

1985

Provincial Geologists Journal

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VOLUME THREE

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Committee of Provincial Geologists

Publication annuelle du
Comite des Geologues Provinciaux

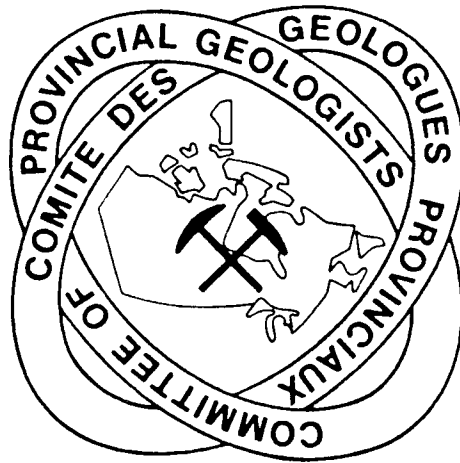
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1985

**PROVINCIAL GEOLOGISTS JOURNAL
JOURNAL DES GÉOLOGUES PROVINCIAUX**



VOLUME 3

PUBLICATION ANNUELLE DU
COMITÉ DES GÉOLOGUES PROVINCIAUX

PUBLISHED ANNUALLY BY
COMMITTEE OF PROVINCIAL GEOLOGISTS

FOREWORD

We are pleased to present Volume 3 of the Provincial Geologists Journal. Ivo Tyl noted in last year's foreword that Volume 2 should test the need for the Journal. It received a wider distribution than Volume 1 and we hope that it has been useful to the recipients. I have only recently joined the Committee of provincial geologists and have found the journal very handy; it gives a good overview of what is going on in the various geological surveys and is a good reference source for names, addresses and organizational information.

With Volume 3 you will find a request to send your name and address to us. We intend to do a reader survey later in the year and use the results to improve Volume 4.

I would like to thank all the people and institutions that helped put together this volume. They include W.R. Smyth, Ministry of Energy Mines and Petroleum Resources, British Columbia; D. Fogwill, Manitoba Department of Mines and Energy; G. Kendricks, Ontario Ministry of Northern Affairs; A.F. Laurin, Ministère de l'Énergie et des Ressources, Quebec; P.S. Giles, Nova Scotia Department of Mines and Energy and E. Jackson, Department of Natural Resources, New Brunswick. The Alberta Research Council looked after compilation and production of this volume. Joe MacGillivray of the Research Council's Geological Survey Department, was the central driving force. Conrad Gietz, Editing Department, was responsible for the technical production. Doug Boisvert did much of the proof reading and Sheila Binda and Betty Wagenseil, Geological Survey Department did a lot of typing in a hurry. Thanks to you all.

The Provincial Geologist Journal is available in each province and territory through the offices of geological surveys or relevant information centres or distribution offices of mineral resources departments of provincial or territorial governments.

Jan Boon
Head
Alberta Geological Survey Department
Alberta Research Council

THE COMMITTEE OF PROVINCIAL GEOLOGISTS CHAIRMAN'S REPORT - 1985

As in previous years, meetings of The Committee of Provincial Geologists were held in conjunction (1) with the Annual Meeting of the Prospectors and Developers Association in Toronto, Ontario (March 10), (2) with the meeting of the Provincial Mines Ministers, this year at Charlottetown, Prince Edward Island (September 16), and (3) in its interface with the Geological Survey of Canada as the National Geological Survey Committee in Fredericton, New Brunswick (May 14). These meetings provide a forum wherein matters of mutual interest and benefit to the goals and operations of geological programs in the Provinces and Territories are explored. Such matters include organizational formats, budgets, program outputs, fiscal arrangements for federal-provincial cooperation on geological projects, and regulatory environments for mineral exploration. Formalized presentations of these topics follow in the *Journal* for this year.

Other highlights include: (1) the near complete coverage of the Provinces and Territories in the institution of local industry-government Mineral Advisory Committees. The intent is to render the planning and implementation of geological programs more amenable to industry needs; (2) a successful Committee-sponsored unified display by the Provinces and Territories of their geological programs and mineral resources at the Prospectors and Developers Annual Meeting; and (3) passing of a resolution inviting the Territorial Governments of the Yukon and the Northwest Territories to provide observers to the meetings of the Committee.

The Committee takes this opportunity to express its appreciation to a founding member who has taken his retirement: John B. Hamilton of New Brunswick. Likewise, it welcomes the new representatives from Alberta, Jan Boon, and from New Brunswick, Les Davies.

In closing, The Committee of Provincial Geologists thanks the Government of Prince Edward Island for the courtesies extended it at the September meeting and the Prospectors and Developers Association for its continued support.

Provincial Geologists Committee, 1985

J.E. Christopher



Front Row, from left

Mr. R. Gibbons, Newfoundland; Dr. V.G. Milne, Ontario; Dr. J.E. Christopher, Saskatchewan;
Dr. A.F. Laurin, Quebec; Mr. J.R. DeGrace, Prince Edward Island; Dr. D. McRitchie, Manitoba.

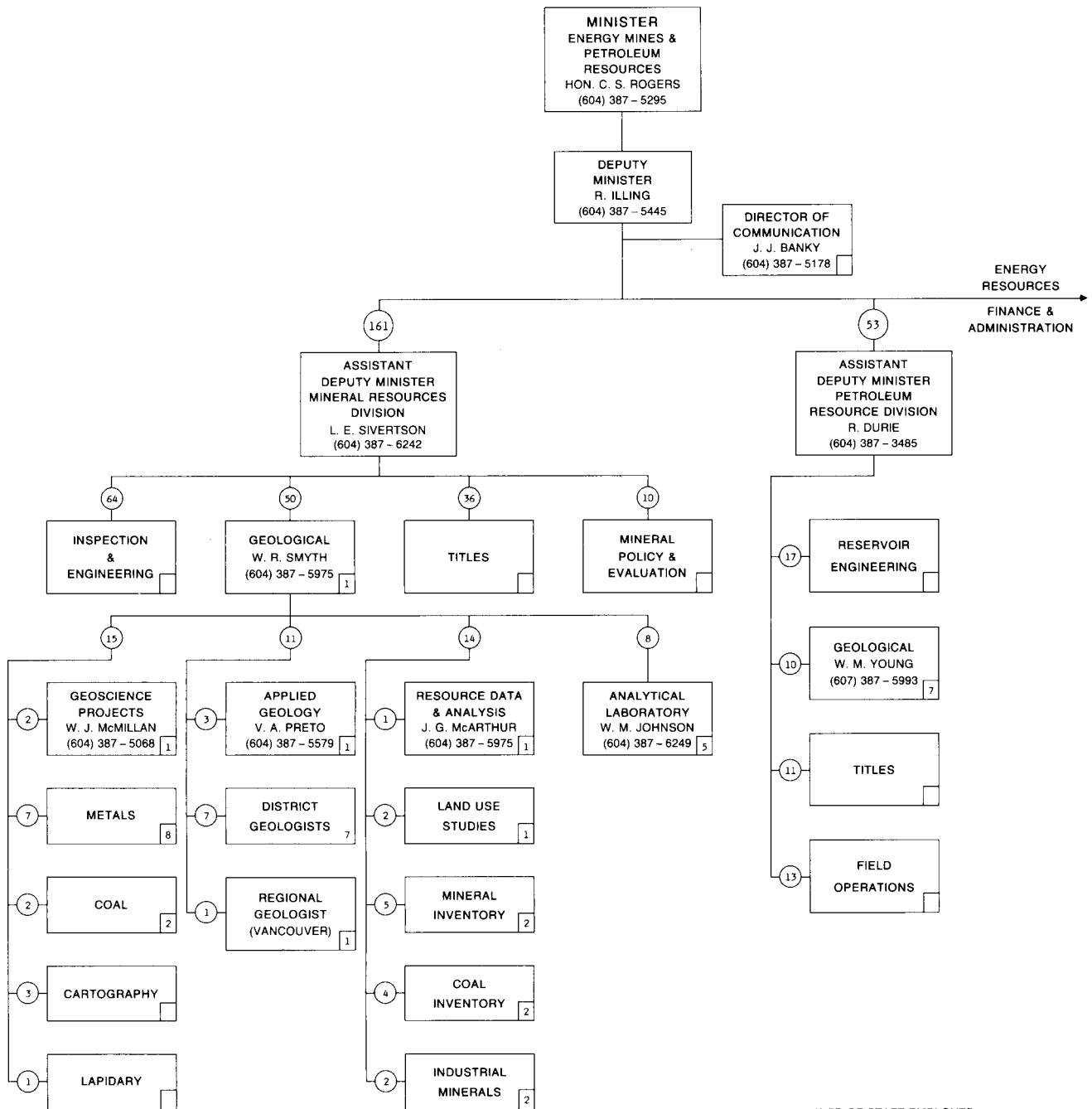
Rear Row, from left

Dr. W.A. Padgham, Northwest Territories; Dr. J.L. Danes, New Brunswick; Dr. J. Morin,
Yukon; Mr. I. Tyl, Alberta; Dr. W.R. Smith, British Columbia; Mr. D. Murray, Nova Scotia.

GEOSCIENCE ORGANIZATION CHARTS

Each provincial and territorial government in Canada has developed its own organizational structure for conducting geoscientific survey and research work. Some provinces have what is formally called a Geological Survey (e.g. Ontario Geological Survey), but in most jurisdictions the main elements of the geological survey function are embraced in one or more Branches or Divisions of provincial Mines/Energy/Natural Resources Departments (e.g. the British Columbia Ministry of Energy, Mines and Petroleum Resources is divided into a Mineral Resources Division and a Petroleum Resources Division, with the bulk of geological survey and research work conducted in the Geological Branch of the Mineral Resources Division). The following organization charts are set out in standard format to help alleviate confusion amongst potential users of provincial geoscience services. The charts contain reference to the lines of reporting of the various unit in each hierarchy, the manpower associated with each separate jurisdiction, and the names and telephone numbers of key individuals in each system.

BRITISH COLUMBIA GEOSCIENCE ORGANIZATION CHART

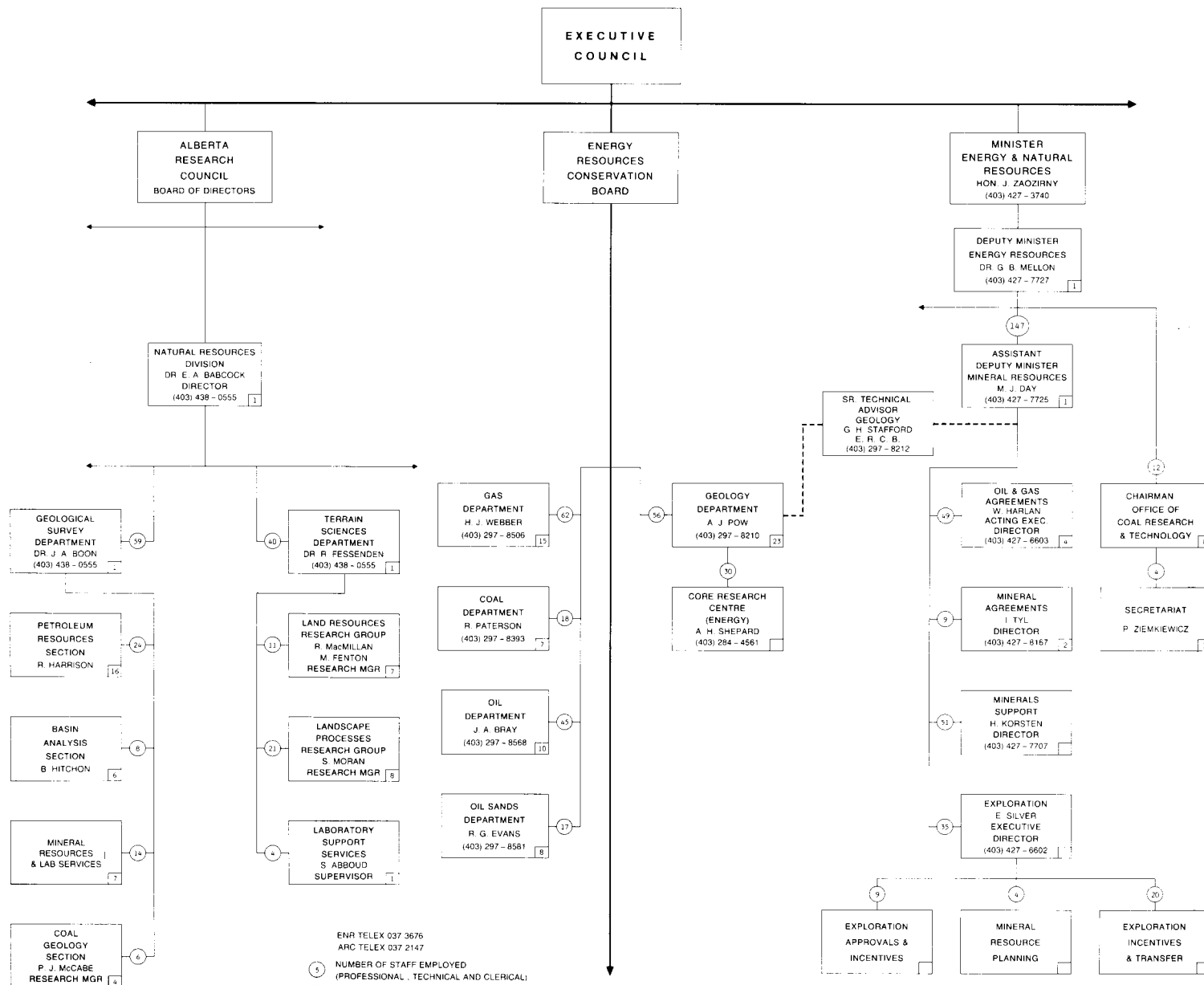


(5) NUMBER OF STAFF EMPLOYED
(PROFESSIONAL, TECHNICAL AND CLERICAL)

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

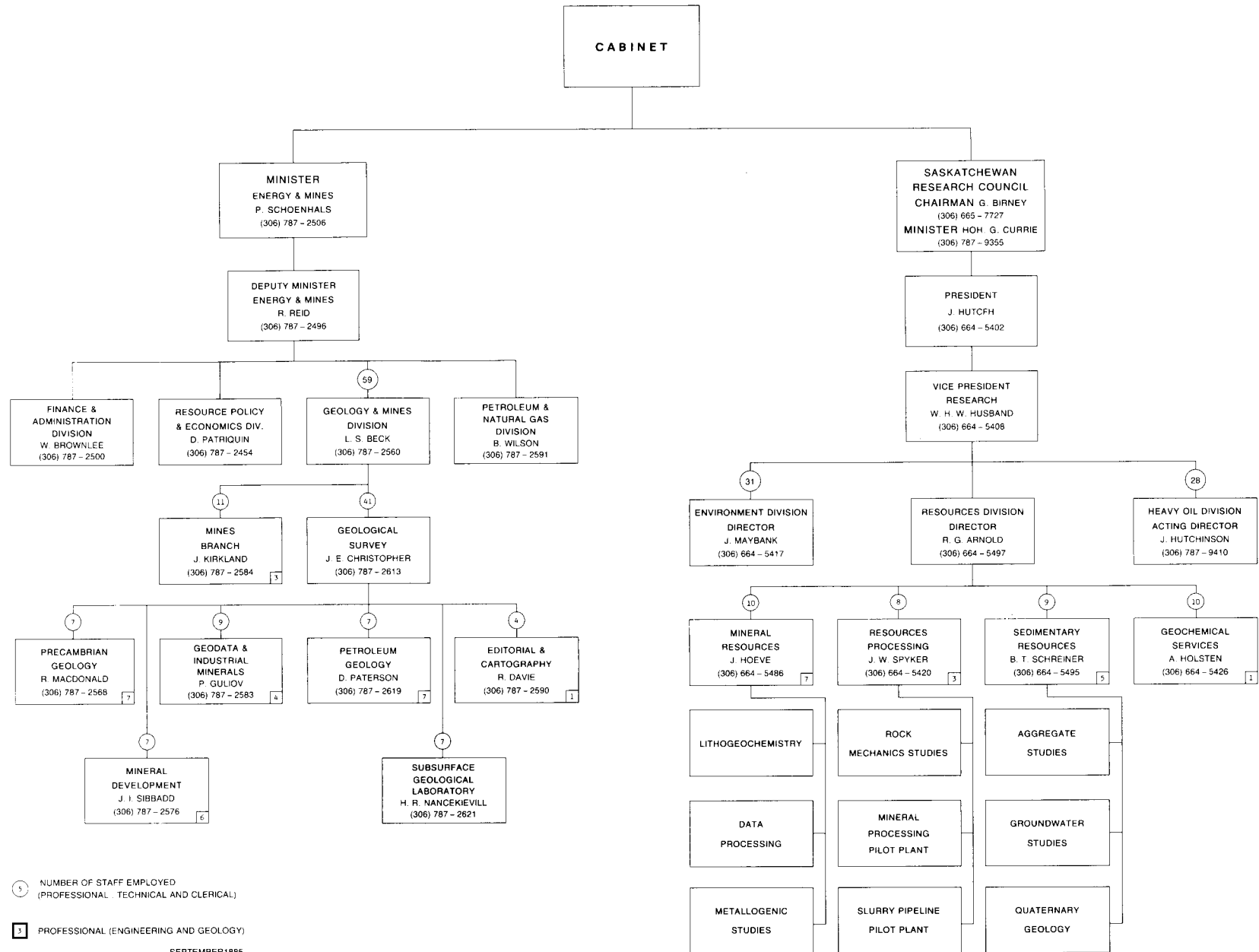
SEPTEMBER 1985

ALBERTA GEOSCIENCE ORGANIZATION CHART

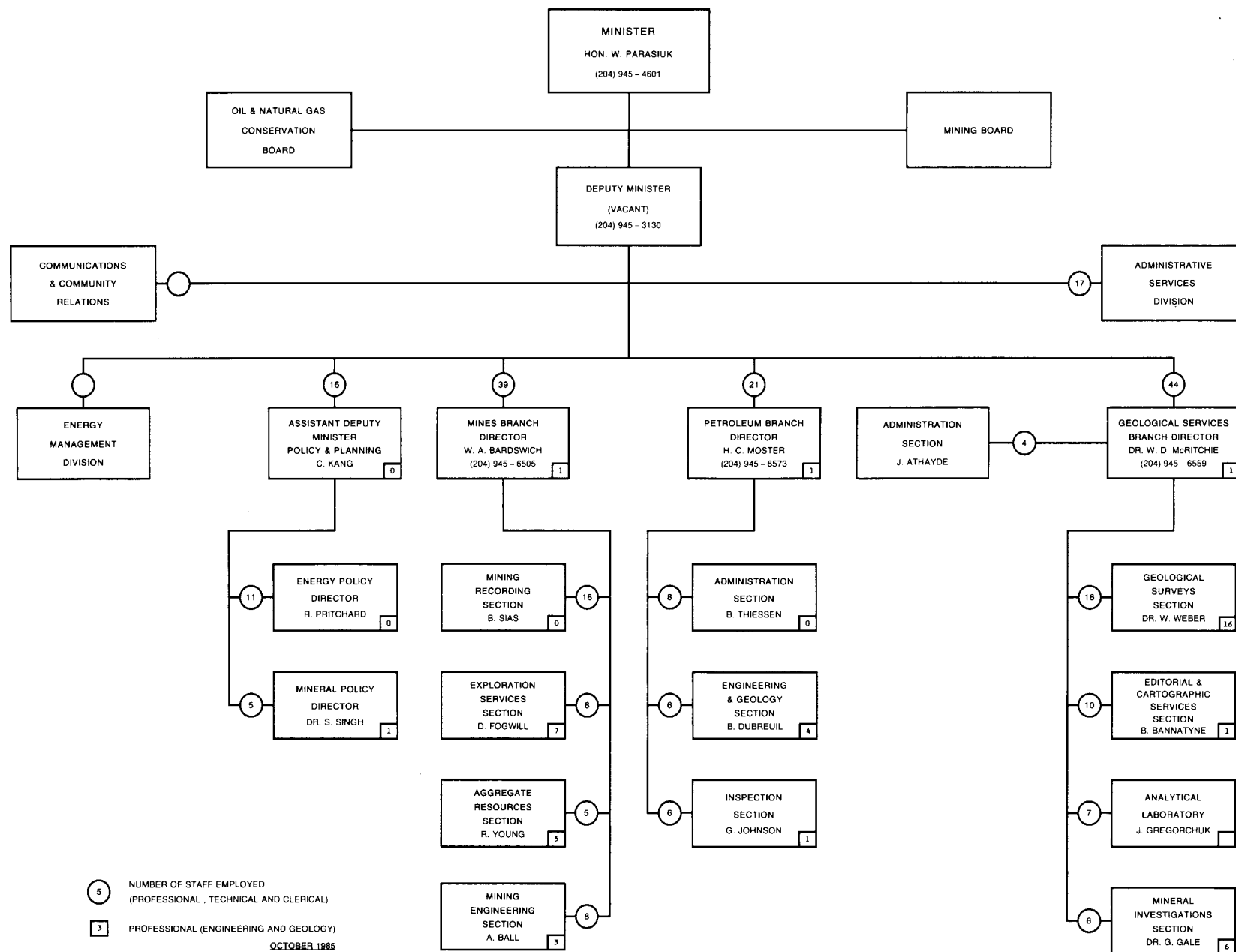


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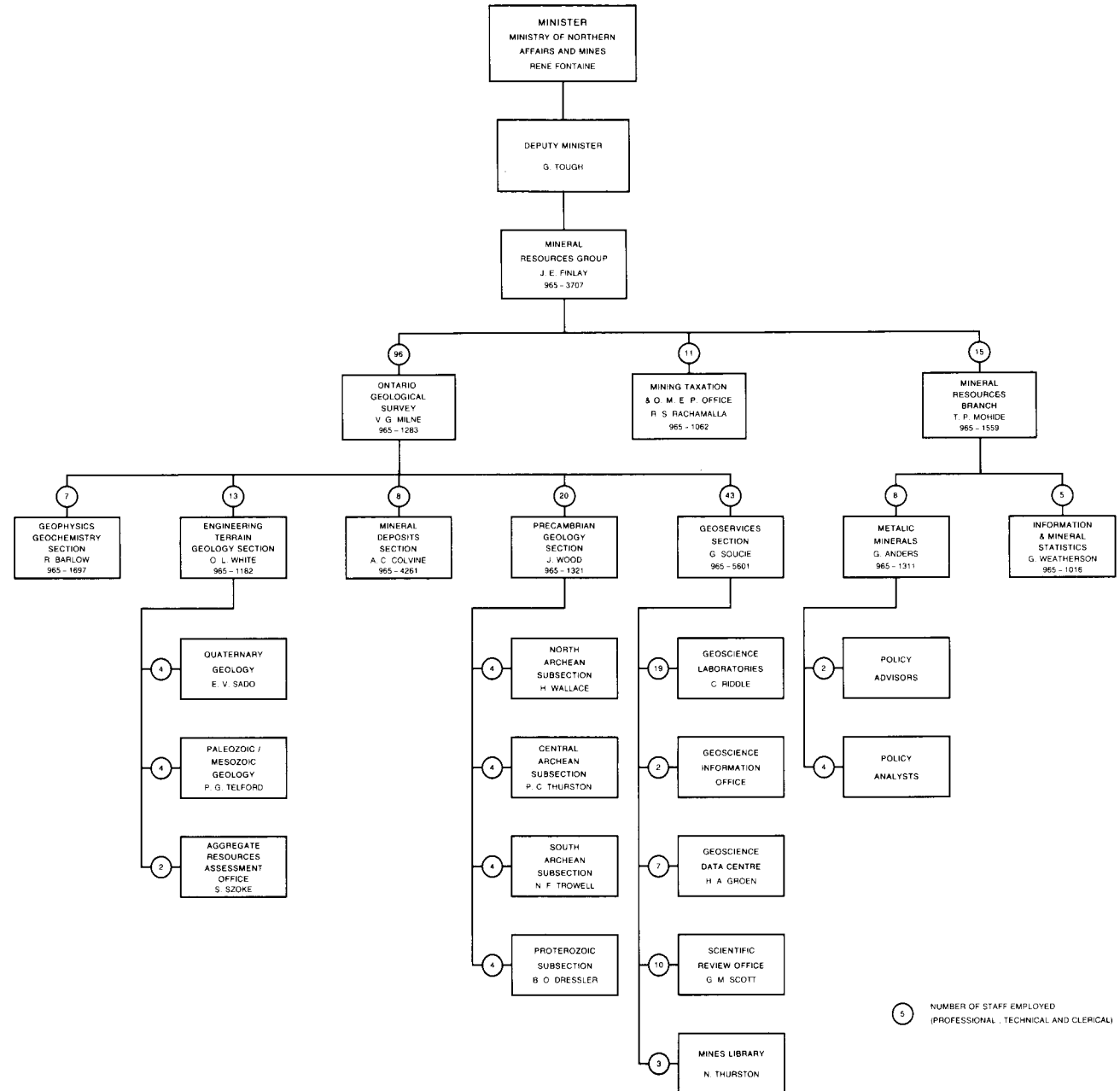
SASKATCHEWAN GEOSCIENCE ORGANISATION CHART



