



Ministry of  
Energy, Mines and  
Petroleum Resources  
Hon. Jack Davis, Minister

Canadian  
Geoscience  
Council

**REPORT OF THE  
1982 ADVISORY COMMITTEE  
TO THE  
GEOLOGICAL BRANCH  
MINISTRY OF ENERGY, MINES  
AND PETROLEUM RESOURCES**

Open File 1986-8



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GEOLOGICAL SURVEY BRANCH  
MINERAL RESOURCES DIVISION**

**BY THE  
CANADIAN GEOSCIENCE COUNCIL ADVISORY COMMITTEE TO THE  
BRITISH COLUMBIA GEOLOGICAL BRANCH  
CHAIRMAN: H.C. MORRIS  
MEMBERS: H. GREENWOOD, G. MOSSOP, E.R.W. NEALE, A.E. SOREGAROLI**

**VICTORIA  
BRITISH COLUMBIA  
CANADA  
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## Preface

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This external review of the Geological Branch was commissioned by the Deputy Minister, Mr. R.A. Illing, in 1981 on the recommendations of the then Deputy Minister, Mr. A. Freyman and Chief Geologist, Dr. A. Sutherland Brown. The review was undertaken in the fall and winter of 1981 and was finalized in 1982. The report captures the status of the Branch in 1981, a time of some disarray due to the exodus of many professional staff to an expanding local mining industry.

The terms of reference required the Committee, drawn from industry, government and academia, to conduct a wide-ranging overview of all aspects of the Branch, including the question of its continued existence.

The insights and recommendations in the report have been widely used by Dr. W.R. Smyth, the new Chief Geologist, and the new management team of the Branch in charting initiatives and directions during recent years. In particular, the section "Need for a Geological Branch" helped justify and maintain programs during the restraint evaluation process.

Many of the Committee's recommendations have been implemented by the new management team, for example:

1. The backlog in Branch publications, a major shortcoming, was virtually eliminated in 1985-86.
2. An office was opened in Vancouver in 1986 staffed by a Senior Regional Geologist.
3. A formal planning process has been established, and 1 and 5 year plans have been drawn up for each of the sub-sections.
4. A new Coal Sub-section was created in 1986 to provide a better focus and direction for the Branch's coal program.
5. A plan for replacing obsolete equipment in the analytical laboratory was adopted and in 1986, a new XRF unit was purchased.

However, some of the problems identified still persist. Hence this report is being made available to a wider audience at this time to help focus attention on the outstanding issues and to stimulate a dialogue with all interested parties. The Ministry, the Branch, and the Committee will welcome comments on the conclusions drawn and recommendations made.

It is highly to the credit to the Ministry and the Geological Branch that an independent review was commissioned in 1981. The Branch is to be commended for its interest and participation in the original investigation, for the energy and dedication which they have brought to correcting some of the observed deficiencies, and for publishing the report. It is hoped that release of this summary of the Committee's findings will stimulate on-going discussion with the interested public and enable the Branch to advance with a further round of constructive initiatives.

H.C. Morris, Chairman  
Vancouver, November 1986

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# Introduction

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## Composition of the Advisory Committee

The Advisory Committee convened by the Deputy Minister of the Ministry of Energy, Mines and Petroleum Resources, Mr. Illing, is as follows:

Chairman — Dr. Hugh C. Morris, President and Chief Operating Officer, Geomex Minerals Ltd., Calgary.\*

Dr. Hugh Greenwood — Head, Department of Geological Sciences, The University of British Columbia, Vancouver.

Dr. A. E. Soregaroli — Vice-President, Explorations, Westmin Resources Ltd., Vancouver.

Dr. Grant Mossop, Head, Alberta Geological Survey, Alberta Research Council, Edmonton.

Dr. Ward Neale, Sr. Scientist, Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, Calgary.\*\*

\*Presently: Chairman and CEO, Imperial Metals Corporation, Vancouver, B.C.

