-----	-----	-----	228	231	5,100
Totals.....	11 557 590	8 580 649	3 813	150 946	64 608	248 607	1 783	6 865 306	1 089 118	8 269 422	8 424 181	328,846,883

Table 3-9—Principal Items of Expenditure, Reported for Operations of All Classes

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
	\$	\$	\$
Metal-mining	140,680,466	38,856,380	157,986,284
Exploration and development	89,119,504		
Coal	55,184,287	11,829,045	17,536,996
Petroleum and natural gas (exploration and production)	9,128,723		
Industrial minerals	15,104,459	4,589,590	2,931,220
Structural-materials industry	28,164,710	15,874,298	13,570,857
Totals, 1977	337,382,149	71,149,313	192,025,357
1976	277,736,828	59,220,204	170,075,616
1975	246,953,568	49,104,838	154,476,238
1974	272,945,078	42,381,258	140,002,685
1973	221,877,595	36,750,711	103,840,649
1972	199,351,449	31,115,621	77,092,955
1971	179,175,692	23,166,904	68,314,944
1970	172,958,282	19,116,672	59,846,370
1969	123,450,327	14,554,123	43,089,559
1968	113,459,219	13,818,326	38,760,203
1967	94,523,495	13,590,759	34,368,856
1966	93,409,528	12,283,477	28,120,179
1965	74,938,736	11,504,343	30,590,631
1964	63,624,559	10,205,861	27,629,953
1963	57,939,294	10,546,806	12,923,325
1962	55,522,171	9,505,559	14,024,799
1961	50,887,275	8,907,034	17,787,127
1960	52,694,818	7,834,728	21,496,912
1959	49,961,996	7,677,321	17,371,638
1958	48,933,560	8,080,989	15,053,036
1957	56,409,056	8,937,567	24,257,177
1956	57,266,026	9,762,777	22,036,839
1955	51,890,246	9,144,034	21,131,572
1954	48,702,746	7,128,669	19,654,724
1953	55,543,490	8,668,099	20,979,411
1952	62,256,631	8,557,845	27,024,500
1951	52,607,171	7,283,051	24,724,101
1950	42,738,035	6,775,998	17,500,663
1949	41,023,786	7,206,637	17,884,408
1948	38,813,506	6,139,470	11,532,121
1947	32,160,338	5,319,470	13,068,948
1946	26,190,200	5,427,458	8,367,705
1945	22,620,975	7,239,726	5,756,628
1944	23,131,874	5,788,671	6,138,084
1943	26,051,467	7,432,585	6,572,317
1942	26,913,160	7,066,109	6,863,398
1941	26,050,491	3,776,747	7,260,441
1940	23,391,330	3,474,721	6,962,162
1939	22,357,035	3,266,000	6,714,347
1938	22,765,711	3,396,106	6,544,500
1937	21,349,690	3,066,311	6,843,330
1936	17,887,619	2,724,144	4,434,501
1935	16,753,367	2,619,639	4,552,730

NOTE—This table has changed somewhat through the years, so that the items are not everywhere directly comparable. Prior to 1962, lode-mining referred only to gold, silver, copper, lead, and zinc. Prior to 1964, some expenditures for fuel and electricity were included with process supplies. Process supplies (except fuel) were broadened in 1964 to include "process, operating maintenance and repair supplies . . . used in the mine/mill operations; that is, explosives, chemicals, drill steel, bits, lubricants, electrical, etc. . . . not charged to Fixed Assets Account . . . provisions and supplies sold in any company-operated cafeteria or commissary." Exploration and development other than in the field of petroleum and natural gas is given, starting in 1966.

Table 3-10—Employment in the Mineral Industry, 1901-1977

Year	Metals					Coal Mines			Structural Materials		Industrial Materials	Exploration and Development	Petroleum and Natural Gas Exploration and Development	Total	
	Placer	Mines		Concentrates	Smelters	Total	Under	Above ¹	Total	Quarries and Pits					Plants
		Under	Above												
1901		2,736	1,212			3,948	3,041	933	3,974						7,922
1902		2,219	1,126			3,345	3,101	910	4,011						7,356
1903		1,662	1,088			2,750	3,137	1,127	4,264						7,014
1904		2,143	1,163			3,306	3,278	1,175	4,453						7,759
1905		2,470	1,240			3,710	3,127	1,280	4,407						8,117
1906		2,680	1,303			3,983	3,415	1,390	4,805						8,788
1907		2,704	1,239			3,943	2,862	907	3,769						7,712
1908		2,567	1,127			3,694	4,432	1,641	6,073						9,767
1909		2,184	1,070			3,254	4,713	1,705	6,418						9,672
1910		2,472	1,237			3,709	5,903	1,855	7,758						11,467
1911		2,435	1,159			3,594	5,212	1,661	6,873						10,467
1912		2,472	1,304			3,886	5,275	1,855	7,130						10,966
1913		2,773	1,505			4,278	4,950	1,721	6,671						10,949
1914		2,741	1,433			4,174	4,267	1,465	5,732						9,906
1915		2,709	1,435			4,144	3,708	1,283	4,991						9,135
1916		3,357	2,036			5,393	3,694	1,366	5,060						10,453
1917		3,290	2,198			5,488	3,760	1,410	5,170						10,658
1918		2,626	1,764			4,390	3,658	1,769	5,427						9,817
1919		2,513	1,746			4,259	4,145	1,821	5,966						10,225
1920		2,074	1,605			3,679	4,191	2,158	6,349						10,228
1921		1,355	975			2,330	4,722	2,163	6,885						9,215
1922		1,510	1,239			2,749	4,712	1,932	6,644						9,393
1923		2,102	1,516			3,618	4,342	1,807	6,149						9,767
1924		2,353	1,680			4,033	3,894	1,524	5,418						9,451
1925		2,298	2,840			5,138	3,828	1,615	5,443						10,581
1926	299	2,608	1,735	808	2,461	7,610	3,757	1,565	5,322	498	324	124			14,172
1927	415	2,671	1,916	854	2,842	8,283	3,646	1,579	5,225	647	138	122			14,830
1928	355	2,707	2,469	911	1,748	8,855	3,814	1,520	5,334	412	368	120			15,424
1929	341	2,926	2,052	966	2,948	8,892	3,675	1,353	5,028	492	544	268			15,566
1930	425	2,316	1,260	832	3,197	7,605	3,889	1,256	4,645	843	344	170			14,032
1931	688	1,463	834	581	3,157	6,035	2,957	1,125	4,082	460	526	380			12,171
1932	874	1,355	900	542	2,036	4,833	2,628	980	3,608	536	329	344			10,524
1933	1,134	1,788	1,335	531	2,436	6,088	2,241	853	3,094	376	269	408			11,369
1934	1,122	2,796	1,729	631	2,890	8,046	2,050	843	2,893	377	187	360			12,985
1935	1,291	2,740	1,497	907	2,771	7,915	2,145	826	2,971	536	270	754			13,737
1936	1,124	3,959	1,840	720	2,678	8,197	2,015	799	2,814	931	288	825			14,179
1937	1,371	3,603	1,818	1,168	3,027	9,616	2,286	867	3,153	724	327	938			16,129
1938	1,303	3,849	2,266	919	3,158	10,192	2,088	874	2,962	900	295	369			16,021
1939	1,252	3,905	2,050	996	3,187	10,138	2,167	809	2,976	652	311	561			15,890
1940	1,004	3,923	2,104	1,048	2,944	10,019	2,175	699	2,874	827	334	647			15,705
1941	939	3,901	1,823	1,025	3,072	9,821	2,229	494	2,723	766	413	422			15,084
1942	489	2,920	1,504	960	3,555	8,939	1,892	468	2,360	842	378	262			13,270
1943	212	2,994	1,699	891	2,855	7,819	2,240	611	2,851	673	326	567			12,448
1944	255	1,896	1,825	849	2,981	7,551	2,150	689	2,839	690	351	628			12,314
1945	209	1,933	1,750	822	2,884	7,339	1,927	503	2,430	921	335	586			11,820
1946	347	1,918	1,817	672	2,813	7,220	1,773	582	2,305	827	555	679			11,933
1947	360	3,024	2,238	960	3,461	9,683	1,694	731	2,425	977	585	869			14,899
1948	348	3,143	2,429	1,126	3,884	10,582	1,594	872	2,466	1,591	656	754			16,397
1949	303	3,034	2,724	1,203	3,763	10,724	1,761	545	2,306	2,120	542	626			16,621
1950	327	3,399	2,415	1,259	3,759	10,832	1,745	516	2,261	1,916	616	660			16,612
1951	205	3,785	3,695	1,307	4,044	12,831	1,462	463	1,925	1,783	628	491			17,863
1952	230	4,171	3,923	1,516	4,120	13,730	1,280	401	1,681	1,530	557	529			18,257
1953	132	3,145	2,589	1,371	3,901	11,006	1,154	396	1,550	1,909	559	634			15,790
1954	199	2,644	2,520	1,129	3,119	9,412	1,076	358	1,434	1,861	638	584			14,128
1955	103	2,564	2,553	1,091	3,304	9,512	1,100	378	1,478	1,646	641	722			14,102
1956	105	2,637	2,827	1,043	3,359	9,846	968	398	1,368	1,598	770	854			14,539
1957	67	2,392	2,447	838	3,328	9,006	1,020	360	1,380	1,705	625	474			13,257
1958	75	1,919	1,809	625	3,081	7,434	826	260	1,086	1,483	677	446			11,201
1959	99	1,937	1,761	618	3,008	7,324	765	291	1,056	1,357	484	459			10,779
1960	86	1,782	1,959	648	3,134	7,423	894	288	1,182	1,704	557	589			11,541
1961	74	1,785	1,882	626	3,118	7,423	711	705	237	942	1,828	508			11,034
1962	35	1,677	1,976	949	3,956	7,958	548	228	776	1,523	481	517	270		11,560
1963	43	1,713	2,012	850	3,239	7,814	501	247	748	909	460	528	450		10,952
1964	5	1,839	1,967	822	3,281	7,909	446	267	713	1,293	444	509	772		11,645
1965	2	1,752	2,019	965	3,529	8,265	405	244	649	1,079	422	639	786	441	12,283
1966	2	2,006	2,296	1,014	3,654	8,979	347	267	614	1,269	393	582	1,894	478	14,202
1967		1,928	2,532	992	3,435	8,887	260	197	457	1,309	372	584	1,264	507	13,330
1968		1,823	2,369	1,072	3,283	8,547	195	358	553	1,207	380	582	3,990	400	15,659
1969	7	1,794	2,470	1,099	3,468	8,881	245	456	700	1,097	649	567	4,270	416	16,435
1970		2,160	3,167	1,391	3,738	10,396	242	1,033	1,275	740	647	627	4,964	437	19,086
1971		2,078	3,058	1,513	3,481	10,125	444	1,013	1,457	846	794	666	4,040	493	18,423
1972		1,833	3,463	1,734	3,353	10,383	214	1,771	1,985	1,116	800	527	4,201	458	19,470
1973		1,704	4,005	2,394	3,390	11,493	265	1,951	2,216	898	802	667	3,392	454	19,322
1974		1,509	4,239	2,352	2,767	10,367	267	2,255	2,522	895	782	646	2,848	509	19,069
1975		1,100	3,619	1,983	3,753	10,435	290	2,464	2,768	826	725	705	2,951	518	18,903
1976		1,268	3,733	2,048	3,542	10,591	327	2,300	2,627	931	680	670	3,101	495	19,095
1977		1,208	3,768	2,224	3,590	10,790	312	2,556	2,868	1,380	626	766	3,537	490	20,457

¹ Commencing with 1967, does not include employment in by-product plants.

NOTE—These figures refer only to company employees and do not include the many employees of contracting firms.

Table 3-9—Principal Items of Expenditure, Reported for Operations of All Classes

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
	\$	\$	\$
Metal-mining	140,680,466	38,856,380	157,986,284
Exploration and development	89,119,504		
Coal	55,184,287	11,829,045	17,536,996
Petroleum and natural gas (exploration and production)	9,128,723		
Industrial minerals	15,104,459	4,589,590	2,931,220
Structural-materials industry	28,164,710	15,874,298	13,570,857
Totals, 1977	337,382,149	71,149,313	192,025,357
1976	277,736,828	59,220,204	170,075,616
1975	246,953,568	49,104,838	154,476,238
1974	272,945,078	42,381,258	140,002,685
1973	221,877,595	36,750,711	103,840,649
1972	199,351,449	31,115,621	77,092,955
1971	179,175,692	23,166,904	68,314,944
1970	172,958,282	19,116,672	59,846,370
1969	123,450,327	14,554,123	43,089,559
1968	113,459,219	13,818,326	38,760,203
1967	94,523,495	13,590,759	34,368,856
1966	93,409,528	12,283,477	28,120,179
1965	74,938,736	11,504,343	30,590,631
1964	63,624,559	10,205,861	27,629,953
1963	57,939,294	10,546,806	12,923,325
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1960	52,694,818	7,834,728	21,496,912
1959	49,961,996	7,677,321	17,371,638
1958	48,933,560	8,080,989	15,053,036
1957	56,409,056	8,937,567	24,257,177
1956	57,266,026	9,762,777	22,036,839
1955	51,890,246	9,144,034	21,131,572
1954	48,702,746	7,128,669	19,654,724
1953	55,543,490	8,668,099	20,979,411
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1950	42,738,035	6,775,998	17,500,663
1949	41,023,786	7,206,637	17,884,408
1948	38,813,506	6,139,470	11,532,121
1947	32,160,338	5,319,470	13,068,948
1946	26,190,200	5,427,458	8,367,705
1945	22,620,975	7,239,726	5,756,628
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1938	22,765,711	3,396,106	6,544,500
1937	21,349,690	3,066,311	6,843,330
1936	17,887,619	2,724,144	4,434,501
1935	16,753,367	2,619,639	4,552,730

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Table 3-11—Employment at Major Metal and Coal Mines, 1977

	Tonnes		Days Operating Mill	Average Number Employed ¹					
	Mined	Milled		Administrative, Etc.	Mine		Mill	Others	Total
					Surface	Under-ground			
<i>Metal Mines</i>									
Afton Mines Ltd. ²	122 340	122 340	23	21	12	—	2	1	36
Anaconda Canada Ltd. (Britannia) ³	—	—	—	5	1	—	—	5	11
Bethlehem Copper Corp. (Bethlehem)	5 568 004	5 554 855	310	22	192	—	95	—	309
Brenda Mines Ltd. (Brenda)	9 806 253	9 634 421	365	118	156	—	166	8	448
Canex Placer Ltd. (Endako)	11 579 427	9 084 501	344	133	125	—	335	—	593
Cominco Ltd. (H.B.)	357 256	357 256	342	26	25	60	12	—	123
Cominco Ltd. (Sullivan)	2 194 218	2 194 218	344	115	—	537	209	83	944
Craigmont Mines Ltd. (Craigmont)	1 849 726	1 884 335	363	86	122	137	41	—	386
Dankoe Mines Ltd. (Horn Silver)	29 030	31 984	246	7	4	22	4	—	37
Gibraltar Mines Ltd. (Gibraltar)	19 408 617	12 764 959	363	129	129	—	281	—	539
Granby Mining Corp. (Phoenix)	—	832 583	334	8	29	—	42	—	79
Granisle Copper Ltd. (Granisle)	4 491 792	4 474 119	365	70	136	—	118	—	324
Lornex Mining Corp. Ltd. (Lornex)	15 583 834	15 480 725	365	92	364	—	314	—	770
Newmont Mines Ltd. (Granduc Operating Division)	1 252 362	1 252 362	362	105	72	122	44	—	343
Newmont Mines Ltd. (Similkameen Division)	6 473 909	7 135 737	365	78	160	—	84	—	322
Noranda Mines Ltd. (Bell)	4 231 876	4 409 135	365	84	44	—	137	—	265
Noranda Mines Ltd. (Boss Mountain)	523 603	523 453	352	50	63	73	37	—	223
Northair Mines Ltd. (Warman)	84 366	84 366	355	23	—	44	16	15	98
Silvana Mines Ltd. (formerly Kam-Kotia-Burkam Joint Venture)	16 646	15 996	250	1	—	23	6	—	30
Teck Corporation Ltd. (Highland Bell)	33 977	33 977	355	7	—	15	9	5	36
Utah Mines Ltd. (Island Copper)	12 920 996	13 106 006	365	186	506	—	176	—	868
Wesfrob Mines Ltd. (Tasu)	1 020 886	1 020 886	180	45	8	12	76	—	141
Western Mines Ltd. (Lynn and Myra)	247 646	269 068	313	53	—	163	20	39	275
Total metal mines	—	—	—	1,464	2,148	1,208	2,224	156	7,200
<i>Coal Mines</i>									
Byron Creek Collieries Ltd.	372 473	—	365	24	34	—	4	—	62
Coleman Collieries Ltd.	258 335	—	365	—	31	—	—	—	31
Fording Coal Ltd.	4 152 798	—	365	75	673	—	286	—	1,034
Kaiser Resources Ltd.	6 773 699	—	365	443	813	312	173	—	1,741
Total coal mines	—	—	—	542	1,551	312	463	—	2,868

¹ The average number of employed includes wage-earners and salaried employees. The average is obtained by adding the monthly figures and dividing by 12, irrespective of the number of months worked.

³ Copper precipitate produced incidental to treatment of water as required by Pollution Control Branch.

² Mill commenced operating December 8, 1977.

<i>Lillooet Mining Division</i>										
Nil										
<i>Nanaimo Mining Division</i>										
Island Copper	Rupert Inlet	Utah Mines Ltd.	13 106 006	Copper concentrates, 202 558 t; molybdenite concentrates, 2 302 t containing 987 627 kg of molybdenum; rhenium shipments are confidential	1 496 459	9 699 222	46 749 860			
<i>Nelson Mining Division</i>										
HB	Salmo	Cominco Ltd.	357 256	Lead concentrates, 4 813 t; zinc concentrates, 22 606 t		996 696	615	1 931 566	12 593 518	95 893
Silver Dollar	Salmo	W. E. Tambling, Squamish	182	Crude ore	1 275	45 193	170	1 577	1 274	
<i>New Westminster Mining Division</i>										
Nil										
<i>Nicola Mining Division</i>										
Craigmont	Merritt	Craigmont Mines Ltd.	1 884 335	Copper concentrates, 63 193 t; iron concentrates, 39 246 t			17 659 393			
<i>Omineca Mining Division</i>										
Bell (Newman)	Babine Lake	Noranda Mines Ltd. (Bell Copper Div.)	4 409 135	Copper concentrates, 59 378 t	714 280	2 066 888	15 890 606			
Endako	Endako	Canex Placer Ltd. (Endako Mines Div.)	9 084 501	Molybdenite concentrates, 24 t; molybdic tri-oxide, 12 651 t; ferro-molybdenum, 228 t; total content 7 691 235 kg of molybdenum						
Granisle	Babine Lake	Granisle Copper Ltd.	4 474 119	Copper concentrates, 49 724 t	559 761	5 990 904	17 404 635			
Silver Standard	Hazelton	George Braun, Hazelton	148	Crude ore	560	236 725	484	11 541	15 681	
<i>Osoyoos Mining Division</i>										
Brenda	Brenda Lake	Brenda Mines Ltd.	9 634 421	Copper concentrates, 54 837 t; molybdenite concentrates, 6 792 t; molybdic oxide, 15 t; total content 3 866 503 kg of molybdenum	102 080	8 017 576	16 133 570			
Horn Silver	Keremeos	Dankoe Mines Ltd.	31 984	Bulk and jig concentrates, 1 168 t	24 260	8 917 790	4 170	23 759	27 993	
<i>Revelstoke Mining Division</i>										
Nil										
<i>Similkameen Mining Division</i>										
Similkameen (Ingerbelle)	Princeton	Newmont Mines Ltd. (Similkameen Div.)	7 135 737	Copper concentrates, 74 838 t	969 169	3 980 500	20 596 981			

¹ Commenced production December, 1977.

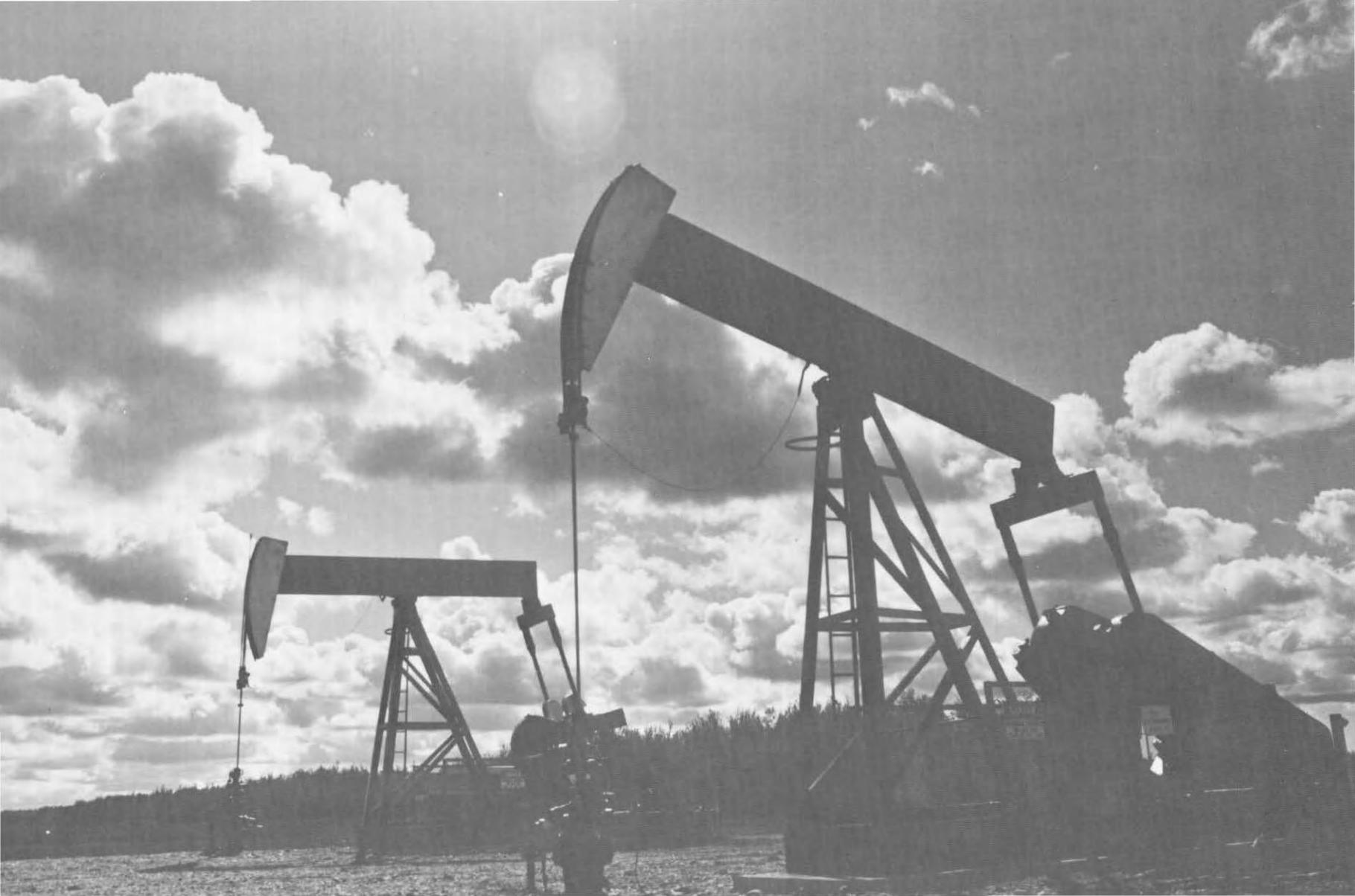
² Estimated.