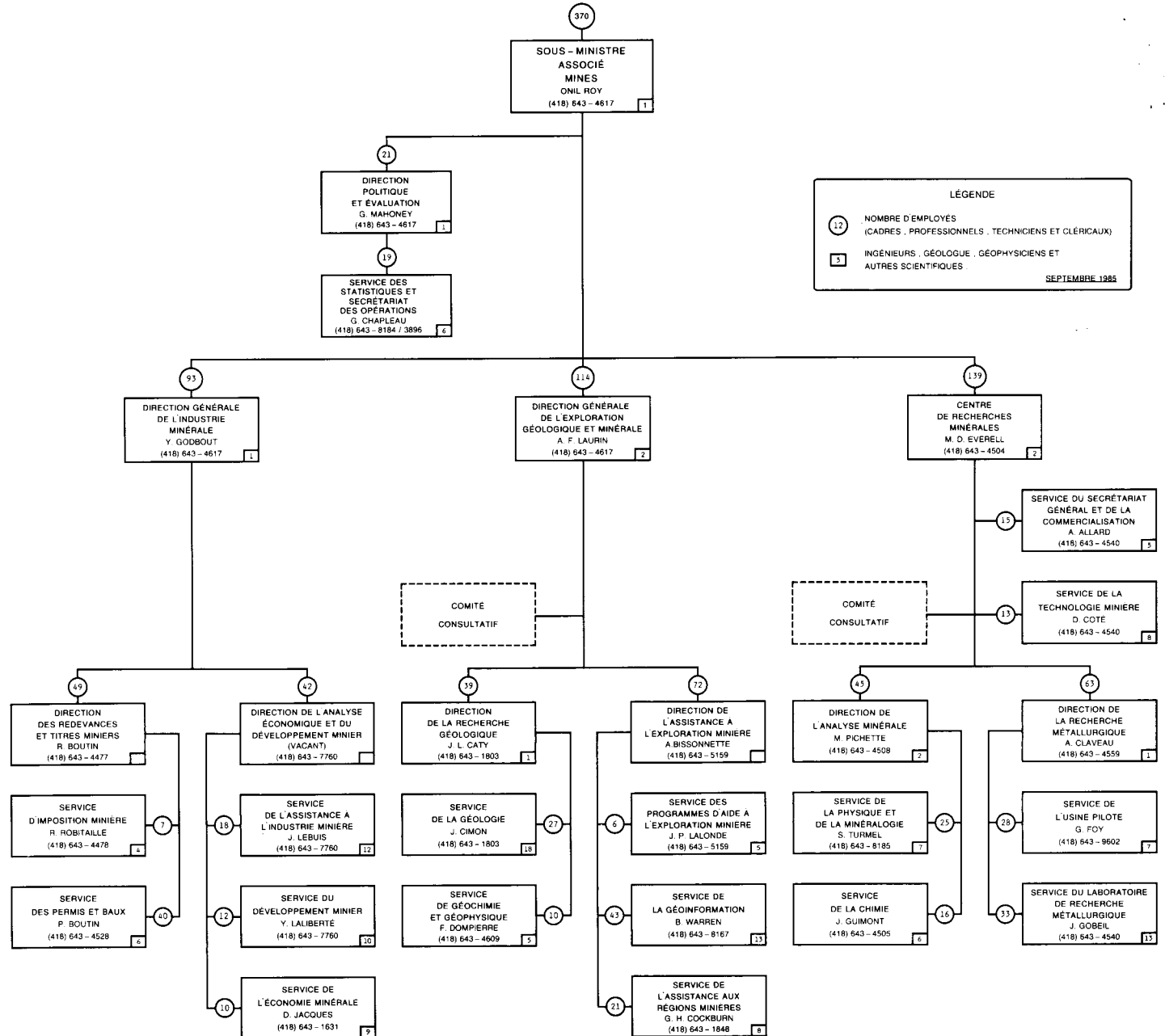
MANITOBA GEOSCIENCE ORGANIZATION CHART



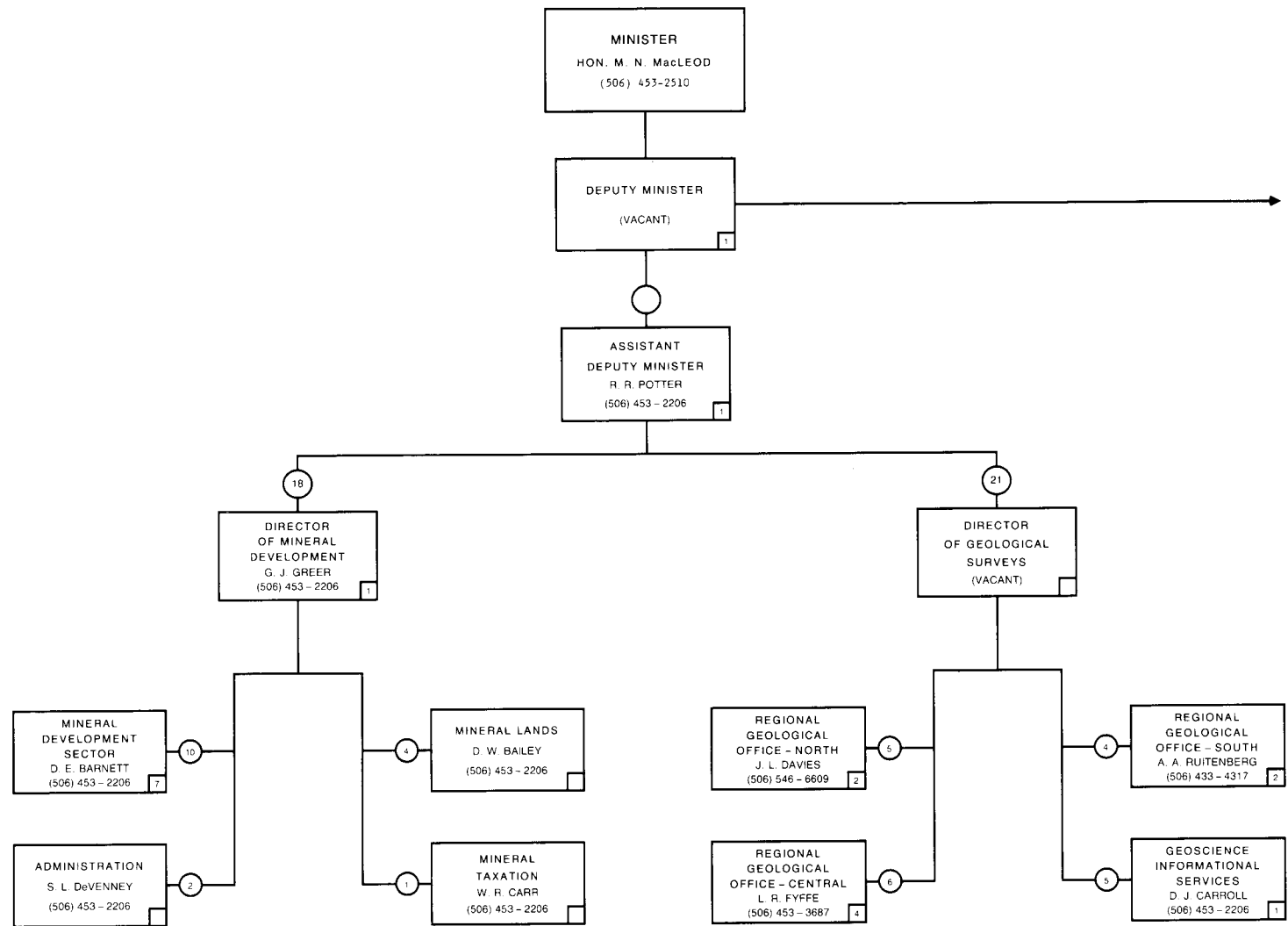
ONTARIO GEOSCIENCE ORGANIZATION CHART



ORGANIGRAMME GÉOSCIENCE DU QUÉBEC



NEW BRUNSWICK GEOSCIENCE ORGANIZATION CHART

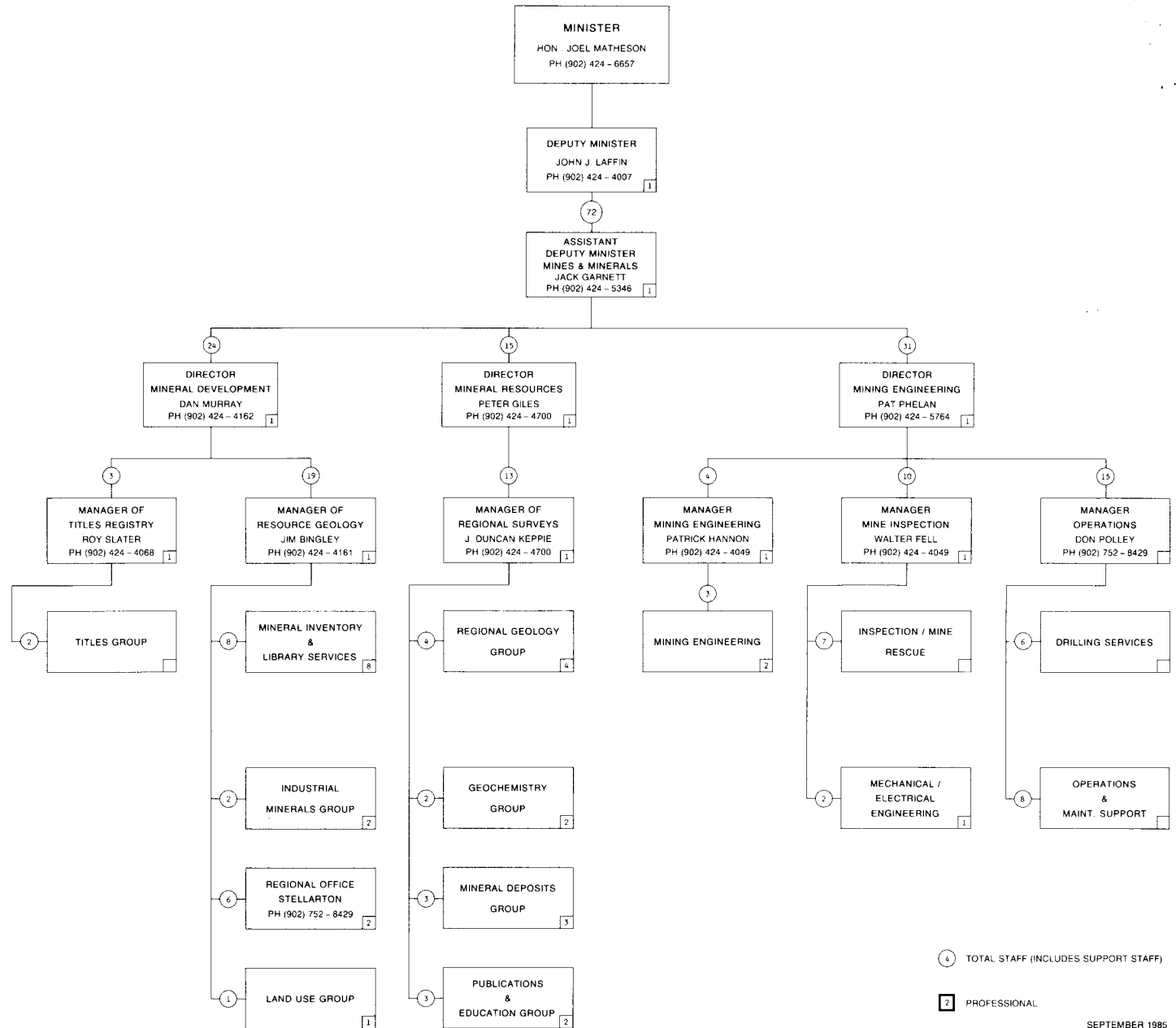


5 NUMBER OF STAFF EMPLOYED
(PROFESSIONAL, TECHNICAL AND CLERICAL)

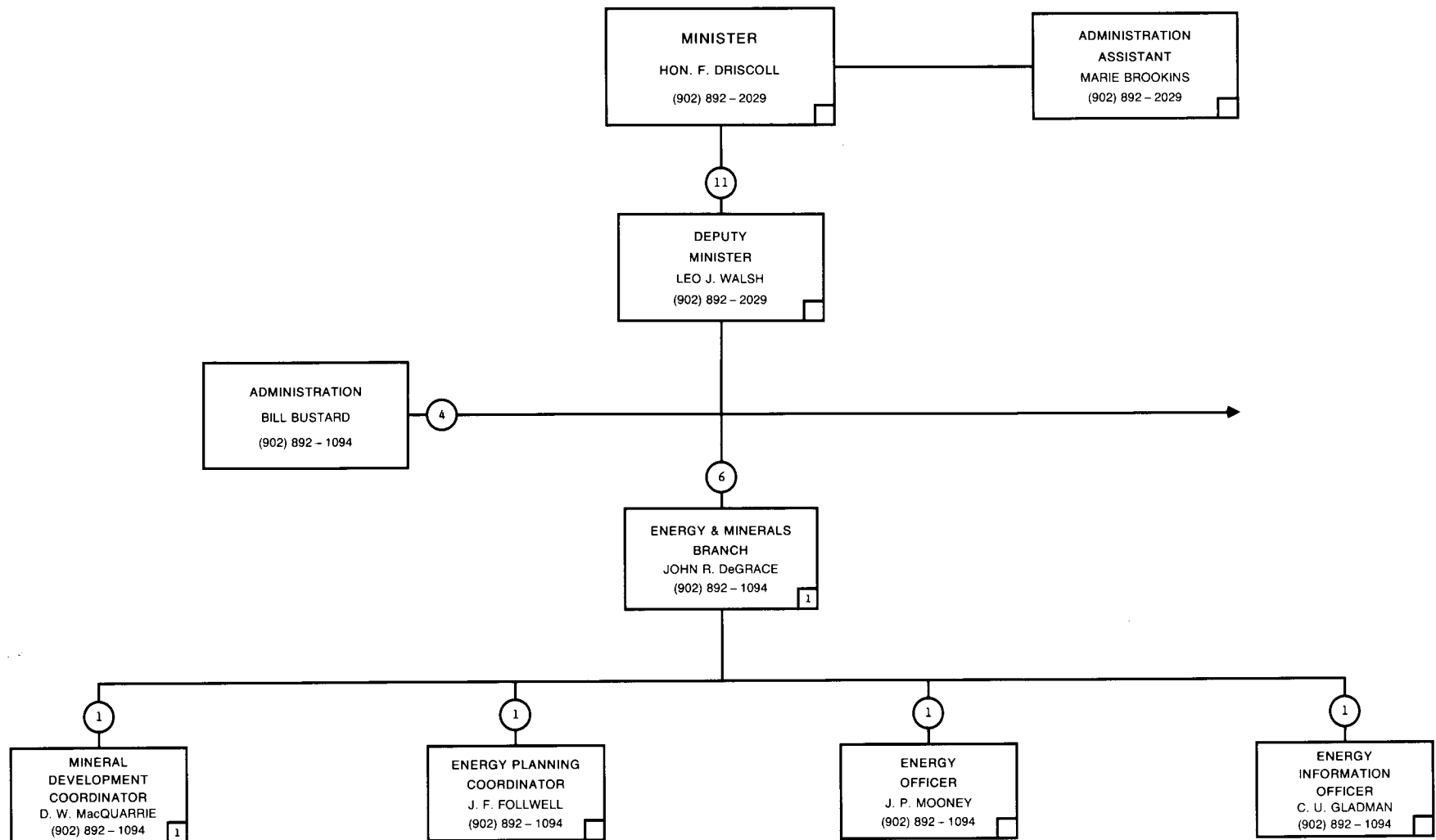
4 PROFESSIONAL (ENGINEERING AND GEOLOGY)

OCTOBER 1985

NOVA SCOTIA GEOSCIENCE ORGANIZATION CHART



PRINCE EDWARD ISLAND GEOSCIENCE ORGANIZATION CHART

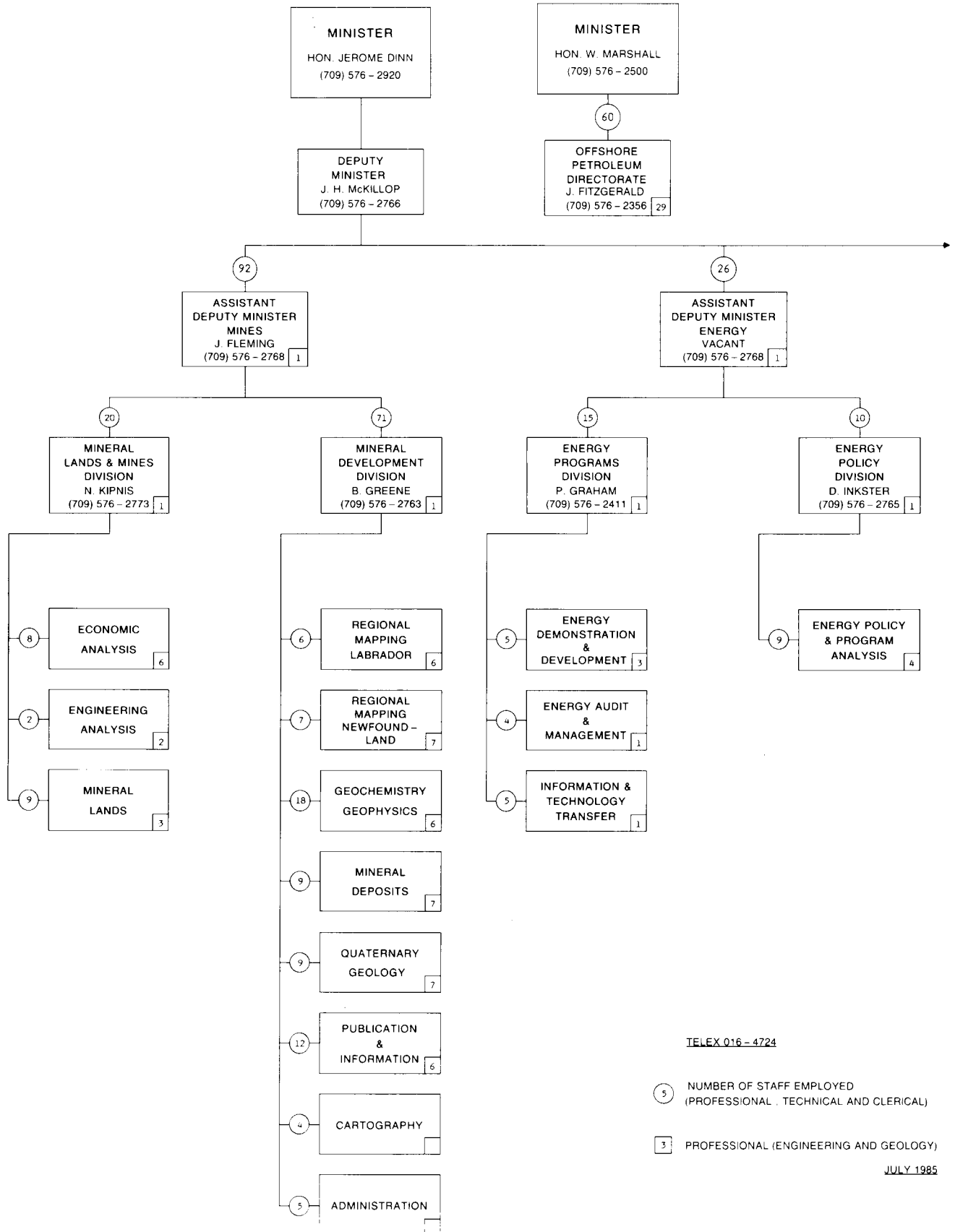


④ NUMBER OF STAFF EMPLOYED
(PROFESSIONAL , TECHNICAL AND CLERICAL)

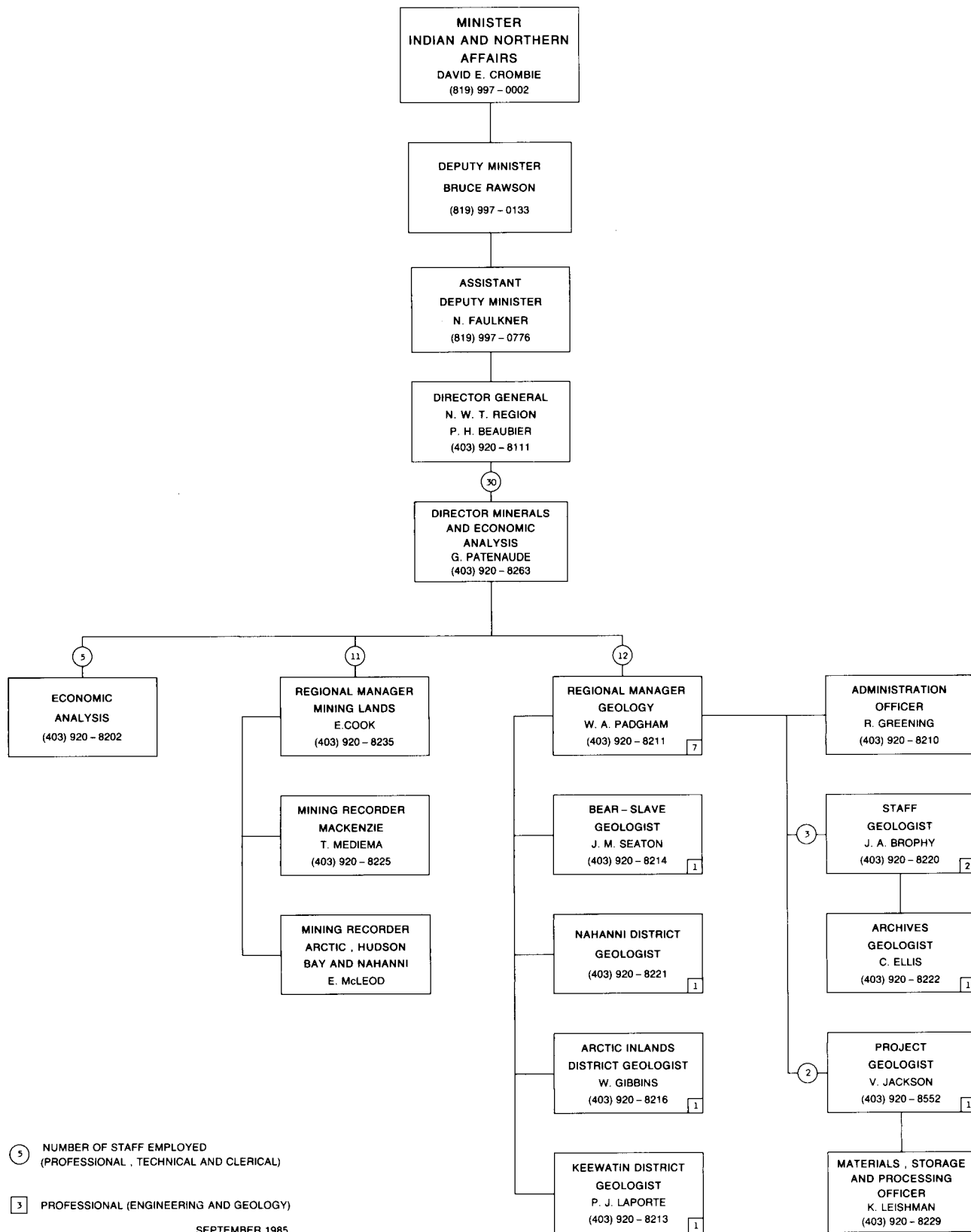
□ 1 PROFESSIONAL (ENGINEERING AND GEOLOGY)

OCTOBER 1985

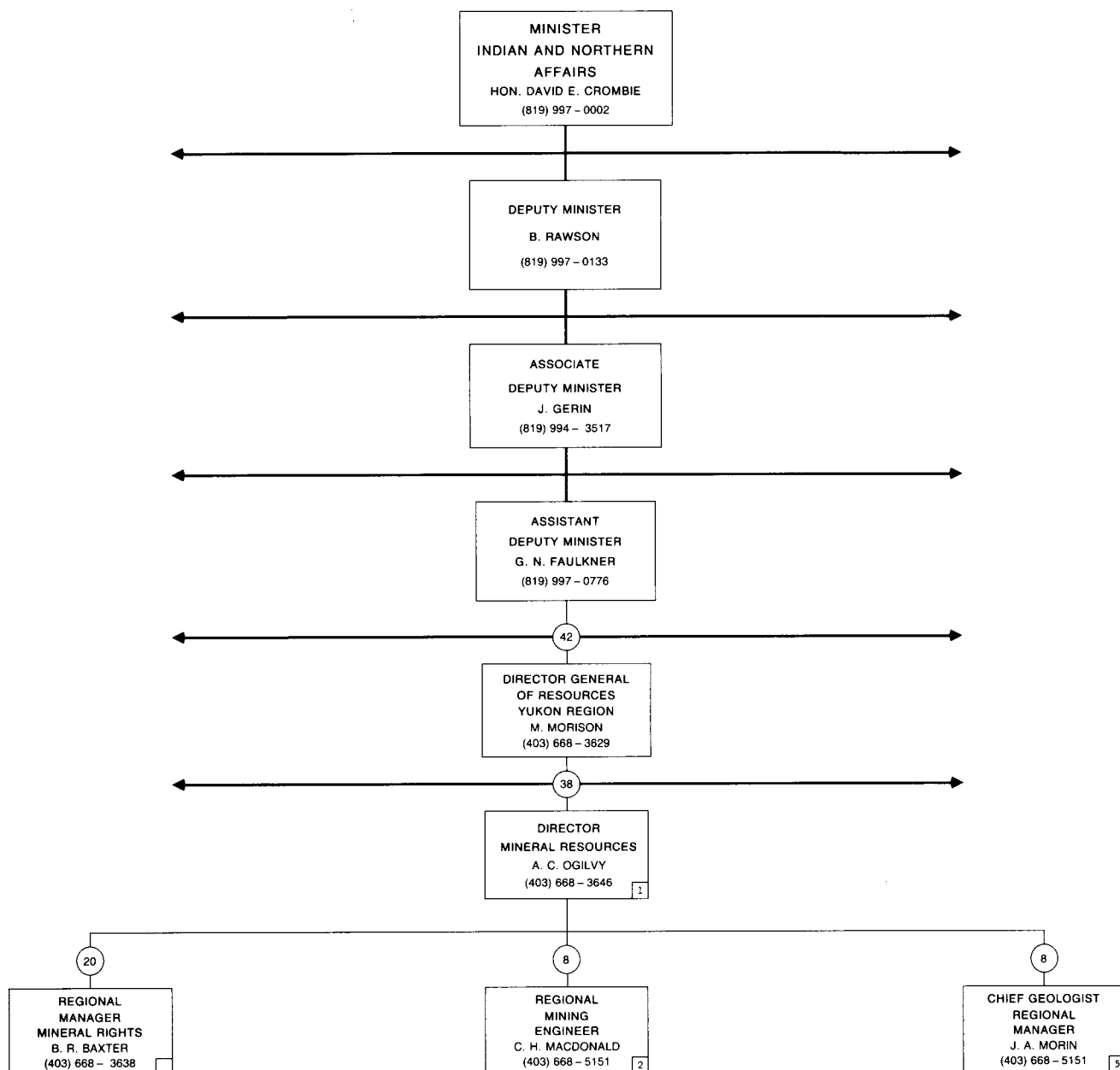
NEWFOUNDLAND GEOSCIENCE ORGANIZATION CHART



NORTHWEST TERRITORIES GEOSCIENCE ORGANIZATION CHART



YUKON GEOSCIENCE ORGANIZATION CHART



5 NUMBER OF STAFF EMPLOYED
(PROFESSIONAL, TECHNICAL AND CLERICAL)

3 PROFESSIONAL (ENGINEERING AND GEOLOGY)

SEPTEMBER 1985

PROVINCIAL GEOLOGICAL SURVEY EXPENDITURES, 1984-85

Summary tables of expenditures of provincial surveys have been published in the Proceedings of the Mines Minister's Conference for four years and were available the year previous in the report of the Committee of Provincial Geologists. Previously the tables were composed of budget estimates by some provinces but now they represent expenditures.

Figures for the past two years have appeared in the Provincial Geologists Journal. This year, as with last year, the Yukon and Northwest Territories are included.

**PROVINCIAL GEOSCIENCES EXPENDITURES
1984-85**

PROVINCE/ TERRITORY	SURVEY EXPENDITURES \$ X 10 ⁶	% OF TOTAL	TOTAL 1984 VALUE OF PROVINCIAL MINERAL PRODUCTION* \$ X 10 ⁶	SURVEY EXPENDITURES AS % OF TOTAL VALUE OF PROVINCIAL MINERAL PRODUCTION	AREA OF PROVINCE/ TERRITORY km ² x 10 ³	SURVEY \$ SPENT/km ²	POPULATION (1981) x 10 ³	SURVEY \$ SPENT/ CAPITA
Newfoundland	4.1	8.5	993.5	0.41	405	10.1	568	7.2
Nova Scotia	4.2	8.7	293.0	1.4	55	76.4	847	4.9
Prince Edward Island	-	-	0.9	-	6	-	123	-
New Brunswick	2.0 ¹	4.0	590.4	0.34	73	27.4	696	2.9
Quebec	14.0	29.0	2 043.4	0.70	1 541	9.1	6 438	2.2
Ontario	14.0	29.0	4 493.7	0.31	1 069	13.1	8 625	1.6
Manitoba	1.1	2.3	755.7	0.20	650	1.7	1 026	1.1
Saskatchewan	2.3	4.8	3 785.2	0.06	652	3.5	968	2.4
Alberta	1.2	2.5	25 963.7	0.005	661	1.8	2 238	0.5
British Columbia	3.4	7.1	3 353.7	0.10	948	3.6	2 744	1.2
Yukon	0.3	0.6	59.6	0.50	483	0.6	23	13.0
Northwest Territories ...	1.3	3.3	737.8	0.18	3 380	0.4	46	28.3
TOTALS	47.9	-	43 070.7	-	9 922	-	24 343	-

*Preliminary; Includes petroleum and natural gas values as follows:

Manitoba, \$165.0; Saskatchewan, \$2 323.7; Alberta, \$24 625.4; British Columbia, \$825.4

¹Includes Mineral Development Branch and Geological Surveys Branch expenditures

PROVINCE: BRITISH COLUMBIA
1984-1985

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT ¹ SMY	CASUAL SMY	SALARIES PERMANENT \$	CASUAL/ TEMPORARY \$	OPERATING EXPENDITURES \$	TOTALS \$
Chief's Office	GB (MRD)	EMPR	1	2	-	86 000	-	33 000	119 000
Core Repositories	GB (MRD)	EMPR	1 ²	1	-	21 000	-	1 000	22 000
Geochemical Surveys:									
(1) Bedrock	GB (MRD)	EMPR	-	-	-	-	-	-	-
(2) Drainage	GB (MRD)	EMPR	1	-	-	-	5 000	71 757	76 757
(3) Soil	-	-	-	-	-	-	-	-	-
Geological Surveys, Bedrock:									
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-	-	-	-
(2) Detailed (>1:50 000)	GB (MRD)	EMPR	10	15	3	568 668	89 000	238 865	1 013 929
Geological Surveys, Surficial:									
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-	-	-	-
(2) Detailed (>1:50 000)	GB (MRD)	EMPR	1	1	-	-	-	-	-
Geophysical Surveys:									
(1) Airborne Electromagnetic	-	-	-	-	-	-	-	-	-
(2) Airborne Magnetic	-	-	-	-	-	-	-	-	-
(3) Ground Magnetic	-	-	-	-	-	-	-	-	-
(4) Gravity	-	-	-	-	-	-	-	-	-
(5) Seismic	-	-	-	-	-	-	-	-	-
(6) Radiometric	-	-	-	-	-	-	-	-	-
Hydrogeological Surveys	OM	-	-	-	-	-	-	-	-
Education	GB (MRD)	EMPR	11	1	-	33 456	-	21 155	54 611
Laboratory Analysis	GB (MRD)	EMPR	9	8	-	296 600	-	92 454	389 054
Mineral Deposit Inventory and Analysis ..	GB (MRD)	EMPR	4	13	2	450 000	-	157 000	607 000
Oil and Gas Inventory and Analysis	GB (PRD)*	EMPR	2	11	-	344 306	-	95 163	439 469
Publications	EMPR	EMPR	11	2	-	-	-	-	-
District Geologist's Office	GB (MRD)	EMPR	7	7.5	1	291 641	19 052	61 550	353 191
Petroleum Subsurface Investigations.....	GB (PRD)*	EMPR	1	1	-	53 000	-	17 000	70 000
Water Resource Inventory and Analysis ...	OM	-	-	-	-	-	-	-	-
TOTALS:									
GB (MRD)	-	-	-	30.5	3	1 743 150	105 052	1 084 562	2 932 764
GB (PRD)	-	-	-	12	-	397 306	-	112 163	439 469

¹Full Time Employees

²Charlie Lake

*GB (MRD) — Geological Branch (Mineral Resources Division)

GB (PRD) — Geological Branch (Petroleum Resources Division)

EMPR — Ministry of Energy, Mines and Petroleum Resources

OM — Other Ministries

PROVINCE: ALBERTA
1984-1985

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES PERMANENT \$	CASUAL \$	SUPPLIES & SERVICES \$
Chief's Office	ARC/ERCB	ARC/ERCB	2	9.5	-	454 000	-	146 000
Core Repositories	ARC/ERCB	ERCB/AENR	2	35.0	3.0	895 000	60 000	60 000
Geochemical Research/Surveys	ARC	ARC	1	0.2	-	7 000	-	10 500
Geological Surveys, Bedrock:								
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-	-	-
(2) Detailed (>1:50 000)	ARC	ARC	1	1.0	-	62 000	-	3 000
Geological Surveys, Surficial:								
(1) Reconnaissance (>1:10 000)	ARC	ARC/AENR	1	2.0	-	84 500	-	23 000
(2) Detailed (>1:50 000)	ARC	ARC	5	2.0	-	88 000	-	31 000
(3) Reclamation/Environmental Impact ..	ARC	LCRC/ARC/ TAU	2	10.0	2.0	475 000	50 000	368 000
Geophysical Surveys	-	-	-	-	-	-	-	-
Hydrogeological Surveys	ARC	ARC/AENR	5	12.0	0.5	387 000	-	114 000
Information and Education	ARC/ERCB	ERCB/ARC	2	2.5	-	115 000	-	22 000
Laboratory Analysis	ARC	AOSTRA/ARC AENR	5	8.0	-	250 000	-	85 000
Mineral Deposit Inventory and Analysis ..	ARC	ARC/AENR	7	8.0	-	350 000	-	112 500
Energy Resource Inventory and Research:								
(1) Petroleum and Natural Gas	ARC/ERCB	ERCB/AENR ARC	3	23.5	0.3	923 000	3 500	40 000
(2) Oil Sands	ARC/ERCB	ERCB/ARC AOSTRA	10	14.0	0.6	511 500	14 500	79 500
(3) Coal Geology	ARC	AENR/ARC	5	6.0	1.0	257 000	21 500	101 500
Stratigraphic Research	ARC/ERCB	ERCB/ARC	3	4.5	0.3	271 000	7 000	16 000
Other	ERCB	ERCB	4	21.5	-	808 500	-	9 000
TOTALS	-	-	58	199.7	7.7	5 938 500	156 500	1 221 000

ARC — Alberta Research Council
AENR — Alberta Energy and Natural Resources
AOSTRA — Alberta Oil Sands Technical Research Authority
ERCB — Energy Resources Conservation Board
LCRC — Land Council and Reclamation Council
TAU — TransAlta Utilities Ltd.