\*\*Presently: Vice-President (Academic), Memorial University, St. Johns, Newfoundland.

## Activities of the Committee

The initial activity of this committee was an extended briefing provided to it by the management and staff of the Geological Branch in Victoria. This meeting included a session with department managers, a tour of facilities, an overview by Dr. Freyman, the Assistant Deputy Minister and the Chief Geologist, Dr. Sutherland Brown, and a question period. The Committee then held an initial meeting, elected its chairman, and established some rules and procedures for its activities.

The Committee adopted the following overall plan of investigation for its assignment. Selected subdivisions of the Geological Branch were reviewed in detail by individual members of the Committee. Interviews were conducted with a substantial number of senior and junior employees of the Geological Branch and with a number of industry, government, and institutional geologists and executives who have had dealings with the Branch or whose activities parallel it.

The Committee met on several occasions as a group in Vancouver, and additional meetings of subgroups within the Committee were held in Calgary and Vancouver, as convenient, for additional discussions on specific topics.

At the draft stage, a review meeting was conducted with the Chief Geologist, Dr. Sutherland Brown, to provide an opportunity for further input and representation by the Geological Branch.

## Acknowledgments

The Committee wishes to record its sincere appreciation for the truly outstanding cooperation they have received from

all members of the Geological Branch. Their frankness and interest are gratefully acknowledged.

The Committee must also record its gratitude to the many persons in the mineral community who responded so readily to the enquiries made of them. Their responses were a major contribution to the work of the Committee, and their interest in the Geological Branch and its activities augers well for its future.

The Committee compliments the Ministry and the management of the Geological Branch on their decision to invite outside review. This is a progressive and wise action which will prove to be constructive and rewarding.

## Terms of Reference

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### Mandate

The mandate of the Advisory Committee to the Geological Branch was set forth by the Ministry of Energy, Mines and Petroleum Resources as follows:

- (1) To review and report on the need for a Geological Branch and, if there is a positive need, to recommend the level and direction of effort.
- (2) To review and report on the present and desired relationship with the respective components of the minerals sector (exploration, mining, processing), with universities and research institutes, and with branches of government (British Columbia, other provinces, federal).
- (3) To review and report on the goals, objectives, organizations, operations, management, and effectiveness of the Geological Branch.

## Need for a Geological Branch

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### General

To properly assess the nature of the need for a Geological Branch in the British Columbia Ministry of Energy, Mines and Petroleum Resources, it is necessary and appropriate to consider the nature of mineral exploration. This will establish the context and setting against which to appraise the function and role of the Geological Branch.

### Mineral Exploration

Exploration for naturally occurring mineral resources can be described as a complex problem-solving activity with major components of interpretation and logical analysis. The exploration process requires multistage selections which start with the appraisal and analysis of a large amount of existing data. These data are highly varied. They include scientific information and measurement of geological, geophysical, geochemical, and other parameters; they may include historical records relating to past exploration or exploitation activity; they may also include comparative data derived from parallel situations in similar geological environments from many other regions of Canada or other parts of the world.

This appraisal and analysis stage is normally followed by a data-gathering stage during which new measurements are made and additional information is developed. This in turn leads to an interpretive function which culminates in the definition of a "target".

This target is now tested by one or more of several physical procedures such as sampling or trenching or drilling. The testing process frequently sets up a new cycle of the data-collecting and analysis steps. This cycle may continue for one to several repetitions as the workers attempt to converge on a clear outcome.

The severity and complexity of the difficulties inherent to mineral exploration are borne out by the fact that there are so few successes. When one considers the number of claims, properties, projects, and active field parties in the Province of British Columbia in a single season, and contrasts this to a number of discoveries, a measure is obtained of the degree of difficulty and the probability of failure in the exploration process.

In 1980, 70 000 claims were staked and over \$100 million was expended in British Columbia. Over 5 000 man-years of work were conducted. This huge and intense effort resulted in less than 10 significant mineral discoveries, of which less than half will likely attain profitable production in less than 6 years.