Table 3-12—Metal Production, 1977—Continued

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content						
					Gold	Silver	Copper	Lead	Zinc	Cadmium	
<i>Skeena Mining Division</i>											
Granduc	Stewart	Newmont Mines Ltd. (Granduc Operating Division)	t 1 252 362	Copper concentrates, 46 575 t	g 130 011	g 8 631 953	kg 13 262 755				
Premier	Stewart	Nick Benkovich, Stewart	42	Clean-up	1 490	38 091	262	7 629	6 091		
Tasu	Tasu Sound	Wesfrob Mines Ltd.	1 020 886	Iron concentrates, 384 309 t; copper concentrates, 11 660 t	1 817	80 671	5 080 107				
<i>Slocan Mining Division</i>											
Bluebell	Riondell	D. Pearce, Nelson	238	Salvaged lead concentrates, 51 t; zinc concentrates, 187 t		39 221		18 024	112 717		
Chief	Mt. Ruppel	N. Block, Nelson	3	Crude ore	9	7 167		121	8		
Enterprise	Enterprise Creek	T. Mazur, Calgary	89	Crude ore	21	64 228	54	2 225	3 025		
Galena Farm	Silverton	Selmon Resources Ltd.	33	Clean-up; lead concentrates, 9 t; zinc concentrates, 24 t	47	117 445		6 216	13 025	94	
Lucky Thought	Silverton	S. Berisoff, Silverton	327	Crude ore		329 630	144	25 407	28 819	191	
Moose	Silverton	D. Pengelly, Silverton	45	Crude ore		143 229		24 053	4 982		
Ottawa	Springer Creek	C. Thickett, Slocan	1 304	Silver concentrates, 8 t; crude ore, 112 t	33	1 325 579	196	557	344		
Scranton	Kaslo	Star Syndicate and Hem Mines Ltd.	6 869	Lead concentrates, 259 t; zinc concentrates, 287 t	29 019	468 660	35	182 843	171 209	3 740	
Silmonac (Minniehaha)	Slocan Lake	Silvana Mines Ltd. (formerly Kam-Kotia-Burkam Joint Venture)	15 996	Lead concentrates, 1 873 t; zinc concentrates, 1 041 t		9 163 815		1 102 548	712 759	3 995	
Victor (Violamac)	New Denver	E. Pederson, New Denver	15	Crude ore	311	57 136	34	92	298		
Whitewater	Retallick	P. Leontowicz and L. Fried, New Denver	11	Crude ore		15 552	45	1 831	3 069		
<i>Trail Creek Mining Division</i>											
Bluebird	Rossland	Standonray Mines Ltd.	2 081	Crude ore	1 454	586 758		29 709	35 135		
I.X.L.	Rossland	J. A. Ruelle and L. G. McLellan	43	High-grade ore	1 584	1 664	51	127	42		
<i>Vancouver Mining Division</i>											
Astra—Cambria, Blue Jack	Alta Lake	Van Silver Mines Ltd.	8 067	Silver concentrates, 97 t	1 381	157 468	1 290	6 764	9 857		
Britannia	Howe Sound	Anaconda Canada Ltd. and D. Pearce, Nelson	236	Copper precipitate clean-up		7 465	56 555				
Warman (Northair)	Callaghan Creek	Northair Mines Ltd.	84 366	Lead concentrates, 2 489 t; zinc concentrates 2 347 t; dore bars	1 234 043	10 341 094		1 217 824	1 265 112	1 354	
<i>Vernon Mining Division</i>											
Nil											
<i>Victoria Mining Division</i>											
Nil											

Table 3-13—Destination of British Columbia Concentrates in 1977

	Lead	Zinc	Copper	Iron
	t	t	t	t
Trail	121 665	185 737		
Other Canadian			73 054	60 940
United States	2 489	10 727	54 212	33 862
Japan			775 766	323 462
Other foreign		10 936	84 159	27 053
Totals	124 154	207 400	987 191	445 317



Petroleum and Natural Gas Statistics

CHAPTER 4

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Chapter 4 is a series of tables and figures providing important information on the petroleum industry operations in 1977. It complements the review of the industry in Chapter 1 and the work of the Ministry reported in Chapter 2.

TABLE 4-14 — GAS-PROCESSING PLANTS, 1977

Operator	Location	Fields Served	Plant Type	Year of First Operation	Plant Capacity Million SCF/Day		Natural Gas	Residual Gas to—
					In	Out		
Amoco Canada Petroleum Limited	Units 68, 69, Block J, N.T.S. Map 94-N-16	Beaver River	Dehydration	1971	247	239.5	. . . . .	Westcoast Transmission Co. Ltd.
Imperial Oil Limited . . .	S.E. ¼ Sec. 2, Tp. 85, R. 14, W6M	Boundary Lake	Inlet separator, M.E.A. absorption treating, glycol absorption dehydration, combined refrigeration and oil absorption natural gas liquid recovery distillation	1964	21	17	Pentanes plus, propane-butane mix	Westcoast Transmission Co. Ltd.
Mobil Oil of Canada Ltd.	Unit 91, Block D, N.T.S. Map 94-I-14	Sierra	Inlet separator, dry desiccant dehydration	1969	127	125	. . . . .	Westcoast Transmission Co. Ltd.
Pacific Petroleum Ltd. . .	Sec. 36, Tp. 82, R. 18, W6M	All British Columbia producing gasfields except Parkland, Dawson Creek, Boundary Lake, Sterra, Clarke Lake, Yoyo, and Beaver River	Inlet separator, M.E.A. treating, dry desiccant dehydration, oil absorption, distillation	1957	500	455	Condensate, pentanes plus, propane, butanes	Westcoast Transmission Co. Ltd.
Westcoast Transmission Co. Ltd.	N.W. ¼ Sec. 10, Tp. 85, R. 14, W6M	Boundary Lake	M.E.A. absorption, dehydration	1961	9.4	8.9	Condensate	Westcoast Transmission Co. Ltd.
Westcoast Transmission Co. Ltd.	Unit 85, Block G, N.T.S. Map 94-J-10	Beaver River, Clarke Lake, Yoyo, Helmet, Louise, Petitot	Potassium carbonate, M.E.A., D.E.A. absorption, dehydration	1965	1 096	910	. . . . .	Westcoast Transmission Co. Ltd.

TABLE 4-15 — SULPHUR PLANTS, 1977

Name	Location	Raw Material	Principal Product	Year of First Operation	Capacity (Long Tons per Day)
Westcoast Transmission Co. Ltd.	Taylor	Hydrogen sulphide	Sulphur	1957	260
Westcoast Transmission Co. Ltd.	Fort Nelson	Hydrogen sulphide	Sulphur	1976	400

TABLE 4-1 - ACREAGE OF CROWN PETROLEUM AND NATURAL GAS RIGHTS HELD, 1968 - 77

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Petroleum and natural gas permits	32 622 739	31 893 990	21 379 461	18 726 137	19 891 946	17 410 475	16 227 862	13 292 568	13 252 878	12 929 825
Petroleum and natural gas leases	10 029 674	8 837 265	7 765 668	7 226 320	6 493 633	6 196 570	6 405 086	5 574 381	5 899 025	7 194 899
Natural gas licences	-----	-----	-----	-----	-----	20 781	15 565	7 809	7 175	36 374
Natural gas leases	518 826	475 419	472 964	471 919	470 260	479 754	479 960	487 739	503 555	516 721
Petroleum leases	644	-----	-----	1 284	1 284	1 284	1 284	3 180	3 180	3 180
Drilling reservations	384 925	350 546	292 402	337 656	452 079	419 878	360 807	317 693	525 151	836 870
Totals	43 556 808	41 557 220	29 910 495	26 763 316	27 309 202	24 528 742	23 490 564	19 683 370	20 190 964	21 517 869

PETROLEUM AND NATURAL GAS REVENUE, 1947 - 1977

	1947-68	1969	1970	1971	1972	1973	1974	1975	1976	1977	1947-77
	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
<i>Rentals and Fees</i>											
Permits	42 547 760	1 772 064	1 426 448	1 615 619	1 729 829	1 524 431	2 224 111	2 150 965	2 114 161	2 128 190	59 233 578
Drilling reservations	992 818	79 796	48 156	79 120	107 537	77 344	85 481	75 635	124 196	172 078	1 842 161
Natural gas licences	68 254	-----	-----	-----	-----	803	8 057	4 155	3 838	-----	85 107
Leases (all)	61 921 459	8 488 114	7 699 844	7 733 584	6 976 517	6 500 830	9 678 015	10 242 543	11 925 123	13 680 926	144 846 955
Total rentals	105 530 291	10 339 974	9 174 448	9 428 323	8 813 883	8 103 408	11 995 664	12 473 298	14 167 318	15 981 194	206 007 801
<i>Crown Reserve Disposition Bonuses</i>											
Permits	43 167 015	16 516 392	9 506 074	14 688 570	13 818 020	7 877 134	15 434 610	6 623 647	27 548 820	60 017 393	215 197 575
Drilling reservations	25 226 959	1 394 215	1 825 404	2 486 763	3 011 025	3 108 092	2 669 318	2 708 463	6 152 419	30 633 861	79 216 519
Leases	59 455 172	3 735 845	5 008 323	5 101 918	3 666 617	6 791 215	4 851 506	3 417 137	9 525 202	34 816 472	136 278 407
Crown reserve disposition total	127 849 146	21 646 452	16 339 801	22 186 251	20 495 662	17 776 441	22 955 334	12 749 247	43 226 441	125 467 726	430 692 501
<i>Crown Royalties</i>											
Gas	17 406 300	3 730 634	3 948 356	4 209 793	5 580 434	6 061 250	2 843 329	2 848 930	173 315	180 951	46 983 292
Oil	34 069 246	9 017 352	9 483 937	10 415 656	9 845 125	14 543 621	48 296 036	44 782 489	43 925 220	41 015 470	265 394 152
Processed products and penalties	920 428	48 847	42 314	42 517	44 379	42 675	134 180	570 321	711 810	888 799	3 446 270
Gas revenue from B.C. Petroleum Corporation	-----	-----	-----	-----	-----	-----	26 000 000	172 150 000	149 850 000	174 250 000	522 250 000
Crown royalties total	52 396 974	12 796 833	13 474 607	14 667 966	15 469 938	20 647 546	77 273 545	220 351 740	194 660 345	216 335 220	838 073 714
Miscellaneous fees	262 992	19 625	21 843	35 604	42 775	27 028	19 104	18 541	32 248	64 583	544 343
Total petroleum and natural gas revenue	286 038 403	44 802 884	39 010 699	46 318 144	44 822 258	46 554 423	112 243 647	245 592 826	252 086 352	357 848 723	1 475 318 359

TABLE 4-2 — ESTABLISHED HYDROCARBON AND BYPRODUCT RESERVES, DECEMBER 31, 1977

December 31, 1977

	Crude Oil, MSTB	Raw Gas, BSCF	Residue Gas, BSCF ¹	Residue Gas, BSCF (Basis 1 000 BTU/SCF) ¹	Propane, MSTB ¹	Butanes, MSTB ¹	Pentanes, MSTB ¹	Sulphur, MLT ¹
Original hydrocarbon in place	1 342 812.7	16 720.3	-----	-----	-----	-----	-----	-----
Ultimate recovery, current estimate	458 117.3	13 379.7	11 568.9	12 074.6	15 911.7	23 187.9	45 044.1	9 044.0
Cumulative production to December 31, 1976	277 505.7	4 717.8	4 157.1	4 370.0	7 577.4	10 584.1	20 684.7	1 628.6
Reserves estimated at December 31, 1976	154 981.0	8 519.5	7 309.6	7 588.4	8 053.8	12 153.9	23 448.7	6 467.0
Drilling in 1977	+26 159.6	+643.1	+544.6	+560.0	+417.8	+710.7	+1 539.9	+885.0
Revisions in 1977	-529.0	-500.7	-442.4	-443.8	-137.3	-260.8	-629.2	+63.4
Production in 1977	-13 842.6	-391.8	-338.4	-352.5	-443.7	-647.5	-1 321.3	-159.1
Production adjustment	+41.3	-----	-----	-----	-----	-----	-----	-----
Reserves at December 31, 1977	166 810.3	8 270.1	7 073.4	7 352.1	7 890.6	11 956.3	23 038.1	7 256.3

NOTES —

MSTB — Thousand stock tank barrels, where one gallon contains 34.9723 Canadian gallons.

BSCF — Billion standard cubic feet at 14.65 psia and 60° F.

MLT — Thousand long tons.

¹Figures in these columns are estimates based on average gas analyses and estimated plant recoveries. Actual recoveries of propane, butanes, pentanes, and sulphur were 574.2, 700.4, 1 287.7 MSTB and 146.1 MLT respectively.

TABLE 4-3 - WELLS DRILLED AND DRILLING, 1977

Well Authorization Number	Well Name	Date Spudded	Date Rig Released	Total Depth (Feet)	Status at December 31, 1977
3914	AEG et al Niteal a-23-I	Jan. 30, 1977	Mar. 2, 1977	5430	Debolt gas.
4034	AEG CanPlac E Silverberry 6-18-88-19	Jul. 28, 1977	Aug. 13, 1977	5245	Abandoned-dry.
3883	AEG et al Strip b-82-D	Jan. 4, 1977	Jan. 24, 1977	5282	Jean Marie gas.
4042	AEG ATAPCO Sunset 7-13-79-18	Aug. 14, 1977	Aug. 24, 1977	2730	Standing.
3759	ATAPCO et al Janis d-98-G	Mar. 28, 1976	Jan. 1, 1977	8512	Slave Point gas.
3892	ATAPCO Klua d-51-F	Jan. 22, 1977	Feb. 26, 1977	7587	Debolt gas.
4238	AmMin Thetlaandoa b-26-C	Dec. 31, 1977	-----	-----	Drilling.
4165	Anadarko et al N Boundary 7-18-88-14	Nov. 26, 1977	Dec. 13, 1977	4410	Abandoned-dry.
4089	Anadarko Cdn-Sup Buick d-55-J	Sep. 13, 1977	Oct. 2, 1977	4765	Abandoned-dry.
4207	Aquit et al Donnamarie a-93-C	Dec. 28, 1977	-----	-----	Drilling.
3895	Aquit et al Kiwigana d-87-G	Jan. 18, 1977	Feb. 10, 1977	4001	Abandoned-dry.
3882	Ashland et al Birch a-67-E	Dec. 29, 1976	Jan. 12, 1977	4186	Bluesky gas.
3977	Ashland et al Birch b-10-L	Mar. 26, 1977	Apr. 9, 1977	4146	Baldonnel gas.
4070	Ashland et al Buick b-2-D	Aug. 31, 1977	Sep. 10, 1977	3387	Dunlevy gas.
3902	Ashland et al Buick b-22-D	Mar. 4, 1977	Mar. 12, 1977	3553	Dunlevy gas.
4113	Ashland et al Buick c-34-H	Sep. 23, 1977	Oct. 10, 1977	4635	Abandoned-dry.
3970	Ashland Buick c-36-H	Mar. 15, 1977	Mar. 23, 1977	3620	Abandoned-dry.
3982	Ashland Numac Buick d-19-I	Mar. 17, 1977	Mar. 25, 1977	3830	Abandoned-dry.
4224	Ashland et al W Buick c-96-E	Dec. 19, 1977	-----	-----	Drilling.
3855	Ashland Numac Inga d-77-B	Dec. 28, 1976	Jan. 12, 1977	4488	Dunlevy gas.
4146	Ashland Numac Jeans b-2-G	Oct. 28, 1977	Nov. 25, 1977	5438	Dunlevy gas.
3987	BP AEG Bullmoose a-22-E	Dec. 4, 1977	-----	-----	Drilling.
3817	BP et al Bullmoose c-20-L	Mar. 19, 1977	Sep. 6, 1977	10518	Baldonnel gas.
4029	BP et al Murray d-48-I	Aug. 23, 1977	-----	-----	Drilling.
3773	BP Sukunks b-59-A	Sep. 2, 1976	Aug. 10, 1977	13310	Abandoned-dry.
3793	BP Sukunks b-65-B	Sep. 21, 1976	Mar. 21, 1977	9614	Baldonnel gas.
4210	Baay et al Otter 6-31-88-15	Dec. 30, 1977	-----	-----	Drilling.
4021	Baysel et al Peejay d-51-G	Jul. 21, 1977	Jul. 30, 1977	3957	Abandoned-dry.
4026	CDCOG Cecil 6-18-85-17	Sep. 2, 1977	Sep. 15, 1977	4453	Abandoned-dry.
3888	CDCOG Union Mel c-57-J	Feb. 19, 1977	Apr. 1, 1977	8090	Slave Point, Jean Marie and Pine Point gas.
3901	CDCOG et al Tooga c-20-K	Jan. 30, 1977	Mar. 10, 1977	6575	Slave Point gas.
4119	CDCOG Weasel d-46-B	Dec. 6, 1977	Dec. 29, 1977	3980	Halfway oil.
3912	CS et al Conroy a-27-F	Jan. 27, 1977	Feb. 9, 1977	4000	Abandoned-dry.
4098	CZAR et al Birch c-14-I	Sep. 17, 1977	Oct. 3, 1977	4225	Baldonnel gas.
3476	CZAR et al Birch b-64-I	Nov. 20, 1977	Dec. 11, 1977	680	Halfway and Baldonnel gas.
4125	CZAR et al Birch b-66-I	Oct. 22, 1977	Nov. 14, 1977	4930	Dunlevy gas.
42C3	CZAR et al Birch d-77-I	Dec. 16, 1977	-----	-----	Drilling.

TABLE 4-3 - WELLS DRILLED AND DRILLING, 1977 -- Continued

Well Authorization Number	Well Name	Date Spudded	Date Rig Released	Total Depth (Feet)	Status at December 31, 1977
3810	CZAR et al N Blueberry c-40-E	Mar. 12, 1977	Apr. 17, 1977	7360	Abandoned-dry.
4183	CZAR et al Callisto 6-5-83-20	Nov. 27, 1977	Dec. 20, 1977	5100	Abandoned-dry.
4151	CZAR et al Callisto 10-3-83-21	Nov. 3, 1977	Nov. 22, 1977	5015	Halfway gas.
4164	CZAR et al Flatrock 10-18-85-15	Nov. 27, 1977	Dec. 20, 1977	4930	Halfway gas.
4079	CZAR et al Flatrock 6-21-85-15	Sep. 8, 1977	Sep. 19, 1977	4828	Halfway gas.
3811	CZAR et al Monias 7-6-82-21	Mar. 27, 1977	May 18, 1977	5075	Abandoned-dry.
4110	CZAR et al Monias 11-9-82-21	Oct. 6, 1977	Oct. 30, 1977	4890	Halfway gas.
4104	CZAR et al Pluto 11-31-85-16	Sep. 30, 1977	Oct. 16, 1977	4800	Abandoned-dry.
4030	Canhunter Bernadet 11-31-87-24	Aug. 8, 1977	Sep. 10, 1977	5778	Dunlevy and Baldonnel gas.
4057	Canhunter Cutbank d-93-A	Aug. 25, 1977	Oct. 3, 1977	8022	Dunvegan gas.
3878	Canhunter Dogrib b-22-L	Jan. 10, 1977	Feb. 8, 1977	5878	Dunlevy gas.
4144	Canhunter N Jullienne a-89-D	Nov. 8, 1977	-----	-----	Drilling.
4017	Canhunter N Jullienne b-22-H	Aug. 6, 1977	Oct. 10, 1977	8377	Debolt gas.
4080	Canhunter S Jullienne d-33-L	Feb. 28, 1977	Dec. 21, 1977	8776	Debolt and Shunda gas.
3955	Canhunter et al S Jullienne b-A82-L	Feb. 26, 1977	May 11, 1977	7905	Debolt gas.
4060	Canhunter S Jullienne c-92-L	Oct. 16, 1977	Dec. 24, 1977	8500	Baldonnel gas.
4015	Canhunter Kobes d-35-A	Jul. 14, 1977	Aug. 6, 1977	4380	Dunlevy gas.
3962	Canhunter et al W Kobes b-30-A	Jun. 19, 1977	Aug. 30, 1977	8650	Inga gas.
4145	Canhunter et al Nig b-30-A	Oct. 27, 1977	Nov. 10, 1977	4305	Gething gas.
3916	Canhunter GIM Prespatou a-63-B	Feb. 13, 1977	Feb. 19, 1977	2900	Notikewin gas.
4074	Canhunter Town a-5-C	Sep. 5, 1977	Oct. 26, 1977	8050	Abandoned-dry.
3870	Canhunter et al Town a-21-C	Jun. 26, 1977	Aug. 12, 1977	7750	Baldonnel gas.
3877	Canhunter Nemco Town a-69-J	Feb. 22, 1977	Mar. 7, 1977	4709	Baldonnel gas.
4026	Canhunter Townsend c-20-H	Sep. 17, 1977	Oct. 21, 1977	5720	Halfway gas.
3956	Canhunter et al N Townsend a-1-J	Feb. 27, 1977	Mar. 9, 1977	1737	Abandoned-junked.
3983	Canhunter et al N Townsend a-A1-J	Mar. 12, 1977	Apr. 30, 1977	7910	Coptin gas.
3876	Canso HB Gleam c-56-D	Jan. 10, 1977	Jan. 22, 1977	3665	Abandoned-dry.
3964	Canso BP Silver b-6-D	Mar. 11, 1977	Mar. 23, 1977	3970	Halfway gas.
4216	Canso BP Silver c-76-L	Dec. 18, 1977	-----	-----	Drilling.
4241	Cdn Res et al Dahl d-19-A	Dec. 29, 1977	-----	-----	Drilling.
4235	Cdn Res et al Dahl c-56-A	Dec. 27, 1977	-----	-----	Drilling.
3965	Cdn Res et al Hoss a-23-J	Mar. 1, 1977	Mar. 27, 1977	6615	Slave Point gas.
3935	Cdn Res et al E Kotcho d-83-G	Feb. 6, 1977	Mar. 5, 1977	6502	Slave Point gas.
3865	Cdn Res et al E Kotcho b-41-J	Dec. 21, 1976	Jan. 29, 1977	6784	Abandoned-dry.
4227	Cdn Res Dome Cons Suhm b-5-A	Dec. 31, 1977	-----	-----	Drilling.
3897	Cdn Res Suhm b-45-A	Jan. 13, 1977	Feb. 25, 1977	6089	Slave Point gas.
4228	Cdn Res et al S Suhm b-42-I	Dec. 26, 1977	-----	-----	Drilling.