**PROVINCE: SASKATCHEWAN
1984-1985**

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES		OPERATING EXPENDITURES \$
						PERMANENT \$	CASUAL/ TEMPORARY \$	
Administration (Head Office)	SGS	SGS	1	9.0	-	239 900	-	35 000
Core Repositories	SGS	SGS	1	7.0	1.3	146 000	23 000	25 200
Geochemical Surveys: (UofR)								
(1) Bedrock	-	-	-	-	-	-	-	25 000
(2) Drainage	-	-	-	-	-	-	-	-
(3) Vegetation	SGS	SGS	2	2.0	1.0	104 000	35 000	39 000
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:100 000)	SGS	SGS	2	3.0	2.3	134 000	79 500	212 100
(2) Detailed (1:50 000)	-	-	-	-	-	-	-	-
Geological Surveys, Surficial:								
(1) Reconnaissance (1:100 000)	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	-	-	-	-	-	-	-	-
Geophysical Surveys:								
(1) Airborne Electromagnetic	-	-	-	-	-	-	-	-
(2) Airborne Magnetic	-	-	-	-	-	-	-	-
(3) Ground Magnetic	-	-	-	-	-	-	-	-
(4) Gravity	-	-	-	-	-	-	-	-
(5) Seismic	-	-	-	-	-	-	-	-
(6) Geothermal	-	-	-	-	-	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-	-	-
Information and Education	SGS	SGS	1	-	-	-	-	-
Laboratory Analysis	SRC/UofR Carleton	SGS	2	-	-	-	-	13 000
Mineral Deposit Inventory and Analysis								
Including Industrial Minerals	SGS	SGS	4	4.0	2.3	165 000	54 000	45 000
Oil and Gas Inventory and Analysis	SGS	SGS	1	9.0	-	240 300	18 500	15 400
Publications	SGS	SGS	-	-	-	-	-	50 000
Resident Geologist's Office	SGS	SGS	3	3.0	0.4	112 900	4 800	33 400
Subsurface Investigations	SGS	SGS	5	6.0	1.0	276 700	20 000	8 500
Water Resource Inventory and Analysis ...	-	-	-	-	-	-	-	-
Metallogenic Mineral Deposit Studies	SGS	SGS	1	1.0	0.6	96 600	6 400	35 000
TOTALS	-	-	-	44.0	8.9	1 515 400	241 200	536 600
Grand Total							2 293 200	

SGS — Saskatchewan Geological Survey
SRC — Saskatchewan Research Council
UofR — University of Regina

PROVINCE: MANITOBA
1984-1985

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	PERMANENT \$	SALARIES CASUAL/ TEMPORARY \$	OPERATING EXPENDITURES \$
Core Repositories	-	-	-	1	1.26	25 000	25 000	190 000
Geochemical Surveys:								
(1) Bedrock	MGS	MAN	1	-	1.13	-	35 000	15 000
(2) Drainage	-	-	-	-	-	-	-	-
(3) Soil (Till, Peat)	MGS	MAN	3	1	2.04	40 000	48 000	83 000
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:100 000)	MGS	MAN	1	1	-	40 000	-	10 000
(2) Detailed (1:50 000)	MGS	MAN	9	9	3.20	380 000	97 000	130 000
(3) Phanerozoic	MGS	MAN	1	1	-	46 000	-	-
(4) Compilations (1:250 000)	MGS/MM	MAN	2	0.13	1.0	12 000	32 000	20 000
Geological Surveys, Surficial:								
(1) Reconnaissance (1:>50 000)	-	-	-	-	-	-	-	-
(2) Detailed (1:<50 000)	MGS/CAN	CAN	1	0.13	0.13	10 000	5 000	10 000
(3) Resource Management	-	-	-	-	-	-	-	-
Geophysical Surveys:								
(1) Airborne Electromagnetic	-	-	-	-	-	-	-	-
(2) Airborne Magnetic, Gradiometer	-	-	-	-	-	-	-	-
(3) Ground Magnetic	UofM	MAN	-	-	-	-	-	20 000
(4) Gravity	-	-	-	-	-	-	-	-
(5) Seismic	-	-	-	-	-	-	-	-
(6) Radiometric	-	-	-	-	-	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-	-	-
Information and Education								
Assessment Services	MM	-	3	2.39	-	103 000	-	10 000
Laboratory Analysis	MGS	MAN	3	11	2.0	310 000	30 000	52 000
Mineral Deposit Inventory and Analysis ..	(Univ)	MAN	-	-	-	-	-	50 000
	MGS	MAN	11	3.39	8.24	180 000	200 000	84 000
Oil and Gas Inventory and Analysis	-	-	-	-	-	-	-	-
Publications	MGS	MAN	-	1	-	46 000	-	42 000
Resident Geologist's Office	-	-	-	-	-	-	-	-
Subsurface Investigations, Industrial								
Minerals Drilling and Management	MGS	MAN	2	1	2.05	40 000	65 000	51 000
Water Resource Inventory and Analysis ...	-	-	-	-	-	-	-	-
Other:								
Administration	MGS	MAN	-	5	1.0	150 000	20 000	220 000 ¹
Drafting	MGS	MAN	-	9	2.0	250 000	27 000	13 000
Uranium/Lead Isotope Analysis	GSC/UofM	MAN/CAN	3	-	-	-	-	42 000
	U of							
	Windsor							
Pegmatite Studies	UofM	MAN	1	-	-	-	-	50 000
TOTALS	-	-	-	45	25.01	1 632 000	584 000	1 092 000

MGS — Manitoba Geological Services Branch

MM — Manitoba Mines Branch

GSC — Geological Survey of Canada

UofM — University of Manitoba

CAN — Canada

¹ Includes 180.0 for field equipment

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**PROVINCE: ONTARIO
1984-1985**

PROGRAMS	FUNDING AGENCY	NO. OF PROJECTS	MAN-YEARS		SALARIES		OPERATING EXPENDITURES \$	TOTALS \$
			PERMANENT	CASUAL	PERMANENT \$	CASUAL \$		
Administration (Head Office)	MNR	-	4	2	171 000	60 000	45 000	276 000
Core Repositories	MNR	5	-	5	-	160 000	90 000	250 000*
Geochemical Surveys/Research	-	-	-	-	-	-	-	-
Geophysical Surveys:								
Airborne Electro/Magnetic	MNR/MNA	10	7	6	278 000	159 000	973 000	1 410 000
Gravity	-	-	-	-	-	-	-	-
Seismic	-	-	-	-	-	-	-	-
Geological Surveys:								
Precambrian	MNR/MNA/ DREI	20	20	21	831 000	583 000	454 000	1 868 000
Geological Surveys:								
Phanerozoic	-	-	-	-	-	-	-	-
Quaternary	MNR/MNA	9	13	10	426 000	286 000	173 000	885 000
Aggregate	-	-	-	-	-	-	-	-
Geoservices:								
Publications	-	-	-	-	-	-	-	-
Laboratory Analysis	MNR/MNA/ DREI	-	38	15	1 167 000	432 000	1 260 000	2 859 000
Assessment Services	-	-	-	-	-	-	-	-
Equipment, Vehicles	-	-	-	-	-	-	-	-
Information, Education, Library ...	MNR/MNA	-	5	-	153 000	7 000	42 000	202 000
Mineral Deposits Studies Including	MNR/MNA/ DREI	20	8	15	328 000	501 000	333 000	1 162 000
Industrial Minerals	-	-	-	-	-	-	-	-
Resident Geologist's Offices	MNR/MNA	-	30	22	984 000	417 000	402 000	1 803 000*
Geoscience Research Grants								
Program	MNR	23	-	-	-	20 000	452 000	472 000
Exploration Technology Development								
Fund	BILD	18	-	1	-	25 000	876 000	901 000
Hydrocarbon Energy Resources								
Program	BILD	7	-	10	-	215 000	1 670 000	1 885 000
Drill Core Storage Program	BILD	1	-	-	-	-	-	-
TOTAL	-	-	125	107	4 338 000	2 865 000	6 770 000	13 973 000

MNR — Ontario Ministry of Natural Resources

MNA — Ontario Ministry of Northern Affairs

DREI — Federal Department of Regional Expansion of Industry

BILD — Board of Industrial Leadership Development

*Estimate

PROVINCE: QUEBEC
1984-1985

PROGRAMS	DIR. GENERALE EXPLORATION GEOL. ET MINERALE	FUNDING AGENCY MINISTERE ENERGIE ET RESSOURCES	NO. OF PROJECTS	PERMANENT STAFF MAN-YEARS P-T-C	CASUAL STAFF* MAN-YEARS	BUDGET ALLOCATION* \$
Core Repositories	DGEGM	MER	-	-	-	79 500
Geochemical Surveys:	DGEGM	-	-	3P-2T-1C	1.0	-
(1) Bedrock	-	-	-	-	-	-
(2) Drainage	-	***MER/EMR	4	-	-	224 300
(3) Lakes	-	-	1	-	-	40 000
Geological Surveys, (Bedrock)	DGEGM	***MER/EMR	50	12P-4T-3C	27.0	4 607 900
Geological Surveys, (Surficial)	-	-	-	-	-	-
Geophysical Surveys:	-	-	-	2P-1T	-	-
(1) Airborne Electromagnetic	DGEGM	***MER/EMR	4	-	-	1 250 000
(2) Airborne Magnetic	-	***MER/EMR	1	-	-	100 000
(3) Ground Magnetic	-	-	-	-	-	-
(4) Gravity	-	-	-	-	-	-
(5) Others	-	MER	2	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-
Information and Education	DGEGM	MER	1	-	-	20 000
Laboratory Analysis	DGEGM	MER	-	-	-	950 000
Mineral Deposit Inventory Analysis	DGEGM	***MER/EMR	15	6P	-	917 700
Publications and Cartography	DGEGM	MER	-	7P-22T-2C	-	1 244 600
Publication Distribution	DGEGM	MER	-	2P-1T-3C	1.9	231 800
Resident Geologists' Offices**	DGEGM	MER	-	8P-4T-9C	2.2	1 031 600
Subsidies	DGEGM	MER	40	3P-1C	-	2 971 700
Research and Development	DGEGM	MER	1	1P	-	72 000
Geoscience Information Acquisitions	DGEGM	MER	-	2P-5C	2.0	213 000
Other	-	-	-	-	-	-
TOTALS	-	-	119	46P-34T-24C	34.1	13 954 100

P: Professional

T: Technical

C: Clerical

*Salaries of permanent staff not included

**Regional representatives

***Program 1, Canada/Quebec subsidiary agreement on mineral development

PROVINCE: NEW BRUNSWICK
1984-1985

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT	STAFF-YEARS CONTINUING AUXILIARY	SUMMER AUXILIARY	PERMANENT \$	SALARIES CONTINUING AUXILIARY \$	SUMMER AUXILIARY \$	OPERATING EXPENDITURES \$
Core Repositories	GSB	DNR	5	0.2	-	0.4	12 000	-	5 000	12 000
Geochemical Surveys:										
(1) Bedrock	-	-	-	-	-	-	-	-	-	-
(2) Drainage	GSB	DNR	2	-	-	-	-	-	-	30 000
(3) Soil	GSB/MDB	DNR	2	0.1	-	0.8	19 000	-	7 500	3 000
Geological Surveys, Bedrock:										
(1) Reconnaissance (1:100 000)	-	-	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	GSB/MDB	DNR	3	3	-	1.2	108 000	-	14 000	65 000
Geological Surveys, Surficial:										
(1) Reconnaissance (1:100 000)	-	-	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	-	-	-	-	-	-	-	-	-	-
(3) Granular Resources	MDB	DNR	2	2	-	0.6	55 000	-	6 700	25 000
Geophysical Surveys:										
(1) Airborne Electromagnetic	-	-	-	-	-	-	-	-	-	-
(2) Airborne Magnetic	-	-	-	-	-	-	-	-	-	-
(3) Ground Magnetic	-	-	-	-	-	-	-	-	-	-
(4) Gravity	GSB	DNR	1	0.4	-	0.3	12 000	-	4 000	3 000
(5) Seismic	GSB	DNR	1	0.3	-	0.3	9 000	-	3 000	2 000
(6) Radiometric	-	-	-	-	-	-	-	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-	-	-	-	-
Information and Education	GSB	DNR	2	2	-	-	52 000	-	-	30 000
Laboratory Analysis	GSB	DNR	2	2	-	0.3	36 000	-	3 500	2 000
Mineral Deposit Inventory and Analysis ..	GSB/MDB	DNR	2	2	-	0.6	70 000	-	7 500	3 000
Coal Inventory and Analysis	-	-	-	-	-	-	-	-	-	-
Oil and Gas Inventory and Analysis	-	-	-	-	-	-	-	-	-	-
Publications	GSB	DNR	-	4	-	-	9 400	-	-	23 000
Resident Geologist's Office	GSB	DNR	2	9	-	-	253 000	-	-	94 000
Subsurface Investigations	-	-	-	-	-	-	-	-	-	-
Peat Inventory	MDB	DREE/CIC	1	-	-	-	-	-	-	26 000
Water Resource Inventory and Analysis ...	-	-	-	-	-	-	-	-	-	-
Other Studies*	GSB/MDB	DNR	3	-	-	-	-	-	-	41 000
TOTALS	-	-	28	24.8	-	3.5	720 000	-	51 200	359 000
Grand Total	-	-	-	-	-	-			1 190 000	

GSB — Geological Surveys Branch

MDB — Mineral Development Branch

DNR — Department of Natural Resources

DREE — Canada Department of Regional Economic Expansion

CIC — Community Improvement Corporation

*Includes potash rock mechanics, digital mapping, and geoscience compilation feasibility studies.

**PROVINCE: NOVA SCOTIA
1984-1985**

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT STAFF MAN-YEARS	CASUAL STAFF MAN-YEARS	BUDGET ALLOCATIONS \$
Core Repositories	NSDME	NSDME/NSDOD	3	2	1	-
Geochemical Surveys:	NSDME	NSDME/NSDOD	1	1	1	140 000
(1) Bedrock	-	-	-	-	-	-
(1) Drainage	-	-	-	-	-	-
(2) Soil	-	-	-	-	-	-
Geological Surveys, Bedrock:	-	-	-	-	-	-
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-
(2) Detailed (>1:50 000)	NSDME	NSDME/NSDOD	2	2	1	216 000
Geological Surveys, Surficial:	-	-	-	-	-	-
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-
(2) Detailed (>1:50 000)	NSDME	NSDME	1	1	1	42 000
Geophysical Surveys:						
(1) Airborne Radiometrics	-	-	-	-	-	-
(2) Airborne Magnetic (Includes VLF-EM)	-	-	-	-	-	-
(3) Ground Magnetic	-	-	-	-	-	-
(4) Gravity	-	-	-	-	-	-
(5) Seismic	-	-	-	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-
Information and Education	NSDME	NSDME	1	1	-	90 000
Laboratory Analysis (Included in budgets above)	-	-	-	-	-	-
Mineral Deposit Analysis	NSDME	NSDME/NSDOD	4	4	1	246 000
Mineral Deposit Inventory	NSDME	NSDME/NSDOD	4	5	1	575 000
Coal and Peat	NSDME	NSDME	3	7	5.4	574 000
Oil and Gas Inventory and Analysis	NSDME	NSDME	1	4	-	452 000
Publications	NSDME	NSDME	N/A	2	-	797 000
Resident Geologist's Office	NSDME	NSDME	N/A	6	-	688 000
Subsurface Investigations	NSDME	NSDME	N/A	12	-	413 000
TOTALS	-	-	20	47	11.4	4 233 000

NSDME — Nova Scotia Department of Mines and Energy
NSDOD — Nova Scotia Department of Development

PROVINCE: NEWFOUNDLAND
1984-1985

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT ¹ SMY	CASUAL SMY	PERMANENT \$	SALARIES CONTRACT \$	CASUAL \$	OPERATING EXPENDITURES \$
Director's Office	NDME	NDME	-	7	2	144 064	34 400	8 100	234 100
Core Repositories	NDME	NDME	3	2	2	31 400	29 800	4 463	78 900 ²
Geochemical Surveys:									
(1) Bedrock	-	-	-	-	-	-	-	-	-
(2) Drainage	NDME	NDME	3	3	9	122 600	-	29 600	85 400
(3) Soil	-	-	-	-	-	-	-	-	-
Geological Surveys, Bedrock:									
(1) Reconnaissance (>1:100 000)	NDME	NDME/DEMR	5	5	10	156 800	41 800	45 164	219 800
(2) Detailed (>1:50 000)	NDME	NDME/DEMR	6	6	17	164 800	73 800	80 138	287 800
Geological Surveys, Surficial:									
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-	-	-	-
(2) Detailed (>1:50 000)	NDME	NDME	7	8	9	82 000	167 700	58 300	232 600
Geophysical Surveys:									
(1) Airborne Electromagnetic	-	-	-	-	-	-	-	-	-
(2) Airborne Magnetic	-	-	-	-	-	-	-	-	-
(3) Ground Magnetic	-	-	-	-	-	-	-	-	-
(4) Gravity	-	-	-	-	-	-	-	-	-
(5) Seismic	-	-	-	-	-	-	-	-	-
(6) Radiometric	-	-	-	-	-	-	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-	-	-	-
Information and Education	NDME	NDME	-	-	-	-	-	-	-
Laboratory Analysis	NDME	NDME/DEMR	1	10	3	146 500	58 100	7 600	117 800
Mineral Deposit Inventory and Analysis ..	NDME	NDME/DEMR	6	12	15	204 036	121 100	82 800	457 000
Publications	NDME	NDME	N/A	18	-	216 400	86 300	-	148 500
Resident Geologist's Office	-	-	-	-	-	-	-	-	-
Subsurface Investigations	-	-	-	-	-	-	-	-	-
Water Resource Inventory and Analysis ...	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
TOTALS	-	-	31	71	67	1 268 600	613 000	316 165	1 861 900
Grand Total							4 059 665		

¹Includes long term temporary staff

²Includes 31 080 capital expenditure estimate

NDME — Newfoundland Department of Mines and Energy

DEMR — Department of Energy, Mines and Resources Canada

**TERRITORY: NORTHWEST TERRITORIES
1984-1985**

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES		OPERATING EXPENDITURES \$
						PERMANENT \$	CASUAL/ TEMPORARY \$	
Head Office (Administration, General Support)	INA	INA	1	2.7	1.0	102 000	13 500	74 600
Core Repositories	INA	INA	1	1.0	0.3	40 000	3 500	10 000
Geochemical Surveys:								
(1) Bedrock	-	-	-	-	-	-	-	-
(2) Drainage	-	-	-	-	-	-	-	-
(3) Soil	-	-	-	-	-	-	-	-
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:00 000)	-	-	1	-	2.7	-	6 000	20 000
(2) Detailed (1:50 000)	INA	INA	20	1.2	0.7	50 000	117 800	184 500
Geological Surveys, Surficial:								
(1) Reconnaissance (1:100 000)	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	INA	INA	-	-	-	-	-	-
Geophysical Surveys:								
(1) Airborne Electromagnetic	-	-	-	-	-	-	-	-
(2) Airborne Magnetic	-	-	-	-	-	-	-	-
(3) Ground Magnetic	-	-	-	-	-	-	-	-
(4) Gravity	-	-	-	-	-	-	-	-
(5) Seismic	-	-	-	-	-	-	-	-
(6) Radiometric	-	-	-	-	-	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-	-	-
Education	INA	INA	1	-	-	-	-	-
Laboratory Analysis	INA	INA	1	0.1	-	5 000	-	5 000
Mineral Deposit Inventory and Analysis ..	INA	INA	7	4.0	-	238 590	-	126 400
Oil and Gas Inventory and Analysis	-	-	-	-	-	-	-	-
Publications	INA	INA	2	2.5	1.0	97 000	38 923	-
Resident Geologist's Office	-	-	-	-	-	-	-	-
Subsurface Investigations	-	-	-	-	-	-	-	-
Water Resource Inventory and Analysis ...	-	-	-	-	-	-	-	-
Other:								
Prospectors' Assistance	INA	MRD	-	-	-	-	-	18 250
Geological Contracts	INA	-	12	0.5	-	20 000	-	80 000
TOTALS:								
Geology Division	-	-	-	-	-	552 590	179 720	542 940
Grand Total							1 275 250	

INA — Indian and Northern Affairs, Canada
MRD — Mineral Rights Division INA

TERRITORY: YUKON
1984-1985

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES		OPERATING EXPENDITURES \$
						PERMANENT \$	CASUAL/ TEMPORARY \$	
Head Office (Administration, General Support)	INA	INA	1	3	1	95 000	15 000	104 000
Core Repositories	INA	INA	1	0.5	-	15 000	-	10 000
Geological Surveys, Bedrock: Detailed (1:50 000)	INA	INA	2	-	2	-	55 000	40 000
Geological Surveys, Surficial: Detailed (1:50 000)	INA	INA	3	1	1	45 000	25 000	20 000
Education	INA	INA	3	-	-	-	-	5 000
Laboratory Analysis	INA	INA	4	-	-	-	-	20 000
Mineral Deposit Inventory and Analysis ..	INA	INA	7	2.5	2	115 000	50 000	50 000
Publications	INA	INA	-	1	-	35 000	-	20 000
Other: Prospectors' Assistance	INA	MRD	-	-	-	-	-	26 000
TOTALS:								
Exploration and Geological Services Division, Yukon	-	-	21	8	6	305 000	145 000	269 000
Grand Total	-	-	21	8	6	305 000	145 000	295 000

INA — Indian and Northern Affairs, Canada
MRD — Mineral Rights Division, INA

**GEOLOGICAL PROGRAM
HIGHLIGHTS**

**PROVINCIAL AND TERRITORIAL
GEOLOGICAL SURVEYS
1984 — 1985**

GEOLOGICAL BRANCH MINERAL RESOURCES DIVISION
BRITISH COLUMBIA MINISTRY OF ENERGY, MINES
AND PETROLEUM RESOURCES

INTRODUCTION

The Geological Branch is one of four Branches in the Mineral Resources Division. Its role is to provide accurate and current information on the geology and the mineral and coal resources of British Columbia for government and industry; to provide maps, databases, ideas, and interpretations useful in the search for new deposits; and to stimulate and facilitate the exploration, development, and use of these resources for the benefit of the Province. To carry out this, the Branch is organized into sections: 1) Geoscience Projects; 2) Resource Data and Analysis; 3) Applied Geology; and 4) Analytical Laboratory. The following overview adheres to this organization breakdown.

The year 1984/85 was a year of transition in the Branch. Atholl Sutherland Brown retired as Chief Geologist after 33 years of distinguished service. W.R. Smyth was appointed to be his replacement in September 1984. The Branch offices on Michigan Street were "temporarily" relocated to 756 Fort Street. Government restraint policies initiated in 1983/84 continued into 1985 and presented an increased challenge for the Branch to operate a meaningful field program. Staff were further reduced from 53 to 50, a 20% reduction in two years.

However, on an optimistic note, it appears likely that the Province will join the Federal Government in signing a five-year Mineral Development Agreement under ERDA to further the development of the province's exploration and mining industry. The pending Agreement will greatly accelerate the Branch's geological and geochemical surveys and the development of geoscience data systems.

The Branch held its fourth annual Open House in Vancouver in January 1985 in conjunction with the Cordilleran Round Up of the British Columbia and Yukon Chamber of Mines. Over 800 geoscientists and explorationists attended a lively day of talks and poster sessions.

GEOSCIENCE PROJECTS SECTION

Geoscientific mapping, surveys, and related research is provided by the Geoscience Projects Section in order to stimulate and facilitate effective exploration and production of provincial mineral and coal resources. The exploration industry has a particularly critical need for the products of field mapping and related research produced by the section.

1984 Highlights

Field projects undertaken by Geoscience Projects in 1984 continued at a relatively low level due to reduced operating funds and hiring restraints. Three of the eight Project Geologists, Andre Panteleyev, B. Neil Church, and Gerry Ray, had significantly shortened or no field seasons. Most projects focused on precious metal and massive sulphide potential. Activity in coal continued at the same level as last year with efforts in north-central British Columbia being concentrated on the Mount Klappan anthracite deposit. Cooperative programs carried out with Applied Programs and Resource Data geologists highlighted the year's activities.

In the southeast coalfield, Ward Kilby and David Grieve analyzed resource potential in part of the Northern Dominion Coal Block. In the north, Andre Panteleyev worked with Tom Schroeter on precious metal deposits in the Toodoggone area, and Don MacIntyre worked with Tom Schroeter on massive sulphide potential in the Tatshenshini area. In the northeast, Ward Kilby and Andrew Legun continued efforts to improve stratigraphic definition and correlation of the coal measures, and in the northwest, Jahak Koo and Gary White assessed the Seeley Lake Prospect. Don MacIntyre and Gary White also worked together in the Dome Mountain Gold Camp near Smithers.

Interaction with post graduate students has proven fruitful. Andre Panteleyev and Tom Schroeter worked with Larry Diakow of the University of Western Ontario in the Toodoggone area, and Trygve Hoy with Francoise Gautier of the University of British Columbia in a study of the metallogeny of southeastern British Columbia.

Other projects included the precious metal potential of the Harrison Lake area by Gerry Ray, the Bob Creek area near Houston by Neil Church, the Salmon River area near Stewart by Dani Alldrick, and the area around the Mt. Klappan anthracite deposit by Jahak Koo.

Selected Achievements

Andre Panteleyev and Tom Schroeter have also begun a 1:200 000 scale compilation map of gold and silver occurrences in British Columbia; their work has led to the development of a genetic model of ore deposition that spans the interval from porphyry copper to epithermal vein to hot spring deposits. Work in the Cirque, Midway, and Tatshenshini areas enabled Don MacIntyre to construct comparative models for the settings of massive sulphide deposits in northern British Columbia. Similarly, other studies are leading toward a genetic model for precious metal deposits in the Harrison Lake (Gerry Ray) and Stewart (Dani Alldrick) areas; volcanogenic massive sulphide deposits in southern British Columbia (Trygve Hoy); and skarn and other deposits in south-central British Columbia (Neil Church).

In coal, the focus is on tectonic and stratigraphic setting, coal measure and coal seam correlation, and resource evaluation. Coal petrography and computer analysis are well used tools in both the northern (Jahak Koo) and northeastern (Ward Kilby) coalfield studies.

APPLIED PROGRAMS SECTION

The Applied Programs Section is responsible for monitoring and assisting the field activities of the mineral exploration industry. Geological information on exploration activities and opportunities is provided by this section to industry. The Section also offers technical aid and training assistance to prospectors, exploration personnel, and developers.

The Eighth Annual Mineral Exploration Course for Prospectors was successfully held at the Cowichan Lake Forestry Research Station, April 26 to May 12, 1984. Students totalling 31 in number graduated from this 15-day advanced course which was jointly sponsored by the Ministry of Education, Malaspina College, and Ministry of Energy, Mines and Petroleum Resources. In addition, nine basic prospectors courses were delivered in seven locations throughout the Province in 1984.

Highlights of the 1984 field season are: 1) assessment of the mineral potential of the proposed Wokkpash Recreation area by Andre Legun; 2) assessment of the mineral potential of Tweedsmuir Park by E.L. Faulkner; 3) assessment of the mineral potential of Syringa Creek and Deer Park proposed Ecological Reserves by G.G. Addie; 4) assessment of the mineral potential of Sutton Creek Ecological Reserve by H.P. Wilton.

RESOURCE DATA AND ANALYSIS SECTION

The Resource Data and Analysis Section compiles and interprets exploration and development data gathered on coal and mineral resources. This data provides an important source of information that allows government and industry to increase exploration efficiency. The section also makes assessments of mineral potential of lands before various land use dispositions, which could alienate areas from exploration, are approved, thereby helping to ensure that mineral lands are properly managed. Most of the exploration industry information collected by the section is made available to the public after a one-year confidential period.

In 1984, the section carried or sponsored four field programs: 1) Mineral potential evaluation of the proposed ecological reserve on the Brooks Peninsula, Vancouver Island, by W.R. Smyth; 2) Mineral potential evaluation of the Penticton west-half map area (NTS 82E/11) with the goal of producing an updated and revised style of Mineral Deposit/Land Use Map by W.R. Smyth; 3) In cooperation with the University of British Columbia, the section gave logistical and limited financial support to post-doctoral researcher, Jennifer Pell for a study of the economic Potential of Carbonatites and Related Intrusives in British Columbia. In addition, the section published a

1:2 000 000 scale map showing the distribution of Areas Alienated or Restricted from Mining in British Columbia, 1983. The map includes Indian reserves, parks, ecological reserves, recreation areas, flooding reserves, and agricultural land reserves.

The section also assisted with the preparation for publication of the Ministry's Land Use Policy. Z.D. Hora compiled a major review of industrial minerals in British Columbia for publication in the May 1984 issue of the Industrial Minerals International Congress in Toronto.

ANALYTICAL LABORATORY

The analytical Laboratory conducts a complete range of geochemical analyses in support of the projects conducted by Branch Geologists. Some custom laboratory work is performed for various other government agencies. The laboratory is further responsible for certifying assayers in the province, and through this program controls the quality of work done by commercial mining assay laboratories.

The results of a joint Federal/Provincial Regional Geochemical Survey of the Hazelton (93M) and Takla (93N) map sheets were released in July 1984. The 93G/E and 93H/W map sheets were sampled in 1984.

There was some method development and related work done in the Laboratory during 1984. Analyses on geochemical standards and a continuation of a study of the mineralogy of the Tillicum Mountain gold deposit were performed. These studies were as follows: 1) continuing

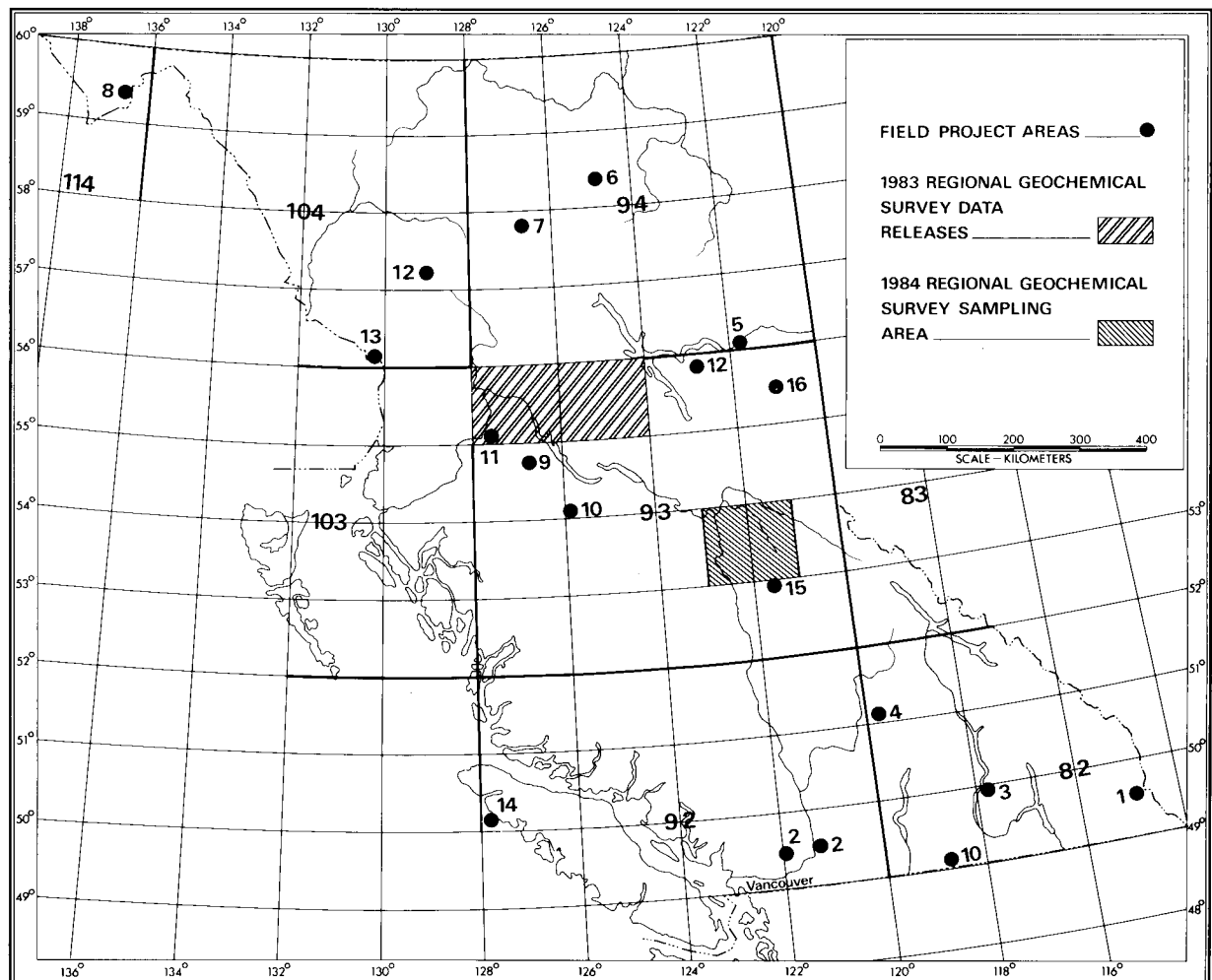


Figure 1. Distribution of programs in British Columbia

TABLE 1: SUMMARY OF MAJOR PROJECTS IN 1984

(Numbers refer to Figure 1)

Map No.	Project	Area (NTS)	Geologist	Stage	Most Recent Publication
1	Northern Dominion Coal Block	82M	W. Kilby, D. Grieve	FC*	GF 84**
2	Harrison Lake Gold	92G,H	G. Ray	FC	GF 84
	Coquihalla Gold Belt	92H	G. Ray	FC	GF 84
3	Tillicum Gold	82F,K	G. Ray, Y.T.J. Kwong	FC	GF 84
4	Hilton Rea Gold	82M	G.E.P. White	FC	GF 84
5	Butler Ridge Area	93	A. Legun	FC	GF 84
6	Wokkpash Park Proposal	94K	A. Legun	FC	GF 84
7	Toodoggone Precious Metal Deposits	94	A. Panteleyev, T. Schroeter (L. Diakow)	FC	GF 84
	Precious Metal Deposits in the Cordillera	-	"	I	-
8	Tatshenshini Area Massive Sulphides	-	D. MacIntyre, T. Schroeter	I	GF 84
9	Dome Mountain Gold	93L	D. MacIntyre	I	GF 84
10	Buck Creek Area	93L	B.N. Church	FC	GF 84
	Greenwood/Midway	82E	B.N. Church	FC	GF 84
11	Seeley Lake Coal	93M	G. White, J. Koo	FC	GF 84
12	Mt. Klappan Anthracite	104H	J. Koo	I	GF 84
	Carbon Creek Area	93O	A. Legun	FC	GF 84
13	Stewart Area Mineral Deposits	104B	D. Alldrick	FC	GF 84
14	Brooks Peninsula Vancouver Island	92L	R.W. Smyth	FC	GF 84
15	Quesnel Gold-Copper	-	A. Panteleyev	I	-
16	Northeast Coalfield Correlation	93,94	W. Kilby (H. Oppelt)	I	GF 84
	Metallogeny of S.E. B.C.	82	T. Hoy (F. Gautier)	I	GF 84
	Regional Geochemical Sampling Program	83G/E; H/W	R. Schmitt, W.J. McMillan	FC	BCRGS 10,11 (GSC Open File 1000, 1001)
	Activity Related to Regional Geochemical Program	93M,N	T. Schroeter G. White	C	GF 84

* Symbols: I - in progress, FC - fieldwork complete, C - completed

**GF 84: Geological Fieldwork 1984, Paper 1985-1.

Names in brackets are graduate students.

development of methodology for the determination of major and trace elements using X-ray fluorescence techniques by V.V.B. Vilkos; 2) a continuing combined field and laboratory study of the mineralogy of the Tillicum Mountain gold deposit by Y.T.J. Kwong in conjunction with G.G. Addie; 3) a study of the possibility of extracting titanium from the mine tailings of copper mines in the Province by Y.T.J. Kwong and Z.D. Hora; 4) continued participation in interlaboratory standard reference material programs by B. Bhagwanani, M.A. Chaudhry, W.M. Johnson, and P.F. Ralph; 5) continued participation by W.M. Johnson in Canada/Japan studies on the liquefaction of British Columbia coals.