A number of studies have been made by both industry and government of the ratio of success to failure, of the probability of success at any stage, etc. One particularly relevant review, by R. A. Spencer of Cominco, calculated that probability of success on any individual property at the time of staking is less than one chance in one thousand. These odds have been supported by other studies, all of which demonstrate that successful mineral exploration is a sophisticated exercise in risk management and problem solving.

One may also consider the exploration process as similar to an applied research undertaking. It calls in most cases for the application of many related and occasionally even unrelated subdisciplines of science and technology such as geophysics, chemistry, satellite imagery, computer technology, etc.

This theoretical framework can be demonstrated for everyday mineral exploration as follows. It starts out with the period of office research and study. This leads to the delineation of a field area in which the exploration process is applied. This exploration process would usually consist of a multi-pronged attack utilizing geological mapping, geochemical and geophysical surveys, prospecting, etc. It culminates in the acquisition of mineral property through staking or leasing, and the definition of targets for drilling. It may require a stage of detailed exploration, of detailed surveying, and of multiple further stages of refining and testing. With encouragement, new factors such as metallurgical recovery, mineral processing technology, marketing, and the economics of exploitation become involved. These will lead to mining studies and feasibility analyses which will finally identify the degree of failure or success in a particular exploration venture.

One clearly emerging and fundamental point is that the total process uses a vast amount of data and a major body of scientific understanding. Both stem from scientific and

professional activities in applied science which have taken place over many years and which are continuing. These are mainly conducted by industry, supplemented by research institutions such as the Geological Branch, by other government agencies, and by universities.

### **The Role of Government**

Natural resources in Canada are (at least at present) a provincial responsibility. In every province in Canada, therefore, the provincial administrations have a broad responsibility and accountability for nurturing and fostering the natural resource industries.

The Provincial Government of British Columbia has over all major responsibilities for the generation of provincial wealth from the natural resource base, for the protection of the provincial environment, and for providing opportunity for private enterprise to individual provincial residents. The Geological Branch is in a unique and responsible position relative to these provincial responsibilities in the Mineral Exploration field. No other organization can supply technical leadership in the sense of coordinating and integrating mineral exploration procedures and technologies. No other organization is in the position to supply all embracing service to the smaller private enterprise and to individuals. No other organization is in the position to provide discriminating data for good policy decision-making.

All provincial governments in Canada have recognized that there is a vital need for a combined technological and administrative bureau which addresses itself to the many geological facets of the mineral industry.

The Committee agrees categorically with this position. It is clearly essential to have a Ministry within the Provincial Government which addresses the jurisdiction of resources. For this Ministry to function adequately and creatively, it is necessary to have a geologically oriented organization which can administer many of the technological aspects of resource management, and which can provide up-to-the-minute data to provide a base for enlightened and progressive decision-making by the Ministry.

### **Level of Effort**

The task of estimating a desirable level of effort, and of its associated expenditure, is complex. In an era of inflated government spending, there are many urgent reasons for recommending economies and cost reductions by the administration. Furthermore, governmental monitoring and regulating bodies represent a form of "overhead" which is levied in one way or another on the provincial wealth. It is only too easy for such overhead functions to become self-perpetuating and unessential consumers of public tax monies.

However, just as it is proper for government to exercise due concern and prudence with public funds, so it is incumbent on them to make judicious and timely investment of these revenues into areas and activities where the private sector is not able to function effectively. The process of regulating, monitoring, and stimulating the minerals sector is clearly one of these.

Even given this position and conclusion, it is no easy

matter to select and recommend a specific financial level. The committee feels that it is not able to specify budget levels, etc., given the limited time at its disposal. Instead, it proposes to consider certain relevant factors and to conclude and recommend in general terms only.