3830	Cdn Res et al Tenaka b-86-K	Jan. 2, 1977	Mar. 2, 1977	8255	Pine Point gas.
3976	Cdn-Sup Fina Ojay b-57-G	Jul. 27, 1977	-----	-----	Drilling.
3929	Cdn-Sup Septimus 6-26-81-19	Feb. 21, 1977	Mar. 15, 1977	5750	Abandoned-dry.
3840	Chaut Dunbar Eagle 6-30-84-18	Jan. 17, 1977	Feb. 10, 1977	5828	Belloy oil.
4142	Chaut et al Eagle 14-30-84-18	Oct. 31, 1977	Dec. 1, 1977	6141	Belloy oil.
4177	Chaut et al Eagle 16-30-84-18	Dec. 5, 1977	-----	-----	Drilling.
4062	Chaut et al W Eagle 14-19-84-18	Aug. 13, 1977	Aug. 30, 1977	6137	Belloy oil.
3884	Chaut Dunbar Ft St John 6-13-84-19	Feb. 28, 1977	Mar. 25, 1977	6332	Halfway and Mississippian gas.
4000	Chaut Dunbar Ft St John 8-24-84-19	Jun. 13, 1977	Jul. 11, 1977	6257	Abandoned-dry.
3844	Chevron N Cabin d-74-F	Dec. 31, 1976	Feb. 16, 1977	7346	Slave Point gas.
3933	Chevron Amoco Ekwan b-6-L	Feb. 8, 1977	Apr. 6, 1977	6981	Slave Point gas.
3909	Chevron CCL Imp Helmet c-84-B	Jan. 29, 1977	Feb. 23, 1977	6301	Abandoned-dry.
3843	Chevron CCL Imp Helmet b-31-G	Jan. 2, 1977	Feb. 4, 1977	6287	Abandoned-dry.
3995	Coseka et al N Buick c-53-F	Jun. 27, 1977	Jul. 6, 1977	3900	Dunlevy and Bluesky gas.
4148	Coseka et al N Buick b-73-F	Oct. 24, 1977	Nov. 6, 1977	4020	Abandoned-dry.
4121	Coseka et al N Buick a-75-F	Oct. 6, 1977	Oct. 19, 1977	4000	Bluesky gas.
3980	Coseka et al W Buick d-17-E	Mar. 17, 1977	Apr. 3, 1977	4720	Dunlevy oil and Bluesky gas.
3881	Coseka Wescent W Buick c-74-E	Dec. 31, 1976	Jan. 9, 1977	3850	Bluesky gas.
3986	Coseka Wescent W Buick d-93-E	Mar. 23, 1977	Apr. 4, 1977	4195	Abandoned-dry.
3942	Coseka Wescent W Buick b-94-E	Mar. 11, 1977	Mar. 20, 1977	4093	Bluesky gas.
4002	Coseka Exalta et al Clarke d-77-L	Jun. 29, 1977	Aug. 2, 1977	4420	Kakisa gas.
3936	Coseka et al Gundy b-A69-A	Feb. 28, 1977	Mar. 14, 1977	5092	Baldonnel gas.
4140	Coseka et al Gundy c-12-G	Oct. 24, 1977	Nov. 9, 1977	4320	Baldonnel and Dunlevy gas.
4162	Coseka et al W Gundy a-3-B	Nov. 10, 1977	Dec. 17, 1977	4251	Baldonnel gas.
4083	Coseka et al W Gundy b-13-B	Sep. 17, 1977	Nov. 22, 1977	6915	Baldonnel gas.
4090	Coseka et al E Nig d-78-L	Sep. 19, 1977	Oct. 25, 1977	6220	Halfway gas.
4056	Coseka et al N Red Creek 10-14-86-22	Aug. 5, 1977	Aug. 23, 1977	5600	Abandoned-dry.
4039	DWOG et al Siphon 11-14-86-16	Oct. 7, 1977	Oct. 26, 1977	4814	Notikveyn gas.
4131	Decalta et al Beavertail d-59-C	Oct. 25, 1977	Nov. 3, 1977	3550	Abandoned-dry.
4132	Decalta et al Buick d-33-J	Nov. 6, 1977	Nov. 26, 1977	4755	Dunlevy gas.
4127	Dome Aitken a-29-L	Oct. 15, 1977	Nov. 3, 1977	4780	Abandoned-dry.
3945	Dome Altares a-3-H	Oct. 23, 1977	-----	-----	Drilling.
3944	Dome Altares d-75-H	Jul. 27, 1977	Oct. 19, 1977	8420	Abandoned.
4033	Dome Buick b-86-A	Jul. 23, 1977	Jul. 31, 1977	3600	Gething gas.
3971	Dome CanDel Buick c-56-D	Mar. 4, 1977	Mar. 15, 1977	3533	Abandoned-dry.
3927	Dome Buick c-34-G	Feb. 10, 1977	Feb. 17, 1977	3745	Dunlevy gas.
3988	Dome Buick c-54-G	Jun. 23, 1977	Jul. 2, 1977	3685	Abandoned-dry.
4123	Dome Bulck b-8-H	Nov. 21, 1977	Nov. 30, 1977	3610	Dunlevy gas.
4016	Dome Buick a-27-H	Aug. 11, 1977	Aug. 20, 1977	3600	Abandoned-dry.
3799	Dome CanDel N Buick a-69-F	Jan. 27, 1977	Feb. 8, 1977	3930	Dunlevy gas.
3899	Dome CZAR W Buick c-52-E	Aug. 23, 1977	Sep. 3, 1977	4140	Bluesky gas.
3900	Dome CZAR W Buick d-73-E	Sep. 9, 1977	Sep. 18, 1977	3845	Bluesky gas.
3787	Dome et al Christina a-60-J	Mar. 8, 1977	Apr. 25, 1977	4910	Abandoned-dry.
3906	Dome et al Dahl d-75-H	Feb. 8, 1977	Feb. 17, 1977	3930	Bluesky gas.

TABLE 4-3 - WELLS DRILLED AND DRILLING, 1977 - *Continued*

Well Authorization Number	Well Name	Date Spudded	Date Rig Released	Total Depth (Feet)	Status at December 31, 1977
3984	Dome et al Fireweed d-99-D	Mar. 22, 1977	Apr. 1, 1977	4140	Dunlevy gas.
3926	Dome Fireweed c-18-H	Jun. 12, 1977	Jun. 26, 1977	4500	Dunlevy and Baldonnel gas.
4078	Dome Kobes-Townsend d-13-A	Sep. 9, 1977	Oct. 11, 1977	4235	Abandoned-dry.
4133	Dome Nig d-73-H	Oct. 3, 1977	Nov. 20, 1977	4020	Abandoned-dry.
3953	Dome Wintershall W Peejay a-21-G	Feb. 18, 1977	Mar. 2, 1977	4040	Gething gas.
4059	Dome et al Red Creek 11-32-85-21	Aug. 10, 1977	Aug. 30, 1977	5525	Abandoned-dry.
3960	Dome et al Silver d-33-C	Mar. 1, 1977	Mar. 12, 1977	3960	Abandoned-dry.
3880	Dome et al Silver d-39-C	Jan. 17, 1977	Jan. 26, 1977	3500	Bluesky gas.
3952	Dome et al Silver b-68-C	Feb. 19, 1977	Feb. 27, 1977	3550	Abandoned-dry.
3871	Dome Silver b-22-D	Jan. 1, 1977	Jan. 14, 1977	3610	Bluesky gas.
4196	Dome Stoddart 6-17-86-18	Dec. 5, 1977	Dec. 31, 1977	6210	Abandoned-dry.
4185	Dome Total Tupper 6-10-77-14	Nov. 29, 1977	-----	-----	Drilling.
3898	Dome et al Velma d-93-A	Jan. 15, 1977	Jan. 27, 1977	3773	Gething gas.
3922	Dome S Welrus d-83-H	Feb. 14, 1977	Feb. 25, 1977	1920	Abandoned-dry.
4143	Dome Wargen d-75-D	Nov. 6, 1977	Nov. 16, 1977	4275	Abandoned-dry.
3862	Exalta Canhunter Dahl b-88-A	Jan. 29, 1977	Feb. 6, 1977	3220	Bluesky gas.
3863	Exalta Canhunter N Dahl a-87-D	Mar. 8, 1977	Mar. 16, 1977	3204	Bluesky gas.
3860	Exalta Canhunter N Dahl a-21-H	Feb. 27, 1977	Mar. 5, 1977	3150	Bluesky gas.
3861	Exalta Canhunter N Dahl a-65-H	Feb. 26, 1977	Feb. 23, 1977	3200	Abandoned-dry.
3831	Exalta Coseka Kotcho d-55-E	Jan. 15, 1977	Feb. 12, 1977	6842	Slave Point gas.
3832	Exalta Canhunter Ladyfern d-71-G	Dec. 29, 1976	Jan. 9, 1977	4434	Abandoned-dry.
4088	Focus et al Airport 10-28-83-17	Sep. 10, 1977	Oct. 7, 1977	6696	Bluesky gas.
3997	Focus et al Airport 10-32-83-17	May 26, 1977	Jun. 19, 1977	5136	North Pine Oil and Dunlevy gas.
4180	Focus et al Boundary 16-5-84-13	Dec. 2, 1977	Dec. 18, 1977	4540	Gething gas.
3999	Focus et al Fireweed a-21-A	Aug. 16, 1977	Aug. 28, 1977	4348	Abandoned-dry.
4160	Focus Scurry Stoddart A10-22-85-19	Nov. 6, 1977	Nov. 29, 1977	6305	Standing.
4019	Focus et al Stoddart 7-28-85-19	Jul. 21, 1977	Aug. 12, 1977	6363	Abandoned-dry.
4130	Focus Scurry W Stoddart 6-3-86-20	Oct. 13, 1977	Nov. 3, 1977	6275	Bellay oil.
3937	GAO Pacific Cabin d-91-C	Feb. 16, 1977	Mar. 9, 1977	7268	Abandoned-dry.
3958	GAO BP Yoyo c-56-L	Mar. 8, 1977	-----	-----	Drilling.
4069	GPD Eagle 6-32-84-18	Sep. 6, 1977	Sep. 30, 1977	6389	Bellay oil.
4156	Gulf POOC Butler a-65-C	-----	Dec. 13, 1977	-----	Drilling.
3836	Gulf Nig d-24-F	Jan. 9, 1977	Apr. 8, 1977	11725	Baldonnel gas.
4035	Gulf W Nig b-50-C	Sep. 5, 1977	Oct. 2, 1977	5384	Abandoned-dry.
4105	Gulf W Nig b-66-D	Oct. 19, 1977	Dec. 17, 1977	5535	Baldonnel oil.
3891	Gulf Parkland 11-32-81-14	Jan. 19, 1977	Mar. 15, 1977	12045	Abandoned-dry.
4053	Gulf et al Parkland 10-35-81-15	Aug. 17, 1977	Nov. 18, 1977	12420	Webamun gas.

4170	Gulf Peppermint d-37-E	Dec. 19, 1977	-----	-----	Drilling.
3904	Gulf POOC HBOG W Pocketknife d-64-I	Mar. 18, 1977	Aug. 11, 1977	6000	Debolt gas.
4209	Gulf Trutch d-6-I	Dec. 30, 1977	-----	-----	Drilling.
3837	Gulf Trutch b-65-J	Dec. 17, 1976	Mar. 8, 1977	6000	Debolt gas.
3940	HB Burn d-35-C	Feb. 13, 1977	Mar. 7, 1977	4373	Abandoned-dry.
3930	HB Fina Pan Canadian July b-7-A	Feb. 10, 1977	Mar. 9, 1977	6900	Pine Point and Jean Marie gas.
4092	HB et al Pocketknife c-38-L	Nov. 25, 1977	-----	-----	Drilling.
4020	Highfield et al Red Creek 6-3-85-21	Jul. 13, 1977	Aug. 13, 1977	5277	Abandoned-dry.
85	Highfield et al Red Creek 9-36-85-22	Jun. 29, 1977	Jul. 11, 1977	372	Standing.
4147	Huber Buick b-90-L	Oct. 31, 1977	Nov. 13, 1977	3600	Abandoned-dry.
4008	Huber W Stoddart 7-21-87-20	Jul. 27, 1977	Aug. 16, 1977	6431	Doig oil.
4107	Huber W Stoddart 6-22-87-20	Sep. 24, 1977	Oct. 28, 1977	6370	Abandoned-dry.
4206	IOE et al Red Creek 11-25-85-22	Dec. 11, 1977	-----	-----	Drilling.
4052	IOE Red Creek 6-30-85-21	Jul. 31, 1977	Aug. 24, 1977	5785	Abandoned-dry.
3885	Imp Dome et al Junior d-A11-E	Jan. 8, 1977	Feb. 17, 1977	6410	Abandoned-dry.
4087	Imp et al Mica 6-34-81-14	Sep. 9, 1977	Sep. 27, 1977	5115	Boundary oil.
4068	Imp et al Mica 16-34-81-14	Aug. 19, 1977	Sep. 7, 1977	5054	Abandoned-dry.
4013	Ipex et al N Pine 6-22-85-18	Jun. 29, 1977	Jul. 23, 1977	6004	North Pine oil.
3849	Kilo Dome Bulck b-4-H	Jan. 29, 1977	Feb. 5, 1977	3630	Dunlevy gas.
4094	Kilo Dome Bulck b-6-H	Oct. 2, 1977	Oct. 14, 1977	3650	Abandoned-dry.
3969	Kilo Buick d-49-I	Mar. 3, 1977	Mar. 19, 1977	4800	Abandoned-dry.
3973	Kilo Buick d-A57-I	Mar. 21, 1977	Apr. 12, 1977	4620	Doig oil.
3996	Kilo Buick d-58-I	Jun. 7, 1977	Jun. 25, 1977	4630	Doig oil.
4065	Kilo Buick d-59-I	Oct. 17, 1977	Nov. 6, 1977	4775	Dunlevy gas.
3992	Kilo Buick d-68-I	May 21, 1977	Jun. 6, 1977	4730	Doig oil.
4158	Kilo E Rigel 11-8-88-16	Nov. 7, 1977	Nov. 17, 1977	3550	Abandoned-dry.
4169	Kilo Scurry Stoddart 11-18-85-18	Nov. 19, 1977	Dec. 26, 1977	6315	Bellay gas.
4075	Kilo Stoddart 6-19-85-18	Sep. 2, 1977	Sep. 24, 1977	6211	Bellay and Cecil gas.
4166	Kilo et al Stoddart 10-13-85-19	Nov. 14, 1977	Dec. 11, 1977	6050	Bellay gas.
3990	Kilo Stoddart 11-24-85-19	Jun. 14, 1977	Jul. 1, 1977	6040	Bellay gas.
4115	Kilo W Stoddart A 7-7-87-20	Dec. 6, 1977	Dec. 21, 1977	5500	Abandoned-dry.
4215	Kilo et al S Wargen b-10-J	Dec. 29, 1977	-----	-----	Drilling.
3925	Mobil Fontas d-79-E	Feb. 21, 1977	Mar. 22, 1977	7400	Abandoned-dry.
3858	Mobil Sahtaneh a-45-I	Dec. 31, 1976	Mar. 3, 1977	6702	Slave Point gas.
3981	Mobil Sahtaneh d-35-J	Mar. 20, 1977	Dec. 20, 1977	7015	Abandoned-dry.
4193	Mobil Sierra a-76-C	Dec. 13, 1977	-----	-----	Drilling.
4095	Mobil Sierra a-89-C	Oct. 6, 1977	Nov. 26, 1977	7413	Pine Point gas.
3854	Mobil Sierra d-90-C	Dec. 17, 1976	Feb. 14, 1977	7206	Pine Point gas.
4182	Mobil S Sierra d-64-K	Dec. 5, 1977	-----	-----	Drilling.
3911	Monsanto Scurry Cecil 6-6-84-17	Jan. 23, 1977	Feb. 11, 1977	5110	Abandoned-dry.
3943	Monsanto Cecil 16-6-85-17	Feb. 13, 1977	Feb. 23, 1977	4450	North Pine gas.
3867	Monsanto CPOG Cecil 6-7-85-17	Dec. 18, 1976	Jan. 20, 1977	5995	North Pine gas.
4018	Monsanto Cecil 6-20-85-17	Jul. 20, 1977	Aug. 11, 1977	6073	Abandoned-dry.
4023	Murphy N Boundary 16-19-87-14	Aug. 20, 1977	Aug. 30, 1977	4700	Halfway oil.

TABLE 4-3 - WELLS DRILLED AND DRILLING, 1977 - *Continued*

Well thorization Number	Well Name	Date Spudded	Date Rig Released	Total Depth (Feet)	Status at December 31, 1977
4024	Murphy N Boundary 6-29-87-14	Aug. 2, 1977	Aug. 17, 1977	4700	Halfway gas.
4084	Murphy Deds b-86-J	Sep. 9, 1977	Sep. 23, 1977	4025	Bluesky gas.
4109	Norcen S Boundary 7-31-83-14	Oct. 15, 1977	Oct. 31, 1977	4375	Abandoned-dry.
3760	Numac PreCambrian Rigel 6-29-87-16	Nov. 28, 1977	Dec. 18, 1977	4445	Abandoned-dry.
4192	OIL et al Bulck d-37-C	Dec. 4, 1977	-----	-----	Drilling.
4049	OIL et al W Bulck b-8-C	Sep. 9, 1977	Sep. 25, 1977	4850	Dunlevy gas.
4117	OIL et al W Bulck b-50-C	Oct. 4, 1977	Oct. 15, 1977	3654	Dunlevy gas.
4124	Ocelot Bulrush d-76-F	Oct. 15, 1977	Oct. 25, 1977	3730	Halfway oil.
4155	Ocelot Nig b-30-B	Nov. 9, 1977	Nov. 29, 1977	4440	Baldonnel gas.
4178	Pacific WP Airport 10-27-83-17	Nov. 24, 1977	Dec. 8, 1977	3448	Abandoned-dry.
4149	Pacific WP Airport 6-33-83-17	Nov. 8, 1977	Nov. 18, 1977	3371	Bluesky gas.
4007	Pacific WP Airport 6-34-83-17	Jun. 22, 1977	Jul. 6, 1977	3296	Bluesky gas.
4103	Pacific WP Airport 6-35-83-17	Oct. 23, 1977	Nov. 5, 1977	3271	Standing.
4051	Pacific WP Airport 6-36-83-17	Jul. 29, 1977	Aug. 7, 1977	3150	Bluesky gas.
3991	Pacific et al Boundary 9-9-85-14	Jun. 21, 1977	Sep. 1, 1977	9680	Dunlevy and Baldonnel gas.
3834	Pacific HB Branot a-15-G	Dec. 12, 1976	Jan. 25, 1977	4495	Abandoned-dry.
3934	Pacific Buffalo d-93-J	Mar. 9, 1977	Mar. 18, 1977	537	Abandoned-junked.
4043	Pacific Burch c-31-K	Oct. 1, 1977	-----	-----	Drilling.
4077	Pacific Imp Clarke a-4-D	Sep. 7, 1977	Oct. 7, 1977	6760	Abandoned-dry.
3910	Pacific Imp Clarke c-91-I	Jan. 31, 1977	Mar. 6, 1977	6290	Slave Point gas.
4004	Pacific et al Clarke a-51-J	Jul. 27, 1977	Aug. 27, 1977	6288	Slave Point gas.
3961	Pacific Imp Clarke d-72-L	Mar. 8, 1977	Apr. 5, 1977	6232	Slave Point gas.
4116	Pacific Imp Clarke c-75-L	Oct. 10, 1977	Nov. 3, 1977	6290	Slave Point gas.
4167	Pacific Imp Clarke d-96-L	Nov. 13, 1977	Dec. 14, 1977	6351	Slave Point gas.
67	Pacific Ft St John 4-32-83-18	Dec. 15, 1977	Dec. 23, 1977	321	Abandoned-dry.
4082	Pacific WP Ft St John 10-15-84-19	Sep. 10, 1977	Sep. 28, 1977	5100	North Pine oil, Halfway and Baldonnel gas.
3975	Pacific Prov Fox d-60-D	Mar. 20, 1977	Apr. 4, 1977	4060	Baldonnel oil.
3766	Pacific Norcen Horn a-26-A	Sep. 14, 1977	Nov. 29, 1977	11282	Halfway gas.
4028	Pacific N Julienne b-94-H	Aug. 13, 1977	Oct. 30, 1977	6206	Abandoned-dry.
4252	Pacific Union Kelly b-28-I	Dec. 28, 1977	-----	-----	Drilling.
3959	Pacific Kestrel d-39-J	Mar. 6, 1977	Mar. 18, 1977	4003	Halfway gas.
3905	Pacific Kestrel d-31-K	Jan. 24, 1977	Feb. 5, 1977	3435	Debolt gas.
3754	Pacific GAO E Kotcho a-63-J	Jan. 23, 1977	Jan. 29, 1977	2150	Abandoned-dry.
3872	Pacific Nig a-1-B	Dec. 29, 1976	Jan. 18, 1977	4425	Abandoned-dry.
3890	Pacific HB Ojay b-29-L	Feb. 22, 1977	Sep. 2, 1977	10977	Abandoned-dry.
4066	Pacific Osprey b-26-J	Aug. 28, 1977	Sep. 4, 1977	3410	Bluesky gas.
4120	Pacific Osprey a-29-J	Oct. 8, 1977	Oct. 20, 1977	3985	Bluesky gas.

4067	Pacific Osprey d-37-J	Sep. 9, 1977	Sep. 20, 1977	3437	Bluesky gas.
3853	Pacific Osprey d-57-J	Jan. 5, 1977	Jan. 20, 1977	3990	Halfway and Gething gas.
3998	Pacific WP Parkland 7-30-81-15	Jun. 25, 1977	Jul. 21, 1977	7125	Belloy oil.
3873	Pacific et al Parkland 11-32-81-15	Jan. 2, 1977	Apr. 6, 1977	11805	Belloy gas.
3826	Pacific et al Peajay b-40-E	Feb. 9, 1977	Feb. 18, 1977	3976	Halfway oil.
3887	Pacific WP Pingel 11-17-81-18	Jan. 7, 1977	Jan. 21, 1977	3588	Abandoned-dry.
4071	Pacific Pingel 6-25-81-18	Aug. 19, 1977	Aug. 31, 1977	3385	Abandoned-dry.
3920	Pacific Redeye a-67-I	Feb. 21, 1977	Mar. 3, 1977	4100	Bluesky gas.
4038	Pacific Stoddart 16-18-86-19	Aug. 8, 1977	Aug. 18, 1977	4275	Baldonnel gas.
3985	Pacific Stoddart 16-19-86-19	Mar. 23, 1977	Apr. 3, 1977	4170	Cecil oil.
3993	Pacific Stoddart 16-13-86-20	Jul. 21, 1977	Aug. 3, 1977	4480	Abandoned-dry.
3919	Pacific et al Suhm d-15-D	Feb. 2, 1977	Feb. 9, 1977	1419	Mississippian gas.
3978	Pacific et al Swampfire a-86-B	Mar. 10, 1977	Mar. 18, 1977	2452	Abandoned-dry.
3954	Pacific et al E Tooga c-67-H	Mar. 1, 1977	Mar. 7, 1977	2220	Abandoned-dry.
3660	Pacific Yoyo c-36-I	Dec. 28, 1977	-----	-----	Drilling.
4032	Pengaea et al Maple c-18-E	Jul. 17, 1977	Jul. 28, 1977	4273	Baldonnel gas.
3889	Pengaea et al N Nettle c-98-A	Jan. 15, 1977	Jan. 24, 1977	3970	Gething gas.
3866	Pengaea et al Nig a-83-J	Dec. 21, 1976	Jan. 9, 1977	4400	Abandoned-dry.
3948	Pembina Numac Helmet a-1-K	Mar. 14, 1977	Apr. 25, 1977	6026	Slave Point gas.
3868	Pembina Laprise c-56-I	Apr. 24, 1977	May 14, 1977	4440	Abandoned-dry.
3907	Pembina W Laprise b-4-J	Mar. 12, 1977	Apr. 17, 1977	5226	Abandoned.
3931	Pembina Pickell c-94-J	Feb. 13, 1977	Feb. 27, 1977	4167	Halfway gas.
4011	Petromark HG Goose 10-32-84-21	Jul. 27, 1977	Aug. 20, 1977	6540	North Pine gas.
3921	Petromark Canhunter E Osborn d-51-J	Feb. 1, 1977	Feb. 20, 1977	5105	Gething oil.
4122	Petromark HG Stoddart 6-35-86-20	Nov. 30, 1977	-----	-----	Drilling.
4112	Petrorep W Stoddart A10-28-86-20	Oct. 2, 1977	Oct. 20, 1977	4596	Charlie Lake gas.
3932	Quasar Chevron et al Etaho d-77-J	Feb. 22, 1977	-----	-----	Drilling.
3814	Quasar Mobil Flatbed c-76-D	Nov. 18, 1976	Mar. 25, 1977	10565	Abandoned.
4081	Quasar Grizzly d-13-A	Oct. 23, 1977	-----	-----	Drilling.
3903	Quasar Union Kiowee d-19-E	Mar. 3, 1977	Dec. 20, 1977	7230	Slave Point gas.
3845	Quintana Clarke a-17-K	Dec. 18, 1976	Jan. 20, 1977	7022	Abandoned-dry.
3856	Quintana PCP S Helmet a-81-C	Feb. 3, 1977	Mar. 6, 1977	6275	Abandoned-dry.
3894	Quintana Klua d-74-C	Jan. 24, 1977	Mar. 3, 1977	6765	Slave Point gas.
4061	Quintana HBOG Roger d-40-A	Aug. 27, 1977	Oct. 19, 1977	7130	Pine Point gas.
4099	SOC et al Fireweed a-41-A	Oct. 28, 1977	Nov. 12, 1977	4255	Abandoned-dry.
4102	SOC et al Fireweed c-54-A	Oct. 14, 1977	Oct. 25, 1977	4172	Dunlevy gas.
3842	SOC et al Graham b-A21-D	Jan. 17, 1977	Feb. 5, 1977	3280	Bluesky gas.
3874	SOC et al Graham c-32-D	Feb. 7, 1977	Mar. 2, 1977	3400	Gething gas.
238	SOC et al Graham c-53-D	Dec. 9, 1976	Jan. 27, 1977	822	Debolt gas.
4100	SOC et al Inga d-53-B	Nov. 15, 1977	Nov. 28, 1977	4150	Dunlevy gas.
4093	SOC et al Inga a-67-B	Sep. 19, 1977	Oct. 10, 1977	4110	Dunlevy gas.
4191	Sabine Wainoco Numac Fox 11-11-86-21	Dec. 14, 1977	-----	-----	Drilling.
4108	Sabre Canhunter Coplin A8-17-85-23	Sep. 23, 1977	Oct. 12, 1977	4263	Abandoned-dry.
4097	Sabre Canhunter Sojer a-47-D	Oct. 17, 1977	Nov. 16, 1977	5024	Halfway gas.