ALBERTA GEOLOGICAL SURVEY

ALBERTA RESEARCH COUNCIL

The activities of the Alberta Geological Survey in 1985 were organized into four sections: (1) Petroleum Resources; (2) Mineral Resources; (3) Coal Geology; and (4) Basin Analysis. The following overview adheres to this organizational breakdown. Further information on any of the Survey's projects or operations may be obtained by reference to the cited publications or to the Annual Report of Investigations of the Alberta Geological Survey.

PETROLEUM RESOURCES

Activities within the Petroleum Resources Section of the Alberta Geological Survey are focused on regional stratigraphic synthesis, petroleum-oriented sedimentological studies, mapping and characterization of Alberta's non-conventional oil sands and heavy oil resources, and supporting specialist studies in palynology. A substantial portion of the funding for this section, the largest within the Survey, is derived from various contracts with two main agencies: the Alberta Oil Sands Technology and Research Authority (AOSTRA), and Alberta Energy and Natural Resources (AENR). The palynological research provides important fundamental data for subtle problems of facies analysis and stratigraphic separation. In addition, two long-term investigations are presently underway: (1) a synthesis of numerous individual studies previously done on the Lower Cretaceous oil sand deposits; and (2) a study of the coal-bearing Late Cretaceous strata in the Red Deer River Valley of southern Alberta.

Regional, petroleum-oriented stratigraphic and sedimentological studies over the past year have seen the completion of several problem-specific investigations and the initiation of a major long-term, large-scale study in the vicinity of the Peace River Arch in northwestern Alberta. As a result of the former investigations, Open File reports will be available on: (1) the northern extension of the Upper Devonian Leduc reef trend in northeastern Alberta; (2) the regional stratigraphy of the Upper Devonian Grosmont Formation; (3) the bitumen resource potential of the Upper Grosmont north of Township 88; and (4) the stratigraphic relationships between the Jurassic and Cretaceous sands in the Niton area of west-central Alberta. The Peace River Arch study is being done in partial collaboration with a deep crustal seismic program presently being undertaken by the Geological Survey of Canada's Calgary-based Institute of Sedimentary and Petroleum Geology. Overall, the program is endeavouring to unravel the tectonic history of the Peace River Arch and its affect on and reflection in the stratigraphic patterns and reservoir development throughout the entire Phanerozoic sequence of this area.

During the past year, formation-top data has been captured from hundreds of wells, and, an extensive suite of refined structural and isopach maps have been generated. Attention is presently being given to the development of a regional network of cross sections and the identification of selected intervals for both reconnaissance-level and detailed facies analysis.

Within the oil sands aspect of the program, the past year saw the completion of major long-term studies on the northern part of the Athabasca deposit, the adjacent Wabasca deposit, and the westernmost Peace River deposit. The first of these studies is summarized in an Alberta Research Council Bulletin, the other two have been submitted as reports to AOSTRA before being cleared for publication.

The results of several other studies, in various degrees of maturity, have also been submitted to AOSTRA prior to public release: namely parts of the Cold Lake oil sands deposit, the Lloydminster heavy oil belt, the bitumen-bearing Devonian Grosmont Formation and Mississippian Pekisko Formation, and the southern part of the Athabasca deposit. In addition to these regional studies, a great deal of time and effort has been devoted, through AOSTRA's technical and financial partnership in several industry-operated in-situ pilot projects, to proprietary, site-specific reservoir studies.

MINERAL RESOURCES

The Mineral Resources Section of the Alberta Geological Survey is engaged in basic geological research and resource data applications. Activities such as bedrock mapping and mineral economic studies are conducted in support of mineral exploration and resource management. Sufficient industrial and metallic minerals research has been completed at the reconnaissance level to contemplate integrating the data and identifying optimal directions for continuing minerals research. One result of this evaluation has been the production of an atlas of the Industrial and Metallic Minerals Research completed in Alberta. This atlas will form the basis for identifying gaps in the current information.

The Athabasca Basin of northeastern Alberta has significant economic mineral potential. A major study of the Athabasca Group has been completed. Research continues on the saprolite and fresh and hydrothermally altered basement beneath the basin.

Two of Alberta's most important industrial minerals are sand and gravel. The inventory of Alberta's sand and gravel resources is slated to continue until at least 1990. Recent mapping has been conducted on a reconnaissance level in the more northerly parts of the province. A major econometric report for the Edmonton-Lloydminster region at the time of writing, is in press and will provide fundamental information for aggregate resource management.

Significant effort is being directed to computerizing aggregate resource data and integrating this information with other industrial minerals information systems. Information geology is a function of the Mineral Resources Section.

GEODIAL, a geologic, bibliographic database, has continued to expand in terms of content and outside, online usage. GEODIAL was used in the past year for the compilation and publication of CSPG and Geoscience Canada indices.

COAL GEOLOGY

The Alberta Geological Survey is under contract to Alberta Energy and Natural Resources (AENR) to make an evaluation of the plains' coal deposits. The objectives are: (1) to evaluate the coal resources to identify commercial occurrences of coal in the Alberta Plains from a near-surface depth to approximately 400 m; and (2) to develop geologic facies modelling techniques which will allow prediction of the distribution, thickness, and continuity of coal seams in the Alberta Plains region. In addition, research has also been done on the structural geology and stratigraphy of Lower Cretaceous coal measures in the foothills.

Priority has been given to completing the computer databases for the Horseshoe Canyon coal, the Ardley coal, and the Belly River coal zones. In total, over 4600 oil and gas and Alberta Research Council (ARC) coal wells from the U.S. border to Township 64 have been used to construct these databases. Over 25 000 coal and geologic picks were made from these well records. Maps have been generated showing the structure of various marker horizons, cumulative coal thicknesses, maximum seam thicknesses, and depth to the major coal-bearing sections. Detailed studies of two smaller areas, approximately 36 townships each, have been done for both the Ardley coal zone and the lower Horseshoe Canyon coals. The purpose of these studies is to develop an understanding of the continuity and variation in character of the coals of these zones. Final maps and reports pertaining to the AENR contract will be ready before April 1986. The Horseshoe Canyon study is currently in the write-up stage. Major coal seams of this formation are continuous for tens of km, but generally cannot be traced for hundreds of km. The coal originated as a peat that accumulated on a coastal plain and the best coals are found at the transitional area between marine sediments of the Bearpaw Formation

and fluvial sediments of the middle Horseshoe Canyon Formation. The coal zone is diachronous. Coals of the formation in the Drumheller area are much younger than those of the Edmonton area. Both the Ardley and Belly River studies are nearing completion of the data collection phase and work is currently underway to synthesize the data.

The coal geology group published several reports during the year. These include an ARC report on coal quality and rank of coals in the plains region, a review of depositional models for coal-bearing strata, a report on the ARC coal drilling program between 1961 and 1983, two papers on foothills coals, and a paper on the Carbon-Thompson coal zone.

BASIN ANALYSIS

The major achievement of the Basin Analysis Section within the past year was completion of a contract report for Alberta Environment, "Hydrogeology of the Cold Lake Study Area, Alberta, Canada". The six-part report, three-part database, and accompanying atlas of 220 maps at a scale 1:500 000 describe the steady state flow regime in the 23 800 km² Cold Lake Study Area and the numerical simulation of the flow pattern prior to major commercial insitu recovery operations. A follow-up study currently in progress includes extension of the model into Saskatchewan.

Work under contract to Environment Canada continued during 1985 with further phenol adsorption experiments using C-14 as a tracer, and additional analyses of injected waste waters.

Major effort during the year was directed at evaluating the Swan Hills area for potential deep waste disposal. The study was carried out under contract for the Alberta Special Waste Management Corporation and comprised both steady state and transient flow simulation of several potential injection aquifers at their Swan Hills special waste treatment site. Recommendations were made and drilling is presently underway to test one of the recommended injection aquifers. Other studies under investigation include the hydrogeology of the Peace River region and an examination of the geopressed regime in the Beaufort-Mackenzie Basin.

SASKATCHEWAN GEOLOGICAL SURVEY

SASKATCHEWAN DEPARTMENT OF ENERGY AND MINES

The Canada-Saskatchewan Mineral Development Agreement under E.R.D.A. was implemented on May 16, 1984. It provides for a 5-year, 50-50 parallel delivery program, totalling \$6,380,000, on mineral prospecting studies in the Precambrian Shield of northern Saskatchewan and on industrial minerals in the sedimentary strata of southern Saskatchewan. Program delivery is shared with Canada Energy, Mines and Resources, under a joint federal-provincial management committee. The major part of this program concentrates on projects designed to stimulate and assist the mineral industry in exploration for gold and other precious metals in northern Saskatchewan, as well as augment and update the geoscience inventory of the province.

A number of projects ranging from 1:20 000 scale mapping to detailed mineral deposit and geochemical studies were carried out in the "gold belt" between La Ronge, Reindeer Lake, and Flin Flon by the Precambrian Geology Section. Two field parties mapped about 350 km² in the Central La Ronge Metavolcanic Belt, providing a better basis for geological and metallogenic modelling in what is currently regarded as the most promising gold exploration terrain in the province. This work was supplemented by geochemical studies by the University of Regina. Other specialized studies in the gold belts were also conducted with the University of Regina (Flin Flon) Hanson Lake geochemistry, University of Saskatchewan (Sedimentology of the Martin Formation), and Carleton University and the University of Kansas (geochronological determinations).

Exploration for metallic deposits by the sampling and analysis of plant material has been pur-

sued with some success on an experimental basis by the Saskatchewan Geological Survey in the delineation of uranium trace anomalies. The technique makes use of the uptake of metallic elements by plants from the surrounding soil.

This year, an expanded project under the Mineral Development Agreement was applied to gold in the Sulphide Lake region north of La Ronge. The Mineral Development Section was newly formed in 1984 from the Economic Geology Section and the Precambrian Records Unit of the Geodata Section. It is responsible for maintenance of the mineral exploration assessment files and the Saskatchewan Mineral Deposits Index, for evaluation and geological studies of metallic mineral deposits of northern Saskatchewan, and for programs run through the offices of the resident geologists in La Ronge and Creighton. A total of 321 mineral exploration assessment files submitted under the Mineral Disposition Regulations were processed, 85 visitors received, and 86 requests for information handled. Two indexes to assessment files, for the Southern and Athabasca Mining Districts respectively, were published. Work continued on the Saskatchewan Mineral Deposits Index with documentation of new occurrences and updating. The Index provides a primary reference for mineral exploration and land use planning. There were 17 major requests for index data. Studies of gold deposits were undertaken in the Goldfields area south of Uranium city, at Sulphide Lake near La Ronge, and at the Rio Zone gold deposit in the Flin Flon area, and involved detailed geological mapping of deposits and their surroundings, together with mineral and geochemical investigations. Collection of mineralized core by the resident geologist in La Ronge continued with additions from the Deilmann orebody at Key Lake, from several gold prospects in the La Ronge Belt, and from gold and base-metal properties in the Flin Flon area. A new index to the collection was completed and released as an open file report. The first of a new series of 1:250 000 scale metallogenic maps was published and work continued to further develop this series.

In the southern half of the province, petroleum-related exploration activity continued its hectic pace. This is reflected in the work of the Well Records Unit, where 3200 new well files were created and 1600 new wells were added to the computerized well information system.

Demand for information services increased substantially during the period. The staff pulled and refilled the records of 30 439 wells; provided industry with over 55 000 pages of photocopied data, and conducted 24 computerized data searches. Over 16 000 submissions of technical data were processed and nearly 1300 letters requesting overdue information of delinquent companies were mailed.

Conversion to a new computerized data system, which will provide direct on-line input and greater versatility in data access is underway. To redress what had become a critical deficiency of standardized subsurface geological data arising from the intense petroleum and natural gas exploration, the traditional role of the former Sedimentary Research Geology Section was de-emphasized. The data synthesizing role of the Geodata Section was transferred to a newly organized Petroleum Geology Section as a primary function. Smaller and more narrowly focused studies on hydrocarbon related topics would also be conducted as resources permitted. Priority was given to picking well logs in order to clear up a backlog from previous years. This objective was achieved; a total of 6011 logs were picked. Four cross sections were constructed, suitable for distribution as blue-line copies. These are part of an ongoing series intended eventually to cover the southern half of the province, to tie into neighbouring provinces, and to standardize and speed up log-picking.

Sedimentary geological studies included two projects on the heavy oil producing region of west-central Saskatchewan; the one on the Sedimentology of the Lower Cretaceous Mannville Group in the Tangleflags area, and the other, on the heavy oil reserves of the region.

Industrial Minerals projects included the close out of the peat reconnaissance program and the Buffalo Narrows Fuel Peat Demonstration Project, but a new initiative through the Mineral Development Agreement on the feasibility of quarrying limestones in central Saskatchewan was undertaken. The general industrial mineral program on the potash ore-bearing strata was continued with completion of a study on the geochemistry and distribution of carnallite. Likewise, an overview of the industrial minerals of the province was started.

SASKATCHEWAN RESEARCH COUNCIL RESOURCE DIVISION

Programs of this Division complement those of the Saskatchewan Geological Survey, especially in the disciplines of surficial geology and hydrology. They also supplement in projects dealing with geochemistry and metallogeny. Additionally, the Division pursues studies on technological aspects of geology in the mining process. The current geological projects are described as follows.

METALLOGENIC STUDIES

Current studies focus on: 1. geochemistry and diagenesis of Athabasca sediments which host the uranium ores to provide a lithogeochemical framework and background information for the interpretation of exploration data; 2. continuing investigation of the relationship between alteration haloes, mineralization, and Athabasca Group diagenesis using stable isotope methods; 3. A new perspective on the origin of the metallic deposits in the Beaverlodge district is being developed. Studies suggest the possibility of gold, tin, and tungsten mineralization in addition to the traditional uranium deposits due to massive soda metasomatism. This process is recognized in other countries and has been responsible for some major mineral deposits.

DATA PROCESSING

Projects have included work on coal, water, and environmental databases, predictive models for potash mining and water resource utilization. Various tasks performed are: 1. database projects for uranium tailings and Project Wollaston (environmental); 2. manipulation and testing of 20 different atmospheric models; 3. modification of water quality program; 4. computer survey and recommended selection for the Energy Engineering group; 5. implementation of a computer mining model for potash mine; 6. software development for digitization of x,y,z coordinates for geographic data.

LITHOGEOCHEMISTRY

In this project, the application of lithogeochemistry and data analysis to mineral exploration in Saskatchewan are investigated. Lithogeochemistry is becoming more important in exploration as an increasing proportion of discoveries are "blind ores" at depth. Current emphasis is on developing lithogeochemical "signatures" which will be useful in the exploration for gold in the La Ronge and Flin Flon regions. Methodology will involve the use of pattern recognition techniques to study major and trace element multivariate spaces.

QUATERNARY GEOLOGY

Recent work includes: 1. examination of surficial sediments by shallow drilling and excavation in the Nipawin area in support of archaeological investigations, and studies of the history of glacial Lake Agassiz for the Canadian Prairie Correlation Project and the Lake Agassiz Symposium; 2. compilation of 1:250 000 scale Quaternary maps of the plains region, and a 1:1 000 000 scale map of the province; 3. mapping and geochemical sampling of drift in the La Ronge "gold belt" in support of gold exploration in the region.

GROUNDWATER

Approximately 70% of rural residents in the plains depend upon groundwater for their water supplies. Recent work includes: 1. operation and evaluation of a 50 station groundwater level monitoring network; 2. evaluation of groundwater in terms of quality and quantity; analyse the hydrographs from the 50 station observation well network; assist the public, private, and government sectors in dealing with groundwater supply and pollution problems; 3. develop approaches to predictive groundwater models and recharge processes, and evaluate the implication of subsurface disposal; 4. groundwater monitoring at a Potash Mine, the evaluation of subsurface brine migration, and the development of methods to control vertical and lateral brine migration; 5. installation and monitoring of piezometers at Dalmeny in order to determine the hydraulic and geochemical properties of glacial tills and determine the groundwater flow patterns and chemical evolution.

AGGREGATE STUDIES

Ten million tonnes of aggregates are consumed each year in Saskatchewan. Geological in-

sights assist in exploration for additional reserves. Four 1:50 000 scale NTS areas around Saskatoon are being mapped.

GEOLOGICAL SERVICES BRANCH

MANITOBA ENERGY AND MINES

September 1984-85

The results of the first year's field programming under the Canada-Manitoba Mineral Development Agreement (1984-89) were released at the Annual Meeting with Industry held in Winnipeg (223 registrants) on November 14-15, 1984. A Report of Field Activities, 12 Preliminary maps, 2 Open File Reports, displays, and oral presentations on key components of the program were given, including presentations from the Geological Survey of Canada and the Department of Earth Sciences, University of Manitoba.

During 1985, governmental geoscientific activities in Manitoba were facilitated, coordinated, and funded under the Canada-Manitoba Mineral Development Agreement (1984-89) a sub-agreement under the Economic Regional Development Agreement (ERDA). Under the terms of the agreement, Canada and Manitoba will spend a total of \$24.7 million dollars to implement geological, geophysical, and geochemical surveys; research into mining technology development, marketing, and other mineral economic studies in order to improve the level of effectiveness of mineral exploration; and to investigate potential new developments that could lead to a diversification of the mineral base currently exploited in the Province.

The 1985/86 Workplan for Sector 'A', Geoscientific Activities, identified 60 Provincial and 20 Federal projects including contributions to be contracted through universities in Manitoba and elsewhere in Canada. Copies of the Workplan were forwarded to the newly constituted Mineral Exploration Liaison Committee in March, 1985 to solicit feedback that might be incorporated into this year's field program. At the outset of field activities, a five-day demonstration and field tour was given for the benefit of industry, Federal government, and other Provincial geologists working along the Kiseeynew metallotect north of Flin Flon. Subsequent tours of shorter duration were led by Provincial geologists in the Cross Lake area, in the Pikwitonei region, and at Snow Lake. A progress report covering all aspects of MDA geoscientific programming during fiscal 1984-85 was released in September, 1985 as yet another means of providing full visibility to these governmental surveys and investigations. In subsequent years, it is intended that similar progress reports will be released in late Spring prior to the onset of the field season.

LYNN LAKE

As in previous years, heavy emphasis was placed on assisting the search for new ore deposits in the Lynn Lake and Flin Flon regions and on raising the level of exploration elsewhere in the Province. A substantial database has been generated in the Lynn Lake region over the past 10 years and an intensive effort is currently underway to analyze and process the data for publication. Open File reports on basal till investigations and biogeochemical surveys over the Agassiz metallotect were released in the fall of 1985, as was a detailed report on the geochemistry of the volcanic rocks in the Lynn Greenstone Belt.

Geophysical data stemming from Geological Survey of Canada sponsored gradiometer surveys of the Ruttan district and Fox Mine area are currently being processed and will be released as 1:20 000 scale contour maps and 1:50 000 scale colour applicon plots in the Spring of 1986. Work is continuing on the 1:250 000 scale synoptic geological compilations for the Granville and Uihman Lakes sheets (NTS 64C and B) as well as a report on the Brochet and Big Sand Lake area (NTS 64F and G) immediately north of Lynn Lake. Reports and maps are also under development for the Barrington, MacMillan, Kamuchawie, and Eden Lakes areas as well as a detailed investigation of metavolcanic rocks of the Ruttan district. Uranium/lead isotope studies conducted by the Federal and Provincial surveys in this part of the Churchill Province have been extended through cooperative work with the University of Kansas (supported by the National

Sciences Foundation).

Work by the Geological Survey of Canada and the Provincial Survey identified two distinct ages of volcanism. This is of significance to the ongoing tectonic and stratigraphic analysis of the area and will be a key element in unravelling the region's metallogeny.

New rubidium/strontium results from the Chipewyan Batholith and Goldsand Lakes region confirm observations that the paragneisses and associated intrusions of the Southern Indian Lake domain predate emplacement of the intrusive phases of the Chipewyan Batholith. Mineral deposit documentation was undertaken in the area between Lynn Lake and Barrington Lake. Detailed mapping and geochemical studies of the "Lar" massive sulphide deposit and Cartwright Lake gold occurrence were completed. Investigations along the Agassiz metallotect included geological mapping of known occurrences, lithogeochemical sampling of Agassiz-type rocks, and a regional basal till study. These studies confirm the presence of Agassiz-type rocks in the Nickel Lake area and re-affirm the 60 km strike length of rock units having a potential to contain gold deposits. Metamorphosed alteration zones in the Laurie Lake area were mapped and sampled as potential sources of abrasive and refractory minerals. Case studies of glacial dispersion haloes were undertaken near Ruttan, Dot Lake, and Le Clair Lake.

FLIN FLON

A geological reconnaissance of the Athapapuskow Lake area confirmed the desirability for 1:20 000 scale geological mapping and geochemical work to upgrade the existing mapping to permit a stratigraphic analysis of the stratabound mineral occurrences. Initial findings suggest that major faults disrupt the Amisk Group successions, juxtapose blocks of widely differing metamorphic grade, and in some cases appear to be the loci of gold mineralization. A zone characterized by low metamorphic grade (prehnite-pumpellyite) was traced from the Schist Creek/West Arm area to Hook Lake. A reconnaissance of the Snow Lake region confirmed the need for 1:20 000 scale mapping of a burnt-over area between Chisel and Morgan Lakes. The area contains seven significant volcanogenic massive sulphide deposits and detailed maps are required to define the extent and degree of hydrothermal alteration zones as well as the stratigraphy of the volcanic rocks.

North of Flin Flon on the south flank of the Kiseynew Belt, a new 1:20 000 mapping program has been initiated to resolve the stratigraphy of the paragneissic sequences and provide additional information on the nature and whereabouts of the Kiseynew metallotect. Shallow dipping paragneissic sequences and amphibolites were traced westward along Kiseynew Lake into equivalent formations documented in Saskatchewan. Amphibolites encountered at several levels in the sequence, commonly contain sulphide mineralization. A domal gneissic complex south of Weasel Bay possesses a unique granulitic aspect that is typical of the Archean Pikwitonei region rather than Hudsonian assemblages of the Churchill Province. Uranophane-bearing pegmatites were also encountered near the Saskatchewan border. Detailed geological mapping was initiated in the Big Island area on Kiseynew Lake, and earlier work near Lobstick Narrows was also continued. Both projects are encountering a much greater diversity of rock types and structure than was previously anticipated, factors which will inevitably affect the conduct of future surveys in this region.

South of Flin Flon, an additional 16 holes were drilled through the limestone as part of the Province's contribution to sub-Paleozoic investigations in the Project Cormorant area. The Geological Survey of Canada has initiated a compilation of all information from the southern half of NTS area 63K including complete re-logging of all available exploration drill core, and provincial "Scout" drill core, and correlation with gradiometer, total field and VLF data, etc. Documentation of mineral occurrences in the Flin Flon region proceeded in the Snow Lake and North Star Lake areas. In-depth studies of alteration zone geochemistry were initiated in the Snow Lake area to establish parameters for base metal exploration. At Flin Flon, selected mineral occurrences such as the Vamp deposit, the Tartan Lake gold deposit, the Centennial Mine, and the Baker-Patton copper-zinc deposit, were mapped thematically to resolve metallogenic problems identified during work in 1984. Detailed 1:5000 mapping and investigations of gold occurrences in the Kiseynew metallotect re-affirmed the stratigraphic nature and regional extent of gold-bearing strata within parts of the Kiseynew terrain. Known occurrences of garnet, staurolite,

kyanite, and sillimanite in the Star and Snow Lake areas were mapped in detail, and sampled as potential sources of abrasives and refractory materials.

SOUTHEASTERN MANITOBA

In the Rice Lake Greenstone Belt, 1:10 000 scale mapping in the Stormy Lake area added a new unique stratigraphic marker at the boundary between felsic volcanic rocks, and metasediments containing gold and stibnite mineralization. Favourable hosts for gold mineralization are carbonated and silicified shear zones in gabbroic rocks. A U/Pb zircon geochronological program conducted through the University of Windsor, Ontario, has yielded results suggesting the felsic volcanic and intrusive rocks are comagmatic and relatively young for northwest Superior Province greenstone belts. In the Cat Creek area, much improved access along timber-cutting roads facilitated detailed geological mapping and the discovery of several layered magnetite- and olivine-bearing pyroxenite sills within the volcanic sequences. Several "scout" drill holes in the Whitemouth area permitted sampling of magnetic anomalies in the Precambrian basement beneath thick Quaternary cover. Mineral investigations in southeastern Manitoba resulted in detailed mapping of iron formations in the Wallace Lake area to assess their potential as hosts to gold mineralization. Mineral occurrences in the area east of the San Antonio Mine were documented and sampled to establish the geological setting of gold and base metal mineralization. A dimension stone survey initiated in the region south of the Winnipeg River provided background data for the preparation of a promotional brochure on building stone potential in this part of the Province.

THOMPSON

In the Cross and Pipestone Lakes area, mapping confirmed the presence of subaerial-fluvial metasediments overlying an older volcanic sequence. Geophysical surveys, detailed mapping, and sampling of an elongate gabbro-anorthosite complex traced magnetite-bearing layers to the east channel of the Nelson River, thereby extending the vanadium and titanium potential significantly. Analyses to date indicate high niobium contents associated with the higher vanadium values. Uranium/lead isotope investigations in the northwest part of the Superior Province yielded a precise age for the end of the Hudsonian overprint in the Thompson Belt, and confirmed an early Proterozoic age for granitoid plutons in this belt and their derivation from Archean precursors. Preliminary ages from the Pikwitonei domain confirm the relatively young age of the granulite metamorphism. Mapping at Phillips Lake confirmed that leucogneiss is retrogressed from felsic granulites and that granulitic domains survived the otherwise intense Proterozoic deformational and metamorphic overprint. To the northeast and north of the Nelson River, a regional compilation project completed documentation of bedrock occurrences in the sparsely exposed northern half of NTS area 54D. Proterozoic sequences equivalent to those occurring on Assean Lake and near Rock Lake were documented north of a prominent cataclastic zone marking the boundary between the Churchill and Superior Provinces. Industrial mineral investigations in the Thompson area delineated sources for carving, building and ornamental stones.

GODS - ISLAND LAKES

Regional greenstone mapping in the Island Lake area was completed with mapping at Stevenson, Knight, and Wass Lakes. Stratigraphically, Knight Lake is a continuation of the Bigstone Lake succession. Felsic volcanic rocks mapped near the major northwest-trending fault zone are presently viewed as silicified mafic flows. Assay data from Bigstone Lake yield significant zinc and precious metal values. North of Loonfoot Island (Island Lake), a large slightly differentiated gabbro intrudes the youngest Hayes River Group. South of Savage Island, abundant iron formation was mapped. Along the southern contact of the greenstone belt, hornblende and serpentinite related to olivine gabbro norite may be metallogenically significant. Rare element pegmatite studies were completed on Cross Lake. On Magill Lake, a lithium-enriched halo associated with granite is dispersed to the west and northwest. Two dikes with spodumene and one beryl-bearing dike were discovered.

MANITOBA GENERAL

A regional industrial mineral resource program was initiated this year in the Swan River area (NTS 63C). Other industrial mineral activities in the southern part of the Province continued the evaluation of commodities such as silica sand, bentonite, kaolin, glauconite, gypsum, and ce-

ment rock. A basal till sampling profile was conducted along the Pelican Rapids Road as part of the ongoing search for lead-zinc mineralization in the Paleozoic. The study was augmented by geochemical analysis of Paleozoic drill core from five drill cores in the west-central part of the Province. Stratigraphic drilling in the Project Cormorant area confirmed the uniformity of the Precambrian erosion surface and overlying Phanerozoic strata. Structural trends on the Precambrian surface change gradually from 090° (in the east) to 070° (in the west). This northeast-trending synclinal flexure is coincident with the Churchill-Superior boundary. Stratigraphic mapping and geochemical lake sediment sampling of the Moose Lake-Cormorant Lake area was completed. Drilling in southeast Manitoba confirmed the eastward extension of large Mesozoic channel deposits within the Precambrian. Drilling at Dawson Bay confirmed the superficial local structural relief resulting from draping over the buried Winnipegosis reefs. Comparison of drill data with seismic profiles permits an evaluation of the complex velocity anomalies affecting seismic interpretation of the reef complexes.

EXPLORATION SERVICES

The Exploration Services Section of the Mines Branch has continued to spearhead core retrieval activities and the upgrading of core storage facilities in the Province. Plans for construction of a new core shed at Thompson have been suspended in favour of consolidating and upgrading facilities in Winnipeg. During 1985, a total of 13 418 m of core were retrieved in the Flin Flon (6108) and Lynn Lake (7310) districts; existing holdings at the Pas and Winnipeg were classified and organized into readily retrievable configurations; total holdings at the Pas and Winnipeg were reduced by 11 851 m as part of the ongoing consolidation and screening program. The accelerated level of operations funded through the MDA permitted reactivation of the Province's Mineral Inventory Project (dormant since 1979) as well as the development of a comprehensive bibliography on literature pertaining to Manitoba's geology and mineral resources.

REMOTE SENSING

The Province's continuing evaluation of remote sensing, as a tool for mounting a Province-wide inventory of peat resources, this year completed pilot studies in southeastern Manitoba.

The joint peat study (Departments of Energy and Mines and of Natural Resources, and the Botany Department, University of Manitoba) continued classification of peatlands in the Lac du Bonnet-Sprague area. Peatland classification maps, data on bog thickness and a preliminary assessment of bog potential will be released as a report in the Spring of 1986. Stressed vegetation studies, resulting from metal concentrations in bedrock, have been initiated in cooperation with the Ontario Centre for Remote Sensing and the Department of Earth Sciences, University of Manitoba. Test sites at Flin Flon and Lynn Lake are scheduled for coverage in September, 1985, with data and image analysis proceeding thereafter.