The level of effort may be analysed by the following three comparisons:

- (i) Comparison of mineral industry with other resource industries,
  - (ii) Comparison with similar provincial expenditures in Canada,
  - (iii) Comparison of British Columbia mineral industry with the United States of America.
- (i) **Mineral Industry Compared to Other Resource Industries**

One method of approaching the question of how much money should be invested by government in the geological characterization of mineral deposits is to relate the governmental investment to the value of the minerals industry in the province. Table 1 sets out the dollar value production figures

for materials mined in British Columbia over the five years 1976 to 1980. The mined resources include metallic minerals, nonmetallic minerals, structural materials (aggregate, lime, clay products, etc.) and coal, all of which fall under the purview of the Geological Branch. As the table indicates, the total value of production from British Columbia mines over these years is in excess of \$8.2 billion. The mining industry is clearly a major contributor to the economic health of British Columbia.

How does the mining industry compare in size to other resource industries? Table 2 compares the dollar value of mining production with that of petroleum production over the same period. The figures indicate that the production value of crude oil, natural gas, and natural gas byproducts is in the order of \$2.4 billion over five years. Of the total value of production from geological resources in British Columbia over the past five years (\$10.7 billion), 77 per cent is from the mining sector (Table 2).

The only resource industry that surpasses mining in terms of economic impact in British Columbia is the forest industry.

**TABLE 1**  
**DOLLAR VALUE OF MINERAL PRODUCTION**  
**BRITISH COLUMBIA<sup>1,2</sup>**

	1976	1977	1979	1979	1980
METALS	698 425 822	781 556 843	868 319 276	1 367 866 248	1 465 617 000
NONMETALS	54 756 979	81 603 650	61 420 237	85 931 558	115 127 000
STRUCTURAL MATERIALS <sup>3</sup>	105 303 164	119 463 016	143 402 199	185 192 766	247 040 000
COAL	297 756 900	294 954 000	374 467 000	488 135 000	445 430 000
TOTALS	1 156 242 865	1 277 577 509	1 447 608 712	2 127 125 572	2 273 214 000
5-YEAR TOTAL 8 281 768 658					

<sup>1</sup>Source - Canadian Mining Journal 1978, 1979, 1980, 1981.

<sup>2</sup>Includes all earth resources produced by mining (i.e. the so called "hard minerals"), Government geological responsibility for which rest with Geological Branch, Mineral Resources Division.

<sup>3</sup>Includes sand and gravel, stone, lime, clay products, and cement.

**TABLE 2**  
**DOLLAR VALUE OF BRITISH COLUMBIA**  
**MINING AND PETROLEUM PRODUCTION<sup>1</sup>**

	1976	1977	1978	1979	1980	5-YEAR TOTAL
MINING <sup>2</sup>	1 156 242 865	1 277 577 509	1 447 608 712	2 127 125 572	2 273 214 000	8 281 768 658
PETROLEUM <sup>3</sup>	489 957 000	408 933 000	435 043 000	549 611 000	522 124 000	2 405 668 000
TOTAL VALUE OF PRODUCTION FROM GEOLOGICAL RESOURCES						10 687 436 658
<b>PERCENTAGE OF TOTAL PRODUCTION VALUE</b>						
	MINING	$8\,282 \times 10^6 / 10\,687 \times 10^6 = 77\%$				
	PETROLEUM	$2\,406 \times 10^6 / 10\,687 \times 10^6 = 23\%$				

<sup>1</sup>Source - Canadian Mining Journal, 1978, 1979, 1980, 1981.

<sup>2</sup>Includes metals, nonmetals, structural materials, and coal (i.e. "hard minerals").

<sup>3</sup>Includes crude oil, natural gas, and natural gas by-products (i.e. petroleum resources).