TABLE 4-3 - WELLS DRILLED AND DRILLING, 1977 - Continued

Well Authorization Number	Well Name	Date Spudded	Date Rig Released	Total Depth (Feet)	Status at December 31, 1977
3957	Sceptre et al Buick c-32-B	Mar. 27, 1977	Apr. 4, 1977	3780	Dunlevy gas.
4047	Sceptre et al Buick d-71-B	Sep. 11, 1977	Sep. 22, 1977	3812	Dunlevy gas.
3938	Sceptre et al Buick b-84-B	Mar. 19, 1977	Mar. 29, 1977	3830	Abandoned-dry.
4012	Sceptre et al Buick d-39-G	Aug. 17, 1977	Sep. 9, 1977	4978	Abandoned-dry.
3939	Sceptre et al E Siphon 7-5-87-15	Mar. 18, 1977	Mar. 26, 1977	4000	Baldonnel gas.
3994	Scurry CanPlac Eagle 16-21-84-18	Jun. 21, 1977	Jul. 16, 1977	6110	Belloy oil.
4058	Scurry CanPlac Eagle 16-27-84-18	Aug. 17, 1977	Aug. 28, 1977	4330	Abandoned-junked.
4085	Scurry CanPlac Eagle A16-27-84-18	Aug. 30, 1977	Sep. 16, 1977	6127	Belloy oil.
4153	Scurry CEGO Eagle 16-31-84-18	Nov. 16, 1977	Dec. 5, 1977	6190	Belloy oil.
4027	Scurry CanPlac Eagle 6-35-84-18	Jul. 19, 1977	Aug. 14, 1977	6089	Belloy oil.
4187	Scurry CEGO Eagle 15-25-84-19	Dec. 10, 1977	-----	-----	Drilling.
4006	Scurry CEGO Eagle 16-35-84-19	Jun. 14, 1977	Jul. 7, 1977	6335	Belloy oil.
3967	Scurry et al Eagle 6-2-85-18	Mar. 9, 1977	Apr. 4, 1977	5990	Abandoned-dry.
4010	Scurry CEGO Eagle 6-6-85-18	Jul. 9, 1977	Jul. 27, 1977	6250	Belloy oil.
3928	Scurry Murphy Eagle 6-10-85-18	Feb. 7, 1977	Mar. 7, 1977	6060	Belloy gas.
3989	Scurry CEGO Eagle A6-1-85-19	May 19, 1977	Jun. 9, 1977	6220	Belloy oil.
4154	Scurry CEGO Eagle 6-11-85-19	Nov. 11, 1977	Dec. 2, 1977	6333	Belloy oil.
4072	Scurry CanPlac W Eagle 6-31-84-18	Sep. 28, 1977	Oct. 13, 1977	6125	Belloy oil.
4111	Scurry CanPlac W Eagle 6-25-84-19	Oct. 16, 1977	Nov. 13, 1977	6260	Belloy oil.
4076	Scurry CanPlace W Eagle 6-12-85-19	Sep. 1, 1977	Oct. 8, 1977	6110	Belloy oil.
4128	Scurry et al Maillard 16-6-85-19	Oct. 12, 1977	Nov. 8, 1977	6497	Abandoned-dry.
4037	Scurry Elf Stoddart 16-16-85-19	Jul. 29, 1977	Aug. 26, 1977	6460	Abandoned-dry.
3917	Shell QuIntana Jackfish b-64-K	Dec. 29, 1977	-----	-----	Drilling.
4163	Shell Killkarran 10-23-77-14	Nov. 9, 1977	-----	-----	Drilling.
4135	Slebens et al Gopher 7-22-85-16	Oct. 29, 1977	Nov. 25, 1977	6145	Abandoned-dry.
4126	Signalta et al N Bulck a-29-F	Oct. 19, 1977	Oct. 20, 1977	3820	Abandoned-dry.
4050	Signalta Cache 10-19-88-22	Aug. 16, 1977	Sep. 3, 1977	4880	Abandoned-dry.
3915	Skelly Getty CS Commotion a-23-D	Jun. 15, 1977	-----	-----	Drilling.
4172	Skye et al Bulck d-46-I	Dec. 1, 1977	Dec. 21, 1977	4618	Dolg oil.
3963	Skye et al Fireweed d-53-H	Jun. 20, 1977	Jul. 5, 1977	4200	Abandoned-dry.
4045	Sun Fina E Inga 10-28-87-22	Aug. 24, 1977	Oct. 2, 1977	6820	Abandoned-dry.
3950	Sun E Rigel 11-17-88-16	Aug. 16, 1977	Aug. 27, 1977	4295	Dunlevy gas.
3949	Sun E Rigel 6-20-88-16	Oct. 6, 1977	Oct. 14, 1977	3570	Standing.
4041	Sundance Inga 7-22-88-23	Jul. 29, 1977	Aug. 26, 1977	5800	Abandoned-dry.
4106	Sundance W Milligan c-11-F	Oct. 24, 1977	Nov. 6, 1977	3870	Abandoned-dry.
4138	Sundance Nig b-84-C	Dec. 1, 1977	-----	-----	Drilling.
4139	Sundance Nig a-85-J	Nov. 14, 1977	Nov. 27, 1977	4542	Abandoned-dry.

4091	Texex et al Beavertall c-97-C	Nov. 29, 1977	Dec. 15, 1977	4240	Halfway gas.
3968	Texex Gulf N Boundary 8-20-87-14	Sep. 13, 1977	Sep. 26, 1977	4635	Abandoned-dry.
4022	Texex et al N Boundary 16-30-87-14	Oct. 4, 1977	Oct. 18, 1977	4577	Abandoned-dry.
4063	Texex et al Bulck c-56-J	Oct. 4, 1977	Oct. 22, 1977	5060	Baldonnel oil.
3851	Total et al Helmet c-60-G	Dec. 28, 1976	Jan. 26, 1977	6403	Abandoned-dry.
4137	Turbo Ranger Gopher 6-25-85-16	Nov. 4, 1977	Dec. 4, 1977	6053	Halfway gas.
3796	Union et al Carlbou b-10-J	Dec. 12, 1976	Apr. 8, 1977	12188	Abandoned-dry.
3875	Union Sahtanah d-73-J	Jan. 11, 1977	Feb. 13, 1977	7350	Abandoned-dry.
4096	Uno-Tex BP Notsah b-7-L	Dec. 17, 1977	-----	-----	Drilling.
4046	WCE W Paejay d-71-G	Aug. 1, 1977	Aug. 13, 1977	3914	Abandoned-dry.
4036	Wainoco CZAR Cache c-A16-L	Jul. 19, 1977	Aug. 1, 1977	4796	Coplin gas.
4141	Wainoco et al Cache d-37-L	Oct. 20, 1977	Nov. 20, 1977	5416	Charlie Lake gas.
4114	Wainoco et al W Eagle 6-3-85-19	Oct. 10, 1977	Nov. 11, 1977	6630	Abandoned-dry.
4190	Wainoco Flatrock 10-14-84-17	Dec. 12, 1977	Dec. 25, 1977	4790	Standing.
4189	Wainoco Monias 6-22-82-21	Dec. 28, 1977	-----	-----	Drilling.
4152	Wainoco Monias 6-23-82-21	Nov. 16, 1977	Dec. 14, 1977	4851	Halfway gas.
4159	Wainoco et al Pluto 7-34-85-17	Nov. 15, 1977	Dec. 7, 1977	6130	Abandoned-dry.
4054	Wainoco Ashland Pluto 11-3-86-17	Aug. 5, 1977	Aug. 24, 1977	5900	Abandoned-dry.
3848	Westcoast et al Black a-45-F	Dec. 28, 1976	Jan. 13, 1977	4125	Charlie Lake gas.
3859	Westcoast et al Junior d-78-J	Jan. 1, 1977	Feb. 20, 1977	6725	Abandoned-dry.
4214	Westcoast Numac Pickell b-30-D	Dec. 28, 1977	-----	-----	Drilling.
4005	Westcoast et al Pluto 6-11-86-17	Jun. 22, 1977	Jul. 18, 1977	6025	Abandoned-dry.
3886	Westcoast Numac Silver d-19-B	Jan. 16, 1977	Jan. 31, 1977	4064	Bluesky gas.
3946	Westcoast Numac Silver d-51-C	Feb. 17, 1977	Mar. 1, 1977	3820	Abandoned-dry.
3896	Westcoast et al Velma b-2-I	Feb. 3, 1977	Feb. 14, 1977	3930	Abandoned-dry.
3972	Westcoast et al S Wargen d-13-J	Mar. 4, 1977	Mar. 20, 1977	4135	Abandoned-dry.
3974	Woods Fina Bearberry d-93-L	Mar. 13, 1977	Mar. 29, 1977	5209	Abandoned-dry.
4073	Woods Bulck b-44-D	Aug. 20, 1977	Aug. 30, 1977	3552	Dunlevy gas.
4129	Woods Fina N Cache c-58-L	Nov. 1, 1977	Nov. 25, 1977	5470	Halfway gas.
4174	Woods Wainoco Monias 7-26-82-21	Dec. 28, 1977	-----	-----	Drilling.
4001	Woods Wainoco Ashland Oak 8-7-86-17	Jul. 14, 1977	Jul. 29, 1977	4672	Abandoned-dry.
4055	Woods et al Oak 16-12-86-18	Aug. 5, 1977	Aug. 18, 1977	4622	Water Disposal.
4048	Woods Anadarko Siphon 6-32-86-16	Nov. 21, 1977	Dec. 13, 1977	4525	Siphon and Cecil gas.
3852	Woods et al E Siphon 10-10-87-15	Jan. 12, 1977	Jan. 26, 1977	4516	Dunlevy oil.
3869	Woods Two Rivers 6-3-83-16	Dec. 20, 1976	Jan. 14, 1977	4941	Abandoned-dry.
4009	Woods et al Wilder 6-22-83-20	Jul. 25, 1977	Aug. 23, 1977	4457	Wilder oil.

TABLE 4-4 - SUMMARY OF DRILLING AND PRODUCTION STATISTICS, 1977

Well Authorizations	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
Issued	45	37	15	3	15	20	31	30	43	35	35	67	376
Cancelled	-----	-----	1	-----	2	-----	1	-----	-----	4	-----	-----	8
Wells spudded	37	36	34	1	3	18	23	31	30	42	33	38	326
Rigs operated (during month)	39	43	41	24	10	22	30	42	39	42	47	56	651
Rigs operated (at month-end)	34	38	25	6	7	21	27	20	28	34	34	44	-----
Development footage	76 188	61 050	112 250	44 379	4 440	13 860	46 667	133 794	64 060	103 356	94 549	79 005	832 348
Exploratory outpost footage	21 456	46 616	46 117	46 606	11 375	11 366	29 657	56 910	20 131	58 299	90 368	42 784	480 674
Exploratory wildcat footage	19 346	45 061	82 436	30 199	1 605	-----	6 777	17 203	31 758	30 681	12 408	29 528	307 252
Total footage drilled	116 989	152 727	240 803	120 184	17 420	26 216	82 101	207 907	115 949	192 336	197 325	151 317	1 620 274
Wells abandoned	11	12	20	6	2	-----	6	17	6	16	13	9	118
Service wells	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	1
Standing wells	-----	-----	-----	-----	-----	-----	1	1	-----	1	2	1	6
Oil wells completed	1	3	-----	4	-----	4	5	5	4	4	3	5	38
Producible oil wells	702	702	704	710	709	711	715	719	722	727	728	733	-----
Producing oil wells	513	515	511	512	519	512	502	527	533	540	531	527	-----
Production in barrels	1 269 427	1 156 357	1 286 256	1 157 230	1 177 276	888 070	1 170 098	1 196 545	1 146 770	1 151 107	1 108 273	1 153 079	13 839 488
Average daily production	40 949	41 298	41 460	38 574	37 977	28 936	37 745	38 598	38 226	37 132	36 942	37 196	-----
Gas wells completed	16	17	30	10	1	3	6	15	16	15	20	17	165
Producible gas wells	1 062	1 073	1 103	1 138	1 143	1 147	1 149	1 161	1 182	1 198	1 218	1 255	-----
Producing gas wells	398	411	400	432	429	430	402	423	430	454	453	457	-----
Production in MSCF ²	35 043 166	31 763 607	34 994 779	33 567 773	33 389 088	27 213 893	25 643 824	25 442 984	27 801 257	33 932 947	34 891 730	35 914 808	379 599 825
Average daily production	1 130 425	1 134 414	1 128 864	1 118 926	1 077 066	907 130	827 820	820 741	926 708	1 094 611	1 163 058	1 158 542	-----

¹Rigs operated during 1977.²Non-associated gas production only.

NOTE - Each zone of a multiple completion is counted as one well.

TABLE 4-5 - MONTHLY CRUDE-OIL AND CONDENSATE PRODUCTION BY FIELDS AND POOLS, 1977
(Quantities in barrels)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
Aitken Creek-													
Gething	29 492	27 406	26 694	27 836	31 420	24 125	25 688	26 445	24 814	26 126	25 262	23 764	318 072
Gething ¹	111	-----	-----	-----	1 438	1 311	1 491	1 117	1 261	1 327	1 481	1 422	10 959
Field totals	29 603	27 406	26 694	27 836	32 858	25 436	27 179	27 562	26 075	27 453	26 743	25 186	329 031
Bear Flat-North Pine													
Bear Flat-North Pine	1 956	1 563	1 763	982	1 300	1 811	1 623	1 934	2 663	2 301	2 192	2 505	22 593
Beetton River-Halfway	34 856	30 227	28 512	28 020	29 031	23 756	25 292	27 483	25 662	27 624	26 061	26 924	333 448
Beetton River West-Bluesky	27 216	25 950	27 671	25 459	27 995	24 441	21 966	26 840	24 517	26 232	27 936	24 629	310 852
Beeverdam-Halfway ¹	108	128	145	144	160	138	42	-----	-----	123	153	158	1 299
Blueberry-Debolt	29 753	27 232	28 510	18 561	11 736	19 589	25 587	25 854	25 034	25 020	27 961	19 618	284 455
Boundary Lake-													
Baldonnel ¹	431	-----	92	-----	-----	93	-----	-----	-----	-----	-----	-----	616
Cecil	625	437	616	594	651	608	751	574	733	658	669	707	7 623
Boundary Lake	579 110	533 795	592 679	576 449	569 500	352 892	580 651	586 212	571 369	585 641	538 321	565 879	6 632 498
Halfway	4 127	5 014	6 046	6 658	6 276	3 231	2 968	5 798	5 941	5 960	5 463	3 980	61 462
Halfway ¹	-----	-----	541	-----	-----	-----	-----	-----	-----	-----	-----	-----	541
Field totals	584 293	539 246	599 974	583 701	576 427	356 824	584 370	592 584	578 043	592 259	544 453	570 866	6 702 740
Boundary Lake North-													
Halfway	1 578	103	-----	-----	717	675	1 010	1 253	1 006	1 323	1 457	1 079	10 201
Halfway ¹	455	827	459	655	1 076	399	836	717	837	780	434	227	7 702
Field totals	2 033	930	459	655	1 793	1 074	1 846	1 970	1 843	2 103	1 891	1 306	17 903
Buick Creek-													
Bluesky ¹	53	102	122	77	29	54	89	19	35	17	15	109	721
Dunlavy	-----	-----	-----	-----	195	213	254	258	49	-----	-----	-----	969
Dunlavy ¹	587	642	540	652	719	603	437	452	824	615	740	799	7 610
Dolg	-----	452	627	-----	-----	1 671	4 092	1 522	5 487	7 921	781	334	22 887
Field totals	640	1 196	1 289	729	943	2 541	4 872	2 251	6 395	8 553	1 536	1 242	32 187
Bulrush-Halfway	2 750	2 438	2 947	2 608	2 778	2 683	2 764	2 402	2 675	2 494	2 591	2 014	31 144
Cache Creek-Halfway ¹	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	767	310	1 077
Cecil Lake-													
Cecil	6 455	5 918	6 988	727	-----	4 030	4 779	6 313	6 195	7 178	7 077	7 031	62 691
Cecil ¹	-----	1 228	2 072	2 327	936	-----	-----	-----	-----	-----	-----	-----	6 563
North Pine	2 671	2 734	2 868	1 514	1 709	1 983	3 726	3 115	4 164	2 214	3 940	4 160	34 796
Field totals	9 126	9 880	11 926	4 668	2 645	6 013	8 505	9 428	10 359	9 392	11 017	11 191	104 050
Crush-Halfway	18 500	13 834	14 660	13 026	13 442	11 993	9 990	8 642	4 946	6 456	7 343	7 401	130 233
Currant-Halfway	10 013	8 120	6 727	3 856	-----	2 999	9 718	8 150	6 625	3 812	5 816	5 507	71 343
Eagle-													
Siphon	376	225	799	387	1 577	2 702	1 515	945	1 294	1 188	1 250	1 295	13 553
Belloy	19 105	14 630	23 723	9 017	16 675	19 842	26 622	30 233	36 917	35 668	46 308	49 697	329 437
Belloy ¹	-----	-----	-----	-----	-----	-----	-----	48	-----	-----	-----	-----	48
Field totals	19 481	14 855	24 522	9 404	18 252	22 544	28 137	31 226	38 211	38 856	47 558	50 992	342 038

PETROLEUM AND NATURAL GAS STATISTICS

¹Condensate.

TABLE 4-5 - MONTHLY CRUDE-OIL AND CONDENSATE PRODUCTION BY FIELDS AND POOLS, 1977 - *Continued*
(Quantities in barrels)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
Fireweed-Dunlevy ¹	1 348	1 065	1 174	610	1 340	422	853	344	542	220	1 100	697	9 615
Flatrock-													
Boundary Lake	43	-----	-----	-----	214	746	306	402	433	346	-----	-----	2 490
Halfway ¹	945	991	1 451	1 176	1 318	1 270	1 205	1 090	1 622	1 189	1 186	1 171	14 614
Field totals	988	991	1 451	1 176	1 532	2 016	1 511	1 492	2 055	1 535	1 186	1 171	17 104
Fort St. John-Pingel	3 104	5 490	4 234	4 097	4 597	4 000	2 746	3 629	3 698	3 670	3 855	2 755	45 875
Inga-Inga	151 609	133 389	153 205	129 185	135 501	70 285	122 098	123 290	106 766	119 574	114 731	135 434	1 495 067
Jedney-													
Baldonne ¹	54	63	64	51	120	1	57	60	97	120	70	28	785
Halfway ¹	25	14	15	49	38	-----	17	26	30	47	21	12	294
Field totals	79	77	79	100	158	1	74	86	127	167	91	40	1 079
Laprise Creek-Baldonne ¹	-----	-----	-----	-----	-----	-----	-----	-----	112	100	100	-----	312
Mica-													
Mica	1 451	1 519	1 775	292	1 394	1 410	1 591	450	1 855	1 378	874	1 772	16 761
Confidential	-----	-----	-----	-----	-----	-----	-----	-----	-----	127	1 399	1 096	2 622
Field totals	1 451	1 519	1 775	292	1 394	1 410	1 591	450	1 855	1 505	2 273	2 868	18 383
Mike-Gething	2 192	1 894	3 839	99	-----	-----	-----	-----	-----	-----	-----	-----	3 411
Milligan-Halfway	74 039	64 574	75 941	64 182	63 545	63 220	62 812	57 359	49 345	46 263	41 013	37 150	699 443
Nig Creek-													
Baldonne ¹	-----	-----	-----	-----	70	241	-----	-----	-----	-----	-----	-----	311
Baldonne ¹	474	456	415	337	443	410	469	486	372	476	284	79	4 701
Field totals	474	456	415	337	513	651	469	486	372	476	284	79	5 012
North Pine-Confidential	-----	-----	-----	-----	-----	-----	-----	469	57	220	-----	-----	900
Oak-													
Cecil ¹	-----	286	380	130	86	160	141	122	332	221	292	284	2 434
Halfway	11 928	11 037	12 251	9 662	12 196	9 026	11 419	10 575	10 638	10 665	8 438	7 010	124 845
Halfway ¹	446	1 673	4 332	3 818	3 497	2 713	153	1 695	1 892	2 580	4 911	3 031	30 741
Field totals	12 374	12 996	16 963	13 610	15 779	11 899	11 713	12 392	12 862	13 466	13 641	10 325	158 020
Osprey-Halfway	1 977	1 776	2 654	1 478	-----	-----	503	227	2 977	4 130	3 385	3 440	22 547
Peajay-													
Halfway	138 690	132 423	144 646	127 367	132 635	126 354	131 311	123 207	107 965	108 670	95 734	103 992	1 472 994
Halfway ¹	-----	64	45	54	62	5	15	54	34	3	116	-----	452
Field totals	138 690	132 487	144 691	127 421	132 697	126 359	131 326	123 261	107 999	108 673	95 850	103 992	1 473 446
Peajay West-Halfway	-----	-----	-----	-----	-----	-----	341	153	1 858	2 065	1 640	1 942	7 999
Red Creek-Dolg	1 764	1 130	1 071	509	195	-----	-----	1 522	751	59	-----	-----	7 001
Rigel-Dunlevy	3 551	3 065	3 223	2 242	3 457	2 364	3 415	3 194	2 446	3 250	3 162	3 131	36 500
Silverberry-Coplin ¹	178	88	79	-----	152	148	97	10	161	172	131	-----	1 215
Siphon-													
Dunlevy ¹	28	-----	67	36	37	14	34	32	11	57	47	63	426
Siphon ¹	151	158	201	103	129	20	77	104	53	34	47	17	1 094
Halfway ¹	238	197	481	432	413	163	306	306	213	292	252	331	3 622
Field totals	415	355	749	571	579	197	417	442	277	383	346	411	5 142

Siphon East—Bluesky ¹	174	62	-----	109	109	53	-----	30	91	106	74	48	856
Stoddart—													
Cecil	2 218	103	-----	535	2 403	2 411	6 242	4 082	4 943	5 186	4 984	4 762	37 869
Belloy	2 369	2 147	2 278	1 129	2 211	2 094	2 287	2 178	2 109	2 199	2 155	1 936	25 092
Belloy ¹	179	146	163	112	98	108	141	137	38	70	127	103	1 422
Field totals	4 766	2 396	2 441	1 776	4 712	4 613	8 670	6 397	7 090	7 455	7 266	6 801	64 383
Stoddart West—													
Belloy	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	92	92
Belloy ¹	3 388	2 469	3 546	2 978	3 504	3 105	3 974	4 388	3 657	3 196	3 875	3 860	41 940
Field totals	3 388	2 469	3 546	2 978	3 504	3 105	3 974	4 388	3 657	3 196	3 875	3 952	42 032
Velma—Charlie Lake	864	886	875	-----	-----	-----	-----	-----	-----	-----	-----	-----	2 625
Weasel—													
Halfway	82 470	72 717	81 983	78 484	79 788	59 619	45 980	66 994	69 760	47 431	68 699	69 451	823 376
Halfway ¹	-----	-----	45	-----	-----	-----	-----	-----	-----	-----	-----	-----	45
Field totals	82 470	72 717	82 028	78 484	79 788	59 619	45 980	66 994	69 760	47 431	68 699	69 451	823 421
Weasel West—Halfway	5 798	6 098	6 698	2 478	1 030	4 753	7 216	7 061	6 364	6 052	6 241	6 374	67 163
Wildmint—Halfway	8 653	11 591	13 525	12 713	15 354	14 939	14 349	18 072	15 715	14 076	19 121	16 293	174 401
Willow—													
Gething	1 427	1 284	1 409	1 222	1 383	1 226	1 264	1 283	1 255	1 159	1 025	987	14 924
Halfway ¹	133	237	270	210	16	184	149	143	228	240	183	212	2 175
Field totals	1 560	1 521	1 679	1 432	1 399	1 410	1 413	1 426	1 483	1 399	1 178	1 199	17 099
Wolf—Halfway	5 697	5 156	4 733	5 862	6 301	6 138	7 222	7 202	7 038	6 239	5 239	4 532	71 359
Other areas—													
Belloy	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	475	841	1 316
Confidential	-----	-----	88	-----	-----	-----	-----	1 223	706	532	13	-----	2 562
Field totals	-----	-----	88	-----	-----	-----	-----	1 223	706	532	488	841	3 878
Totals—													
Crude	1 269 427	1 156 367	1 285 256	1 157 230	1 177 276	868 070	1 170 098	1 196 545	1 146 770	1 151 107	1 112 611	1 153 079	13 843 826
Condensate	9 504	10 896	16 699	14 060	15 720	11 374	10 583	11 380	12 442	11 985	16 376	12 861	153 880
Crude and condensate	1 278 931	1 167 263	1 301 955	1 171 290	1 192 996	879 444	1 180 681	1 207 925	1 159 212	1 163 092	1 128 987	1 165 940	13 997 706

¹Condensate.