GEOLOGICAL SURVEY OF CANADA

Programs delivered by the Geological Survey of Canada included U/Pb isotope investigations, and detailed studies of alteration zones and assemblages in the Flin Flon and Lynn Lake area (Linda-Nicoba deposits). Structural studies were initiated at the Pipe Pit and in southeastern Manitoba; both such studies are an attempt to define parameters controlling mineralization in these areas. Detailed property-scale mapping of chromitite seams and ultramafic phases was initiated in the Bird River Complex. Applied Geoscience Research projects conducted by the Geological Survey of Canada and Department of Earth Sciences, University of Manitoba, continued work on the mafic and ultramafic intrusions of the Flin Flon Belt as well as detailed mapping and petrological studies of the Falcon Lake Stock. Metamorphic studies southwest of the Fox Mine on Laurie Lake are being conducted in cooperation with Queen's University. Precious metal oriented investigations were continued in the Flin Flon Belt as part of a broader metallogenic evaluation of mineralization in this region. Gradiometer surveys, contracted to Kenting, were conducted in the Mamew and Nokomis Lake regions and over the northern one-third of the Moose Lake area. Regional lake sediment surveys covered most of the well exposed Kisseynew terrain in NTS areas 63 N and 63 O/W as well as in Flin Flon greenstone belt in NTS area 63 K/N and 63 J/NW. Sampling and mapping of surficial deposits was completed for the northern half of the Uhlman Lake (64 B) and Big Sand Lake areas. Airphoto interpretation of surficial deposits was extended into NTS area 53 E, L, and K with output intended at a scale of 1:250 000.

ONTARIO MINISTRY OF NATURAL RESOURCES, MINERAL RESOURCES GROUP

ONTARIO GEOLOGICAL SURVEY

During 1984/85, the Ontario Geological Survey (OGS) carried out a large number of independent geological, geophysical, geochemical, geochronological, and mineral deposit studies. In addition, studies were undertaken in cooperation with the ministry's regional geological staff, personnel from a number of universities, and several private consulting firms. Funding for a number of regional stimulation projects was provided by the Ontario Ministry of Northern Affairs (MNA), the Government of Canada, and the Ontario Ministry of Natural Resources (MNR), and for the Hydrocarbon Energy Resources Program (HERP) by the Ontario Ministry of Treasury and Economics under the Board of Industrial Leadership and Development (BILD) Program. The Ministry carried out 59 field projects in various parts of the province and supported 23 applied research projects by Ontario universities as well as 18 exploration technology development projects by the private sector of Ontario's mineral industry. Program highlights are detailed below.

PRECAMBRIAN GEOLOGY SECTION

Staff of the Precambrian Section took part in 18 geological mapping projects and special studies; 11 involved detailed areal mapping (1:15 840), one was a regional reconnaissance survey, four were surveys to solve specific geological problems, and two were regional tectonostratigraphic syntheses projects. Regional reconnaissance mapping in the Uchi Subprovince further refined the volcanic stratigraphy and defined major structural zones that represent empirical exploration targets for gold. A special study in the Hemlo area is intended to produce an unified detailed overview of the geology of Ontario's newest gold "camp". An integrated geological, geochronological, paleomagnetic, and lithogeochemical program in the Batchewana area has greatly elucidated the geological evolution of this part of the Superior Province. Continuation of a program to identify supracrustal stratigraphy in regions of high metamorphic grade identified an assemblage of volcanic rocks (formerly mapped as sediments) that have a peraluminous mineral assemblage similar to those found in alteration zones associated with massive sulphide studies. Projects in Lakehead-Atikokan, Kirkland Lake-Larder Lake, and other areas integrated geological information where significant new data are available. New stratigraphic and tectonic syntheses will be based on these compilations in preparation for work on a revised geological map of Ontario.

Engineering and Terrain Geology Section

In 1984/85, the staff of the Engineering and Terrain Geology Section completed the Quaternary geology mapping in the Brampton area to the immediate west of Metropolitan Toronto, and commenced the mapping of the surficial deposits around the Hemlo gold camp and the Opapimiskan area in Northern Ontario. Peatland inventories were continued in Northern Ontario and aggregate inventories in both Northern and Southern Ontario. The inventory of Ontario oil shales continued in Southwestern Ontario and the James Bay Lowland. The Quaternary geology staff operating in Northern Ontario have been active in mapping and special studies in three gold camp areas, (Black River-Matheson, Hemlo and Opapimiskan) to establish the geological environments and to develop drift exploration methodologies. Staff have actively participated in several mineral exploration/geochemistry seminars as a means of more widely publicising their findings. Following the completion of Quaternary mapping in the Algonquin Provincial Park in Southern Ontario, the staff have prepared a visitor's guide to the geology of the Park and an inventory of significant geological features for the Park staff to use in their interpretive programs as well as a regular geological report on the area. Staff have made presentations during the year to personnel undertaking forest soil mapping and acid rain study programs, and to study teams concerned with shoreline erosion on Lake Erie and slope stability in the Toronto metropolitan area.

Aggregate Assessment

Office staff carried out assessments of sand and gravel potential in several townships in Elgin, Huron, Perth, Grey, and Peterborough Counties in Southern Ontario, as well as in the Espanola, Hemlo, and Opapimiskan Lake areas of Northern Ontario. The staff of the Paleozoic/Mesozoic geology subsection continued with the fourth year of a five-year Hydrocar-

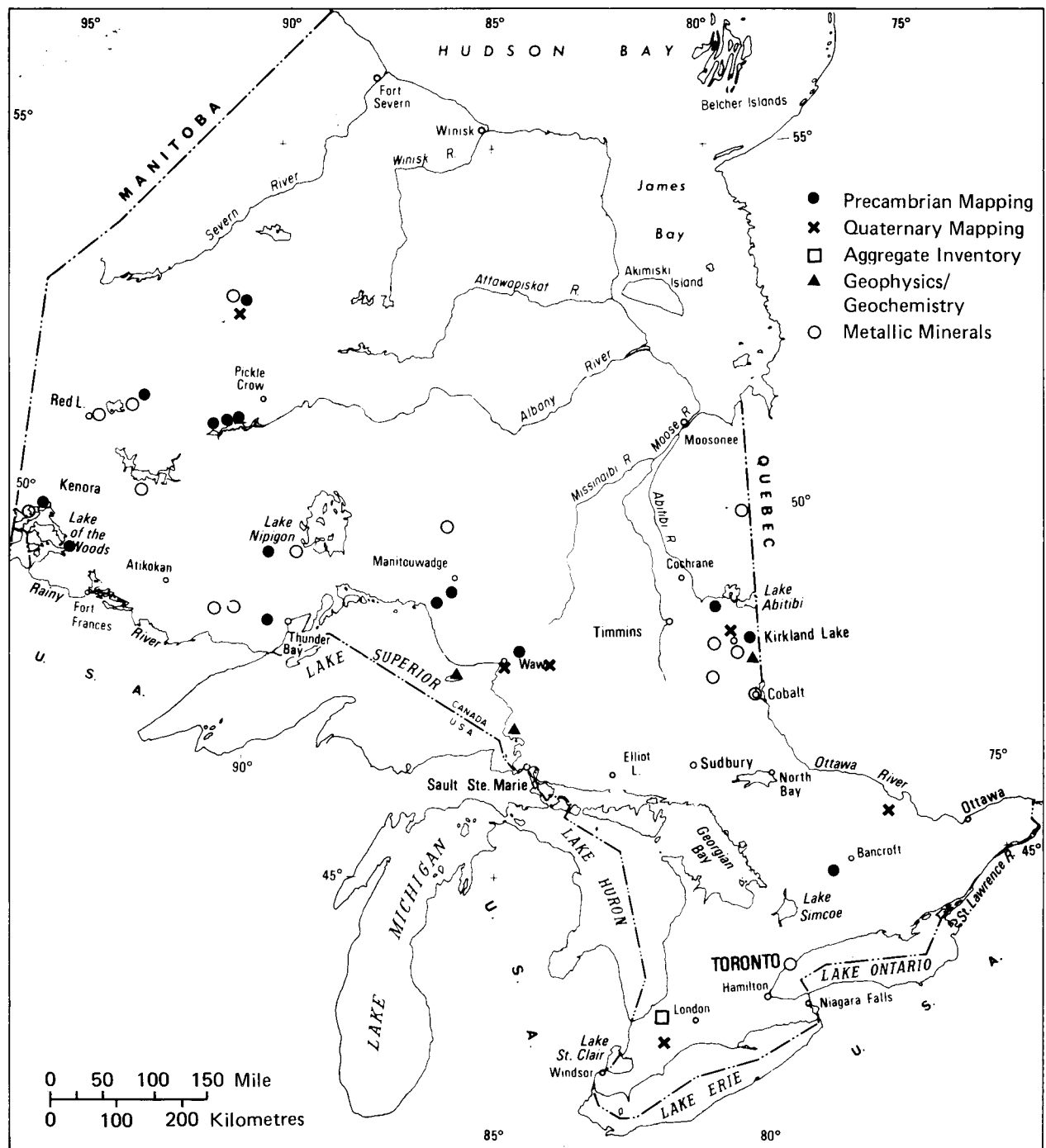


Figure 1. Distribution and type of programs in Ontario

bon Energy Resources Program (HERP) towards providing an assessment of the peat, lignite, oil shale, and conventional oil and gas resources of the province. Peatland inventories were carried out in five areas (Dryden-Lac Seul, Sioux Lookout, Longlac-Nakina, Cochrane-Kapuskasing, and Timmins-Kirkland Lake) totalling about 100 000 km². The Oil Shale Assessment Project, an integrated program of drilling, mineralogical and hydrocarbon analyses, and applied research, included a study of the upper Ordovician Collingwood Member and Devonian Marcellus and Kettle Point Formations of Southern Ontario and the upper Devonian Long Rapids Formations of the James Bay Lowland. During the winter of 1985, a borehole was drilled to a depth of 321 m at Onakawana, providing a complete core through the lignite seams of the Lower Cretaceous Mattagami Formation and through the underlying Paleozoic sequence that is capped by the Long Rapids Formation. The conventional oil and gas component of the program involved evaluation of oil and gas reserves of the Silurian reef complexes of Southwestern Ontario. This included 76 pool studies plus relevant production unit studies in Lake Erie.

MINERAL DEPOSITS SECTION 1984/85

The program of the Mineral Deposits Section continued to emphasize field studies of gold mineralization, while increasing investigation of industrial mineral resources and their uses. Project components in gold included continuing studies of alteration, metamorphism, and deformation in the Red Lake area, associated felsic intrusions in the Abitibi Belt, and the systematic application of U-Pb dating.

New studies were initiated in the North Caribou Lake Belt, the Shebandowan Belt, the Black River-Matheson area, and around the Detour Lake Mine. Studies in the Lake of the Woods and Geraldton areas were completed. The results of this work were synthesised in a comprehensive report which attempted to draw together the important similarities between gold deposits as a basis for aiding exploration; this was published as OGS Open File Report 5524 in November 1984. Work in industrial minerals emphasized clay and ceramic resources, building stone, vermiculite, and the lithophile elements in which continuing projects are underway.

GEOPHYSICS-GEOCHEMISTRY SECTION

The Section Staff established approximately 2000 new gravity stations in the Kirkland Lake, Larder Lake, and Matheson areas of the Abitibi Subprovince. Interpretation of this data is now in progress. As part of an airborne time-domain electromagnetic-magnetic survey, covering an area of approximately 3550 m² from Black River Matheson (BRIM) area to the Ontario-Quebec border, were released in May, 1984. Some of the above digital E.M. data was reprocessed to produce a filtered difference (channel 1 - channel 2) map that could possibly outline deeper sections of lacustrine clays. A ground E.M. technique was also developed for identifying small scale buried valleys in clay covered areas. Survey and research activity continued on the Night Hawk geophysical test range near Timmins. A reconnaissance till sampling program utilizing backhoe sampling techniques was carried out for Quaternary and geochemical studies in the BRIM area. Following this, a deep overburden drilling program was also conducted. Remote sensing methods were applied in conjunction with lake water and sediment analysis to test a technique in two areas. These are located north of Sault Ste. Marie and south of Montreal River, for identifying lakes affected by acid precipitation and to distinguish these acid lakes from naturally occurring acid and non-acid lakes. Sampling for radiometric age determinations was carried out in many areas of the province, that is Favourable Lake, Bamaji Lake - Fry Lake, Meen Lake, Beardmore-Geraldton, Cobalt, and the Hemlo areas.

REGIONAL AND RESIDENT GEOLOGISTS

An advisory service on areal geology and mineral deposits is provided by staff of the Resident Geologists' offices. These offices are located in nine centres across Northern Ontario and in five Southern Ontario communities. Each office maintains a library of published and unpublished geoscience and minerals related reports, including results of exploration work submitted under the Mining Act of Ontario. Resident Geologists and their staff undertook a variety of activities including building stone inventories, industrial mineral and metallic mineral studies, and map compilations. A wall rock alteration study was continued in the Red Lake area; regional and structural studies of Archean basement rocks were conducted in the Temagami-New Liskeard area; depth to bedrock seismic surveys were conducted in Eastern Ontario, and a field trip guide to the Hemlo gold area was prepared. Drill core storage libraries have been constructed in Kirkland Lake, Timmins, Sault Ste. Marie, Bancroft and Tweed; a facility is under construction in Thunder Bay and buildings are planned for Sudbury and Kenora. Approximately 332 000 m of core has been collected, catalogued and stored since the first building was completed two years ago.

GEOSERVICES SECTION

Compilation and computerization of mineral deposit and rock chemical data was continued by the Geoscience Data Centre. Also, new Mineral Resources Group publications and exploration assessment work reports were indexed and added to both the in-house database and the national GEOSCAN bibliographic file, which now totals 17 000 Ontario Geological Survey entries. On request, retrievals are made for the public from the various computerized data files maintained. Three indexes to geoscience data were published: Index to Published Reports and Maps by the Mineral Resources Group, 1984; the microfiche Index to Data in Exploration Reports, edition 1985, and the Ontario Mineral Deposit Inventory, on microfiche. The delivery of a SCIE

"ELAN" inductively-coupled plasma-mass spectrometer (ICP-MS) system was accepted and the investigation began on how to use this system in geoanalysis. The "ELAN" system represents state-of-the-art analytical capabilities by interfacing two proven techniques: plasma excitation of the analyte, and mass spectrometric determination.

It allows a wide range of elements and isotopes to be determined rapidly in a single scan; a capability heretofore unavailable to geoanalysts. A SCIEX "ELAN" users group was formed under the chairmanship of Tony Vander Voet to ensure that information is shared amongst users and that the development of applications takes place in an atmosphere of cooperation. Initial studies focused on the determination of the rare earth elements in rock samples and on the use of laser ablation to study mineral specimens. The Scientific Review Office initiated a "Demand Publishing" system based on laser printing, computerized typesetting, and page layout, and is busy debugging the system. Some equipment for computerized graphics for illustrations and maps is on delivery, and training is about to commence; the rest of the equipment is on order. Benefits expected are reduced production costs, demand printing of publications, and computerization of map production. The Mines Library provides an information and reference service to Ministry personnel and the mining industry on the geology of Ontario and its mineral deposits. During 1984/85, the Library responded to approximately 8500 requests for information.

GEOSCIENCE RESEARCH AND DEVELOPMENT

In 1984/85, the Ontario Geoscience Research Grants Program awarded 24 grants totalling \$451,700 to 10 Ontario universities. The grants finance mission-oriented research in Ontario which is closely integrated with, but does not duplicate the activities of the Ontario Geological Survey. The Exploration Technology Development Program supports joint ventures with Ontario companies, offering research and development capabilities leading to the development of innovative technology, specifically in those areas which support the mineral exploration industry. This Program is sponsored by the Ontario Government's Board of Industrial Leadership and Development (BILD). In total, the 1984/85 program supported 18 projects involving 18 Ontario companies with expenditures totalling \$876,300. Reports by OGRF and ETDF recipients were presented at the annual Ontario Geological Survey Geoscience Research Seminar on December 4 and 5, 1984.

MINISTÈRE DE L'ÉNERGIE ET DES RESSOURCES, GOUVERNEMENT DU QUÉBEC

SECTEUR "MINES" DU QUÉBEC

L'année 1985/86 fut une période de consolidation du mandat du secteur. L'objectif de base du ministère, en ce qui concerne le secteur "Mines", est de promouvoir le développement de l'industrie minière du Québec par un ensemble de mesures visant à appuyer l'initiative et le leadership du secteur privé. Plus particulièrement, il s'agit de:

1. stimuler les investissements privés pour le développement de nouveaux gisements, l'expansion des capacités de production existante et la modernisation des usines de première transformation;
2. localiser la recherche et le développement sur des projets spécifiques répondant aux besoins de l'industrie, pouvant aider à consolider notre position concurrentielle et susciter le développement industriel à court et moyen termes;
3. assurer le renouvellement des réserves domestiques pour les minerais de cuivre et de zinc et favoriser la diversification de la production minière dans les régions du Québec par la stimulation de l'exploration minière.

Chacune des trois directions générales du secteur "Mines" répond plus spécifiquement à un des grands objectifs cités.

LA DIRECTION GÉNÉRALE DE L'INDUSTRIE MINÉRALE

Cette entité administrative a pour mandat d'appuyer le développement, l'exploitation et la transformation des ressources minérales du Québec par l'entreprise privée. Elle administre certains programmes d'assistance financière et les législations minières, notamment celle qui concerne la nouvelle fiscalité minière. De plus, cette direction générale analyse les facteurs économiques et réglementaires qui ont une incidence sur l'industrie minérale en vue de dégager des orientations et des programmes susceptibles de contribuer à son essor.

PROGRAMMES D'ASSISTANCE

Études technico-économiques

Le programme a pour objectif de favoriser l'élaboration de projets industriels miniers et d'inciter l'industrie minérale à analyser diverses avenues susceptibles d'améliorer sa productivité et sa compétitivité. En vertu de ce programme, une assistance financière de 50% du coût de réalisation d'études technico-économiques et de travaux d'expérimentation destinés à vérifier la praticabilité ou la viabilité économique d'un projet peut être accordée, avec un maximum de 250 000 \$ par projet. Cette assistance peut atteindre 75% des dépenses admissibles pour des études de marché et de commercialisation dans le secteur des minéraux industriels.

Embauche de spécialistes

Le programme a pour objectif de favoriser le développement de la capacité technologique des entreprises du secteur minéral et l'embauche de jeunes diplômés universitaires ayant moins de cinq (5) ans d'expérience. En vertu de ce programme, le ministère de l'Énergie et des Ressources accorde une assistance financière de 20 000 \$ pour un nouvel emploi d'une durée minimale de deux (2) ans. Les jeunes spécialistes peuvent être diplômés en sciences minérales, connexes ou de l'administration. De plus, une assistance pouvant atteindre 165 \$ par semaine peut être accordée pour des stages d'étudiants universitaires en sciences minérales. Après dix-huit (18) mois d'opération, près d'une quarantaine de jeunes spécialistes ont été embauchés dans le cadre de ce programme.

Pierres dimensionnelles

Le programme vise à favoriser l'ouverture de nouvelles carrières de pierres dimensionnelles en atténuant le risque associé à ces développements. Ce programme permet au ministère de l'Énergie et des Ressources de consentir une aide équivalente à 25% des dépenses de mises en valeur et de développement. De plus, une assistance financière sous forme d'une prise en charge des intérêts sera possible lors de l'achat de machinerie et d'équipement nécessaires à l'exploitation. Jusqu'à ce jour, les projets en cours pourraient totaliser des investissements de plus de 3,5M\$ et la contribution gouvernementale pourrait être de l'ordre de 730 000 \$.

Infrastructures de développement minéral

Ce programme est inscrit dans le cadre de l'entente auxiliaire Canada-Québec sur le développement minéral. Son objectif est de favoriser l'implantation de nouvelles installations de production et de transformation de minéraux au Québec qui soient hautement productives et concurrentielles au plan mondial, grâce à une intervention gouvernementale qui assurera l'existence des infrastructures nécessaires à leur avènement. En vertu de ce programme, la contribution des gouvernements au coût de construction des infrastructures (routes, lignes électriques, ponts, pipelines, sites résidentiels, aquaduc, égouts, etc.) pourra atteindre 20% du coût total du projet d'immobilisation.

POLITIQUE FISCALE

Les entreprises qui oeuvrent dans le secteur de la production minière au Québec et les particuliers qui veulent y investir bénéficient de nouveaux avantages suite aux améliorations apportées à la fiscalité minière par le dernier budget.

Taux d'imposition

Depuis le 24 avril dernier, les droits sur les mines payables à même les profits annuels des entreprises sont fixés à 18%. Cela représente un énorme avantage alors qu'auparavant les taux d'imposition variaient de 15% à 30%.

De plus, dans l'ancien régime, une entreprise pouvait déduire 250 000 \$ de son profit annuel. Le nouveau budget a remplacé cette exemption par un crédit de droits de 90 000 \$. Ce crédit équivalait

à une réduction de 500 000 \$ du profit annuel, au niveau taux d'imposition de 18%. La partie du crédit de droits inutilisée dans une année peut être reportée sur les trois années ultérieures.

Report des pertes et crédits de droits remboursables pour pertes

Le budget introduit aussi un régime de droits négatifs par le remboursement, à l'exploitant d'une mine au Québec, de 18% de la perte d'une année, jusqu'à concurrence de 18% des dépenses admissibles qui sont les frais d'exploration et de mise en valeur de l'amortissement réclamé au cours de l'année. La partie d'une perte qui ne fait pas l'objet du crédit remboursable sera assujettie à la nouvelle règle de report des pertes sur les trois années précédentes et sur les sept années suivantes.

Le régime antérieur permettait le report de 15% d'une perte sur les quatre années suivantes, ce montant étant déduit des droits autrement payables.

Impôt sur le revenu des particuliers

Présentement, un particulier peut déduire, dans le calcul de son revenu pour une année d'imposition, 166 2/3% des frais d'exploration engagés au Québec avant le 1^{er} janvier 1986. Depuis le discours sur le budget, cette déduction est prolongée jusqu'au 1^{er} janvier 1988 pour les frais qui, à compter du 1^{er} janvier 1986, auront été engagés pour des programmes d'exploration, à condition que ce particulier n'exploite pas une mine.

LE CENTRE DE RECHERCHES MINÉRALES

Le secteur "Mines" du MER, par l'intermédiaire de l'action du Centre de Recherches Minérales (CRM), continue à répondre aux attentes de l'industrie et à offrir un soutien technologique aux entreprises minières et métallurgiques afin qu'elles puissent augmenter leur productivité et se mesurer avec avantage à la concurrence internationale.

Analyse minérale

La Direction de l'Analyse Minérale (DAM) est au service des intervenants du secteur minéral québécois. Elle leur fournit des services d'analyse et de recherche spécialisée.

Son effort principal d'analyse (2/3) est consacré à satisfaire les besoins analytiques de la Direction Générale de l'Exploration Géologique et Minérale (DGEGM) du ministère de l'Énergie et des Ressources (MER). Ces données analytiques sont essentielles pour augmenter la connaissance géologique du territoire québécois. Ces services d'analyse sont évalués à plus d'un million de dollars par année. D'autres travaux d'analyse sont faits pour valoriser certaines cibles auprès de l'industrie minière, pour vérifier la validité de certains résultats ou encore pour mieux comprendre leurs significations.

Environ vingt mille échantillons de minéraux, de roches, de sols, de sédiments et d'eaux souterraines ou de surface sont ainsi acheminés chaque année par la DGEGM au laboratoire du CRM. Ce travail analytique représente plusieurs centaines de milliers de dosages, de déterminations ainsi que d'études minéralogiques et les teneurs des éléments dosés peuvent varier de quelques fractions de partie par milliard (ppb) jusqu'à 50% dans certains cas. Ces exigences requièrent l'utilisation de 16 techniques d'analyse différentes et des systèmes automatisés et informatisés hautement performants tels que la spectrométrie d'émission atomique au plasma (ICP), la spectrométrie des rayons-X et la spectrométrie d'absorption atomique.

Il arrive que les demandes d'analyse de la DGEGM dépassent carrément la capacité normale du laboratoire du CRM. À ces occasions, des contrats d'analyse sont placés à des laboratoires commerciaux. Cette politique du "faire-faire" s'est accentuée au cours des dernières années. Ainsi, au cours de 1983/84 seulement, une somme de 682 701 \$ a été accordée en contrats d'analyse à des laboratoires privés. En 1984/85, le montant était de 307 800 \$.

Actuellement, la Direction de l'Analyse Minérale investit surtout pour développer tout le secteur de la minéralogie. Elle fait tous les efforts requis pour doter le CRM d'un laboratoire minéralogique où l'on retrouvera des spécialistes et des instruments diversifiés et sophistiqués capables de fournir rapidement et avec précision tous les résultats d'analyses minéralogiques et physiques susceptibles d'aider les scientifiques du secteur minéral. Les nouveaux systèmes mis en place contribueront fortement à augmenter les possibilités d'analyse dans le domaine de la minéralogie.

Traitement des minerais et métallurgie extractive

La Direction de la Recherche Métallurgique offre l'ensemble des services techniques nécessaires à la valorisation d'une gamme étendue de différents minerais comme le fer, l'or, le niobium, le zinc, le cuivre, les minéraux industriels, etc. Elle s'implique de plus en plus dans le domaine du contrôle et de l'optimisation des procédés minéralurgiques en vue de satisfaire les besoins prioritaires des industriels miniers.

La survie de l'industrie du minerai de fer au Québec-Labrador repose en grande partie sur la réduction des coûts et sur la mise en marché de nouveaux produits mieux adaptés aux besoins de la sidérurgie. La recherche, le développement et le transfert technologique doivent jouer un grand rôle dans l'atteinte de ces objectifs. Le CRM possède un équipement élaboré et le noyau le plus important d'ingénieurs-chercheurs et de techniciens d'expérience dans ce domaine au Canada.

Dans le secteur de l'or, le CRM est le seul laboratoire québécois qui offre une expertise complète tant au niveau laboratoire qu'à l'échelle pilote. Il offre à la clientèle industrielle des services techniques de qualité tant dans le domaine de la valorisation de nouveaux gisements que dans celui de l'amélioration des exploitations existantes.

Dans le secteur des minéraux industriels, le CRM, avec le personnel scientifique et les équipements dont il dispose, peut jouer un rôle de premier plan en collaborant avec les entreprises du secteur au développement de nouvelles utilisations des minéraux industriels du Québec et à la mise en exploitation de nouveaux dépôts.

Exploitation minière

Le Service de Technologie Minière (STM) effectue et coordonne des études et des travaux dans le domaine de l'exploitation minière afin d'aider l'industrie à optimiser la rentabilité des entreprises et à promouvoir la production rationnelle des substances minérales. Les services du STM s'adressent directement aux exploitants miniers. Le STM intervient principalement dans trois domaines: celui du contrôle du terrain, du génie industriel minier et de l'information appliquée. Il procède à des essais de laboratoire pour connaître la nature et la résistance de la roche ainsi qu'à des mesures in-situ pour déterminer l'intensité des pressions. En ingénierie minière, il contribue à améliorer la conception et le rendement de divers éléments comme la puissance des ventilateurs, les dimensions des ouvertures, les systèmes de soutènement, etc. Il contribue à augmenter la productivité et favorise le transfert des connaissances et de la technologie aux exploitants miniers concernés.

Le CRM fait des efforts particuliers pour améliorer les échanges et les contacts avec l'industrie afin de mieux connaître ses besoins et lui procurer un meilleur service.

LA DIRECTION GÉNÉRALE DE L'EXPLORATION GÉOLOGIQUE ET MINÉRALE

L'année financière 1985/86 fut marquée encore une fois par un haut niveau d'activités en acquisition de connaissances géoscientifiques et par la mise en place du nouveau programme d'assistance financière à l'exploration minière.

Ainsi, la DGEGM a consacré 11,5M\$ au volet "acquisition de connaissances" dont la majorité de cet argent est imputé aux frais directement reliés aux opérations de terrain dans les différentes régions du Québec dont particulièrement, la Fosse du Labrador, la Gaspésie et l'Estrie ainsi que l'Abitibi-Témiscamingue. Un montant de 7M\$ fut consacré à des programmes d'assistance financière à l'exploration minière et à la synthèse de la géoinformation.

ÉTUDES GÉOLOGIQUES

Sud du Québec

La région de la Gaspésie fait présentement l'objet d'un plan quinquennal. La programmation de 1985/86 pour cette région contenait 18 projets dont 11 de terrain. Le budget total affecté à ces activités était de 1,1M\$. Les projets étaient de trois types. Le premier comprenait des études de cartographie, stratigraphie et tectonique en milieu sédimentaire (8 projets). Le deuxième consistait en une étude relationnelle et génétique des différents corps volcaniques, tandis que le troisième visait des études de nature métallogénique (2 projets).

Huit (8) projets de terrain ont été effectués dans la région de l'Estrie et des Basses-Terres du Saint-Laurent. Leur but était de mettre en valeur le potentiel minéral de ces secteurs. Le total des argents

affectés à ces projets était de 700 000 \$. Les projets se divisaient en deux types: les études à caractère essentiellement géologique (4 projets) et les travaux de nature géologique (4 projets). Ces derniers par contre furent effectués dans des régions minéralisées et visaient à augmenter notre connaissance de base dans des zones à fort potentiel.

L'Ouest de Québec

La programmation 1985/86 de la Division de l'ouest comportait 13 projets et il a fallu un budget total de 1,1M\$ pour les réaliser. Plus de 90% du budget (11 projets) fut consacré à des travaux portant sur les roches volcanosédimentaires archéennes du Supérieur. Deux projets avaient pour objet la région de Montauban située dans la province géologique de Grenville.

Les travaux réalisés pendant l'année 1985/86 peuvent être regroupés à l'intérieur de deux types d'activités principales. Le premier type consiste en des levés détaillés dans les districts miniers existants (6 projets) comme ceux de Rouyn, Val-d'Or, Chibougamau, Matagami, ou des districts miniers potentiels (projet de la rivière Eastmain). Le second type comprend des études spécifiques (6 projets) dans les districts miniers et notamment des études métallogéniques (4 projets). Signalons que nous avons accru nos efforts dans le domaine de la géologie notamment en consacrant 20% du budget total de la division à 3 études métallogéniques portant sur l'or.

Les géologues de la division ont participé à l'élaboration de la programmation et ont assumé la supervision des travaux. L'exécution des travaux fut confiée, par contrat, soit à des étudiants gradués (6 projets) soit à des chercheurs ou groupes de chercheurs universitaires (5 projets) soit à des firmes privées (1 projet).

Nord-Est du Québec

Dans ce vaste territoire, une somme de 2,3M\$ a été allouée à la poursuite de 20 projets. Dans le cadre des plans quinquennaux de la Fosse de l'Ungava et de la Fosse du Labrador, nous avons continué nos programmes de cartographie systématique au 1:50 000 dans le but de produire des cartes géologiques servant de base à toute campagne d'exploration minérale dans ces régions. Afin de maximiser l'efficacité de ces travaux, nous y avons incorporé certaines études spécifiques.

Dans la Fosse de l'Ungava, 2 projets de cartographie se sont accompagnés d'une étude métallogénique régionale et d'une étude lithostratigraphique-lithochimique des roches magmatiques. Une somme de 750 000 \$ a été affectée à ces travaux.

Dans la Fosse du Labrador, dont la couverture géologique à 1:50 000 est complétée, nos efforts ont visé à une meilleure compréhension de la métallogénie et de l'évolution tectonique. Ainsi, 6 projets ont porté sur l'étude des minéralisations dans les parties sud et centrale de la Fosse, tandis qu'un projet a concerné la tectonique du secteur nord. Un total de 617 000 \$ a été consacré à ces projets.

Dans l'arrière-pays à l'est de la Fosse du Labrador, nous avons poursuivi notre programme de cartographie systématique avec 2 projets. Des études métallogénique, pétrologique, structurale et géochronologique étaient incorporées à ces travaux. Nous avons également entrepris un programme de cartographie dans la province du Supérieur au nord-ouest de Schefferville. Les travaux dans ces deux régions se sont élevés à 692 000 \$.