**TABLE 3**  
**COMPARISON OF BRITISH COLUMBIA MINING INDUSTRY**  
**AND BRITISH COLUMBIA FOREST INDUSTRY**

[All values shown in millions of dollars (\$ × 10<sup>6</sup>) ]

		1976	1977	1978	1979	1980	5-YEAR TOTAL
MINING INDUSTRY	\$ Value of production <sup>1</sup>	1 156	1 278	1 448	2 127	2 273	8 282
	\$ Revenue to B.C. Treasury <sup>2</sup>	61	35	42	69	119	326
	\$ Expenditure by B.C. Treasury <sup>2</sup>	5	6	6	7	8	32
B.C. Government reinvestment in mining industry, relative to production value = 32/8 260 = 0.4%							
FOREST INDUSTRY	\$ Value of production <sup>3</sup>	3 220	3 776	4 618	5 693	5 652	22 959
	\$ Revenue to B.C. Treasury <sup>4</sup>	86	145	298	609	401	1 539
	\$ Expenditure by B.C. Treasury <sup>4</sup>	85	98	132	244	405	964
B.C. Government reinvestment in forest industry, relative to production value = 964/22 959 = 4.2%							

<sup>1</sup>Source - Canadian Mining Journal 1978, 1979, 1980, 1981 (see Table 1).

<sup>2</sup>Source - Financial and Economic Review, B.C. Ministry of Finance.  
Includes all mining related revenues (expenditures) by B.C. Treasury

<sup>3</sup>Source - B.C. Council of Forest Industries.  
Includes all crude and fabricated forest materials.

<sup>4</sup>Source - Financial and Economic Review, B.C. Ministry of Finance.  
Includes logging tax, stumpage, timber sales, and other lands and forests revenues (expenditures).

As Table 3 shows, the value of forest production over the five years 1976 to 1980 comes to \$22.9 billion, over 2.5 times the production value from mining.

It is constructive to compare the amount of money which the British Columbia government reinvests in these two major resource industries. In the forest area, British Columbia Treasury has invested \$964 million over the past five years (Table 3). In relation to the total value of production (\$22.9 billion) the 964 million represents a governmental reinvestment in the resource of some 4.2 per cent (Table 3). The equivalent figures in mining (8.2 billion production, 32 million invested) show that the total governmental reinvestment in the mining industry comes to only 0.4 per cent. Even

acknowledging that the two industries are very different and that they place different demands on the government, it is difficult to understand how, in relation to the economic value of the respective resources, the mining industry warrants only one-tenth the government support that the forest industry receives.

#### (ii) Comparison With Other Provincial Ministries

Deductions from the preceding considerations relate primarily to the level of budgetary expenditure which might be considered appropriate in the Mineral Resources Division of the Ministry. In like fashion, a second comparison can be used to make a comment on the level of effort which may be

**TABLE 4**  
**GOVERNMENTAL EXPENDITURE ON THE GEOLOGICAL**  
**CHARACTERIZATION OF HARD MINERAL RESOURCES<sup>1</sup>**  
1980

PROVINCE	VALUE OF MINERAL PRODUCTION <sup>2</sup> \$	GEOLOGICAL SURVEY (BRANCH) EXPENDITURE <sup>3</sup> \$	RATIO OF EXPENDITURE/ VALUE	MULTIPLE OF B.C. RATIO (EXPENDITURE/ VALUE)
BRITISH COLUMBIA	2 251 143 000	3 019 000	0.134%	1.0
ONTARIO	4 625 637 000	10 732 000	0.232%	1.7 ×
QUEBEC	2 501 085 000	13 610 000	0.544%	4.0 ×
NEW BRUNSWICK	402 220 000	3 612 000	0.898%	6.7 ×
NEWFOUNDLAND	1 083 319 000	3 484 000	0.322%	2.4 ×

<sup>1</sup>Includes metallic minerals, nonmetallic minerals, structural materials, and coal.

<sup>2</sup>Source - Canadian Mining Journal, February, 1981.

<sup>3</sup>Source - Committee of Provincial Geologists, Report to Mines Ministers, October 1981.

Includes expenditure related to the study of mineable resources only (i.e. exclusive of expenditures on petroleum resource studies).