TABLE 4-6 — MONTHLY NONASSOCIATED AND ASSOCIATED GAS PRODUCTION BY FIELDS AND POOLS, 1977
(Volumes in MSCF at 14.65 psia and 60° F.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
Altken Creek—													
Gething	32 420	-----	-----	-----	94 951	128 123	160 439	100 239	99 330	98 877	92 444	99 865	906 488
Gething ¹	172 603	127 656	155 983	218 690	222 494	202 769	208 340	226 798	227 777	239 974	222 066	228 813	2 453 983
Field totals	205 023	127 656	155 983	218 690	317 445	330 892	368 779	327 037	327 107	338 851	314 510	328 478	3 360 451
Bear Flat—North Pine¹													
Bear Flat—North Pine ¹	21 498	17 699	21 040	12 777	10 827	14 596	13 476	37 698	49 050	48 293	46 078	5 280	346 833
Beaton River—Halfway¹													
Beaton River—Halfway ¹	16 999	10 234	11 262	8 095	8 564	6 630	7 032	8 358	7 386	7 508	7 295	6 514	105 877
Beaton River West—Bluesky¹													
Beaton River West—Bluesky ¹	13 429	8 328	8 571	7 690	8 593	7 855	7 051	8 966	7 251	8 223	8 378	7 458	101 793
Beaverdam—Halfway													
Beaverdam—Halfway	48 585	66 287	69 992	68 328	43 589	68 077	70 676	43 602	-----	55 113	69 598	71 642	672 489
Beaver River—													
Mattson													
Mattson	-----	-----	-----	-----	-----	-----	-----	-----	90 200	206 188	199 878	214 450	710 514
Nahanni													
Nahanni	311 599	209 820	200 620	134 040	131 156	105 304	70 955	107 042	136 273	92 051	79 833	57 202	1 634 895
Confidential													
Confidential	-----	-----	-----	-----	-----	49 711	88 280	87 745	17 600	141 793	55 396	49 184	469 709
Field totals	311 599	209 820	200 620	134 040	131 156	155 015	159 235	174 787	243 073	440 032	334 905	320 836	2 815 118
Beavertail—Gething													
Beavertail—Gething	426 707	388 189	409 319	362 863	296 280	406 370	381 893	304 198	308 791	363 558	356 817	356 038	4 361 023
Bag—													
Baldonnel													
Baldonnel	279 002	271 005	280 356	241 326	118 053	65 861	208 437	148 066	192 654	191 902	227 732	285 083	2 509 484
Halfway													
Halfway	258 066	218 962	257 206	204 965	101 475	57 943	197 125	192 252	203 787	193 383	211 202	151 975	2 248 341
Field totals	537 075	489 967	537 562	446 291	219 528	782 565	405 562	340 318	396 441	385 285	438 934	437 058	4 757 825
Blueberry—													
Dunleavy													
Dunleavy	67 263	61 845	65 230	62 622	68 111	52 983	53 015	59 596	65 429	58 690	62 677	67 291	744 752
Deboit¹													
Deboit ¹	90 487	76 367	93 386	78 446	181 848	86 895	105 979	103 579	82 827	122 105	135 609	140 183	1 287 711
Field totals	157 750	138 212	158 616	141 068	249 959	139 878	158 994	699 175	118 256	180 705	198 286	207 474	2 012 463
Blueberry West—Baldonnel													
Blueberry West—Baldonnel	-----	-----	1 740	11 238	10 217	-----	7 869	16 629	20 788	21 296	22 119	22 923	134 819
Boundary Lake—													
Gething													
Gething	80 607	63 815	65 362	57 566	63 687	12 432	54 702	73 076	58 615	55 011	52 515	55 766	673 154
Dunleavy													
Dunleavy	-----	-----	-----	375	-----	-----	-----	-----	-----	-----	-----	-----	375
Baldonnel													
Baldonnel	72 313	70 751	77 429	65 945	68 952	8 199	63 917	81 323	76 142	73 594	45 301	47 139	751 005
Cecil¹													
Cecil ¹	306	191	310	290	436	278	474	125	291	254	271	255	3 472
Boundary Lake													
Boundary Lake	-----	-----	-----	1 806	-----	-----	-----	-----	-----	-----	-----	-----	1 806
Boundary Lake¹													
Boundary Lake ¹	251 724	227 844	262 830	240 977	259 872	150 365	239 102	255 818	274 678	283 769	238 423	251 885	2 937 277
Basal Boundary													
Basal Boundary	10 501	10 544	11 142	9 778	9 508	1 262	6 070	9 573	8 629	9 185	9 644	9 927	105 783
Halfway													
Halfway	-----	-----	11 504	-----	-----	-----	-----	-----	-----	-----	-----	-----	11 504
Halfway¹													
Halfway ¹	4 123	4 068	4 970	5 195	5 816	2 198	1 292	4 534	4 792	4 555	4 375	2 949	48 867
Field totals	399 574	377 213	433 547	381 932	408 271	174 734	365 557	424 449	423 147	426 349	350 529	367 921	4 533 223
Boundary Lake North—													
Halfway													
Halfway	88 576	110 696	155 943	133 421	154 169	88 864	130 538	121 661	151 984	127 434	101 742	80 795	1 445 823
Halfway¹													
Halfway ¹	4 013	101	-----	-----	1 329	976	1 296	1 064	1 207	1 335	1 188	943	13 452
Field totals	92 589	110 797	155 943	133 421	155 498	89 840	131 834	122 725	153 191	128 769	102 930	81 738	1 459 275
Bubbles—Baldonnel													
Bubbles—Baldonnel	235 950	201 145	227 714	195 542	200 104	79 998	267 754	241 949	259 830	227 836	141 185	220 097	2 499 104
Suick Creek—													
Bluesky													
Bluesky	137 584	118 036	126 862	124 098	138 910	122 447	58 567	107 357	87 541	124 173	127 570	104 539	1 377 684
Dunleavy													
Dunleavy	993 143	893 940	928 075	863 655	903 582	715 656	695 959	599 154	774 876	813 815	973 180	991 201	10 046 236
Dunleavy¹													
Dunleavy ¹	-----	-----	-----	-----	1 389	1 097	1 147	1 199	483	-----	-----	-----	5 294
Cecil													
Cecil	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	10 341	3 531	13 872
Dolg¹													
Dolg ¹	-----	474	1 105	-----	-----	2 188	14 772	8 201	33 634	60 301	2 778	4 195	127 648
Field totals	1 130 727	1 012 450	1 056 042	987 753	1 043 890	841 388	670 445	715 911	896 504	998 289	1 113 869	1 103 466	11 570 734

Buick Creek North—													
Bluesky	21 762	49 941	89 800	80 289	89 013	83 451	76 551	73 813	58 269	51 276	111 552	100 498	885 215
Dunlevy	155 465	188 290	246 754	223 021	203 958	194 196	147 228	154 258	198 461	212 383	195 831	216 395	2 336 240
Field totals	177 227	238 231	336 554	303 310	292 971	277 647	222 779	228 071	256 730	263 659	307 383	316 893	3 221 455
Buick Creek West—													
Bluesky	98 193	52 749	101 576	117 234	104 277	82 051	99 749	92 920	51 046	143 185	192 184	147 705	1 282 849
Dunlevy	133 288	116 940	134 485	113 488	138 284	124 078	77 239	76 057	115 615	128 784	132 296	123 817	1 414 371
Baldonnel	5 078	4 548	4 619	4 032	6 004	4 698	5 738	4 865	5 323	4 762	3 890	4 890	58 447
Field totals	236 559	174 237	240 680	234 754	248 565	210 827	182 726	173 842	171 984	276 711	328 370	276 412	2 755 667
Bulrush—Halfway ¹	75 156	60 477	78 254	63 652	75 854	62 682	74 896	71 080	55 848	65 329	69 980	43 703	796 911
Cabin—Slave Point	320 883	282 751	328 575	312 564	323 087	317 076	310 647	336 822	308 832	287 192	306 172	323 464	3 758 065
Cache Creek—Coplin—													
Coplin	85 692	87 975	88 676	84 779	76 560	77 785	80 103	74 556	63 759	89 996	89 700	88 199	987 780
Halfway	69 313	111 067	95 697	99 070	118 531	24 083	39 968	62 254	19 634	64 384	114 505	55 991	874 497
Field totals	155 005	199 042	184 373	183 849	195 091	101 868	120 071	136 810	83 393	154 380	204 205	144 190	1 862 277
Cecil Lake—													
Cecil	.....	56 137	58 510	50 962	47 492	22 822	3 071	.....	.....	.....	.....	.....	238 994
Cecil ¹	1 623	1 496	1 746	176	.....	1 114	1 326	1 739	1 744	2 128	2 143	2 104	17 339
North Pine ¹	13 125	12 135	10 603	7 229	8 597	10 119	13 574	9 776	14 126	6 795	12 213	13 902	132 094
Halfway	39 753	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39 753
Field totals	54 501	69 768	70 759	58 367	56 089	34 055	17 971	11 515	16 870	8 923	14 356	16 006	428 180
Clarke Lake—Slave Point	5 820 580	5 185 260	5 704 126	5 311 994	5 385 608	3 939 457	2 506 435	4 024 756	4 738 477	5 677 693	5 252 090	5 262 618	58 809 094
Clarke Lake South—Slave Point	301 201	282 608	313 285	272 516	310 119	64 246	204 191	280 033	257 467	281 733	279 491	308 453	3 152 343
Crush—Halfway ¹	25 155	21 649	27 100	23 982	23 487	21 784	19 587	20 291	17 215	18 448	18 040	19 248	255 956
Curreant—													
Halfway	31 843	27 975	30 857	10 373	.....	12 968	30 459	32 919	28 831	14 993	16 365	21 978	259 561
Halfway ¹	.....	602	3 658	.....	.....	.....	.....	.....	.....	.....	.....	.....	4 260
Field totals	31 843	28 577	34 515	10 373	.....	12 968	30 459	32 919	28 831	14 993	16 365	21 978	263 821
Curreant West—Halfway	104 967	73 651	103 670	91 913	99 580	86 229	60 065	.....	.....	.....	.....	.....	620 075
Eagle—													
Siphon ¹	128	108	683	190	1 065	1 063	682	547	938	1 215	1 109	868	8 596
Belloy	.....	.....	.....	.....	.....	.....	.....	7 700	.....	.....	.....	.....	7 700
Belloy ¹	11 845	9 580	34 477	10 934	11 689	16 146	18 836	20 704	27 526	30 693	33 806	37 143	263 379
Confidential	.....	.....	.....	.....	.....	.....	.....	12 657	.....	.....	.....	.....	12 657
Field totals	11 973	9 688	35 160	11 124	12 754	17 209	19 518	41 608	28 464	31 908	34 915	38 011	292 332
Farrell Creek—													
Charlie Lake	46 481	38 153	46 070	19 169	.....	.....	.....	.....	.....	24 521	68 792	69 909	313 095
Halfway	25 579	21 647	24 660	7 719	.....	.....	.....	.....	.....	2 959	30 613	38 626	161 803
Field totals	72 060	59 800	70 730	26 888	.....	.....	.....	.....	.....	37 480	99 405	108 535	474 898
Fireweed—													
Bluesky	165 781	163 753	174 656	185 925	171 602	78 750	135 281	151 902	187 670	193 754	202 153	203 017	2 014 244
Dunlevy	345 992	342 459	470 756	455 579	466 745	327 375	424 470	353 851	380 812	406 228	383 237	412 969	4 779 473
Baldonnel	.....	.....	.....	5 547	8 028	3 710	5 847	5 513	8 751	6 222	5 922	4 642	54 182
Debolt	43 972	39 874	29 103	19 695	18 342	8 777	14 982	6 712	18 253	15 589	14 941	10 045	240 185
Field totals	555 745	546 086	674 515	666 646	664 717	418 612	580 580	517 978	595 486	621 793	606 253	630 673	7 079 084
Flatrock—													
Boundary Lake ¹	404	.....	.....	.....	601	2 096	1 237	1 625	1 004	802	.....	.....	7 769
Halfway	130 462	145 481	198 804	160 841	188 588	134 385	158 585	228 598	211 689	187 340	233 987	221 392	2 300 122
Field totals	130 866	145 481	198 804	160 841	189 189	136 481	259 822	230 223	212 693	188 142	233 987	221 392	2 307 891

¹ Associated Gas.

TABLE 4-6 — MONTHLY NONASSOCIATED AND ASSOCIATED GAS PRODUCTION BY FIELDS AND POOLS, 1977 — *Continued*
(Volumes in MSCF at 14.65 psia and 60° F.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
Flatrock West	-----	-----	-----	913	91 028	71 131	64 253	53 053	25 819	62 576	59 613	75 512	503 898
Fort St. John--													
Dunlevy	-----	-----	-----	-----	3 635	-----	1 861	-----	-----	-----	-----	-----	5 496
Baldonnel	106 395	89 633	100 619	54 986	117 820	17 246	105 949	109 389	114 817	127 386	126 583	129 853	1 200 676
Pingel ¹	16 234	21 415	16 644	14 680	15 343	24 868	11 455	30 428	28 688	34 397	31 379	24 862	270 383
Halfway	149 004	130 977	157 247	126 141	144 694	99 382	139 886	123 825	134 807	114 343	130 408	128 189	1 578 903
Belloy	24 368	18 293	20 492	9 866	5 560	4 658	16 467	23 296	21 734	24 142	23 160	22 191	214 217
Field totals	296 001	260 308	295 002	205 673	287 052	146 154	275 618	286 938	300 046	300 268	311 530	305 085	3 269 675
Fort St. John SE--													
Baldonnel	37 577	21 245	19 348	41 537	31 148	24 066	45 394	28 647	39 967	32 634	30 986	21 720	374 269
Siphon	57 045	77 311	61 344	46 508	44 765	20 746	36 594	52 886	40 064	59 922	57 870	102 267	657 322
Halfway	46 574	34 027	33 948	50 205	45 860	24 084	52 383	40 675	43 327	45 493	46 868	36 144	498 588
Belloy	91 895	85 721	85 114	90 134	81 199	34 462	102 547	71 343	80 757	89 990	79 671	104 664	997 497
Field totals	233 091	218 304	199 764	228 384	202 972	103 358	236 918	193 651	204 115	228 039	214 395	264 795	2 528 676
Gote-Sulphur Point	144 893	134 316	215 783	189 198	229 599	163 449	186 767	250 594	218 167	185 425	172 060	200 947	2 291 198
Grizzly-Dunlevy	-----	-----	-----	-----	-----	-----	-----	3 324	-----	-----	-----	-----	3 324
Grizzly North-Dunlevy	3 450	8 370	-----	-----	-----	-----	-----	4 279	-----	-----	-----	-----	16 099
Gundy Creek--													
Dunlevy	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2 575	2 575
Baldonnel	125 889	124 277	126 828	99 984	107 073	101 455	105 648	91 842	94 411	92 350	93 986	104 630	1 268 373
Field totals	125 889	124 277	126 828	99 984	107 073	101 455	105 648	91 842	94 411	92 350	93 986	107 205	1 270 948
Helmet--													
Jean Marie	-----	-----	8 563	8 648	33 174	35 792	15 999	35 966	33 409	25 654	35 399	-----	232 584
Slave Point	1 333 392	1 170 903	1 289 420	1 678 909	2 303 166	1 738 085	1 938 726	2 484 733	2 250 558	1 828 187	1 629 169	2 081 274	21 726 522
Field totals	1 333 392	1 170 903	1 297 973	1 687 557	2 336 340	1 773 877	1 954 725	2 520 699	2 283 967	1 853 841	1 664 568	2 081 274	21 959 106
Inga--													
Dunlevy	102 686	89 534	125 224	104 509	143 355	77 898	135 060	108 175	128 572	134 438	144 537	143 998	1 437 986
Inga	524 950	494 917	542 876	510 010	617 800	201 259	559 169	534 727	591 974	602 538	572 300	580 426	6 332 946
Inga ¹	218 869	197 799	222 559	195 319	209 526	132 027	206 018	194 553	154 582	172 764	170 636	198 957	2 273 599
Coplin	-----	-----	52 106	70 895	39 807	59 327	49 301	63 473	51 287	59 225	56 011	50 142	501 432
Field totals	846 505	782 250	890 659	861 944	1 041 576	450 991	959 674	886 756	938 601	961 017	946 698	979 392	10 545 983
Jedney--													
Baldonnel	637 241	569 685	608 802	593 013	613 002	199 381	565 513	517 809	503 185	564 783	552 416	591 426	6 516 255
Halfway	526 793	501 692	499 571	525 899	512 194	163 054	445 916	380 218	332 974	440 424	487 867	518 800	5 335 402
Field totals	1 164 034	1 071 377	1 108 373	1 118 912	1 125 196	362 435	1 011 429	898 027	836 169	1 005 207	1 040 283	1 110 225	11 851 657
Julienne Creek-Halfway	39 435	33 530	38 929	28 574	33 500	10 530	4 619	-----	-----	34 980	31 224	20 906	276 227
Julienne Creek S-Confidential	-----	-----	-----	-----	24 329	14 242	-----	10 236	-----	129 140	106 746	-----	333 567
Kobes-Townsend--													
Dunlevy	16 600	14 449	20 073	11 015	9 297	4 250	1 830	-----	731	11 860	7 702	11 949	109 556
Charlie Lake	36 127	28 281	33 455	16 257	10 687	6 847	1 571	-----	-----	12 039	19 366	16 201	180 831
Halfway	240 217	168 081	243 431	219 112	189 716	69 581	29 317	-----	4 866	173 363	229 517	252 547	1 789 737
Debolt	71 381	65 270	67 607	63 138	67 609	29 247	6 789	-----	1 547	43 527	65 799	73 137	564 961
Field totals	364 325	276 081	364 466	309 522	247 308	109 925	39 307	-----	7 144	240 779	322 384	353 834	2 635 075
Kotcho Lake-Slave Point	223 197	249 005	270 020	233 964	249 408	225 685	205 652	235 385	238 700	237 979	214 873	219 249	2 803 117

Kotcho Lake East--													
Bluekey	71 063	67 511	74 339	72 555	73 864	77 374	74 980	71 104	69 784	70 613	37 663	25 511	786 461
Slave Point	492 932	429 014	421 173	466 214	461 294	469 429	489 440	483 303	475 549	457 007	417 788	368 648	5 431 791
Field totals	563 995	496 525	495 512	538 869	535 158	546 803	564 420	554 407	545 333	527 620	455 451	394 159	6 218 252
La Garde--Dunlevy													
Laprise Creek--		279	591	466	576	431							2 343
Gething									6 827	7 587	6 599	2 365	23 379
Baldonnel	2 213 824	2 245 313	2 562 143	2 334 178	2 605 377	2 299 519	1 847 390	1 358 945	1 692 985	2 328 876	2 268 144	2 434 503	26 191 097
Field totals	2 213 824	2 245 313	2 562 143	2 334 178	2 605 377	2 299 519	1 847 390	1 358 945	1 699 712	2 336 463	2 274 743	2 436 869	26 214 476
Louise--Slave Point													
Mica--	68 211	68 867	68 790	56 427	54 293	60 801	61 418	59 234	54 771	57 560	54 325	57 259	721 956
Mica ¹	1 478	1 343	1 569	575	1 112	1 237	1 568	526	1 344	1 407	740	1 268	14 167
Confidential ¹										50	1 322	2 016	3 388
Field totals	1 478	1 343	1 569	575	1 112	1 237	1 568	526	1 344	1 457	2 062	3 284	17 555
Mike--Gething ¹													
Milligan Creek--	4 315	4 112	9 221	328								2 865	20 841
Gething	3 659	4 003	4 710	3 735	3 231	2 938	3 629	2 461	2 307	3 919	5 340	6 686	46 608
Halfway ¹	39 984	39 223	43 841	38 586	35 306	30 277	30 319	24 465	16 839	19 324	14 913	14 658	347 735
Field totals	43 643	43 226	48 551	42 321	38 537	33 215	33 948	26 916	19 146	23 243	20 253	21 344	394 343
Milligan Creek West--Halfway													
Monise--Halfway	3 957	85 200	123 843	61 751	83 679	106 559	114 585	92 006	111 479	108 275	119 873	46 849	1 028 156
Nig Creek--	7 299												7 299
Baldonnel	803 859	750 648	832 585	735 914	794 728	721 059	653 078	603 685	381 623	794 360	733 994	726 868	8 532 401
Baldonnel ¹					378	770							1 148
Field totals	803 859	750 648	832 585	735 914	795 106	721 829	653 078	603 685	381 623	794 360	733 994	726 868	8 533 549
North Pine--													
North Pine	45 145	38 918	43 407	38 513	38 029	34 350	26 424	30 090	26 341	21 190	36 240	4 838	383 475
Confidential ¹									720	2 180	3 043	2 279	8 222
Field totals	45 145	38 918	43 407	38 513	38 029	34 350	26 424	30 800	28 521	24 233	36 240	7 117	391 697
Oak--													
Cecil		205	430	420	435	809	820	360	960	480	634	601	6 154
Halfway	197 140	217 046	334 336	285 800	293 857	268 415	169 968	219 782	81 055	84 840	142 939	215 786	2 510 964
Halfway ¹	11 270	12 092	13 375	11 179	11 849	8 769	11 519	10 155	11 389	11 745	8 570	7 120	129 033
Field totals	208 410	229 343	348 141	297 399	306 141	277 993	182 307	230 298	93 404	97 065	152 143	223 507	2 646 151
Ospray--													
Gething													20 470
Halfway													64 403
Halfway ¹	4 012	2 686	6 845	3 075			1 400	1 689	4 482	5 372	8 332	5 664	43 557
Field totals	4 012	2 686	6 845	3 075			1 400	1 689	4 482	5 372	8 332	90 537	128 430
Parkland--Webarnum													
Peejay--	375 980	334 490	371 094	355 338	367 648	359 077	366 929	363 542	345 551	344 904	336 796	356 254	4 277 603
Gething	31 314	28 962	23 205	29 456	37 576	14 712	23 441	25 563	31 220	35 029	51 112	44 129	375 719
Baldonnel	57 004	60 364	55 652	73 874	91 129	55 101	63 049	61 045	70 325	75 342	92 404	78 179	833 468
Halfway	158 649	115 743	110 413	119 951	143 553	45 992	101 251	103 831	129 778	119 389	126 229	124 605	1 399 314
Halfway ¹	55 958	55 999	62 642	56 792	60 213	49 005	58 865	60 904	58 436	54 210	49 685	56 225	678 934
Field totals	302 925	261 068	251 912	280 073	332 471	164 740	246 606	251 343	289 759	283 970	319 430	303 138	3 287 435
Peejay West--Halfway ¹													
Petitot River--Slave Point	209 182	188 237	206 392	223 578	241 039	209 171	222 007	208 874	221 604	262 213	204 589	216 592	2 603 478
Red Creek--Doig ¹	10 650	8 976	5 048	2 381	1 258			6 950	3 384	303			38 948

¹Associated Gas.