En ce qui concerne le bassin d'Otish près de la limite nord-ouest de la province du Grenville, une compilation et une synthèse des informations disponibles ont été entreprises: ce travail aboutira à la publication d'une carte de compilation au 1:100 000. Dans le Groupe de Wakeham, Moyenne Côte-Nord, nous avons commencé des travaux de cartographie au 1:50 000 qui aboutiront à une synthèse lithostratigraphique de cette importante séquence de roches. De plus, nous avons continué nos recherches métallogéniques dans le secteur uranifère près de Johan-Beetz. Une somme de 265 000 \$ a été allouée à l'ensemble de ces travaux.

Minéraux industriels

Le Ministère a affecté une somme de 215 000 \$ à des projets d'inventaire et d'évaluation de minéraux industriels.

Dans le Sud du Québec la Division des minéraux industriels a poursuivi pour une deuxième année consécutive des travaux d'inventaire des gîtes et indices de talc-stéatite de la ceinture ophiolitique des Cantons de l'Est ainsi que l'étude et la cartographie détaillée des principaux gîtes et indices de graphite de l'Outaouais. Nous avons aussi cartographié les formations de calcaire pur de la

région de Lime Ridge en Estrie.

La Division des minéraux industriels a aussi été active dans le Nord-Ouest où s'est poursuivi l'inventaire des tourbières de l'Abitibi. Dans le Nord-Est, nous avons amorcé une étude des minéralisations en oxyde de fer-titane et apatite associées aux complexes anorthositiques.

Finalement une méthode d'inventaire des ressources en granulats a été mise à l'essai dans les régions de Québec et de Val-d'Or.

GÉOCHIMIE ET GÉOPHYSIQUE

Le Service de Géochimie et Géophysique compte 10 employés permanents. Le budget de 3.5 M\$ pour l'année financière 1985/86 est réparti à peu près également entre les divisions de géochimie et géophysique. Les sommes affectées aux travaux de terrain et études sont en grande partie attribuées par voie de contrats aux firmes privées. L'Abitibi-Témiscamingue, la Fosse du Labrador et les Appalaches constituent des régions-cibles prioritaires pour l'année 1985.

Travaux sur le terrain — Division de la géochimie

Un levé sédiments de ruisseau fut réalisé dans la région de Grandes-Bergeronnes durant l'été 1985. Le MER espère ainsi développer le potentiel aurifère de cette région.

Une étude comparative des sédiments de ruisseau (fraction fine et fraction lourde) le long de la rivière Assématquagan fut amorcée par un échantillonnage systématique le long de cette rivière. Ce travail, en plus de contribuer directement à la recherche de gisements d'or en Gaspésie, permettra peut-être l'identification de techniques d'exploration plus efficaces dans cette région.

Deux (2) études tridimensionnelles cherchant à établir la relation entre la minéralisation et les sédiments meubles firent l'objet de travaux de terrain en 1984. Une première étude dans la région de Palmarolle est menée par monsieur Ghyslain Fréchette de l'Université Laval. Une deuxième étude des sédiments meubles au-dessus du gisement de Selbaie est réalisée en collaboration étroite avec la Société BP Resources.

Des échantillons de sols furent prélevés au-dessus du gisement aurifère Monique qui appartient à la Société SOQUEM et qui est localisé dans la région de Louvicourt. On procédera à des tests pour établir une corrélation possible entre la présence de *Bacillus Cereus* dans ces échantillons de sols et la minéralisation aurifère sous-jacente.

Un échantillonnage du till de la région de St-Pamphile — St-Adalbert en Beauce fut réalisé au cours de l'été 84, ce qui permettra de vérifier les anomalies aurifères déjà détectées par les levés géochimiques de reconnaissance et découvrir d'autres anomalies reliées possiblement à une minéralisation aurifère dans les schistes de Bennett sous-jacents.

Travaux de terrain — Division de la géophysique

Un levé électromagnétique hélicoptère de la région de Grandes-Bergeronnes fut complété ce qui, combiné avec le levé de sédiments de ruisseau réalisé durant la même période, devrait favoriser la découverte d'or dans cette région.

Le projet d'évaluation des grands axes conducteurs confié au Centre de Développement Technologique de l'École Polytechnique fut continué durant l'année et des travaux de terrain réalisés dans la région de Chibougamau. Cette recherche pourrait déboucher sur une exploration plus complète des nombreuses anomalies produites par les levés INPUT du MER.

Une équipe géophysique du MER fit des coupes sismiques dans la région de Harricana-Grasset sise à l'ouest de Matagami, contribuant ainsi des données pour établir de façon judicieuse l'emplacement des forages stratigraphiques qui seront exécutés durant l'hiver 86.

On a confié à l'Institut de Recherche en Exploration Minérale (IREM-MERI) une évaluation préliminaire d'un projet de coupes magnéto-telluriques dans la région de Mont-Vallières — St-Réal en Gaspésie. On cherche à établir des horizons de skarns favorables aux minéralisations cuprifères.

L'inventaire géophysique du Québec continue. Des levés électromagnétiques aéroportés de type INPUT seront réalisés fin 85 dans la Fosse du Labrador et dans la région de Rouyn; des levés électromagnétiques hélicoptères de type Rexhem IV couvriront les régions de Beauce — Appalaches et Orford.

PROGRAMME D'ASSISTANCE FINANCIÈRE À L'EXPLORATION MINIÈRE

C'est en vue d'apporter un soutien à l'économie minérale de certaines régions et de favoriser la diversification des ressources minières que le Ministère de l'Énergie et des Ressources du Québec a instauré un programme d'assistance financière à l'exploration minière. Le budget de ce programme est de 3M\$ (pour l'exercice financier 1985/86). Ce programme encourage certains investissements en exploration minière par le biais de subventions à des intervenants dont le ou les projets d'exploration s'insèrent à l'intérieur des objectifs gouvernementaux.

Le programme d'assistance financière à l'exploration minière touche trois volets de l'exploration minérale:

1. les travaux d'exploration proprement dits;
2. les infrastructures d'accès à l'exploration minière;
3. la mise à l'essai de nouvelles technologies d'exploration minière.

Le programme prévoit une possibilité d'aide financière pouvant atteindre un maximum de 50% du coût des travaux à l'intérieur des zones désignées (régions de Matagami, Chapais, Gaspésie et Fosse du Labrador) et un maximum de 35% à l'extérieur de celles-ci.

Dans le cas des infrastructures, l'aide correspond à 50% du coût de construction des infrastructures nécessaires pour donner accès à une propriété d'exploration minière.

L'assistance financière pour la mise à l'essai de techniques et méthodes dont l'applicabilité routinière n'a pas été démontrée, peut atteindre 75% des coûts de mise à l'essai jusqu'à concurrence de 50 000 \$.

Ce programme d'assistance financière à l'exploration minière dont les normes ont été acceptées en avril 1985 sera en vigueur jusqu'au 31 mars 1987. Il prévoit qu'un projet peut recevoir jusqu'à 200 000 \$ d'aide pour sa réalisation et un demandeur peut recevoir jusqu'à 500 000 \$ d'aide au cours de la même année financière.

GÉOINFORMATION

La banque de données bibliographiques en accès direct, EXAMINE, permettant le repérage et le signalement de l'information de nature géoscientifique, est à la disposition de l'utilisateur au Centre de Documentation de Québec et dans les 5 bureaux des représentants régionaux (Chibougamau, Rouyn, Sainte-Anne-des-Monts, Sept-Îles et Val-d'Or). La possibilité d'interroger EXAMINE sera étendue aux nouveaux bureaux de Montréal et Sherbrooke dès leur ouverture.

Dans le domaine de l'information géoscientifique, signalons la publication de la nouvelle carte géologique du Québec et d'une carte minérale du Québec. La mise à jour de 600 cartes de compilation géoscientifique à l'échelle 1:100 000 pour le Nord-Ouest québécois est maintenant terminée et disponible.

La réalisation de la compilation géoscientifique à l'échelle 1:250 000 accompagnant les cartes des gîtes minéraux se poursuit pour la région de la Fosse du Labrador. La mise à jour des cartes de localisation des travaux géoscientifiques doit s'amorcer dès l'automne 1985.

ASSISTANCE AUX RÉGIONS MINIÈRES

Le Service de l'Assistance aux Régions Minières (ancien Service des Géologues Résidents) a été réorganisé au cours de la dernière année.

Cette réorganisation a permis non seulement de revoir la structure classique des bureaux des géologues résidents, mais de mettre sur pied un service orienté davantage vers les besoins de la clientèle. Aujourd'hui, nos représentants régionaux sont les représentants privilégiés de l'ensemble du secteur "Mines" en région et, à ce titre, sont en mesure d'offrir non seulement tous les services traditionnellement dispensés par les géologues résidents, mais toute une gamme de services additionnels.

Ainsi, et sans pour autant laisser tomber l'information géoscientifique, le représentant régional a le mandat de renseigner l'industrie minérale sur tous les programmes d'assistance financière et technique disponible des gouvernements provincial et fédéral. Il a aussi le mandat de transmettre aux services centraux tous les besoins actuels et anticipés de l'industrie qu'il peut discerner, que ces besoins concernent l'exploration ou l'exploitation, qu'ils soient de nature financière, technique

ou légale. Somme toute, le représentant régional est un conseiller-interlocuteur pro-actif entre les différents palliers du gouvernement et de l'industrie minière québécoise.

En octobre 1985, le district du Sud du Québec a été scindé en deux avec l'ouverture de deux nouveaux bureaux régionaux, dont un à Montréal et l'autre à Sherbrooke. Ceci porte le nombre de bureaux régionaux à sept après Rouyn-Noranda, Val-d'Or, Chibougamau, Sainte-Anne-des-Monts et Sept-Iles.

MINERAL RESOURCES DIVISION

NEW BRUNSWICK DEPARTMENT OF NATURAL RESOURCES

A new five year \$22.7 million dollar agreement was signed with the Federal Government in the spring of 1984. The pact calls for a wide range of programs to be carried out by the New Brunswick Mineral Resources Division and the Canada Department of Energy, Mines, and Resources. The programs fall into four categories: geoscience, mining and mineral technology, economic development, and public information and evaluation. Programs did not begin in earnest until 1985, and even then, a full slate of activities has been thwarted by Provincial Government cuts. Meanwhile, the Mineral Resources Provincial budget for work unrelated to the New Brunswick-Canada agreement is approximately \$1.9 million.

GEOSCIENCE PROGRAM

The 1985 program involved the following projects which were studies of (1) precious and base metal studies in northern New Brunswick, (2) tungsten-tin veins and related granitic rocks in the Burnt Hill area, (3) the St. George Batholith, and (4) the stratigraphy, structure, and gold deposits of the Fundy and St. Croix Zones. Investigations of antimony-gold deposits southeast of the Pokiok Batholith (5) were also undertaken, augmented by a detailed gravimetric study over the Lake George antimony deposit (6). Funds from this program also allowed the first steps to be taken in the compilation of geoscience data in the Bathurst-Newcastle area (7) as well as a drill core storage facility at the Sussex Regional Office (8). Provincial funds were used in a till geochemistry and surficial geological mapping (9) in northern New Brunswick, to aid mineral exploration and forest site classification.

ECONOMIC DEVELOPMENT PROGRAM

The field mapping and assessment of the aggregate inventory continued in Restigouche and Northumberland Counties and 1200 m of drilling was carried out to evaluate the Albert Oil Shales (10) and to assess the oil and gas potential of the formation as a whole. A limestone commodity study was undertaken. An economic assessment of potash potential in Cumberland and Central Basin, as well as a study of problems related to production in these areas was undertaken. A study of Stoney Creek oil and gas field (11) was also begun.

PUBLIC INFORMATION, EVALUATION, AND ADMINISTRATION

Under this program, the initial steps were taken to produce a "travelling mineral show" and a film to promote the mineral industry in the province. Advanced prospecting courses were offered to the general public in the autumn and winter of 1985-1986.

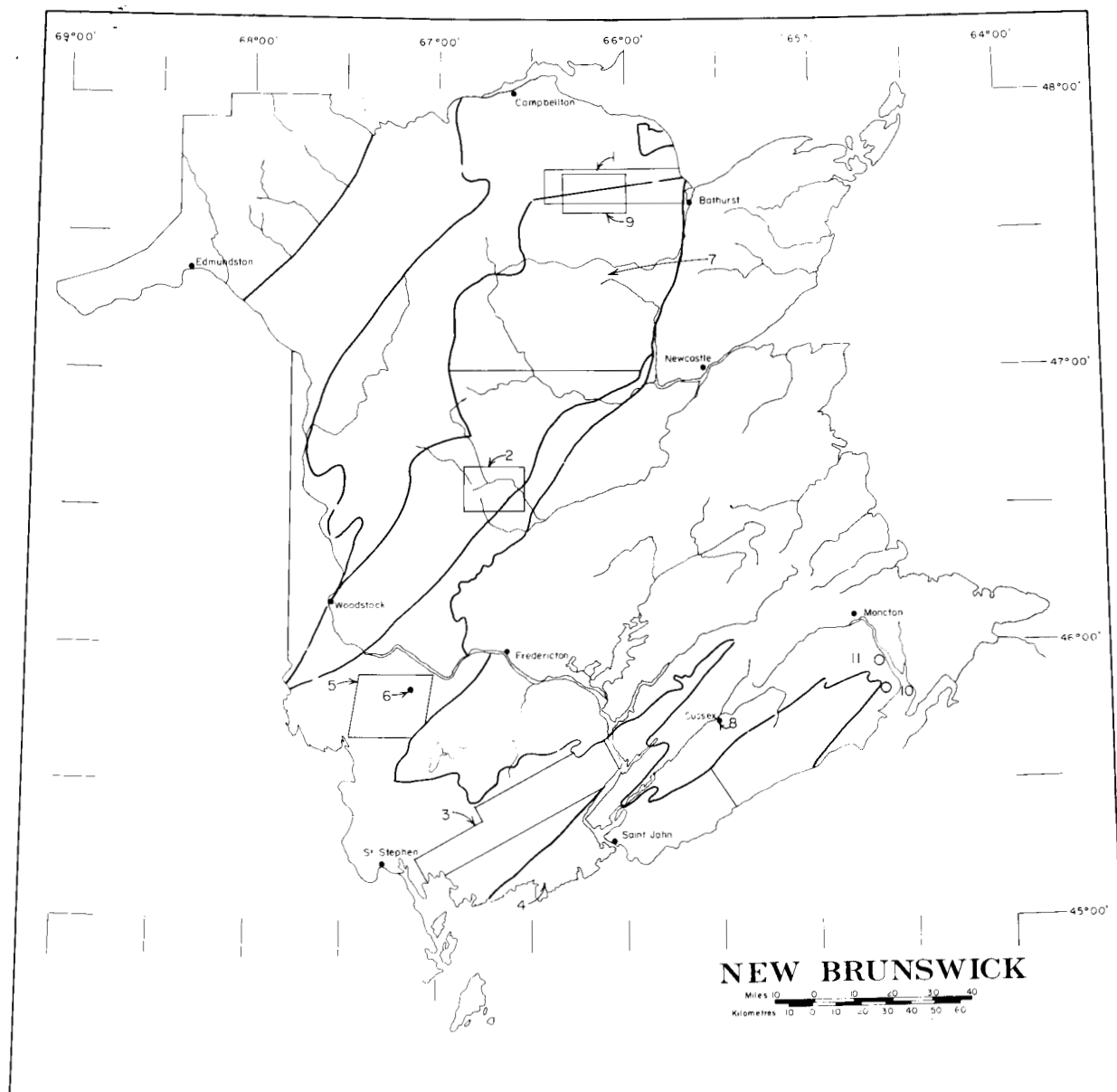


Figure 1. Distribution of programs in New Brunswick

GEOSCIENTIFIC SURVEYS

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY

INTRODUCTION

The Nova Scotia Department of Mines and Energy is responsible for the evaluation, regulation, and management of the Province's energy and mineral resources. Within the Department, three Divisions undertake geoscience work: Mineral Resources, Mineral Development, and Energy Resources. Many of the geoscience programs of the Department began prior to 1984 and received assistance from the Canada - Nova Scotia Co-operative Mineral Agreement 1981-1984 (CMA). This agreement ended in March 1984. A new agreement, the Canada - Nova Scotia Mineral Development Agreement (CNSMDA), came into effect in June 1984. Its main focus is to promote the development of the Province's onshore minerals, between the present and 1989, approximately \$27 million (\$16.1 million from Canada and \$10.8 million from Nova Scotia) will

be invested in parallel, co-ordinated programs. The diversity of projects is shown in Figure 1. The CNSMDA partly or completely funds 19 geoscience projects. All phases of the energy and mineral resources of the Province are being investigated under this Agreement.

MINERAL RESOURCES DIVISION

The Mineral Resources Division undertakes the mapping and evaluation of the Province's geology and mineral resources. Several geoscience projects were managed by the Division in 1984. The regional geochemical survey was started under the CMA. Following completion of the regional geochemical survey during the summer of 1983, selected areas were resampled during the summer of 1984 to ensure analytical accuracy and to follow-up anomalous values of metals in particular areas. All of the data from the sampling program will be combined in a geochemical atlas. A special geochemical study of lake sediments was completed around the East Kemptville tin deposit in Yarmouth County and the regional lake sediment database was upgraded with new analyses. During the 1984 field season, the glacial deposits and till geochemistry were studied in a broad area of northern Cumberland, Colchester, and Pictou Counties. Follow-up geochemical sampling of lead-zinc anomalies began in northwestern Pictou County. This project was designed to assess specific metal anomalies and sampling techniques. Detailed geological investigations continued at Cochrane Hill north of Sherbrooke. This project involves the examination of the open-pit at the Cochrane Hill property of Northumberland Mines Limited and the gold potential of this region of the Meguma Group. The work on this project began under the CMA as part of a regional and multidisciplinary mapping program of the gold potential of the Meguma Group and associated intrusive and metamorphic rocks. It is continuing under the present CNSMDA. The search for new mineral deposits requires a thorough understanding of known deposits and the factors controlling their origin and localization. The mineral deposit studies project will continue to document important deposits and, with supplementary data from other field projects, will develop models for the formation and location of mineral deposits. The East Kemptville tin deposit is only one of many mineral deposits and occurrences in the South Mountain Batholith that are being studied as part of the South Mountain Batholith Project. The granite and related rocks contain occurrences of tin, tungsten, copper, zinc, silver, molybdenum, uranium, manganese, and gold. Preliminary studies of the granite and plans for field work to be undertaken in the next several years began during the summer of 1984.

The Education and Public Awareness Program produced and promoted educational information about the geology, mineral resources, and mining history of the Province, and about the geological projects of the Mines and Minerals Branch and the CNSMDA. The Prospecting Course, displays, the Annual Review of Activities, and various publications were the results of this project.

MINERAL DEVELOPMENT DIVISION

The Mineral Development Division assists companies and individuals who are involved in mineral exploration, and is responsible for regulating functions relating to mineral land titles. At the regional office in Stellarton, the Division maintains an exploration monitoring group and an extensive core library and repository. Other core libraries are located at Debert and Malagawatch. During 1984, over 200 131 feet (61 000 m) of new core were added to the Departmental collection. During 1984, the Division managed several geoscience projects. Two major studies of aggregate resources, one in Cape Breton Island and the other in southwestern Nova Scotia, are nearing completion. This work began under the CMA and will be completed under the CNSMDA. A study of gypsum property ownership and rights is also near completion. The study will assist the Department and industry in understanding the historical development of gypsum mining and property ownership. During 1984, a new project was initiated to produce a comprehensive compilation and review of the distribution and character of gold and other precious metals in Nova Scotia. The project will demonstrate the diversity of geological environments in which precious metals occur and emphasize the economic potential of each. Another new project under the CNSMDA is a land use policy development project. The Division is compiling data on how land use affects the development and production of minerals. Work under this project will examine all lands in the Province. The mineral inventory group maintains databases of mineral resources information. Indexing and entry into GEOSCAN, the national database for bibliographic geological information, was increased significantly. A new GEOSCAN index for petroleum exploration assessment reports was developed. It contains 91

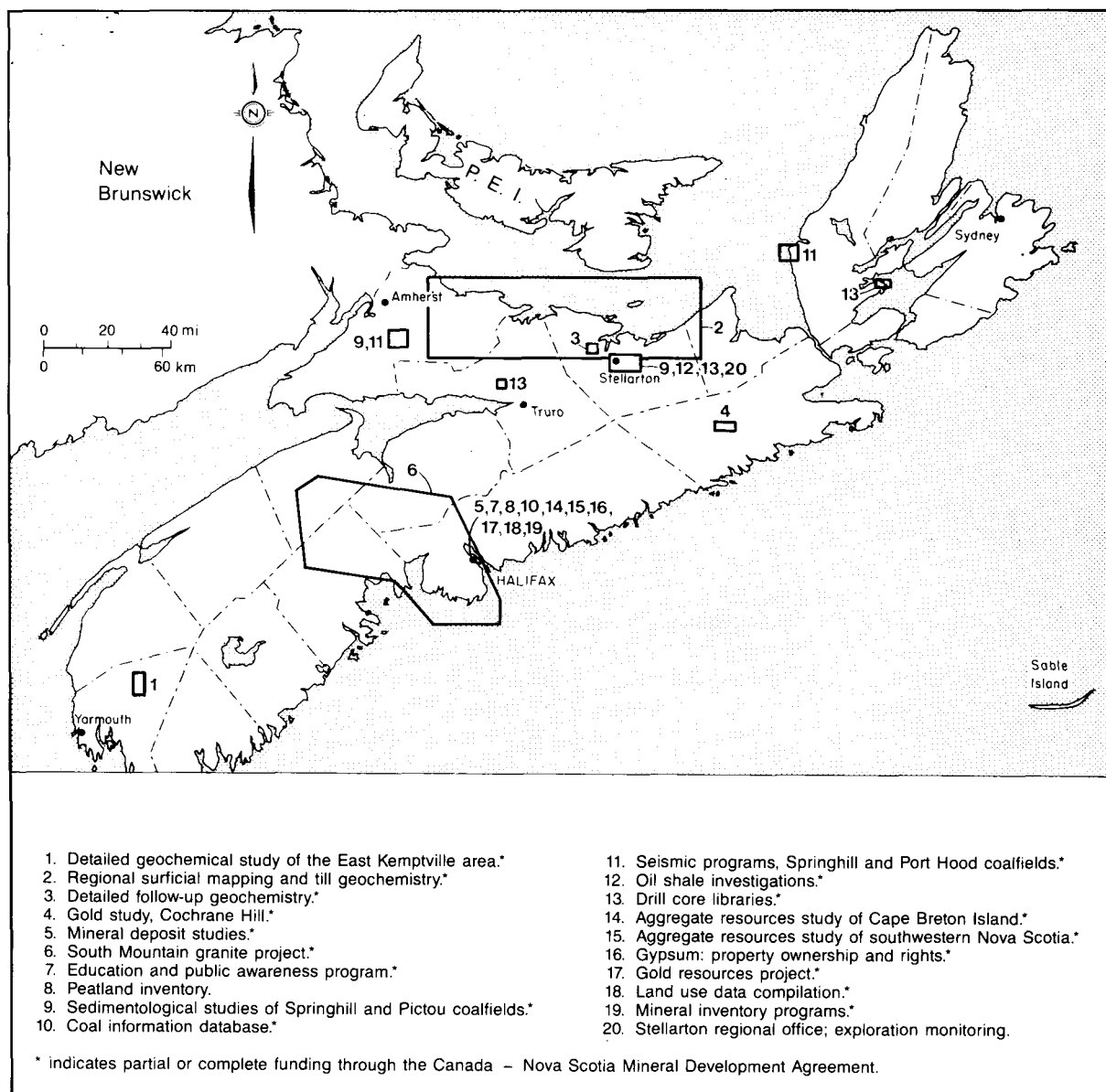


Figure 1. Locations and types of Geoscience projects undertaken by the Nova Scotia Department of Mines and Energy

assessment reports and 270 well reports from the period 1968 to 1984. Journal literature, metallic mineral occurrences data, industrial mineral exploration assessment reports, and drillhole databases were continuously updated so that the Division can provide very helpful assistance for information searches.

ENERGY RESOURCES DIVISION

Evaluation of energy resources included exploration and geological investigations for coal and oil shales. The peatland inventory was completed in 1984 and, at present, data are being compiled and assessed. Demonstration projects are in the initial planning stages. Sedimentological studies were conducted in the Springhill and Pictou coalfields. Under the CNSMDA, a computer database consisting of coal exploration data and analytical data emanating from this program will be established for the Sydney coalfield. Seismic programs were carried out at Springhill and Port Hood. A three year investigation of the oil shale deposits of the Province was begun in 1985 with deposits in the Pictou coalfield receiving attention first.

GENERAL ACTIVITY

Mineral exploration in Nova Scotia during 1984 continued at a moderate level. The number of

claims decreased from 45 000 in 1983 to 31 468. The number of exploration licences also declined from 1350 to 1039; however, estimated exploration expenditures remained constant at \$7,000,000. The Province is encouraged by the scheduled start of mining operations at Rio Algom's East Kemptville tin mine set for late 1985. Nova Scotia looks forward to continuing progress in development of a healthy and diversified mineral industry. Geoscientific activities will continue to assist this development.

ENERGY AND MINERALS BRANCH, PRINCE EDWARD ISLAND

DEPARTMENT OF ENERGY AND FORESTRY

The negotiations for a Mineral Development Subagreement under the province's ERDA continued unsuccessfully throughout the year 1984/85. It is hoped that an agreement will be concluded during the year 1985/86.

MINERAL DEVELOPMENT DIVISION

NEWFOUNDLAND DEPARTMENT OF MINES AND ENERGY

INTRODUCTION

The Mineral Development Division of the Newfoundland Department of Mines and Energy is responsible for obtaining, interpreting, and disseminating the geoscientific data required for the optimal development of the Province's mineral resources. To that end, the Division carried out continuing programs in geological mapping, geochemical surveys, mineral deposit studies, Quaternary mapping, and information services. Many of these programs were carried out under the new five year (1984-1989) cost shared Canada-Newfoundland Mineral Development Agreement in 1984-1985.

GEOLOGICAL MAPPING

The Division fielded eight 1:50 000 geological mapping parties in 1984, six in Newfoundland (Figure 1) and seven in Labrador (Figure 2). Mapping in Newfoundland again concentrated in the south-central part of the island and in the Cambro-Ordovician carbonates along the west coast. A number of the Labrador project leaders spent the season in the office, writing up reports on long term projects completed in 1983. Field mapping at the 1:100 000 scale was carried out in the Goose Bay area and in the eastern part of the Grenville Province.

GEOCHEMISTRY/GEOPHYSICS

The Division continued its program of follow-up studies over anomalies revealed by regional lake sediment surveys. In 1984, follow-up studies were carried out over geochemical anomalies in granitoid rocks in southern Newfoundland, and in sedimentary-volcanic terranes in eastern Newfoundland. The mandate of the Geochemistry Section was expanded to include geophysics, and a new geophysicist was appointed late in 1984. The section continued to provide laboratory and computer support for the Division's programs.

MINERAL DEPOSITS

The Mineral Deposits Section initiated three new metallogenic projects in 1984. These concentrated on: 1. the zirconium-niobium-beryllium-rare earths deposits at Strange Lake and Letitia Lake, Labrador; 2. the gold-bearing volcanic rocks of the Burin Peninsula; 3. the base-metal deposits south of Red Indian Lake. In the industrial minerals area, the Section completed field work in a major project to evaluate the barite resources of the Province and initiated a study of silica and dolomite in Labrador. The mineral inventory file was completed for Insular Newfoundland, and a new effort to computerize the file was started.

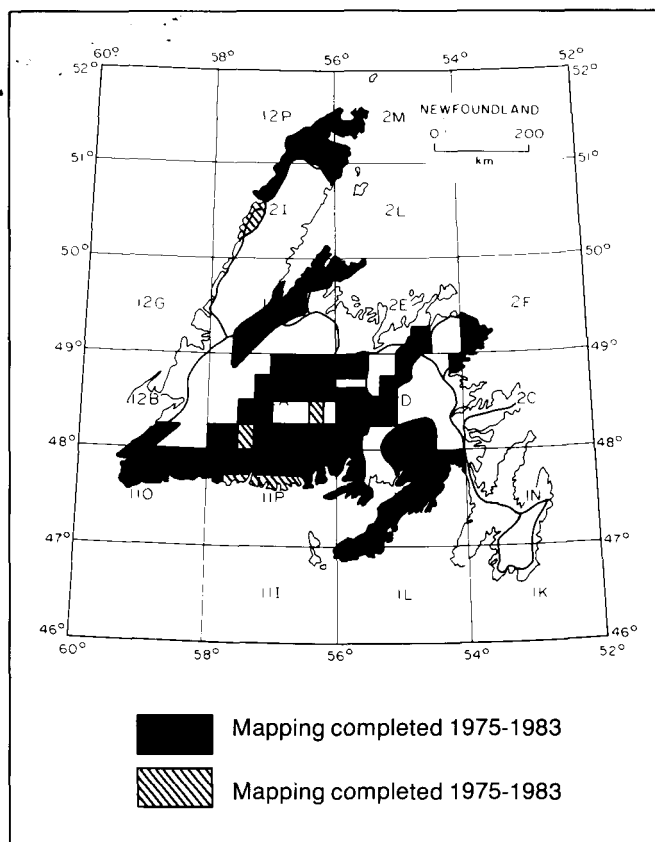


Figure 1. Geological Mapping, Newfoundland

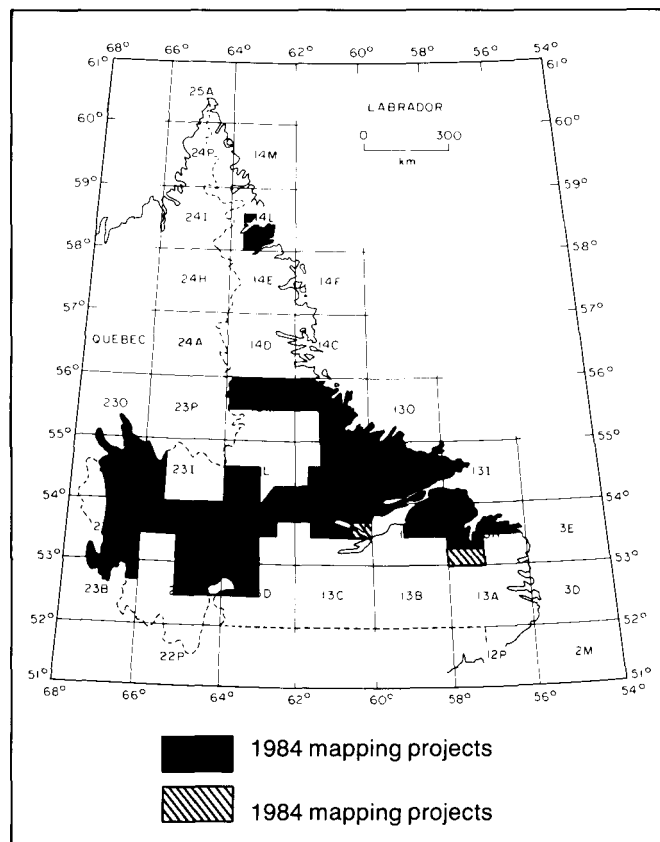


Figure 2. Geological Mapping, Labrador

QUATERNARY GEOLOGY

The Quaternary Geology Section continued programs in surficial mapping and aggregate resource assessment. A major Quaternary mapping project was carried out at Strange Lake, Labrador, and detailed drift prospecting was carried out in central Newfoundland. Aggregate resource inventory was carried out in the vicinity of communities. A study of transportation routes from the Strange Lake deposit to the coast of Labrador was completed.

PUBLICATIONS AND INFORMATION

Results of the Division's field projects were released in some 52 publications and open files during 1984/85. The Publications and Information Section continued its program of drill core collection and storage. To date, the core storage program has collected 149 000 m of drill core, which it stored at facilities in St. John's, Pasadena, and Goose Bay. The Section continued and upgraded its information services to the exploration industry and the general public and its contribution to GEOSCAN, the national geoscientific data base.

GEOLOGY DIVISION

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

NORTHWEST TERRITORIES

The Geology Division of the Northern Affairs Program, Indian and Northern Affairs Canada, administers the quasi-provincial responsibilities for geology and for the mining and mineral exploration industries within the Northwest Territories. Oil and gas developments are administered by COGLA, a joint INAC-EMR group, but coal is under INAC.

The Geology Division, besides monitoring mining and mineral exploration, collects data on these operations, and maintains an extensive archive on the general geology of the territory. A Core Library designed to preserve samples of Northwest Territories rocks and mineral deposits is also maintained. Information, or access to the information and other materials held in the libraries, is provided on request.

A major part of the Division's effort goes into providing advice and assistance to prospectors and mineral explorationists who are working in the Northwest Territories. Overviews of mining, exploration, and geological work (by the Division's staff and contractors) are published yearly.

Lengthier reports on mining and exploration activity (Mineral Industry Report for the Northwest Territories) and on geological work (Contributions to the Geology of the Northwest Territories) are also published on a regular basis. These summarize the assessment work filed on mineral claims and prospecting permits and the results of geological and mineral resource development work. Preliminary geological maps and reports are released in an open file format as they become available.

During 1985, 4 District Geologists monitored mineral exploration in the 3.24 million square km of the Northwest Territories. As few areas are accessible by road, most of this work requires aircraft transportation. By the end of 1985, \$30 million will probably have been spent on various phases of mineral exploration in the Northwest Territories. More than half of this will have been spent on gold exploration in the Slave Province. Another 10% represents gold exploration in the Keewatin. A significant amount will be spent on the Bullmoose gold and Thor Lake rare metal developments.

ACTIVITIES IN THE GEOLOGICAL DIVISION

Extensive geological programs are supported each year by the NWT Geology Division. District geologists conduct property investigations and describe the showings seen for inclusion in our Archive. Various other projects are conducted by Division staff, contract personnel, and summer students.

In 1985, P.J. Laporte, Keewatin District Geologist, sampled rocks in the Tehek area to test its gold potential. Approximately 200 samples will be assayed for Au, Ag, Pb, Zn, Cu, Ni, W, and As.

Dr. Walter A. Gibbins, Arctic District Geologist, studied carvingstone sites in the northern Slave Province around Bathurst Inlet and Hope Bay. With Professor D. Hogarth, he also investigated Frobisher's old mine sites (Canada's first 'Public' Mining Venture) near Frobisher Bay on Baffin Island.

Mapping and geological studies in the Yellowknife Volcanic Belt and adjacent rocks included work by:

Relf, C. with Rivers, T.A.*: mapping of the Mirage Islands, the southernmost part of the belt.

Bailey, G.: studies of Kam-Banting-Jackson Lake stratigraphic relationships.

Helmstaedt, H.*: compilation of 1:12 000 mapping of the Yellowknife Volcanic Belt in 85 J/8, 9 and 16 map sheets.

Bowring, S.A.* and Padgham, W.A.: Geochronological research, yellowknife Volcanic Belt.

Padgham, W.A.: Detailed mapping of the Kam Group - Banting Group transition, and geochemistry of the rocks at the transition.

Brophy, J.A. (Staff Geologist): Detailed mapping of the Crestaurum Formation, northeast of the Yellowknife airport.

Fyfe, W.S.* and Kerrich, R.*, assisted by Ellis, C. (Archives Geologist) began field work in the Western Granodiorite complex.

Brophy, J.A. with Fyson, Dr. W.K.* began a study of the structural relations of gold quartz veins in the Burwash Formation turbidites.

Swatton, S., under the direction of Morton, Dr. R.* worked on the Bullmoose Lake gold deposit in the Burwash Formation of the Yellowknife Basin.

Elsewhere in the Territories:

Jackson, V. and a large crew of summer students conducted 1:20 000 and 1:50 000 scale mapping in parts of the Quya Lake area. This is the final field phase in the preparation of new 1:50 000 scale geological maps of Yellowknife Bay (85J/8), Prosperous Lake (85J-9), and Quya Lake (85J-16) map sheets.

Cullen, R. directed by Fyson, W.K.* began a study of the Cameron River volcanic belt in the Gordon Lake area.

Goodwin, A.M.* continued geochemical investigations of the Yellowknife, Cameron River, and Back River volcanic complexes, and began work (with Division staff) on the High Lake volcanic belt.

Kerr, D. investigated the surficial geology of parts of the east half of the Hepburn Island Area (76M) and continued research in the Richardson River area, northwest of Coppermine.

Johnston, B. and Division summer staff under the direction of Donaldson, J.A.* continued stratigraphic and related work on the Wilson Island group.

St. Seymour, Dr. K.* began work on the petrology and geochemistry of supracrustals in the Point Lake region of the Slave Province.

Kusky, T. began a project to analyse the mafic dyke/volcanic successions in the Yellowknife Supracrustal Basin.

Meintzer, R.E. and Wise, M. directed by Cerny, Dr. P.* continued investigations of rare element pegmatites and granitoids in the Yellowknife Basin.

Jackson, V. conducted 1:50 000 and 1:250 000 reconnaissance mapping in the east half of the Hepburn Island (76-M) area, in preparation of a modern 1:250 000 coloured geological map and report.

St. Jorre, L. under direction of Drs. Trueman, D. (Highwood Resources) and Smith, D.* continued geochemical and mineralogical studies of the Thor Lake beryllium, and rare earth deposit.

*contractor

EXPLORATION AND GEOLOGICAL SERVICES DIVISION

YUKON DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

ACTIVITIES 1984/1985

The Exploration and Geological Services Division, Yukon consists of a staff of five geologists, an office manager, a geological technician, and a secretary. During 1984 and 1985, numerous projects were undertaken by permanent staff members and also individuals on a contract basis. These projects were commonly associated with universities.

Chief Geologist, Jim Morin visited most of the project areas, and continued his ongoing investigations into precious metal mineralization in the Yukon. He also co-authored an open file with Dave Downing on gold-silver deposits and occurrences in the Yukon.

Minerals Geologist, Grant Abbott examined many of the silver-lead-zinc showings in the Rancheria area in 1984, and included them in the 1983 Yukon Exploration and Geology Report. Fieldwork in 1985 expanded to include many of the other precious metal deposits in the Pelly Mountains. He also completed a manuscript reviewing Selwyn Basin stratigraphy and associated stratiform base metal deposits for the upcoming Canadian Institute of Mining and Metallurgy Special Volume "Mineral Deposits of Northern Cordillera".

Placer Geologist, Steve Morrison conducted a study of sedimentology of the Plio-Pleistocene White Channel gravels in the Klondike. He is investigating the relationship of gold distribution and occurrence to specific sedimentary lithofacies. Steve also wrote a paper on placer deposits in Canada for the DNAG volume.

Staff Geologist, Diane Emond joined the Division in January 1984 and replaced Pat Watson. Her M.Sc. thesis dealt with tin-mineralized breccias near Mayo, central Yukon. During the 1984 field season, she mapped the geology and sampled vein and skarn showings on Jubilee Mountain southeast of Whitehorse and investigated 80 Ma old volcanic rocks in the Baker Lake area west of Whitehorse for indications of epithermal mineralization and alteration. In 1985, she conducted a similar study of tin-, tungsten-bearing veins, breccias, and skarns in the Mayo-McQuesten River area.

Staff Geologist, Kate Grapes conducted a project in 1984 on the stratiform lead-zinc-silver massive sulphide deposit at Clear Lake, northwest of Faro. She is studying the ore textures as part of a M.Sc. thesis at Carleton University. Kate left the Division for school and was replaced by Dave Downing. During the 1985 field season, Dave started a mapping project at Sekulmun Lake, southwestern Yukon. There, late Cretaceous to Eocene volcanic and sub-volcanic rocks are associated with precious metal vein mineralization.

Contract geologist, Ruth Debicki finished the 1:50 000 scale bedrock geological mapping program in the Klondike area. In 1984, she concentrated on the southeastern parts of this area near Sulphur and Dominion Creeks. This information was released as an open file map in spring 1985. During late 1985 field season, she mapped in gaps preparatory to a final map and report.

Several university theses were partially supported by the Division. Monica Pride continued her study of the Eocene volcanic rocks in the Mount Skukum area southwest of Whitehorse (Ph.D. thesis, University of Manitoba). Part of her work resulted in a preliminary 1:25 000 scale bedrock geological map released in spring 1985. Bruce McDonald studied the bonanza gold sulphide-poor vein system at Mount Skukum (M.Sc. thesis, University of British Columbia) in 1984 and 1985. This major deposit is similar to other classic epithermal veins. A detailed study of this deposit will assist and encourage exploration for similar deposits in western Yukon. In 1984, Lori Walton studied the Venus deposit south of Whitehorse as part of a M.Sc. thesis at University of Alberta. This deposit is a sulphide-rich epithermal gold-silver-lead-zinc vein quite different from the veins at Mount Skukum. Likewise, her detailed study will assist in mining and exploration for similar veins in the area.

From 1983 to 1985, Mike Defresne studied massive argillic alteration in bedrock and in the white Channel gravel in the Klondike area (M.Sc. thesis, University of Alberta). Source, age, and nature of the altering fluids and relationship to lode and placer gold mineralization is the objective. Certainly, the results are of potential significance to mining and exploration in the Klondike area. Rhys Hughes started a study of the stratigraphy and sedimentology of placer gravels at Miller Creek and the Sixty Mile River (M.Sc. thesis, University of Alberta) in 1984. His work has obvious implications for placer mining and exploration in the area. During the 1985 field season, he sampled gravel sections and examined the stratigraphy of placer gravels in the Dawson Range on a contract basis for the Division. Guy Narbonne (Professor, Queen's University) continued his investigations of the regional unconformity between Precambrian and Cambrian rocks in the Bonnet Plume River area in 1984. His study has implications for a better understanding of breccia-hosted zinc mineralization in the Wernecke and Mackenzie Mountains. Vicki Hansen conducted two seasons of fieldwork studying the geology and structure of rocks in the Teslin Suture east of Whitehorse (Ph.D. thesis, University of California, Los Angeles). Her study has implications regarding exploration for gold-quartz veins and asbestos in southern Yukon.

Calvin Pride (professor, University of Ottawa) conducted a preliminary examination in 1984 of volcanic and sub-volcanic rocks west of Sekulmun Lake that are associated with gold and molybdenum mineralization. Ulrich Glasmacher sampled and mapped geology in the vicinity of precious metal veins and placer gravels in the Sixty Mile River area as part of his graduate studies at University of Aachen, West Germany in 1984 and 1985. He also sampled and map-

ped rocks west of Sekulmun Lake as a follow-up to Pride's work and complementary to Downing's. Tom Skulski investigated the mid-Cenozoic volcanic rocks in the Kluane Range west of Burwash Landing (Ph.D. thesis, McGill University). As part of this study initiated in 1985, he is also geologically mapping and sampling areas and sites of hydrothermal alteration and mineralization. Doug Rucker sampled veins in the Wheaton River area in 1985 as a basis for a M.Sc. thesis at the University of Alberta. These veins bear antimony or precious metal mineralization, and their relationship to veins at Mount Skukum and Montana Mountain will be of interest to mineral explorers in the area. Dave Gaboury spent the summer of 1985 mapping diapir breccia bodies in the Wernecke Mountains. His fieldwork is the basis for a M.Sc. thesis at the University of Manitoba, and is a follow-up to earlier work done by Peter Laznicka in the late 1970s. These breccias are late Proterozoic in age, and are also similar morphologically and metallogenetically to those breccias being mined at the Olympic Dam deposit in Australia for their copper, uranium, and gold contents. Jesse Duke studied drill core and geology of the Grew Creek gold deposit west of Ross River in the summer of 1985 as the basis for a M.Sc. thesis at the University of British Columbia. This epithermal bulk gold deposit is within the Tintina Trench, and physicochemical information about it is critical to understanding why it is there.

An Economic Development Agreement between Canada and the Yukon was signed in May, 1985. The Agreement includes a Minerals Sub-Agreement which involves geological mapping (\$1.1 million), regional geochemical stream sediment surveys (\$2.2 million), and placer mining technology (\$0.6 million) programs. Operational management of the programs is by EGSD, GSC, and the Mining Engineering Division of Northern Affairs Program, Yukon, respectively. The work will be done over a five year period, 1985-1989, with some carryover into 1990. Funding is on a 90:10 basis between DIAND and the Government of the Yukon, respectively.

The geological mapping program was responsible for three projects in 1985. These included 1:50 000 scale geological mapping of the Rancheria area (105 B 1,2) by Grant and Jennifer Lowey. The silver-zinc-lead deposit at Midway in contiguous northern B.C., and several interesting showings in adjacent territory in the Yukon have sparked much interest in the area. Greg Lynch conducted a study of the physicochemistry of mineralization in the Keno Hill district as an EDA project and a Ph.D. thesis topic at the University of Alberta. His preliminary field work has resulted in a picture of district wide metal and mineral zonation. Larry Meinert (Professor, Washington State University) sampled skarn mineralization and host rocks in the Whitehorse Copper Belt with a view to determining controls on their precious metal content.

Multi-element stream sediment geochemical surveys were carried out over the Teslin (105 C), Whitehorse (105 D), Carmacks (115 I), and Aishihik Lake (115 H) map areas. The results should be forthcoming in the spring of 1986.

Much of the 1984 work above was presented at the Cordilleran Exploration and Geology Round-Up in Vancouver in late January 1985. EGSD Yukon poster displays and verbal presentations were featured alongside the British Columbia Geological Branch and Geological Survey of Canada Cordilleran Division. This meeting was well attended by the exploration fraternity and provided for much useful exchange of information. The same meeting is planned for January 1986 as well as a 2 1/2 day Geoscience Forum in Whitehorse in early December 1985.

1984 — 1985

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Addie, G.G. Discussion of Tillicum Mountain Self-potential Test Surveys to Date (82F/13).

Addie, G.G. Amazon Mine (Ainsworth Mining Camp) (82F/15).

Hoy, T. Structural Setting, Mineral Deposits, and Associated Alteration and Magmatism. Sullivan Camp, Southeastern British Columbia (82F/G).

Grieve, D.A. Tonsteins: Possible Stratigraphic Correlation Aids in East Kootenay Coalfields (82G/15; 82J/2).

Ray, G.E., Coombe, S., and White, G. Harrison Lake Project (92H/5,12; 92G/9).

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Aldrick, D. Geological Setting of Mineral Deposits in the Stewart Area.

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Kilby, W. Tonsteins and Bentonites in Northeastern B.C.; Coal Conference, Fernie, September, 1984.

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Ray, G. Mineral Potential of the Hozomeen Fault System; Pacific Geoscience Centre Symposium, April, 1984.

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Map 8425 12P, Blanc-Sablon, Scale 1:250 000.

Map 8444 12G, Bay of Islands, Scale 1:250 000.

Map 8445 2D, Gander Lake, Scale 1:250 000.

Map 8461 11O, Port aux Basques, Scale 1:250 000.

Map 8530 2L & 12I, Port Saunders, Scale 1:250 000.

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ARTICLES

PROVINCIAL DAY AT THE PROSPECTORS AND DEVELOPERS ASSOCIATION CONVENTION

The Prospectors and Developers Association (PDA) Convention, held annually since 1932, traditionally featured a Provincial Day, in which Provincial Geological Surveys were invited to present papers reviewing the provincial exploration scene. Provincial Day was allowed to lapse in the mid-1970s, but was reactivated with a new format at the PDA's 1983 convention.

The new provincial contribution to the PDA convention consists of poster sessions and presentations. The provincial poster session is presented for the full three days of the convention, with each province or territory displaying the results of recent geoscientific work. One morning of the convention is devoted to presentation of papers by the provinces. These papers have a scientific thrust, dealing with the description of mineral deposits and their environments, and the role of geoscience in mineral exploration. Extended abstracts of proposed presentations are reviewed by a selection committee consisting of two provincial geologists, appointed by the Provincial Geologists Subcommittee, and one or two geologists appointed by the PDA Convention Program Committee.

The 1985 PDA convention was held from March 10-14. All provinces and territories, with the exception of Prince Edward Island, participated in the provincial poster displays. On March 13, five provinces presented papers at the morning session, entitled "The Provincial Scene". Titles and authors of these presentations are given below:

British Columbia: Precious metals in the Cordillera: A focus on the transition from porphyry copper to hot spring settings, British Columbia - A. Pantaleyev

Saskatchewan: Biogeochemical prospecting for uranium and gold in the Precambrian Shield of Saskatchewan - C.E. Dunn and T.I.I. Sibbald

Manitoba: Towards delineation of mineral potential in the Agassiz Metallotect, Lynn Lake, Manitoba - M.A.F. Fedikow, E. Neilsen, W.D. McRitchie, and G.H. Gale

Ontario: Golden opportunities for an integrated survey - The Opapimiskan Project - H. Wallace

Newfoundland: Gold-bearing geological environments in Newfoundland - P.L. Dean, H.S. Swinden, C.F. O'Driscoll, and B.F. Kean

ANNUAL REVIEW OF ACTIVITIES PROVINCIAL AND FEDERAL GEOSCIENTIFIC ORGANIZATIONS

Province or Territory Location	Date(s) (No. of Days)	Time for Talks	Universities Involved?	Industry Involved?	Poster Session	Universities Involved?	Industry Involved?	Publication	¹ Energy Matters	² Other Topics	Comments
British Columbia Vancouver	30 Jan. 1986 (1 of 3)	1 day	Yes	Yes B.C. & Yukon Chamber Annual Meeting	Yes	Yes	Yes	Yes - Geological Fieldwork - B.C. Mineral Explorations Review, 1985	Yes Coal, Geo- thermal	Yes	Part of "Cordilleran Geology and Exploration Roundup" Jan. 29 - GSC Jan. 30 - BCEMPR Jan. 31 - BCYCM; DIAND-Yukon
Yukon Territory Whitehorse (DIAND)	2,3,4 Dec. 85 Whitehorse (1)	2.5 days	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Precious metals, heap leaching, small scale mining
	31 Jan. 86 Vancouver (1 of 3)	0.5 days	Yes	No	Yes (3 after- noons)	Yes	No	No	No	No	Part of "Cordilleran Geology and Exploration Round-Up" with BCEMPR and BC-YCM
Northwest Territories Yellowknife (DIAND)	3,4,5 Dec. 85 (3)	3 days	Yes	Yes	Concurrent	Yes	Yes	Yes	Coal only	as required	organized with NWT Chamber of Mines GSC involved
Alberta Edmonton	REVIEW OF ACTIVITIES BIENNIAL - SCHEDULED FOR 1986										
Saskatchewan Regina	21 Nov. 85 (1)	0.5 day	Yes	No	0.5 day	Yes	Yes	Summary of Investigations	Yes	Yes	Sask. Research Council involved, talks and poster displays
Manitoba Winnipeg	19,20 Nov. 85 (1.5)	1 day	Yes	No	1-5 days	Yes	No	Rept. of Field Activities	No	No	Contributions from GSC and University of Manitoba
Ontario Toronto	3,4 Dec. 85 (2)	2 days	Yes	Yes	Concurrent	Yes	Yes	3 Repts. of Activities	Yes	Yes	research oriented; special symposium
Quebec Quebec City	27,28 Nov. 85 (2)	2 days	Yes	Yes	2 days	Yes	No	Rept. of Activities	No	No	Theme: Exploration Geochemistry in Quebec
New Brunswick Fredericton	26 Nov. 85 (1)	0.5 day	No	No	0.5 day	Yes	No	Yes (1984 Project Resumes)	Yes	Yes	GSC involved
Nova Scotia Halifax	27,28 Nov. 85 (1.5)	1 day	Yes	No	0.5 day	Yes	No	Yes Publication	Yes	Yes	GSC involved
Newfoundland St. John's	7 Nov. 85 (1)	0.5 day	Yes	No	0.5 day	Yes	No	Yes	No	Yes	GSC involved
Prince Edward Island	NO OPEN HOUSE										
Geological Surv. Can. Ottawa	22,23 Jan. 86 (2)	2 days	Yes	No	Concurrent	Yes	Yes	Yes (Current Research)	Yes	Yes	Provincial agencies Cooperative Programs

¹Energy Matters: (e.g. oil, gas, coal, oil shales, peat)

²Other Topics: (e.g. administration, engineering, regulations, legislation, etc.)

DRILL CORE COLLECTION AND STORAGE SYSTEMS IN CANADA

by W.D. Fogwill Manitoba Energy & Mines, 1985

INTRODUCTION

Core storage in its broadest sense includes continuous cored sections, rock specimens and drill cuttings from any subsurface boreholes, on land or offshore, for all purposes; for instance oil and gas, 'hard rock' mineral exploration, industrial minerals in 'soft rock', engineering and research drilling and even offshore soft sediment, but the two main groups are for petroleum and mineral exploration.

Because of their obvious differences, petroleum and mineral core storage systems developed separately, the former being much more advanced than the latter. This article will discuss the current status of Government-run mineral exploration core storage systems in Canada and only list in Table 3 the existing petroleum repositories. The rationale for core storage, its brief history, current status and difficulties will be briefly reviewed. Common problems experienced during the much expanded program in Manitoba will be listed. Some opinions expressed are the writer's and don't necessarily reflect those of the Manitoba Department of Energy and Mines or the Provincial Geologists Committee. The reader is referred to the recent excellent compilation of all core storage establishments in Canada by F. Simpson ('A Users' Guide to Core Storage Facilities in Canada', Geological Survey of Canada Paper 84-23, 1985).

REASONS FOR CORE STORAGE

The mining industry of Canada has long stated its concern for the preservation of diamond drill core obtained during exploration programs. Mine development core, in contrast, is nearly always systematically stored at mining sites. The rationale for core preservation is well known - saving the costly, basic data end-product of exploration, reducing future duplication of expenditures and allowing for future study as new concepts evolve. However, the reasons for the somewhat limited or inadequate systems presently in most areas of Canada are also well known - the massive cost commitments necessary in facilities, logistics and manpower especially in the initial phases and the continuing difficulties with such matters as: a) what core should be preserved (all core will never be collected); b) cataloguing-tagging systems to be used; c) levels of service for facilities infrequently used; d) confidentiality issues, and e) core reduction and resampling policies.

HISTORY

Small, special purpose, public sector core systems have existed in Canada for decades, but in recent years as exploration drilling extends deeper, and becomes more expensive and the spectre of vandalized and rotting core sites becomes commonplace, efforts have increased for greater preservation of drill core.

The Standing Subcommittee of Provincial Geologists formulated a recommendation in 1978 to substantially improve the collection and storage of mineral exploration drill core (See Appendix 1). The co-ordinator, Dr. I. Haugh of Manitoba, canvassed and obtained wide response on the recommendation from the Provincial and Federal Ministries and the various Mining Associations. They generally agreed improvements were essential, but reiterated the many financial and administrative difficulties involved (see above). Since this recommendation there has been marked expansion of core programs in most provinces, but uniformity in the level of services from province to province is still lacking and much more effort appears necessary to attain efficient systems acceptable to the industry. Doubts as to the cost-benefit of these programs will probably continue. It is encouraging to see that many of the newly initiated Federal-Provincial Mineral Development Agreements have funded core storage projects.

EXISTING SYSTEMS

The principal components of all core storage programs are: physical facilities or core libraries, staff, cataloguing and access systems, confidentiality policy, examination services and fees, core reduction, resampling policy and back-up assessment data. The provinces vary widely on most of these issues. For example, New Brunswick has 6 separate libraries and Manitoba 4, all unmanned, while Alberta, Saskatchewan, Yukon and Northwest Territories have only one facili-

ty each and these have at least one person permanently on site, either a resident geologist or technician. Ontario, Quebec and Manitoba are presently constructing new facilities.

Alberta and Ontario have established computer indexes to facilitate access to their holdings, while many other provinces are still developing systems. Confidential status varies from - none in Saskatchewan, Nova Scotia and some New Brunswick libraries, to - 'at request of donor' for maximum period of one year in Ontario, Quebec and Alberta, - 3 years in Newfoundland and Northwest Territories - variable in British Columbia and 'as long as property is in good standing' in Manitoba and Yukon. Only British Columbia charges user fees.

Alberta, Saskatchewan, Quebec and some libraries in New Brunswick have established practices for core selection and concentration whereas in most other ministries reduction policy is pending. Most libraries offer heated examination rooms with tables and water supply and many provide sampling equipment (e.g. splitter) and microscopes. Although most libraries allow resampling of core there are usually some restrictions or guidelines. Nearly all ministries have back-up data to their core (e.g. logs, locations, analyses) in assessment files. In newly proclaimed metallic mineral regulations in Alberta, core selection and submission is a mandatory part of the assessment report.

On behalf of the Committee of Provincial Geologists, Manitoba has begun to compile annual statistics on core program activities across the country. Table 1 presents the principal statistics for fiscal year 1984-85. There are inconsistencies in the figures; some are mere approximations and some misleading, but despite this comparisons can be made. British Columbia with its one library at Fort St. John, is the only province to report core collected both from petroleum and mineral companies. Operating costs may not always reflect the amount of core retrieved. Quebec spent only \$17,400 and obtained 41,500 m of core while Northwest Territories spent \$95,200 for 3,677 m, and Manitoba \$137,000 for 26,169 m. It could be assumed that: (a) Northwest Territories retrieval costs are higher; (b) Quebec concentrated on collections while Manitoba and others spent more on capital projects, reorganization and recataloguing and; (c) in some provinces, like Quebec, longstanding core systems and permanent local resident geologists, encouraged large routine industry deliveries, which account for high collection levels. Similar difficulties arise when comparing man-days of work to core collected.

The use of libraries can be difficult to quantify. Does one measure the number of different persons or companies or just each separate significant visit or examination? The latter seems preferable. A figure of interest is the present total core holdings in each ministry. Three provinces have similar levels; Manitoba (180,838 m), New Brunswick (192,000 m) and Newfoundland (160,357 m). Nova Scotia has a high inventory of 307,500 m similar to Ontario. The glaring discrepancy between total exploration drilling versus core collection even though the figures are for one year (see Table 1) clearly shows that it will be impractical in most ministries to attempt to retrieve all exploration core drilled. This strongly emphasizes the need to develop careful selection criteria and standardized core reduction policy.

Efforts are now underway to improve the effectiveness of the annual statistical review as a tool for monitoring core program activities and progress. The reporting form will be simplified and standardized and ministries will be asked to supply timely and accurate figures.

EVALUATION AND PROBLEMS

Continued government support for core programs will depend in large part on the extent to which industry uses and supports the existing services. For the full potential of the programs to be realized, considerable improvements in government-industry liaison still remain to be made in: a) providing notification of newly drilled and available core; b) pooling operational resources to facilitate transfer of core to safe interim storage sites or the core libraries themselves; c) developing less rigid policies governing subsequent access to and possible sampling of drill core by interested parties; and d) increasing the use of the facilities by industry as well as providing critical comment on the program's effectiveness.

Experience gained from a greatly expanded core program under the current Canada-Manitoba

Mineral Development Agreement has highlighted recurring problems which are listed for the benefit of other agencies supporting core programs: (a) capital project control in the initial stages may be lost through transfer of costing and scheduling to other departments, e.g. Government Services; (b) retagging, reorganization and reduction of old inventory is extremely time consuming and must be allocated adequate manpower; (c) definitive selection criteria for which core to keep must be understood by those collecting the core; (d) industry may be skeptical of the usefulness of the program if past government practices have been half-hearted or inefficient; (e) some unrealistic expectations of industry during phasing in of the services may be encountered; (f) unmanned libraries are difficult to run; (g) bush retrievals are often difficult to co-ordinate when temporary industry access is available; (h) difficulties may arise in field core selection or reduction especially in winter; (i) confidential sensitivity; (j) no legislation for core preservation, ownership and vandalism; and (k) incomplete back-up data, for example drill locations and logs are minimum requirement.

Despite the problems Manitoba has found that the core program has offered an excellent opportunity to interact with industry people for exchanging ideas, building rapport and ultimately gaining support and acceptance of this service.

CONCLUSION

There are 33 Government-operated core storage facilities in Canada which presently store well over 1.5 million metres of mineral exploration core. Wide variations occur between provinces, but most have made some commitment toward core preservation especially in the last five years. Many problems remain, particularly the high costs involved, but tangible progress is being seen toward efficient systems acceptable to the industry and public.

TABLE 1 SURVEY OF HARD ROCK DRILL CORE PROGRAMS IN CANADA FISCAL YEAR 1984-85

PROVINCE	B.C.	ALBERTA (1984)	SASK.	MAN.	ONT.	QUE.*4	N.B.
Number of Facilities	1	1	1	4	5	5	6
Staff Man-Days Work 1984-85	286	21	130	1,626	3,500	340	113.5
Capital Costs 1984-85	nil	nil	nil	\$150.0	\$125.0	nil	nil
Operating Costs 1984-85	\$26.3*2	\$14.5	\$10.3	\$137.0	\$225.0	\$17.4	\$8.1
Core Collected or Delivered 1984-85	7 950m	nil	2 154	26 169	173 100	41 500	14 000
Core Reduction*1	nil	-*3	-	nil	22%	90%	-
Use of Facilities (visits or persons) 1984-85	4	6	46	38	585	70	35
Total Core in storage (from all years)	175 000	15 470	53 800	180 838	345 000	n.a.	192 000
Total Exploration Drilling 1984-85	n.a.*3	n.a.	235 515	118 500	561 000	450 000 approx.	n.a.

*1 Figures for 1984-85 collections, but Provinces have various long term reduction policies.

*2 \$26.3 = \$26,300

*3 Figures not available from Survey.

*4 Government-wide 1984-85 cutbacks reduced Quebec activities from previous years.