TABLE 4-6 - MONTHLY NONASSOCIATED AND ASSOCIATED GAS PRODUCTION BY FIELDS AND POOLS, 1977 - *Continued*
(Volumes in MSCF at 14.65 psia and 60° F.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
Rigel-													
Bluesky	10 670	9 341	9 758	9 254	10 739	10 464	9 495	4 646	10 795	11 085	9 657	10 059	115 963
Dunlevy	1 261 867	1 069 984	1 177 115	1 032 960	1 357 285	1 382 669	1 221 283	629 485	1 363 486	1 416 360	1 239 534	1 262 983	14 415 011
Dunlevy ¹	42 295	35 813	32 029	38 214	39 788	35 339	39 367	36 244	38 134	39 668	40 412	39 718	456 821
Lower Dunlevy								3 809	26 874		1 988		32 671
Field totals	1 314 832	1 114 938	1 218 902	1 080 428	1 407 812	1 428 472	1 270 145	674 184	1 439 289	1 467 113	1 291 591	1 312 760	15 020 466
Rigel East-Gething	1 529	768	16 633				56 772	69 578	74 937	95 097	89 392	89 792	494 498
Roger-Slave Point						180 126	328 746	320 533	295 786	456 780	473 721	417 023	2 472 715
Sierra-Pine Point	3 366 512	2 892 403	3 025 199	3 162 521	2 324 433	2 964 800	2 350 512	2 653 986	2 761 315	3 009 538	3 634 966	3 702 265	35 848 450
Silverberry-Coplin	83 771	63 548	68 781	72 282	61 369	65 463	50 141	59 701	67 258	55 006	45 211	52 371	744 902
Siphon-													
Dunlevy	275 076	284 566	268 895	232 642	265 249	127 325	203 555	209 407	258 139	226 501	229 732	269 044	2 849 831
Baldonnel			14 473	38 128	17 422	3 874	1 610						75 507
Siphon	74 361	81 887	83 156	133 043	137 029	21 230	54 406	71 481	141 650	61 184	52 433	43 442	955 102
Halfway	129 252	134 340	136 195	133 307	150 672	74 645	108 765	122 784	132 358	104 376	89 750	102 820	1 419 264
Field totals	478 689	500 593	502 419	537 120	570 372	227 074	368 336	403 672	532 147	392 061	371 915	415 306	5 299 704
Siphon East-Bluesky	239 415	243 914	268 108	236 411	267 081	233 200	61 370	189 645	261 426	240 102	227 428	211 459	2 869 559
Stoddart-													
Cecil ¹	3 440	209		151	837	883	4 810	5 355	3 745	8 798	10 773	15 383	54 384
Balloy	844 450	758 603	842 135	792 498	875 119	840 524	802 736	789 428	712 035	692 645	717 079	723 464	9 390 716
Belloy ¹	2 405	2 791	3 160	1 582	3 764	3 039	4 228	3 108	3 110	2 986	3 232	1 832	35 237
Field totals	850 295	761 603	845 295	794 231	879 720	844 446	811 774	797 891	718 890	704 429	731 084	740 679	9 480 337
Stoddart West-Belloy	281 492	246 004	268 986	240 446	254 413	217 133	202 482	193 209	217 845	209 787	220 971	222 721	2 776 489
Sukunka-Baldonnel													37 000
Sunrise-Cadotte	26 071	21 308	24 459	22 230	21 079	16 919	20 056	16 138	13 732	13 438	361		194 791
Town-													
Baldonnel	19 943	20 467	21 969	2 006	6 321		19 830	24 189	38 696	45 074	51 393	55 221	305 009
Halfway	126 423	104 235	106 370	78 392	31 517		97 662	83 096	96 050	88 623	87 078	88 341	985 787
Field totals	146 366	124 702	128 339	78 398	37 838		117 492	107 285	134 646	133 697	138 471	143 562	1 290 796
Tsee-Slave Point				35 592	74 553	47 360	77 411	98 283	82 183	70 637	9 977	16 331	512 327
Two Rivers-													
Baldonnel						683							683
Halfway	143 105	124 582	135 803	128 922	133 000	36 895	134 460	95 038	144 349	126 255	144 819	132 301	1 449 529
Field totals	143 105	124 582	135 803	128 922	133 000	37 578	134 460	95 038	144 349	126 255	144 819	132 301	1 450 212
Velma-Charlie Lake ¹	788	940	761										2 489
Weasel-													
Baldonnel	1 324	1 395	1 493	1 501	1 536	823		1 004	1 520	1 828	1 688	1 645	15 759
Halfway	13 800		650										14 450
Halfway ¹	40 815	32 105	36 009	36 755	35 636	23 331	17 265	30 526	31 612	21 435	27 238	29 397	361 024
Field totals	55 939	33 500	38 152	38 256	36 074	24 154	17 265	31 530	33 132	23 263	28 926	31 042	391 233
Weasel West-Halfway ¹	3 415	2 940	3 253	1 235	443	2 004	3 512	3 344	2 749	2 949	2 876	3 045	31 765
Wilder-													
Halfway	293 540	272 628	298 466	272 454	293 453	275 500	223 514	285 554	184 988	289 318	133 307	94 678	2 917 400
Belloy	3 560	5 318	9 287	7 707	7 414	7 809	3 332	7 998	3 637	10 844	4 819		71 695
Field totals	297 100	277 946	307 723	280 161	300 867	283 309	226 846	293 552	188 625	300 162	138 126	94 678	2 989 095

Wildmint—													
Bluesky	6 509	5 854	5 651	5 911	6 812	5 851	6 486	6 782	5 188	4 510	5 781	7 607	72 012
Halfway	435	575	2 643	1 405	7 628	2 857	432	899	2 349	10 551	259	-----	30 033
Halfway ¹	45 769	45 854	49 478	41 967	45 842	31 883	23 446	28 757	20 646	30 150	18 322	12 985	395 099
Field totals	52 713	52 283	57 772	49 283	59 282	40 591	30 364	36 438	28 183	45 311	24 332	20 592	497 144
Willow—													
Gething ¹	10 475	9 010	9 221	8 935	8 647	8 801	9 367	9 439	8 070	7 585	6 883	7 230	103 663
Halfway	198 835	139 725	194 080	189 464	208 311	141 870	161 499	149 113	145 196	140 989	139 337	166 228	1 974 647
Field totals	209 310	148 735	203 301	198 399	216 958	150 671	170 866	158 552	153 266	148 574	146 220	173 458	2 078 310
Woodrush—Halfway	-----	-----	-----	-----	-----	-----	102 753	123 176	139 575	137 478	97 745	119 832	720 559
Yoyo—Pine Point	7 386 212	6 609 134	7 029 067	6 976 996	5 708 269	4 878 330	3 424 067	2 129 274	2 659 405	5 909 321	7 203 874	7 303 361	67 217 310
Other Areas—													
Dunlevy	-----	-----	-----	-----	-----	-----	-----	2 168	-----	-----	-----	-----	2 168
Belloy ¹	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	270	478	748
Deboft	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	51 580	51 580
Slave Point	39 921	-----	9 724	-----	-----	-----	-----	-----	-----	-----	-----	-----	49 645
Confidential	-----	-----	68 352	-----	-----	2 040	-----	-----	-----	-----	-----	-----	70 392
Confidential ¹	-----	-----	1 280	-----	-----	-----	-----	-----	1 592	1 082	1 334	119	5 377
Field totals	39 921	-----	79 326	-----	-----	2 040	-----	3 760	1 082	1 334	389	52 058	179 910
Totals—													
Nonassociated	38 043 165	31 763 607	34 994 779	33 567 773	33 389 058	27 213 893	25 643 824	25 442 984	27 801 257	33 932 947	34 891 730	35 914 808	379 599 825
Associated	1 253 515	1 086 150	1 265 749	1 146 999	1 297 717	962 016	1 192 310	1 273 106	1 227 995	1 390 913	1 274 275	1 322 609	14 693 364
Totals	36 296 680	32 849 757	36 260 528	34 714 772	34 686 775	28 175 909	26 836 134	26 716 090	29 029 252	35 323 860	36 166 005	37 237 417	394 293 179

¹Associated Gas.

TABLE 4-7 - MONTHLY SUPPLY AND DISPOSITION OF CRUDE OIL/PENTANES PLUS, 1977

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
<i>Supply</i>													
British Columbia production—													
Crude oil	1 269 427	1 156 357	1 285 256	1 157 230	1 177 276	868 070	1 170 098	1 196 545	1 146 770	1 151 107	1 108 273	1 153 079	13 839 488
Field condensate	9 504	10 896	16 699	14 060	15 720	11 374	10 583	11 380	12 442	11 985	16 376	12 861	153 880
Plant condensate	95 389	94 600	113 790	92 630	112 423	82 034	99 861	76 703	100 119	94 972	93 450	77 873	1 133 844
Total British Columbia	1 374 320	1 261 853	1 415 745	1 263 920	1 305 419	961 478	1 280 542	1 284 628	1 259 331	1 258 064	1 218 099	1 243 813	15 127 212
Alberta imports—													
Pipeline	3 507 714	3 257 091	4 357 615	3 099 059	3 785 335	4 696 411	3 736 246	4 960 802	3 558 286	4 455 675	4 308 453	4 956 710	48 679 397
Rail	19 609	23 243	19 527	8 992	9 927	12 125	19 235	6 860	8 464	11 514	5 872	4 427	149 795
Total Alberta	3 527 323	3 280 334	4 377 142	3 108 051	3 795 262	4 708 536	3 755 481	4 967 662	3 566 750	4 467 189	4 314 325	4 961 137	48 829 192
Total supply	4 901 643	4 542 187	5 792 887	4 371 971	5 100 681	5 670 014	5 036 023	6 252 290	4 826 081	5 725 253	5 532 424	6 204 950	63 956 404
<i>Disposition</i>													
Inventory changes—													
Field	-3	-4 984	9 867	20 177	-7 399	-10 892	-1 472	-501	-732	-957	6 237	3 329	12 670
Plant	-5 509	1 448	12 202	-27 116	-2 503	7 303	5 332	-18 883	-36	-2 509	12 149	-21 667	-39 689
Transporters	-62 161	-228 179	240 169	-35 357	15 296	-120 712	-415 135	362 481	-172 946	678 614	-127 142	-172 134	-37 206
Totals	-67 673	-231 715	262 238	-42 296	5 394	-124 301	-411 275	343 097	-173 714	675 148	-108 756	-190 372	-64 225
Losses and adjustments—													
Field	-143	274	-445	-----	-1 368	-915	-2 052	-4 502	-3 088	-1 229	-4 106	-1 102	-18 676
Plant	19 243	460	5 562	4 251	4 954	3 741	4 893	4 879	5 672	4 444	2 989	3 939	65 017
Transporters	-20 805	19 591	2 191	-5 987	-8 037	7 161	617	9 986	-6 164	654	-15 573	-2 447	-18 613
Totals	-1 505	20 325	7 308	-1 736	-4 451	9 987	3 448	10 363	-3 580	3 869	-16 690	390	27 728
Transfers	41 793	40 458	48 795	36 165	62 618	39 243	40 169	35 814	42 086	38 533	30 138	51 475	507 287
Deliveries—													
To British Columbia refineries—													
British Columbia production	1 360 370	1 342 299	1 545 340	1 066 153	1 383 647	1 203 555	1 289 695	1 372 405	1 196 752	1 224 700	1 262 336	1 316 080	15 562 332
Alberta production	3 102 444	2 920 853	3 315 878	2 542 448	2 878 627	3 662 085	3 341 393	3 496 535	2 894 702	2 998 417	3 797 307	4 350 414	39 301 103
Totals	4 462 814	4 263 152	4 861 218	3 608 601	4 262 274	4 865 640	4 631 088	4 868 940	4 091 454	4 223 117	5 058 643	5 666 494	54 863 435
To export—													
British Columbia production	44 324	37 668	60 052	60 225	42 629	35 297	31 817	40 549	48 996	43 064	50 278	27 247	522 146
Alberta production	419 422	393 140	561 583	682 635	728 840	819 328	734 582	970 010	812 990	721 498	517 009	633 614	7 994 631
Totals	463 746	430 808	621 615	742 860	771 469	854 625	766 399	1 010 559	861 986	764 562	567 287	660 861	8 516 777
Reporting adjustment	2 468	19 159	-8 287	28 377	3 377	24 820	6 194	-16 483	7 849	20 024	1 802	16 102	105 402
Total disposition	4 901 643	4 542 187	5 792 887	4 371 971	5 100 681	5 670 014	5 036 023	6 252 290	4 826 081	5 725 253	5 532 424	6 204 950	63 956 404

British Columbia Refineries

Receipts—

British Columbia crude	1 375 030	1 357 610	1 503 970	1 101 291	1 397 068	1 168 925	1 308 947	1 359 359	1 206 475	1 183 833	1 292 210	311 452	15 566 170
British Columbia condensate	41 793	40 458	48 795	36 165	62 618	39 243	41 949	43 062	42 086	38 533	30 138	51 476	516 315
Totals	1 416 823	1 398 068	1 552 765	1 137 456	1 459 686	1 208 168	1 350 896	1 402 421	1 248 561	1 222 366	1 322 348	1 362 927	16 082 485
Alberta crude	2 280 888	2 738 049	3 062 921	2 350 875	2 584 162	3 288 888	3 111 765	3 197 095	2 697 578	2 697 416	3 311 602	4 048 662	35 869 901
Alberta condensate	237 266	200 310	266 194	212 754	296 440	378 859	239 488	305 979	302 751	308 539	490 952	306 179	3 545 711
Totals	3 118 154	2 938 359	3 329 115	2 563 629	2 880 602	3 667 747	3 351 253	3 503 074	2 900 329	3 005 955	3 802 554	4 354 841	39 415 612
Total receipts	4 534 977	4 336 427	4 881 880	3 701 085	4 340 288	4 875 915	4 702 149	4 905 495	4 148 890	4 228 321	5 124 902	5 717 768	55 498 097

Disposition

Inventory changes	-104 195	95 315	25 723	-154 947	84 601	-132 956	-11 752	61 862	67 945	-155 338	65 486	531 125	372 869
Losses and adjustments	573	-254	377	-415	1 116	365	428	744	756	1 900	973	384	6 947
Refinery runs—													
British Columbia production	1 511 760	1 788 915	1 529 815	1 129 732	1 561 381	1 376 729	1 182 000	1 458 159	1 163 874	1 387 165	1 290 290	1 261 865	16 641 685
Alberta production	3 126 839	2 452 451	3 325 965	2 726 715	2 693 190	3 631 777	3 531 473	3 384 730	2 916 315	2 994 594	3 768 153	3 924 394	38 476 596
Totals	4 638 599	4 241 366	4 855 780	3 856 447	4 254 571	5 008 506	4 713 473	4 842 889	4 080 189	4 381 759	5 058 443	5 186 259	55 118 281
Total disposition	4 534 977	4 336 427	4 881 880	3 701 085	4 340 288	4 875 915	4 702 149	4 905 495	4 148 890	4 228 321	5 124 902	5 717 768	55 498 097

TABLE 4-8 — MONTHLY SUPPLY AND DISPOSITION OF NATURAL GAS, 1977
(Volumes in MSCF at 14.65 psia and 60° F.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
<i>Supply</i>													
British Columbia production—													
Nonassociated gas	35 043 165	31 763 607	34 994 779	33 567 773	33 389 059	27 213 893	25 643 824	25 442 984	27 801 257	33 932 947	34 891 730	35 914 808	379 599 825
Associated gas	1 253 515	1 086 150	1 265 749	1 146 999	1 297 717	962 016	1 192 310	1 273 106	1 227 996	1 390 913	1 274 275	1 322 609	14 693 354
Less injected	278 836	187 246	233 158	267 919	78 365	67 479	78 737	97 715	93 150	104 095	107 424	87 388	1 681 511
Net British Columbia production	36 017 844	32 662 512	36 027 370	34 446 853	34 608 410	28 108 430	26 757 397	26 618 375	28 936 102	35 219 765	36 058 581	37 150 029	392 611 668
Imports—													
Alberta	3 174 833	3 191 019	3 574 650	2 450 590	2 610 110	1 893 532	1 805 735	1 944 829	2 339 845	3 285 691	5 910 775	6 978 149	39 159 758
Northwest Territories	2 658 524	2 329 099	2 537 762	2 400 902	2 457 884	1 464 660	1 540 403	1 882 336	2 410 575	2 319 494	2 291 209	2 347 545	26 640 393
Yukon	54 235	53 379	56 436	53 749	44 793	21 267	23 511	14 720	-----	-----	-----	-----	322 090
Total imports	5 887 592	5 573 497	6 168 848	4 905 241	5 112 787	3 379 459	3 369 649	3 841 885	4 750 420	5 605 185	8 201 984	9 325 694	66 122 241
Total supply	41 905 436	38 236 009	42 196 218	39 352 094	39 721 197	31 487 889	30 127 046	30 460 260	33 686 522	40 824 950	44 260 565	46 475 723	458 733 909
<i>Disposition</i>													
Flared—													
Field	374 386	244 494	402 811	318 745	288 567	336 552	344 949	309 279	301 768	330 379	258 946	392 035	3 903 011
Plant	1 047	-----	427	3 028	2 980	7 246	2 673	24 156	3 515	3 804	4 286	2 677	56 839
Gathering systems	88	9 430	95	837	4 595	54 734	34 903	58	89	8 729	4 034	54	117 646
Totals	375 521	253 924	403 333	322 610	296 142	398 632	382 525	333 493	305 372	342 912	267 266	394 766	4 076 496
Fuel—													
Field	261 334	218 816	257 153	246 007	247 159	184 380	219 047	234 260	228 429	267 686	250 987	276 836	2 892 094
Plant	1 686 607	1 536 576	1 682 608	1 535 150	1 596 781	1 426 905	1 398 120	1 323 262	1 556 285	1 711 102	1 658 560	1 704 604	18 816 560
Compressor	30 592	26 496	31 213	29 060	25 369	15 101	20 703	72 597	16 527	20 176	27 812	26 472	342 118
Totals	1 978 533	1 781 888	1 970 974	1 810 217	1 869 309	1 626 386	1 637 870	1 630 119	1 801 241	1 998 964	1 937 359	2 007 912	22 050 772
Line pack changes	1 698	-699	-5 545	-2 139	-7 679	-64	12 463	-6 210	9 701	409	-8 156	-14 796	-21 017
Losses and adjustments—													
Field	685 688	434 366	299 233	607 294	643 499	472 951	866 519	565 824	761 307	635 193	786 185	1 095 840	7 853 899
Plant	949 827	737 296	896 060	1 098 993	1 020 182	676 171	540 607	957 632	238 550	499 156	362 155	222 316	8 198 945
Gathering systems	67 580	36 720	46 394	19 068	27 734	21 561	31 984	57 446	15 559	150 399	61 657	70 627	606 729
Totals	1 703 095	1 208 382	1 241 687	1 725 355	1 691 415	1 170 683	1 439 110	1 580 902	1 015 416	1 284 748	1 209 997	1 388 783	16 659 573
Processing shrinkage	3 719 875	3 401 806	3 735 071	3 535 996	3 485 334	2 811 753	2 616 447	2 498 189	2 902 212	3 538 097	3 708 658	3 790 682	39 744 120
Available marketable gas in NEBC	34 160 144	31 746 559	34 796 189	32 037 181	32 573 646	25 477 616	24 084 626	24 454 641	27 837 995	33 657 658	37 104 662	38 852 476	376 583 393
Reporting adjustment	-33 430	-155 851	54 509	-77 126	-186 970	2 883	-45 995	-30 874	14 585	2 162	40 779	55 900	-359 428

**British Columbia Transporters
Supply**

Available marketable gas in NEBC	34 160 144	31 746 659	34 796 189	32 037 181	32 573 646	25 477 616	24 084 626	24 454 641	27 637 995	33 667 658	37 104 662	38 852 476	376 583 393
Imports to SEBC—													
Alberta	41 146 403	38 280 930	42 568 683	38 106 029	38 745 495	36 052 506	33 469 289	37 000 092	35 661 044	39 162 331	41 463 902	42 526 245	463 172 949
Total supply	75 306 547	70 027 489	77 364 872	70 143 210	71 319 141	60 530 122	57 553 915	61 454 733	63 299 039	72 819 989	78 558 564	81 378 721	839 756 342

Disposition

Fuel	1 736 722	1 114 693	1 830 566	1 590 208	1 615 209	1 080 568	942 257	1 030 837	1 212 131	1 787 757	2 191 105	2 249 648	18 381 701
Losses and adjustments	159 031	203 865	250 952	418 310	158 243	23 665	-38 703	248 468	-57 438	-353 157	421 294	-684 239	750 291
Line pack changes	26 909	598 730	38 036	-70 860	7 201	-47 884	28 698	-27 111	-77 218	16 135	158 710	-61 002	590 344
Deliveries to British Columbia distributors—													
North	427 589	276 547	336 688	221 761	175 399	134 102	113 218	151 432	192 231	254 262	389 682	499 232	3 171 143
Interior	6 517 555	5 397 756	5 717 686	4 286 602	4 226 224	3 509 633	3 328 699	3 365 352	3 715 810	5 076 600	6 220 848	6 869 254	58 232 019
Lower Mainland	9 674 356	7 610 931	8 306 033	6 145 168	5 673 164	3 994 551	3 656 883	3 473 265	4 692 594	6 666 697	9 060 923	10 075 579	79 030 134
Totals	16 619 500	13 284 234	14 360 407	10 653 531	10 074 787	7 638 286	7 098 800	6 990 039	8 600 635	11 997 559	15 671 453	17 444 065	140 433 296
Export—													
From NEBC	17 128 779	17 932 307	20 079 452	20 880 636	22 004 478	17 662 933	16 811 153	17 351 103	18 779 109	21 052 328	20 439 748	20 678 619	230 800 445
From SEBC	39 625 987	37 091 573	41 163 249	37 011 769	37 659 283	34 095 192	32 660 741	36 990 980	34 814 546	38 272 202	39 637 826	41 484 013	449 497 361
Totals	56 754 766	55 023 880	61 242 701	57 892 305	59 663 761	51 758 125	49 461 894	53 342 083	53 593 655	59 324 530	60 077 574	62 162 532	680 297 806
Reporting adjustments	9 619	-197 913	-357 790	-340 284	-200 060	77 362	60 969	-129 583	27 274	47 165	38 428	267 717	-697 096
Total disposition	75 306 547	70 027 489	77 364 872	70 143 210	71 319 141	60 530 122	57 553 915	61 454 733	63 299 039	72 819 989	78 558 564	81 378 721	839 756 342

British Columbia Distributors

Receipts—													
From transporters	16 859 123	13 368 130	14 449 700	10 662 890	10 190 731	7 723 794	7 191 841	7 085 091	8 722 430	12 170 375	16 051 248	18 029 734	142 495 087
From storage	10 920	9 709	461 229	5 928	-----	-----	-----	-----	-----	2 829	64 610	16 177	571 302
Other receipts	5	6	1 293	1 148	959	462	887	425	337	732	1 493	1 610	9 357
Total receipts	16 870 048	13 377 845	14 912 222	10 659 966	10 191 690	7 724 256	7 192 728	7 085 516	8 722 767	12 173 936	16 117 251	18 047 521	143 075 746

Disposition

Fuel	43 543	54 885	37 255	39 593	49 102	21 233	16 792	23 695	34 534	37 846	39 300	53 926	451 703
Losses and adjustments	1 504 143	-1 954 276	388 086	-2 166 361	-828 611	-1 314 148	-546 131	13 950	1 051 450	1 961 330	3 363 384	2 710 896	4 183 712
Line pack changes	-23 788	30 553	-9 313	5 288	-21 964	-6 460	16 810	-13 058	30 188	592	-4 925	-19 886	-15 963
To storage	-----	-----	-----	-----	98 823	3 526	108 126	91 270	94 302	285	-----	-----	396 332
Transfer	-----	-----	-----	-----	-----	-----	-----	281 358	304 436	398 487	520 223	429 014	1 933 518
Sales—													
Residential	5 396 203	5 458 834	4 747 588	4 166 849	3 033 164	2 198 283	1 502 918	1 142 318	1 256 474	2 112 584	3 410 596	5 199 328	39 625 139
Commercial	4 817 656	4 553 683	4 012 938	3 634 071	2 692 345	2 157 966	1 726 049	1 343 476	1 660 454	2 459 391	3 471 865	4 735 971	37 265 865
Industrial	5 075 570	6 194 512	5 684 736	4 912 470	5 131 081	4 633 420	4 347 637	4 159 553	4 262 036	5 161 780	5 262 466	4 887 862	58 703 123
Electric power	66 721	39 654	60 932	68 056	37 750	30 436	20 527	42 954	38 893	41 642	54 342	50 410	532 317
Total sales	15 346 150	15 246 683	14 496 194	12 781 446	10 894 340	9 020 105	7 597 131	6 688 301	7 207 857	9 775 397	12 199 269	14 873 571	136 126 444
Total disposition	16 870 048	13 377 845	14 912 222	10 659 966	10 191 690	7 724 256	7 192 728	7 085 516	8 722 767	12 173 936	16 117 251	18 047 521	143 075 746

TABLE 4-9 - MONTHLY SUPPLY AND DISPOSITION OF PROPANE, 1977
(Quantities in barrels at 34.9723 Canadian gallons at 60° F.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
<i>Supply</i>													
British Columbia production -													
Plant	51 917	52 373	48 844	40 642	52 260	39 054	48 240	40 420	51 682	50 093	50 809	47 907	574 241
Refinery	51 857	64 205	62 078	51 532	43 789	52 495	44 218	45 840	54 763	41 907	62 742	65 048	630 474
Totals	103 774	106 578	110 922	92 174	96 049	91 549	92 458	86 260	106 445	92 000	113 551	112 955	1 204 715
Alberta imports	301 754	237 265	239 981	334 242	333 991	311 260	283 635	329 198	311 715	375 498	313 820	325 941	3 698 300
Total supply	405 528	343 843	350 903	426 416	430 040	402 809	376 093	415 458	418 160	467 498	427 371	438 896	4 903 015
<i>Disposition</i>													
Inventory change	-360	9 673	-10 319	116	2 368	-5 094	2 587	5 727	-7 006	5 485	105	-1 163	2 119
Fuel													
Losses and adjustments	968	1 812	3 052	740	1 230	593	2 080	2 597	972	1 760	1 736	1 780	19 320
Sales of British Columbia production -													
British Columbia	78 324	65 690	71 849	60 279	58 880	50 946	45 029	47 330	68 139	61 822	86 464	82 906	777 658
Alberta			4 616				114						4 730
Northwest Territories		670		1 545	206				625	1 106	2 241	2 332	8 725
United States	10 918	15 133	22 669	20 994	29 665	28 171	28 948	17 306	25 315	19 527	3 005		221 651
Offshore	13 924	13 600	19 055	8 500	3 700	16 933	13 700	13 300	18 400	2 300	20 000	27 100	170 512
Total British Columbia	103 166	95 093	118 189	91 318	92 451	96 050	87 791	77 936	112 479	84 755	111 710	112 338	1 183 276
Sales of Alberta production -													
British Columbia	86 122	72 199	78 308	46 837	28 719	33 421	33 646	28 945	48 305	81 701	110 417	148 446	797 066
Offshore	215 632	165 066	161 673	287 405	305 272	277 839	249 989	300 253	263 410	293 797	203 403	177 495	2 901 234
Total Alberta	301 754	237 265	239 981	334 242	333 991	311 260	283 635	329 198	311 715	375 498	313 820	325 941	3 698 300
Total sales	404 920	332 358	358 170	425 560	426 442	407 310	371 426	407 134	424 194	460 253	425 530	438 279	4 881 576
Total disposition	405 528	343 843	350 903	426 416	430 040	402 809	376 093	415 458	418 160	467 498	427 371	438 896	4 903 015

TABLE 4-10 — MONTHLY SUPPLY AND DISPOSITION OF BUTANE, 1977
 (Quantities in barrels at 34.9723 Canadian gallons at 60° F).

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
<i>Supply</i>													
British Columbia Production —													
Plant	60 496	57 807	70 159	50 283	63 643	52 803	56 786	46 678	59 769	64 589	60 553	56 848	700 414
Refinery	24 417	40 743	49 700	50 308	60 006	77 854	65 885	65 978	55 241	20 544	35 131	38 174	583 981
Totals	84 913	98 550	119 859	100 591	123 649	130 657	122 671	112 656	115 010	85 133	95 684	95 022	1 284 395
Alberta imports	10 240	7 576	8 696	6 211	4 141	2 264	403	1 022	1 760	2 345	3 258	6 869	54 785
Total supply	95 153	106 126	128 555	106 802	127 790	132 921	123 074	113 678	116 770	87 478	98 942	101 891	1 339 180
<i>Disposition</i>													
Inventory change	-6 266	6 893	5 922	-1 440	22	-4 366	28	5 347	-2 049	-6 463	5 031	-579	2 080
Gasoline enrichment	19 883	17 010	17 603	5 351	7 333	9 703	10 874	11 380	18 211	26 756	22 517	14 590	181 211
Losses and adjustments	20	770	-768	-2	750	2	-----	-749	748	114	-----	-----	885
Sales of British Columbia production —													
British Columbia	40 472	39 982	64 633	58 265	65 186	88 457	63 673	66 888	61 208	33 877	40 367	44 564	667 572
Alberta	-----	-----	3 196	-----	2 258	57	9 726	6 483	-----	-----	-----	915	22 636
United States	30 804	33 895	29 273	38 417	48 100	36 804	38 370	23 307	36 892	30 849	27 769	35 532	410 012
Totals	71 276	73 877	97 102	96 682	115 544	125 318	111 769	96 678	98 100	64 726	68 136	81 011	1 100 219
Sales of Alberta production —													
British Columbia	10 240	7 576	8 696	6 211	4 141	2 264	403	1 022	1 760	2 345	3 258	6 869	54 785
Total sales	81 516	81 453	105 798	102 893	119 685	127 582	112 172	97 700	99 860	67 071	71 394	87 890	1 155 004
Total disposition	95 153	106 126	128 555	106 802	127 790	132 921	123 074	113 678	116 770	87 478	98 942	101 891	1 339 180

MONTHLY SUPPLY AND DISPOSITION OF SULPHUR, 1977
 (Quantities in long tons)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
<i>Supply</i>													
British Columbia production	15 875	14 428	16 166	15 326	14 716	8 594	6 436	7 125	10 924	13 373	14 548	8 622	146 133
<i>Disposition</i>													
Inventory change	13 511	10 452	12 770	12 583	12 759	5 139	1 723	4 229	6 953	8 881	10 557	5 486	105 043
Losses and adjustments	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sales —													
North America	1 105	1 154	1 170	1 035	759	1 054	1 188	1 641	1 819	1 802	1 085	1 650	15 462
Offshore	1 259	2 822	2 226	1 708	1 198	2 401	3 525	1 255	2 152	2 690	2 906	1 486	25 628
Totals	2 364	3 976	3 396	2 743	1 957	3 455	4 713	2 896	3 971	4 492	3 991	3 136	41 090
Total disposition	15 875	14 428	16 166	15 326	14 716	8 594	6 436	7 125	10 924	13 373	14 548	8 622	146 133

TABLE 4-11 - CRUDE-OIL PIPELINES, 1977

Company	Fields Served	Size and Mileage of Main and Lateral Lines		Pumping-stations		Present Capacity (Bbl./Day)	Gathering Mileage	Throughput (Bbl./Day)	Storage Capacity (Bbl.)	
		Size (In.)	Mileage	Number	Capacity (Bbl./Day)					
Blueberry-Taylor Pipeline Co.	Aitken Creek, Blueberry	12 3/4	2.2	----	-----	-----	-----	-----	-----	
		8 5/8	62.8	1	5 000	12 000	37.4	1 667	65 000	
	Fort St. John	-----	-----	-----	-----	-----	-----	184	-----	
	Inge	6 5/8	1.7	1	12 500	12 500	-----	4 105	1 000	
CDC Oil & Gas Limited	Stoddart	-----	-----	-----	-----	-----	-----	74	-----	
		Inge	6 5/8	3.2	-----	-----	-----	-----	-----	-----
		4 1/2	8.7	1	10 000	10 000	13.9	4 000	-----	
Trans-Prairie Pipelines Ltd.	Beatton River, Beatton River West, Boundary Lake, Bulrush, Carrant, Milligan Creek, Osprey, Peejay, Weasel, Wildmint, Willow, Wolf	3 1/2	2.0	1	1 600	-----	-----	-----	-----	
		-----	-----	1	36 000	52 000 ¹	84.6	36 370	160 000	
		4 1/2	77.0	2	45 000	45 000 ²	-----	-----	-----	
		6 5/8	42.9	-----	-----	-----	-----	-----	-----	
		8 5/8	104.0	-----	-----	-----	-----	-----	-----	
Westcoast Petroleum Ltd. . . . .	. . . . .	12 3/4	39.1	-----	-----	-----	-----	-----	-----
		12	505.0	12	70 000	70 000	-----	32 231	586 000	

¹Boundary Lake.²Terminal to Westcoast Petroleum Ltd.

TABLE 4-12 - CRUDE-OIL REFINERIES, 1977

Name	Location	Type	Year of First Operation	Source of Crude	Crude-oil Capacity (Bbl. per Calendar Day)	Storage Capacity (Bbl.)	Cracking-plant Units	Cracking Capacity (Bbl. per Calendar Day)	Other Units
Chevron Canada Ltd.	North Burnaby	Complete	1936	B.C. and Alberta	35 000	1 613 200	Catalytic-fluid	8 100	Catalytic polymerization, catalytic reformer, lube-oil blending plant, asphalt.
Gulf Oil Canada Limited	Kamloops	Complete	1954	B.C. and Alberta	8 800	627 000	Catalytic-fluid	2 530	Catalytic polymerization, catalytic reformer, distillate, desulphurization, merox, asphalt, naphtha.
Gulf Oil Canada Limited	Port Moody	Complete	1958	B.C. and Alberta	37 200	1 763 000	Catalytic-fluid	11 400	Catalytic reformer, distillate, desulphurization, alkylationsulphuric acid, naphtha-desulphurization, merox, sulphur.
Husky Oil Ltd.	Prince George	Complete	1967	B.C.	7 700	675 000	.....	...	Unifiner, reformer, asphalt.
Imperial Oil Enterprises Ltd.	Idco	Complete	1916	B.C. and Alberta	40 000	3 055 000	Catalytic-fluid	11 800	Catalytic polymerization, power-former, toluene extraction, sulphur, LPG plant, desulphurization.
Pacific Petroleum Ltd.	Taylor	Complete	1960	B.C.	14 300	1 100 000	Catalytic-fluid	4 650	H.F. alkylation, asphalt, pentane splitter, platformer unifiner, HDS unit, DDS unit.
Shell Canada Limited	Shellburn	Complete	1932	B.C. and Alberta	22 000	2 465 300	Catalytic-fluid	6 000	Catalytic polymerization, platformer, vacuum flashing, solvent fractionation, distillate hydro-treater, sulphur recovery.

TABLE 4-13 - NATURAL GAS PIPELINES, 1977

Company	Source of Natural Gas	Transmission-lines		Compressor Stations		Present Daily Capacity (MSCF)	Gathering and Distribution Lines		Areas Served by Distributors
		Size (in.)	Mileage	Number	Horsepower		Size (in.)	Mileage	
British Columbia Hydro and Power Authority	Westcoast Transmission Co. Ltd.	42	18.6	----	-----	605 880	-----	4 011.6	Lower Mainland of British Columbia.
		30	38.8	----	-----		-----	-----	
		24	19.2	----	-----		-----	-----	
		20	47.1	----	-----		-----	-----	
		18	19.4	----	-----		-----	-----	
		16	17.2	----	-----		-----	-----	
		12	58.2	----	-----		-----	-----	
		10	14.9	----	-----		-----	-----	
		8	26.1	----	-----		-----	-----	
		6	27.7	----	-----		-----	-----	
Columbia Natural Gas Ltd.	Alberts and Southern Gas Co. Limited	8	55.0	----	-----	85 500	8	1.8	Cranbrook, Fernie, Kimberley, Creston, Sparwood, Elk Valley, Skookumchuk, Eiko, Elkford, and Yahk.
		6	70.7	----	-----		6	4.7	
	Westcoast Transmission Co. Ltd.	4	20.2	----	-----		4	9.8	
		3	28.1	----	-----		3	23.2	
		2	0.5	----	-----		2	46.7	
		-----	-----	-----	-----		1 1/4	64.5	
		-----	-----	-----	-----		3/4	134.0	
		-----	-----	-----	-----		5/8	3.9	
Gas Trunk Line of British Columbia	Beg field	-----	-----	----	-----	-----	16	27.4	To Westcoast Transmission Co. Ltd.
	Boundary Lake field	-----	-----	----	-----	-----	6 5/8	5.9	
	Jedney and Bubbles fields	-----	-----	----	-----	-----	16	31.4	
	Laprise Creek field	-----	-----	----	-----	-----	6 5/8	2.9	
	Nig Creek field	-----	-----	----	-----	-----	12 3/4	31.5	
		-----	-----	----	-----	-----	10 3/4	7.0	
		-----	-----	----	-----	-----	12 3/4	23.8	
Inland Natural Gas. Co. Ltd.	Westcoast Transmission Co. Ltd.			1	1 800	-----	16	28.3	
		12	367.5	3	2 200	207 000	8	12.4	Peace River, Prince George, Cariboo, Thompson, Okanagan, and Kootenay areas.
		10	119.1	----	-----	-----	6	39.8	
	8	33.1	----	-----	-----	4	200.1		
	Alberts and Southern Gas. Co. Limited	6	108.4	----	-----	-----	3	90.9	
		4	144.8	----	-----	-----	2	627.3	
		3	70.2	----	-----	-----	1 1/2	20.7	
		2	72.2	----	-----	-----	1 1/4	300.0	
		1 1/4	1.3	----	-----	-----	-----	-----	

Northland Utilities (B.C.) Ltd.	Peace River Transmission Co.	3	2.0	----	-----	10 900	10	0.4	Dawson Creek, Pouce Coupe, and Rolla.	
		2	0.4	----	-----		8	1.6		
		1 1/4	3.2	----	-----		6	2.7		
				----	-----		4	12.6		
				----	-----		3	5.4		
				----	-----		2	25.7		
				----	-----		1 1/2	0.4		
Pacific Northern Gas. Ltd.	Westcoast Transmission Co. Ltd.	10 3/4	274.3	2	3 150	54 000	6	2.5	Vanderhoof, Fraser Lake, Burns Lake, Smithers, Terrace, Prince Rupert, Kitimat, Houston, Fort St. James.	
		8 5/8	92.4	----	-----		4	10.5		
		6 5/8	36.0	----	-----		3	20.2		
		4 1/2	14.0	----	-----		2	49.3		
		3 1/2	43.7	----	-----		1 1/4	38.2		
		2 7/8	17.8	----	-----		3/4	29.5		
		2 3/8	30.1	----	-----		1/2	0.1		
Plains Western Gas & Electric Co. Ltd.	Westcoast Transmission Co. Ltd.	6	0.3	----	-----	12 000	4	14.5	Fort St. John, Taylor, Grandhaven, Charlie Lake, Airport, Baldonnel.	
		4	20.9	----	-----		3	3.6		
		3	4.6	----	-----		2 1/2	1.5		
		2	2.0	----	-----		2	54.9		
				----	-----		1 1/2	4.5		
				----	-----		1 1/4	0.3		
				----	-----		1	12.7		
Westcoast Transmission Co. Ltd.	Alberta	26	32.5	----	-----	215 000	-----	-----		
	Taylor-Willow Flats	36	23.2	----	-----		-----	-----		
		30	76.3	----	-----		-----	-----		
	Willow Flats-Huntingdon	30	570.3	13	279 640	1 360 000	-----	-----		
		36	485.0	----	-----		-----	-----		
	Altken Creek			----	-----		-----	12 3/4		19.5
	Alaska Highway system			----	-----		-----	26		37.5
				----	-----		-----	20		18.1
				----	-----		-----	18		17.9
				----	-----		-----	12 3/4		9.9
	Beaver River	24	110.9	1	39 000	270 000	-----	-----		
	Blueberry West field			----	-----		-----	8 5/8		6.7
	Boundary Lake field			1	4 000		-----	16		0.5
	Bubbles field			1	660		-----	-----		-----
	Buick Creek field			----	-----		-----	26		1.8
				----	-----		-----	10 3/4		7.3
	Buick Creek East field			----	-----		-----	8 5/8		6.6
	Buick Creek West field			1	1 980		-----	20		16.2
	Cache Creek field			----	-----		-----	6		8.6
	Charlie Lake field			----	-----		-----	6 5/8		2.3
	Clarke Lake field			----	-----		-----	16		16.4
	Dawson Creek field			----	-----		-----	8 5/8		5.4
	Fireweed field			----	-----		-----	10 3/4		15.3
			----	-----		-----	6 5/8	4.2		
			----	-----		-----	3 1/2	5.0		

TABLE 4-13 - NATURAL GAS PIPELINES, 1977 - Continued

Company	Source of Natural Gas	Transmission-lines		Compressor Stations		Present Daily Capacity (MSCF)	Gathering and Distribution Lines		Areas Served by Distributors
		Size (In.)	Mileage	Number	Horsepower		Size (In.)	Mileage	
Westcoast Transmission Co. Ltd. -Continued	Flatrock field	-----	-----	---	-----	-----	3 1/2	5.0	
	Fort St. John field	-----	-----	3	1 980	-----	18	7.8	
		-----	-----	---	-----	-----	10 3/4	0.9	
		-----	-----	---	-----	-----	8 5/8	0.7	
	Fort St. John Southeast field . .	12	7.0	---	-----	-----	12 3/4	4.0	
	Fort Nelson plant	30	220.8	4	93 400	858 000	-----	-----	
	Fort Nelson-Willow Flats	36	45.5	---	-----	-----	-----	-----	
	Gundy Creek field	-----	-----	---	-----	-----	10 3/4	6.1	
	Helmet field	-----	-----	---	-----	-----	16	31.4	
		-----	-----	---	-----	-----	10	12.6	
		-----	-----	---	-----	-----	8	3.6	
	Kobas-Townsend field	-----	-----	1	6 000	-----	12 3/4	18.9	
		-----	-----	---	-----	-----	8 5/8	5.5	
	Kotcho Lake field	-----	-----	---	-----	-----	12	9.7	
	Kotcho Lake East field	-----	-----	---	-----	-----	10 3/4	11.5	
	Laprise Creek field	-----	-----	1	5 160	-----	6 5/8	2.5	
	Milligan-PeeJay system	-----	-----	1	4 000	-----	12	32.2	
		-----	-----	---	-----	-----	10 3/4	23.4	
		-----	-----	---	-----	-----	8 5/8	13.2	
		-----	-----	---	-----	-----	6 5/8	6.8	
	Montney field	-----	-----	---	-----	-----	4 1/2	7.4	
	Nig Creek field	-----	-----	---	-----	-----	6 5/8	2.4	
	Oak field	-----	-----	---	-----	-----	16	20.7	
		-----	-----	---	-----	-----	6	0.9	
	Parkland field	-----	-----	---	-----	-----	8 5/8	6.7	
	Petitot-Louise system	-----	-----	---	-----	-----	10 3/4	11.8	
		-----	-----	---	-----	-----	12 3/4	15.8	
		-----	-----	---	-----	-----	16	6.5	
		-----	-----	---	-----	-----	20	25.9	
	Red Creek field	-----	-----	---	-----	-----	4 1/2	2.9	
Rigel field	-----	-----	1	6 800	-----	12 3/4	11.1		
	-----	-----	1	1 400	-----	10 3/4	11.5		
Rigel North field	-----	-----	---	-----	-----	6	6.6		
Sierra field	-----	-----	---	-----	-----	12	6.8		
	-----	-----	---	-----	-----	18	6.8		
Stoddart field	-----	-----	1	1 400	-----	8 5/8	6.3		
Yoyo field	-----	-----	---	-----	-----	24	48.0		

TABLE 4-14 - GAS-PROCESSING PLANTS, 1977

Operator	Location	Fields Served	Plant Type	Year of First Operation	Plant Capacity Million SCF/Day		Natural Gas	Residual Gas to—
					In	Out		
Amoco Canada Petroleum Limited	Units 68, 69, Block J, N.T.S. Map 94-N-16	Beaver River	Dehydration	1971	247	239.6		Westcoast Transmission Co. Ltd.
Imperial Oil Limited	S.E. ¼ Sec. 2, Tp. 85, R. 14, W6M	Boundary Lake	Inlet separator, M.E.A. absorption treating, glycol absorption dehydration, combined refrigeration and oil absorption natural gas liquid recovery distillation	1964	21	17	Pentanes plus, propane-butane mix	Westcoast Transmission Co. Ltd.
Mobil Oil of Canada Ltd.	Unit 91, Block D, N.T.S. Map 94-I-14	Sierra	Inlet separator, dry desiccant dehydration	1969	127	125		Westcoast Transmission Co. Ltd.
Pacific Petroleum Ltd.	Sec. 36, Tp. 82, R. 18, W6M	All British Columbia producing gasfields except Parkland, Dawson Creek, Boundary Lake, Sierra, Clarke Lake, Yoyo, and Beaver River	Inlet separator, M.E.A. treating, dry desiccant dehydration, oil absorption, distillation	1957	500	455	Condensate, pentanes plus, propane, butanes	Westcoast Transmission Co. Ltd.
Westcoast Transmission Co. Ltd.	N.W. ¼ Sec. 10, Tp. 85, R. 14, W6M	Boundary Lake	M.E.A. absorption, dehydration	1961	9.4	8.9	Condensate	Westcoast Transmission Co. Ltd.
Westcoast Transmission Co. Ltd.	Unit 85, Block G, N.T.S. Map 94-J-10	Beaver River, Clarke Lake, Yoyo, Helmet, Louise, Petitot	Potassium carbonate, M.E.A., D.E.A. absorption, dehydration	1965	1 096	910		Westcoast Transmission Co. Ltd.

TABLE 4-15 - SULPHUR PLANTS, 1977

Name	Location	Raw Material	Principal Product	Year of First Operation	Capacity (Long Tons per Day)
Westcoast Transmission Co. Ltd.	Taylor	Hydrogen sulphide	Sulphur	1967	260
Westcoast Transmission Co. Ltd.	Fort Nelson	Hydrogen sulphide	Sulphur	1976	400

Table 4-16—Petroleum and Natural Gas, 1954-1977

Year	Crude Oil		Field Condensate		Plant Condensate		Natural Gas to Pipeline		Butane		Propane		Total Value
	m ³	\$	m ³	\$	m ³	\$	10 ⁸ m ³	\$	m ³	\$	m ³	\$	
1954							1 715	6,545					6,545
1955	93	480					4 752	18,130					18,610
1956	23 602	299,322					5 292	20,143					319,465
1957	54 901	763,751			4 449	no value	233 138	433,830					1,197,581
1958	81 675	1,009,609			39 915	380,072	1 635 204	3,368,327	12 980	26,115	10 985	22,110	4,806,233
1959	137 484	1,573,227			81 554	367,797	1 817 945	3,928,839	32 916	66,249	15 410	31,016	5,967,128
1960	137 981	1,531,049			119 377	459,741	2 257 170	7,101,949	46 643	93,878	19 888	40,029	9,226,646
1961	161 462	1,900,104	25	297	129 349	737,761	2 703 776	8,818,891	51 148	102,946	25 928	52,185	11,612,184
1962	1 415 772	16,827,118	1 530	18,184	133 206	674,644	3 062 513	10,226,323	61 618	124,019	34 500	69,438	27,939,726
1963	1 989 747	24,900,381	2 174	27,205	133 828	536,193	2 973 071	10,719,298	65 041	130,908	32 619	65,651	36,379,636
1964	1 832 404	23,396,716	4 192	63,436	146 622	587,685	3 351 574	12,192,816	73 415	147,763	38 921	78,337	36,466,753
1965	2 141 679	28,696,841	5 053	67,696	150 632	576,106	3 910 948	14,493,255	75 996	152,956	57 042	114,808	44,101,652
1966	2 645 259	36,268,683	6 291	86,265	154 946	312,360	4 543 460	17,339,587	79 650	160,311	53 153	106,981	54,274,187
1967	3 125 181	44,748,477	6 450	92,357	161 541	267,941	5 596 092	21,667,136	93 505	188,197	65 672	132,178	67,096,286
1968	3 521 783	50,082,837	8 611	122,408	152 670	247,455	6 317 544	24,531,445	83 870	168,814	63 723	128,256	75,281,215
1969	4 023 815	58,176,213	12 425	180,520	150 104	263,278	7 218 831	27,897,585	66 385	133,613	52 069	104,800	86,756,009
1970	4 032 130	60,405,941	17 052	277,829	159 489	253,009	7 678 940	29,804,411	49 074	98,772	66 828	134,505	90,974,467
1971	3 999 185	66,471,856	17 331	287,781	177 137	293,287	7 685 055	31,946,372	50 590	101,822	74 547	150,040	99,251,158
1972	3 788 849	63,166,717	16 619	277,069	161 854	327,820	9 939 498	41,616,824	54 200	106,533	76 323	150,015	105,644,978
1973	3 368 902	68,306,032	20 114	407,807	180 088	222,463	10 789 269	54,762,105	109 057	212,640	99 188	193,398	124,104,445
1974	3 012 501	103,335,328	16 561	568,075	178 534	924,549	9 016 996	128,018,726	105 426	232,085	89 373	196,742	233,275,505
1975	2 269 898	94,229,725	16 094	668,092	185 272	6,525,837	9 236 489	214,733,528	106 427	2,577,205	81 975	1,985,087	320,719,474
1976	2 367 450	116,595,050	18 309	901,711	167 576	7,198,957	8 799 508	287,997,059	109 781	4,591,832	88 195	3,688,955	420,973,564
1977	2 200 303	132,859,085	24 465	1,477,248	180 267	9,751,058	8 895 663	396,601,354	111 357	5,358,167	91 297	4,392,944	550,439,856
Totals	46 332 056	995,544,542	193 296	5,523,980	2 948 410	30,908,013	117 674 443	1,348,244,478	1 439 079	14,774,825	1 137 636	11,837,475	2,406,833,313

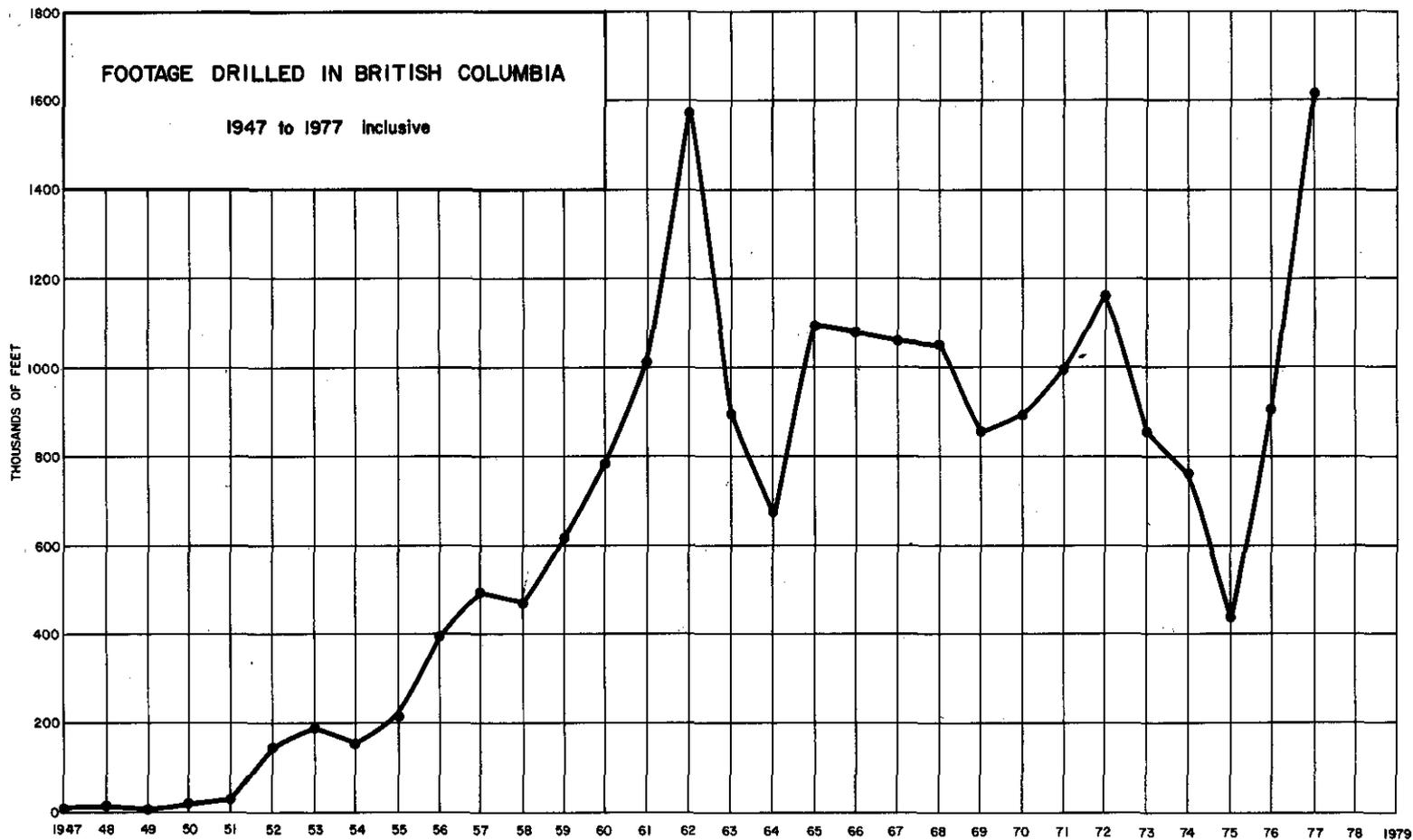


FIGURE 4-1 - FOOTAGE DRILLED IN BRITISH COLUMBIA, 1947-77

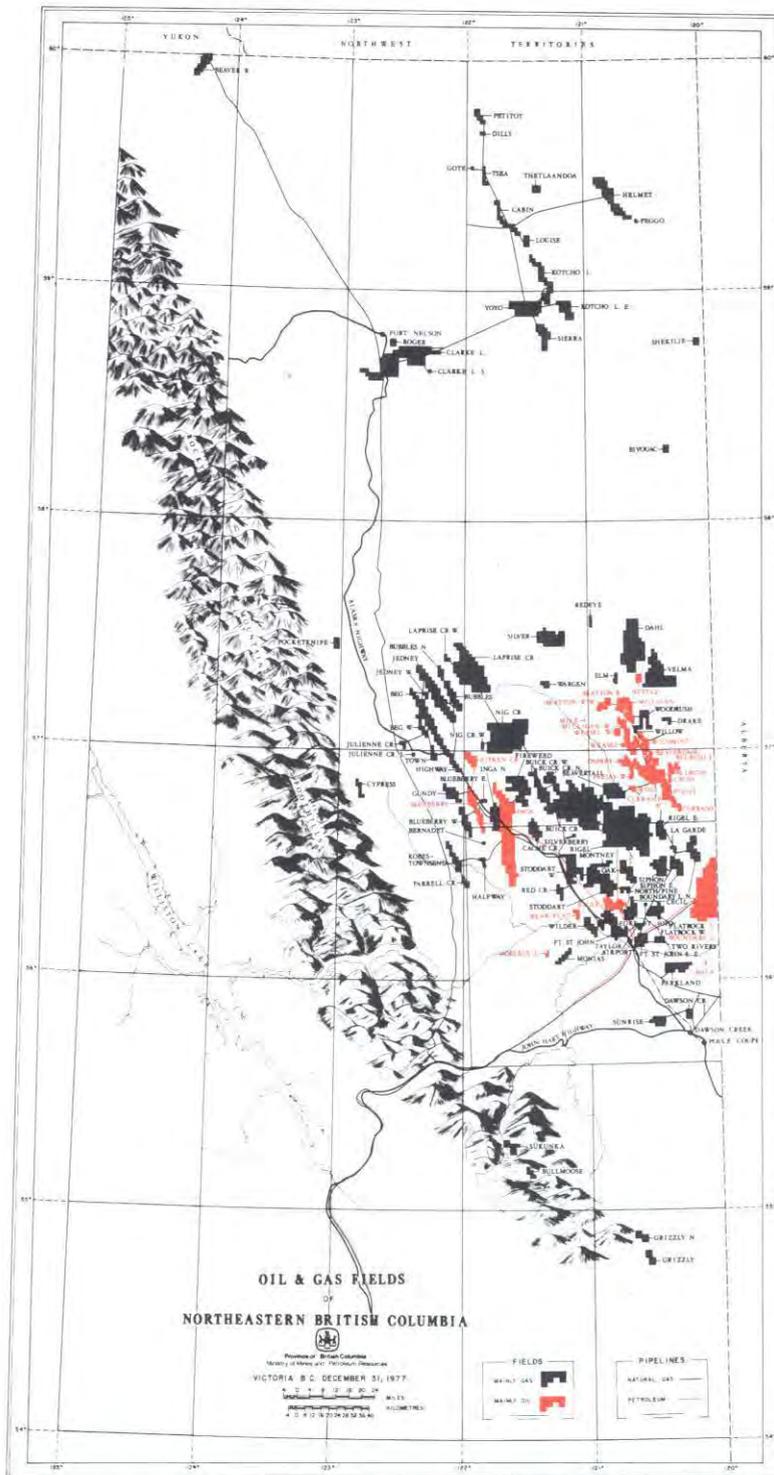


FIGURE 4-2 - PETROLEUM AND NATURAL GAS FIELDS IN BRITISH COLUMBIA, DECEMBER 31, 1977

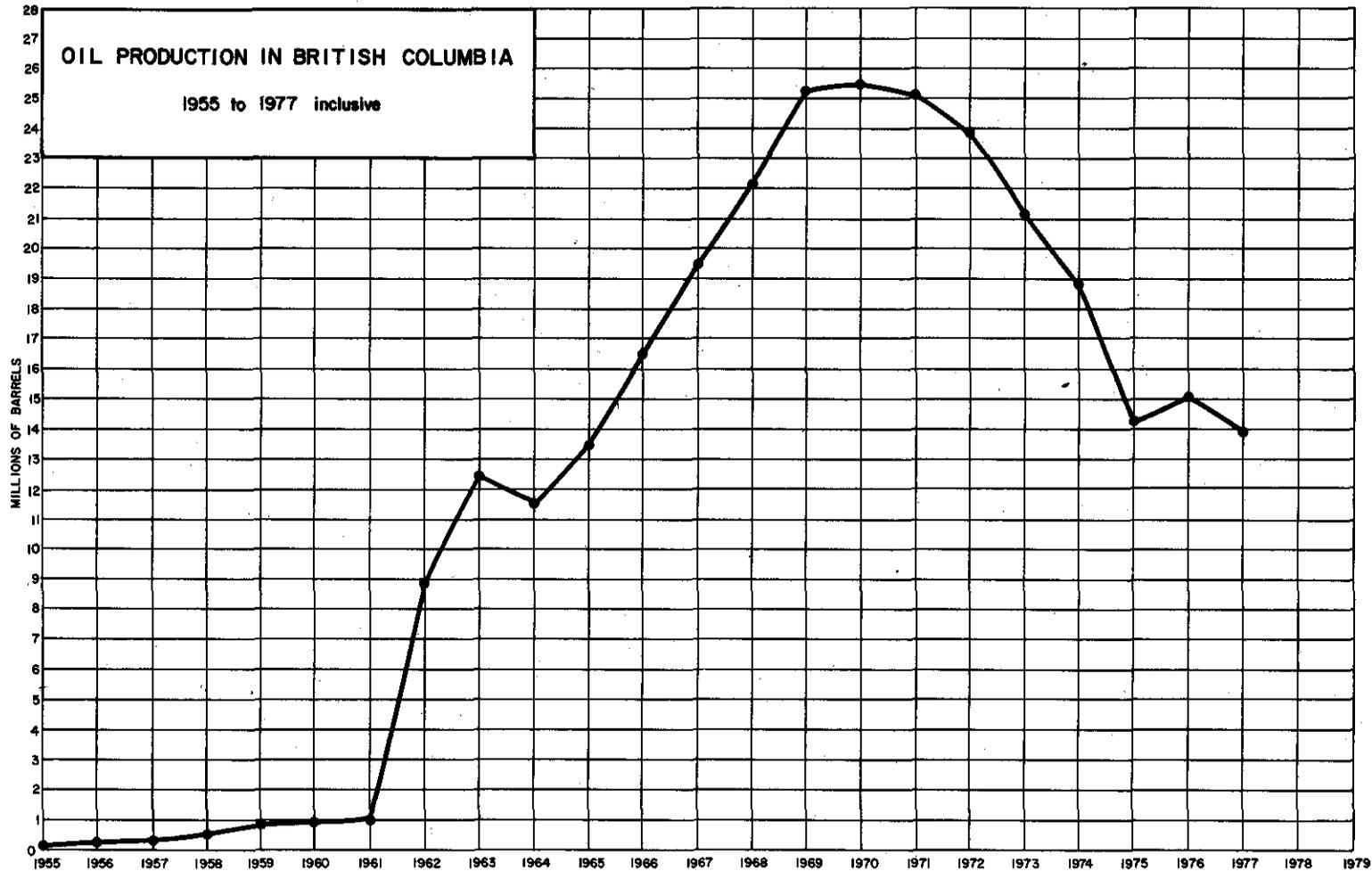


FIGURE 4-3 - OIL PRODUCTION IN BRITISH COLUMBIA, 1955-77

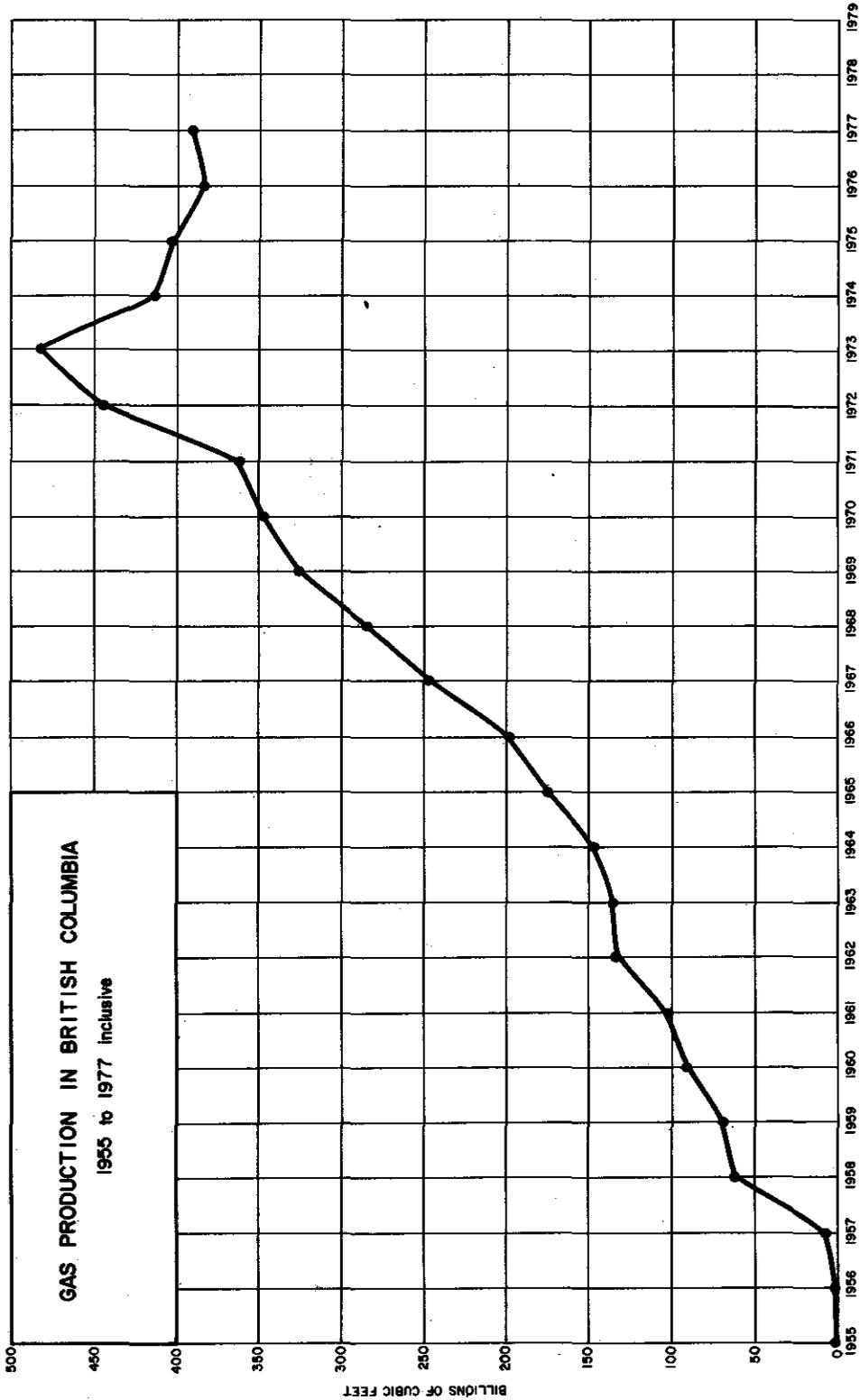


FIGURE 4-4 - GAS PRODUCTION IN BRITISH COLUMBIA, 1955-77

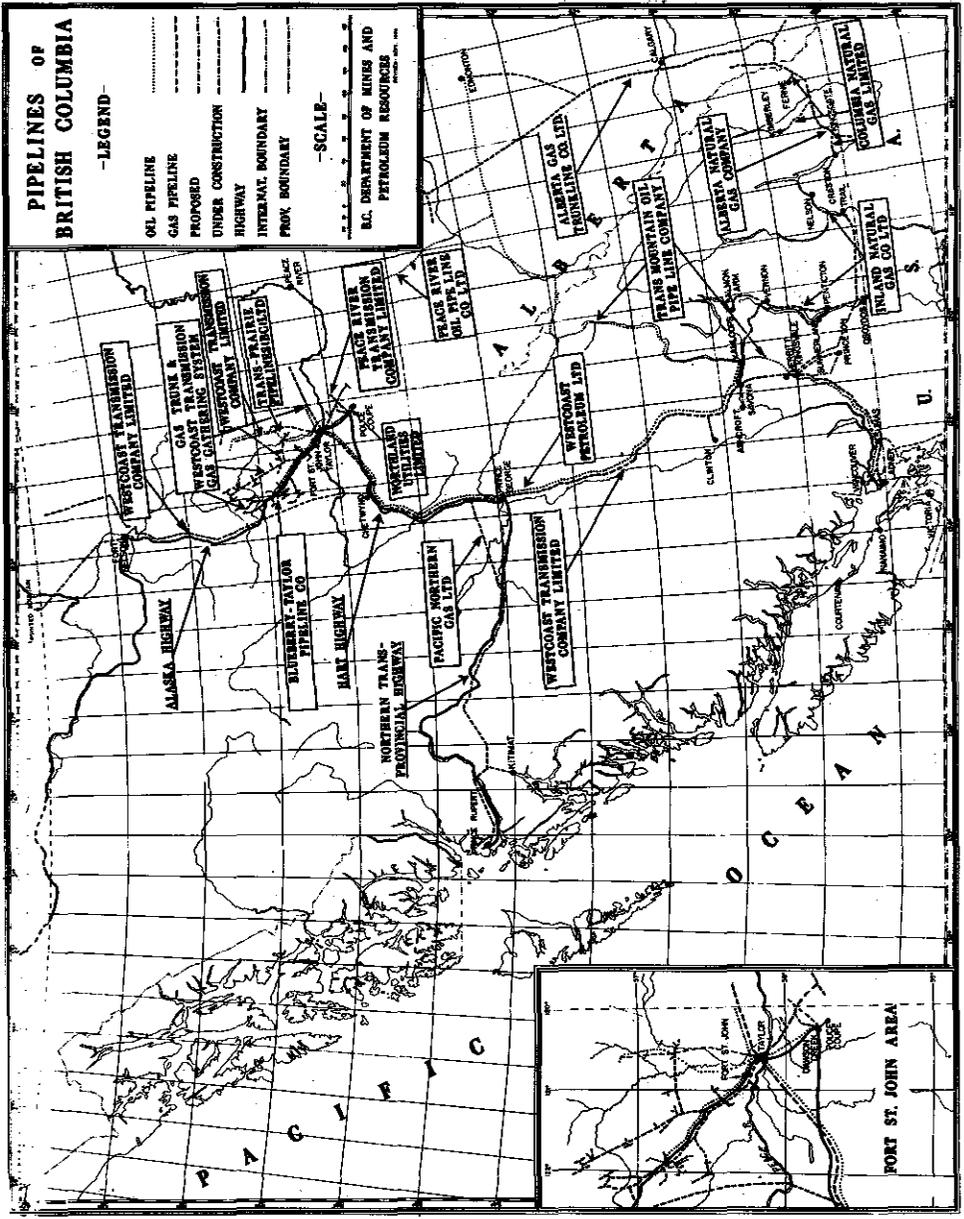


FIGURE 4-5 - PETROLEUM AND NATURAL GAS PIPELINES IN BRITISH COLUMBIA

Directory

(as at November 30, 1978)

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Cathie Green (Personnel Clerk)	Room 429, Douglas Building	387-5765

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