TABLE 2
MINERAL EXPLORATION DRILL CORE LIBRARIES IN CANADA

Repository	Government Agency	Distribution of Wells
Ministry of Energy, Mines and Petroleum Resources Core Laboratory, Box 6880, FORT ST. JOHN, British Columbia V1J 4J3	Ministry of Energy, Mines and Petroleum Resources, Parliament Buildings, VICTORIA, British Columbia V8V 1X4	Land area of British Columbia
Mineral Core Research Facility Alberta Research Council, 11547 - 160 Street EDMONTON, Alberta T5M 3V9	Alberta Geological Survey Alberta Research Council, 3rd Floor, Terrace Plaza, 4445 Calgary Trail South EDMONTON, Alberta T6H 5R7	Alberta, including Precambrian Shield
Precambrian Geological Laboratory, 1310 La Ronge Avenue, P.O. Box 5000, LA RONGE, Saskatchewan S0J 1L0	Saskatchewan Energy & Mines Toronto-Dominion Building, 1914 Hamilton Street, REGINA, Saskatchewan S4P 4V4	Northern Saskatchewan
Precambrian Drill-Core Library, Brady Road at South Perimeter Hwy., WINNIPEG, Manitoba	Manitoba Department of Energy and Mines, Eaton Place, 555 - 330 Graham Avenue, WINNIPEG, Manitoba R3C 4E3	Mainly southeastern Manitoba
Precambrian Drill-Core Library, c/o Conservation Officer, Dept. of Natural Resources, 675 Halstead Street LYNN LAKE, Manitoba R0B 0W0	Manitoba Department of Energy and Mines, Eaton Place, 555 - 330 Graham Avenue WINNIPEG, Manitoba R3C 4E3	Lynn Lake greenstone belt, northern part of Kesseynew basin, northern Manitoba in general
Precambrian Drill-Core Library, c/o Manitoba Department of Energy and Mines, Mining Engineering Section, Provincial Bldg., 59 Elizabeth Drive, THOMPSON, Manitoba R8N 1X4	Manitoba Department of Energy and Mines, Eaton Place, 555 - 330 Graham Avenue, WINNIPEG, Manitoba R3C 4E3	Thompson district of northern Manitoba
Precambrian Drill-Core Library, c/o Mining Recorder, Provincial Building, 3rd and Ross Avenue, THE PAS, Manitoba R9A 1M4	Manitoba Department of Energy and Mines, Eaton Place 555 - 330 Graham Avenue, WINNIPEG, Manitoba R3C 4E3	Flin Flon-Snow Lake district of north- eastern Manitoba
Diamond Drill Core Library, Highway 28, Box 500, BANCROFT, Ontario K0L 1C0	Ontario Ministry of Natural Resources 77 Grenville Street, TORONTO, Ontario M5S 1B3	Algonquin Mining Division of east- central Ontario
Diamond Drill Core Library, 255 Metcalfe Street, Box 70, TWEED, Ontario K0L 3J0	Ontario Ministry of Natural Resources, 77 Grenville Street, TORONTO, Ontario M5S 1B3	Eastern Mining Division of Ontario

TABLE 3
PETROLEUM DRILL CORE LIBRARIES IN CANADA

Repository	Government Agency	Distribution of Wells
Pacific Geoscience Centre, 9850 West Saanich Road, PO Box 6000, SIDNEY, British Columbia	Geological Survey of Canada, 601 Booth Street, OTTAWA, Ontario K1A 0E8	Offshore western Canada
Core Research Centre, 3545 Research Way NW, CALGARY, Alberta T2L 1Y7	Energy Resources Conservation Board, 640-5 Avenue SW, CALGARY, Alberta T2P 3G4	Alberta, excluding Precambrian Shield
Oil Sands Sample Bank, Highway 16E and 17 St., EDMONTON, Alberta	Alberta Research Council, 11315 - 87 Avenue, EDMONTON, Alberta T6G 2C2	Athabasca, McMurray and Peace River districts of northern Alberta
Core and Sample Repository, Institute of Sedimentary and Petroleum Geology, 3303 - 33 Street NW, CALGARY, Alberta T2L 2A7	Geological Survey of Canada, 601 Booth Street, OTTAWA, Ontario K1A 0E8	Onshore and offshore north of 60°00'00" N latitude, west-coast offshore (cores and cuttings); B.C., Alta., Sask., Man., east-coast offshore (cuttings)
Subsurface Geological Laboratory, 201 Dewdney Avenue East, REGINA, Saskatchewan S4N 4G3	Saskatchewan Energy & Mines, Toronto-Dominion Building, 1914 Hamilton Street, REGINA, Saskatchewan S4P 4B4	Southern Saskatchewan
Phanerozoic Drill-Core Library, Building 12, University of Manitoba Campus, WINNIPEG, Manitoba	Manitoba Department of Energy and Mines, Eaton Place, 555 - 330 Graham Avenue, WINNIPEG, Manitoba R3C 4E3	Southwestern Manitoba
Petroleum Resources Laboratory, 458 Central Avenue, LONDON, Ontario N6E 2B5	Ontario Ministry of Natural Resources, 77 Grenville Street, TORONTO, Ontario M5S 1B3	Onshore and offshore (Lake Erie) southwestern Ontario, southeastern Ontario, onshore Ontario part of Hudson platform
Canada Centre for Inland Waters Core Repository, 867 Lakeshore Road, BURLINGTON, Ontario	Canada Centre for Inland Waters, PO Box 5050, BURLINGTON, Ontario L7R 4A6	Offshore southern Ontario (Great Lakes); selected small Ontario lakes
Newfoundland and Labrador Petroleum Directorate, Sample and Core Repository, TORBAY, Newfoundland	Newfoundland and Labrador Petroleum Directorate, PO Box 4750, ST. JOHN'S, Newfoundland A1C 5T7	Offshore Newfoundland
Canada Oil and Gas Land Administration Core Repository, Bedford Institute of Oceanog- raphy, PO Box 1006, DARTMOUTH, Nova Scotia B2Y 4A2	Canada Oil and Gas Land Administration, 355 River Road, Vanier Tower "B", VANIER, Ontario K1A 0E4	Scotian Shelf, Grand Banks, Labrador, Hudson Bay, Northumberland Strait, Bay of Fundy, Gulf of St. Lawrence

Repository	Government Agency	Distribution of Wells
Atlantic Geoscience Centre, Geological Survey of Canada, Bedford Institute of Oceanography, PO Box 1006, DARTMOUTH, Nova Scotia B2Y 4A2	Geological Survey of Canada, 601 Booth Street, OTTAWA, Ontario K1A 0E8	Offshore eastern and northern Canada from Georges Bank to the Beaufort Sea; onshore Nova Scotia, Prince Edward Island, New Brunswick, Quebec, Ontario
Larder Lake Mining Division Diamond Drill Core Library, MNR Kirkland Lake District Office, PO Box 129, SWASTIKA, Ontario P0K 1T0	Ontario Ministry of Natural Resources 77 Grenville Street, TORONTO, Ontario M5S 1B3	Larder Lake Mining Division of northern Ontario
Diamond Drill Core Library, 64 Church Street, SAULT STE. MARIE, Ontario	Ontario Ministry of Natural Resources, 77 Grenville Street, TORONTO, Ontario M5S 1B3	Sault Ste. Marie Mining Division of north-central Ontario
Porcupine Mining Division Diamond Drill Core Library, MNR Timmins District Office, 896 Riverside Drive, TIMMINS, Ontario P4N 3W2	Ontario Ministry of Natural Resources, 77 Grenville Street, TORONTO, Ontario M5S 1B3	Porcupine Mining Division of northern Ontario
Thunder Bay Mining Division Diamond Drill Core Library, c/o MNR North Central Regional Office, 435 James St. South, THUNDER BAY, Ontario P7C 5G6	Ontario Ministry of Natural Resources, 77 Grenville Street, TORONTO, Ontario M5S 1B3	Thunder Bay Mining Division of north- central Ontario
Diamond Drill Core Library, 808 Robertson Street, Box 5160, KENORA, Ontario P9N 3X9	Ontario Ministry of Natural Resources, 77 Grenville Street, TORONTO, Ontario M5S 1B3	Kenora Mining Division or northwestern Ontario
Ministerre de l'Energie et des Ressources du Quebec, Lithotheque de Rouyn, 60 rue Bernatchez, ROUYN, Quebec	Ministere de l'Energie et des Ressources du Quebec, 1520 Boulevard de l'Entente, QUEBEC, Quebec G1S 4N6	Noranda-Rouyn district or northwestern Quebec
Ministere de l'Energie et des Ressources du Quebec, Lithotheque de Val d'Or, 840 5-ieme Ave., VAL D'OR, Quebec	Ministere de l'Energie et des Ressources du Quebec, 1620 Boulevard de l'Entente, QUEBEC, Quebec G1S 4N6	Val d-Or-Matagami district of north- western Quebec
Ministere de l'Energie et des Ressources du Quebec, Lithotheque de Chibougamau, 375 3-ieme Rue, CHIBOUGAMAU, Quebec G8P 1N4	Ministere de l'Energie et des Ressources du Quebec, 1620 Boulevard de l'Entente, QUEBEC, Quebec G1S 4N6	Chibougamau district of northern Quebec

Repository	Government Agency	Distribution of Wells
Ministere de l'Energie et des Ressources du Quebec, Lithotheque du Quebec, 650 rue Godin, Porte no. 5, Ville Vanier, QUEBEC, Quebec	Ministere de l'Energie et des Ressources du Quebec, 1620 Boulevard de l'Entente, QUEBEC, Quebec G1S 4N6	Onshore St. Lawrence and Gaspé regions of southern and south-eastern Quebec, Anticosti Island
Newfoundland and Labrador Dept. of Mines and Energy, Core Library, PASADENA, Newfoundland	Newfoundland and Labrador Dept. of Mines and Energy, PO Box 4750, ST. JOHN'S, Newfoundland A1C 5T7	Insular Newfoundland west of Gander
Newfoundland and Labrador Dept. of Mines and Energy, Core Library, ST. JOHN'S, Newfoundland	Newfoundland and Labrador Dept. of Mines and Energy, PO Box 4750, ST. JOHN'S, Newfoundland A1C 5T7	Eastern insular Newfoundland and St. Lawrence area
Newfoundland and Labrador Dept. of Mines and Energy, Core Library, GOOSE BAY, Labrador	Newfoundland and Labrador Dept. of Mines and Energy, PO Box 4750, ST. JOHN'S, Newfoundland A1C 5T7	Onshore Labrador
New Brunswick Dept. of Natural Resources Core Repository, PO Box 50, BATHURST, New Brunswick E2A 3Z1	New Brunswick Dept. of Natural Resources, Mineral Resources Division, PO Box 6000, FREDERICTON, New Brunswick E3B 5H1	Onshore New Brunswick north of 47°00'00" N latitude
New Brunswick Dept. of Natural Resources Core Repository, MADRAN, New Brunswick	New Brunswick Dept. of Natural Resources, Mineral Resources Division, PO Box 6000, FREDERICTON, New Brunswick E3B 5H1	Onshore New Brunswick north of 47°00'00" N latitude
New Brunswick Dept. of Natural Resources Core Repository, 498 York Street, FREDERICTON, New Brunswick	New Brunswick Dept. of Natural Resources, Mineral Resources Division, PO Box 6000, FREDERICTON, New Brunswick E3B 5H1	Onshore New Brunswick between 46°00'00" and 47°00'00" latitude
New Brunswick Dept. of Natural Resources Soils and Minerals Laboratory, College Hill Road, FREDERICTON, New Brunswick	New Brunswick Dept. of Natural Resources, Mineral Resources Division, PO Box 6000, FREDERICTON, New Brunswick E3B 5H1	Onshore New Brunswick between 46°00'00" and 47°00'00" latitude
New Brunswick Dept. of Natural Resources Core Repository, Piccadilly Road, SUSSEX, New Brunswick	New Brunswick Dept. of Natural Resources, Mineral Resources Division, PO Box 6000, FREDERICTON, New Brunswick E3B 5H1	Onshore New Brunswick south of 46°00'00" latitude
Nova Scotia Dept. of Mines and Energy Drill-Core Repository, 32 Bridge Avenue, PO Box 999, STELLARTON, Nova Scotia B0K 1S0	Nova Scotia Dept. of Mines and Energy, 32 Bridge Avenue, PO Box 999, STELLARTON, Nova Scotia B0K 1S0	Onshore Nova Scotia

Repository	Government Agency	Distribution of Wells
Dept. of Fisheries, Beach Grove Road, CHARLOTTETOWN, Prince Edward Island	Dept of Energy and Forestry, Energy and Minerals Branch, PO Box 2000, CHARLOTTETOWN, Prince Edward Island C1A 7N8	Onshore Prince Edward Island
H.S. Bostock Core Library, Indian and Northern Affairs Canada, 200 Range Road, WHITEHORSE, Yukon Y1A 3V1	Indian and Northern Affairs Canada, Exploration and Geological Services Division, 200 Range Road, WHITEHORSE, Yukon Y1A 3V1	Onshore Yukon
C.S. Lord Core Library, Indian and Northern Affairs Canada, 52 Avenue, YELLOWKNIFE, Northwest Territories	Indian and Northern Affairs Canada, Northern Affairs Program, Geology Division, PO Box 1500, YELLOWKNIFE, Northwest Territories X1A 2R3	Onshore Northwest Territories

APPENDIX 1

COLLECTION AND STORAGE OF DRILL CORE

Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, and the Federal Government have statutes and regulations requiring drillers of petroleum wells to acquire permits before drilling, and to promptly submit to the appropriate governmental agency complete technical data on the wells, cuttings samples taken at specified intervals, and all core.

The net results appear to be two-fold.

1. Petroleum management decisions by governments can be based upon the best available technical information.
2. The widespread availability to industry of full technical data, core and cuttings samples, has led to more effective exploration for, and evaluation of, petroleum resources, and has significantly reduced the costs of exploration. The investment that the petroleum industry makes in detailed core studies, and in maintaining private core libraries, testifies to the usefulness of core storage facilities.

In contrast to the situation concerning petroleum wells and exploration data, there is no uniformity concerning the submission to governments of technical data, samples, or core from mineral exploration drill holes. Most jurisdictions have no statutory requirement that these items from mineral exploration holes be submitted to the appropriate government agency. Indeed there is no general requirement that operators even notify the government that a hole has been drilled.

Government-operated centers for storage of core from mineral exploration drilling are, in general, inadequately staffed and are managed as a low-priority, part-time job of a geologist.

There are several advantages to mineral exploration and development to be gained by a system of core storage. Preservation of core and cuttings from drill holes would:

1. produce an orderly and efficient exploration process by reducing unwarranted duplication of activities and expenditures;
2. provide 3-dimensional data to interpret mineral resource potential as an aid to land-use management and to improve the efficiency and effectiveness of private sector exploration; and

3. provide samples for future study as new mineral exploration concepts evolve.

Because retention of drill core and cuttings is becoming increasingly necessary as the discovery rate of near surface deposits in Canada is declining, the Subcommittee recommends that:

1. All drill core or splits thereof or cuttings must be clearly labelled as to claim number, hole number and depth interval of drill runs, and stored by the claim holder in sequence of recovery in a place and manner acceptable to the Minister and made available for inspection and sampling by government personnel.
2. No property holder shall abandon, discard, and dump or destroy or otherwise reduce the original technical value of the drill core or cuttings without written permission of the Minister.
3. Unless otherwise authorized by the Minister the claim holder shall store and preserve for inspection splits of the sampled core parallel to the long axis of the hole or representative portions of sampled cuttings.
4. The provincial governments provide and maintain core and cuttings storage and examination facilities for selected samples.
5. The provincial governments move toward providing guidelines and standards for the storage and preservation of core and cuttings.
6. Vandalism of core be an indictable offense under all provincial mining acts.

ÉLÉMENTS D'UNE POLITIQUE MINÉRALE DU QUÉBEC

INTRODUCTION

Le Québec est un vaste territoire de près de 1 500 000 km², en majorité inexploré. Sa population d'un peu plus de 6 millions d'habitants occupe principalement la partie sud de ce territoire. Cette province canadienne possède un excellent potentiel en ressources minérales, forestières et hydro-électriques. Dans le domaine minier, le tableau ici projeté montre les principales substances minérales qui y sont actuellement extraites. Parmi les substances métalliques les plus importantes, la production d'or domine avec 29 000 kg (895 061 oz) en 1984 soit une valeur de 444M\$. La production d'argent 37 000 kg (1 141 975 oz), de cuivre (63 000 t) et de zinc (49 000 t) représente pour sa part une valeur de 200M\$. Pour la même année, l'extraction du fer et de l'amiante s'est traduite en des ventes de 660M\$

SUCCÈS DE L'EXPLORATION MINIÈRE

Au cours des dix dernières années, grâce à une exploration minière soutenue et agressive, on a assisté à de nombreuses découvertes de nouvelles réserves minérales.

Je vais vous dresser un bref portrait des découvertes les plus importantes.

1. En 1979, la compagnie Falconbridge Limitée prenait une option sur une propriété appelée Lac Shortt en Abitibi. Cette propriété avait fait l'objet de travaux d'exploration vers la fin des années '60. Suite à une campagne intensive de forage, une zone aurifère contenant 690 000 t à 0,20 oz/t fut découverte dans un horizon de roches volcano-sédimentaires felsiques altérées en carbonate, séricite accompagnées de fuschite. Des travaux de mise en valeur de 8,8 millions \$ ont aussitôt été entrepris. En 1983 la compagnie décidait d'aller en production avec des réserves prouvées de 2,2 millions de tonnes à 0,16 oz/t d'or suite aux travaux de mise en valeur.
2. En 1980, la Corporation Falconbridge Copper effectuait des travaux d'exploration sur le site d'anciennes mines productrices en Abitibi. Les sondages réalisés sur le site de l'ancienne propriété Ansil permirent de recouper une zone de 75 pieds de sulfures massifs titrant 4,23% Cu, 0,06% Zn et 0,60 oz/t d'Ag et ce à une profondeur de plus de 4 000 pieds. Les sondages subséquents ont permis d'évaluer des réserves de 2,8 millions de tonnes de minerai à 7,18% Cu, 0,57% Zn, 0,70 oz/t Ag et 0,05 oz/t Au. Suite à ces résultats, la compagnie a entrepris un projet de 125M\$ pour mettre cette zone en production. Les premières tonnes de minerai devraient être extraites en 1988.

3. En 1981 on assiste à la mise en production de la zone B du dépôt de Selbaie contenant 3,4 millions de tonnes à 4,49% de Cu, 0,80% Zn, 1,23 oz/t d'argent et 0,03 oz/t d'Au. Ce dépôt fut découvert par Selco Mining vers le milieu des années '70 dans la partie nord de l'Abitibi. Une autre zone appelée A-1 contenant 23 millions de tonnes de minerai à 0,39% Cu, 2,3% Zn, 1,1 oz/t Ag est actuellement en développement au coût de 125M\$ pour exploitation à ciel ouvert.
4. En Gaspésie, la division Mines Gaspé du Groupe Noranda qui exploite le gisement de porphyre cuprifère de Murdochville effectua en 1979 des travaux d'exploration sous le gisement alors exploité à ciel ouvert.

Les travaux ont résulté en la découverte d'une nouvelle zone estimée à 20 millions de tonnes minerai à 1,9% de cuivre et 0,4 oz/t d'argent. Actuellement, les travaux de développement sont en cours pour exploiter cette zone.

5. Depuis le début des années '80 la compagnie Inco Ltd est très active dans l'exploration de la région de Casa-Bérardi en Abitibi. L'épaisseur du mort-terrain rend le travail particulièrement difficile mais les efforts soutenus amenèrent la compagnie à y découvrir une première zone de minéralisation aurifère appelée Golden Pond. Suite aux travaux de forage, des réserves de 2,7 millions de tonnes à 0,19 oz/t d'or furent évaluées. Ces chiffres tiennent compte d'une dilution de 20% et d'un facteur de recouvrement de 80%. Une peu plus tard, des travaux de sondage effectués à quelque 2 000 pieds à l'est permirent de découvrir une autre zone minéralisée dont les réserves évaluées sont de 2,8 millions de tonnes à 0,21 oz/t d'or.

La compagnie et un partenaire (Golden Knight) viennent d'annoncer leur décision d'aller sous terre avec un programme d'exploration de près de 7,2M\$.

6. Pour terminer, toujours en Abitibi, à la fin de l'année 1984, une compagnie junior québécoise s'est intéressée à une aire d'altération typique des environnements de gîtes volcanogènes syngénitiques située dans un secteur encore peu exploré. Les premiers sondages ont rapporté des intersections de 12,8 pieds à 1,42% Zn, 0,19 oz/t d'Au et 0,30 oz/t Ag et une autre de 15 pieds à 0,18 oz/t d'or. Depuis, la compagnie Sigma, filiale de Dome Mines Ltd, a décidé de prendre une option sur la propriété. On assiste actuellement à une véritable ruée des différentes compagnies minières vers ce secteur dans le but d'acquérir des propriétés à explorer.

Nous croyons que ces résultats ne peuvent cependant être atteints sans la mise en place de politiques favorables aux investisseurs et ce, principalement en période de récession économique. C'est pourquoi le Québec a tenu à se doter d'une politique minière qui tient compte du marché des substances minérales, du fardeau fiscal de l'industrie minière, de la structure industrielle de la province, de la qualité et de la quantité des connaissances géoscientifiques mises à la disposition du client investisseur de même que la qualité des services gouvernementaux offerts à ces investisseurs.

1. La fiscalité minière
2. L'assistance financière à l'industrie minière
3. La connaissance géoscientifique.

FISCALITÉ MINIÈRE

En raison du risque élevé des activités d'exploration minière, l'industrie accorde une importance particulière aux mesures fiscales en vigueur dans un pays ou une province avant d'investir.

En avril 1985, le Gouvernement, par la voie de son ministre des Finances annonçait d'importantes modifications qui constituent à notre sens un incitatif intéressant à l'investissement.

1. L'échelle de progression de taxation minière, dont le taux d'imposition pourrait varier de 15% à 30% est maintenant remplacé par un taux fixe de 18%.
2. L'exemption de base de 250 000\$ est remplacée par un crédit annuel de 90 000\$ (équivalent à une exemption de 500 000\$ au taux d'imposition de 18%).
3. Une perte donne droit à un crédit de droits remboursable jusqu'à concurrence du moindre de 18% du montant de la perte et de 18% des dépenses admissibles qui sont les dépenses d'exploration et de mise en valeur, ainsi que l'amortissement réclamé au cours d l'année.

4. La partie d'une perte non admissible au remboursement peut être reportée sur les trois années antérieures et les sept années suivantes (au lieu de quatre ans seulement).

De plus, le Gouvernement du Québec a prolongé de deux ans l'allocation additionnelle de 66 2/3% pour les frais d'exploration engagés par des particuliers, c'est-à-dire jusqu'au 31 décembre 1987, pour les personnes qui n'ont pas de revenus de l'exploitation d'une mine.

Cette mesure a été introduite en 1980 et a permis en 1984 des investissements de l'ordre de 90 millions \$ (tableau ci-joint) de la part de particuliers et ce, sur le total des investissements en exploration de 150 millions \$.

Ainsi, que ce soit par la création de sociétés en commandite ou par l'achat d'actions accréditives, les particuliers se sont montrés très intéressés à investir dans ce type d'abri fiscal tout en permettant à l'industrie minière de diminuer sa part de risques dans ses projets d'exploration minière. Les découvertes citées plus haut, telles que Casa-Bérardi et Vior, ont été rendues possibles en partie par l'accès au financement, accès facilité par des incitatifs fiscaux.

ASSISTANCE À L'INDUSTRIE MINIÈRE

Depuis plusieurs années, le Gouvernement de Québec se préoccupe de mettre sur pied des programmes d'assistance financière directe à l'industrie minière.

Ces programmes visent à encourager le démarrage ou la poursuite de projets d'exploration ou de développement minier. L'action de ces programmes est principalement orientée vers des régions ou des substances minérales que le Gouvernement désire voir se développer pour le mieux-être de sa population et de son économie.

Du côté développement minier un programme d'accélération des investissements privés a permis le démarrage de plusieurs projets totalisant près de 900M\$ dans lesquels le Gouvernement a injecté près de 200M\$. Les projets du Lac Shortt, de Ansil, de Selco et Mines Gaspé cités auparavant, ont d'ailleurs bénéficié d'une aide gouvernementale totalisant 68M\$ que ce soit pour la mise en valeur, le développement ou la construction d'infrastructures minières.

Les projets Ansil et Selbaie de Selco à eux seuls ont profité d'une aide de 25M\$ chacun sur des projets évalués à 125M\$ respectivement.

Dans le domaine de l'exploration minière, le programme actuellement en vigueur offre une assistance financière pouvant atteindre 35% des dépenses telles que: décapage, géologie, géophysique, géochimie, analyses, forage et galerie d'exploration. Ce pourcentage d'aide peut même être porté à 50% lorsque les travaux sont réalisés dans des secteurs bien définis. Le transport aérien en région éloignée peut aussi faire l'objet d'une aide financière allant jusqu'à 30% des coûts.

Ce programme s'adresse aussi à la construction d'infrastructures d'accès aux propriétés minières à explorer. Une assistance financière gouvernementale de 50% des coûts est ainsi disponible pour la réalisation de ces travaux d'infrastructures.

Au cours des 5 premiers mois de l'année, près de 40 projets ont bénéficié d'une aide gouvernementale à l'exploration totalisant 3M\$, ce qui a permis de réaliser plus de 8M\$ de travaux de sondage et ce, sans compter les dépenses connexes.

CONNAISSANCE GÉOSCIENTIFIQUE

Une exploration minière efficace doit avoir comme base une documentation géoscientifique complète et de qualité. Ainsi, depuis le début des années '70 le Québec s'est préoccupé de fournir à sa clientèle un éventail de plus en plus complet de données géoscientifiques. Depuis, trois plans quinquennaux d'acquisition de connaissances géoscientifiques ont permis de couvrir de façon systématique de vastes régions à potentiel minier favorable par des levés géophysiques Input aéroportés, des levés géochimiques et des levés de cartographie de détail. Ces types de levés se poursuivent toujours et un accent a été mis sur des études gîtologiques de détail.

A l'intérieur de ces plans quinquennaux, un effort particulier a été mis sur la préparation de cartes synthèses du potentiel minéral et sur des cartes de compilations de tous les travaux à caractère géoscientifique réalisés par l'industrie et le gouvernement. Le Québec est d'ailleurs très fier de ces cartes dont la qualité surpasse de beaucoup celles des autres provinces et même de la majorité des pays à travers le monde.

Les investissements du gouvernement dans l'acquisition de nouvelles données géoscientifiques se font actuellement au rythme de 10 à 12M\$ par année. Aussi, plusieurs autres cartes synthèses sont en préparation ce qui viendra s'ajouter aux différents outils mis à la disposition de l'industrie de l'exploration minière.

La découverte de Vior citée précédemment fait suite aux travaux de cartographie de détail réalisés par le gouvernement. Ce sont ces travaux qui ont permis de découvrir la première zone d'altération.

En conclusion, nous croyons que le Québec a su créer un climat de confiance à l'investissement dans le domaine de l'exploration des ressources minérales de son territoire.

Les résultats obtenus et ce, en pleine période de récession économique, démontrent à notre avis la raison d'être de nos politiques que nous croyons agressives dans le domaine de l'exploration minière.

Nous n'allons cependant pas nous asseoir sur nos lauriers, bien au contraire. Notre ministère continue à examiner d'autres voies où il serait bon d'orienter nos efforts pour maintenir notre industrie minière en santé et susciter de nouveaux investissements.

Septembre 85

"INDUSTRIE MINÉRALE DU QUÉBEC — 1984"

	(millions de \$)				
	1980	1981	1982	1983	1984
Sociétés en commandite	17,0	8,1	9,4	5,1	51,4
Actions accréditives	—	0,2	2,7	37,4	39,8
Actions REA ₂	10,5	7,2	—	56,7	10,5
Autres actions	5,4	14,3	1,0	29,2	10,1
Autres titres ₃	—	—	9,0	—	3,0
TOTAL	32,9	29,8	22,1	128,4	114,8

PROVINCIAL AND NATIONAL MINERAL INVENTORY FILES

BACKGROUND

This report presents the results of a national survey of mineral inventory files. The survey stems from a suggestion made at the National Geological Survey Committee meeting held in Fredericton, May 1, 1985. British Columbia assumed responsibility for conducting the survey and prepared and distributed a questionnaire to provincial, territorial, federal, and private agencies.

The questionnaire requested the survey participants to provide detailed as well as summary information on their provinces. P.E.I. replied that the province does not have a mineral inventory file due to a lack of reported mineral occurrences. Most agencies have computerized their data or plan to in the near future. Alberta, Quebec, New Brunswick and the Northwest Territories are not automated as yet. Newfoundland, Nova Scotia, Ontario, Saskatchewan, British Columbia and the Yukon all have computerized mineral inventory databases. The Geological Survey of Canada maintains a national mineral occurrence index file - Canminindex, that is not available to the public. A summary of the different mineral inventory files is shown in the table.

A copy of the completed questionnaires is available on request from B.C.

GENERAL INFORMATION

Each database is unique in design and structure, but all seem to contain similar information concerning property names, identifiers, location, history, ownership, status, commodities, geology of the deposit, assays and references. Manual files provide more detailed information about occurrences than computerized files.

Results of the survey indicate that information from the different files (except Canminindex) can be obtained as hardcopy (photocopies of original text and maps), microfiche, index lists, computer generated information (file printouts, custom searches with selected parameters, and maps) magnetic tapes and diskettes. The table indicates the type of output available from each mineral inventory file as well as the fee structure.

COMPUTERIZATION

The mineral inventory files reside on a variety of computers (mainframe, minis, and micros) and utilize different kinds of software - both purchased packages and programs developed in-house. The hardware and software associated with each database is summarized in the table. The majority of the databases that reside on mainframe or mini-computers can be downloaded to personal computers.

The amount of money allocated by government agencies for computerization on a yearly basis falls in the range of \$3,000 to \$20,000.

GRAPHICS

Five of the databases have developed graphics software. The survey indicated that computer graphics were included in future development plans for most of the databases.

PROPOSED MODIFICATIONS FOR EXISTING MINERAL INVENTORY FILES

YUKON MINERAL INVENTORY - The data presently resides and is being collected on floppy diskettes. Future plans include hard disk mainframe data storage with PC downloading capabilities. Computerized graphics will be developed in 1987.

NORTHERN CORDILLERA MINERAL INVENTORY - (Archer, Cathro & Assoc.). The manual file will be entered on a Wang micro computer and a search program will be written.

COALFILE (B.C.) - This file is presently being revised to reside on an IBM-PC.

MINFILE (B.C.) - The database will be moved in October 1985 from an IBM Mainframe to a VAX-11-750 mini-computer. New software has been developed using a 4th generation relational database ULTRA/MANTIS. MINFILE has been upgraded and expanded and the amount and

detail of geological information being collected has been greatly enhanced. Loading of new data begins November 1985.

ALBERTA MINERAL DEPOSITS AND OCCURRENCES - Plans are underway for automation of the data and linking with a geographic information system.

SASKATCHEWAN MINERAL DEPOSITS INDEX (SMDI) - Format of the SMDI cards will soon conform with the NMI system. The file is being updated and new software is being developed for fast and easy updating and retrieval.

MANITOBA MINERAL INVENTORY FILE - Updating of this manual file is presently being funded by the Canada-Manitoba Mineral Development Agreement 1984-99. All cards in the file will be entered on a Wang word processor. Future plans include computer links to a new Mines Branch information system currently being developed through the Mineral Agreement.

MINERAL DEPOSIT INVENTORY (Ontario) - Production of Indexes by Township and claim map area is planned.

QUEBEC - The file will be updated and plans are underway for computerization of the data.

METALLIC AND INDUSTRIAL MINERAL OCCURRENCES, AND DRILLHOLES DATABASES (N.S.) - The addition of new occurrences based on information available from 1981 to 1985, and updating of existing occurrences is being done on an ongoing basis. Plans also include loading the database onto the Dalhousie University Cyber.

CANMINDEX (Canada) - A change in the database management system will probably happen within the next year.

Compiled by:
C. Kenyon
Geological Branch
Ministry of Energy, Mines and Petroleum Resources

PROVINCIAL AND NATIONAL MINERAL INVENTORY FILES - SUMMARY TABLE

Province	Organization	Name of File	Size of File (Number of Occurrences)	Summary of Data in File	Computerized (Yes/No)	Hardware	Software	Computerized Graphics	Information Available	Fees	Staff	Contact Person
N.W.T.	Indian and Northern Affairs Canada	Mineral Inventory Cards/Maps	6,000	Property names, locations, history, ownership, commodity, geology, minerals, references.	No	N/A	N/A	N/A	on microfiche	.25/p	1p/y	J.E. Vieira 403-920-8215
Yukon	Exploration & Geological Services	Yukon Mineral Inventory (YMI)	1,900	Property names, locations, claims, deposit type, history, geologic description, Current work.	Yes - 250 Occurrences	Wang PC	D Base II Wang (Word Processing Multiplan)	No (1987)	All reports on microfiche. Custom searches of data by deposit type and commodity.	.10¢/p .10¢/p	3p/y	D. Downing 403-668-5151
Yukon and B.C.	Archer, Cathro & Assoc. (1981) Ltd.	1. Northern B.C. Min. Inven.	1,844	Mineral occurrences in in B.C. - north of 52 Lat. and significant unexplained geophysical and geochemical anomalies. (Location, work history, geology, assay data).	Yes	Wang PC	Wang Word Processor In-house Software (Basic, D Base II)	No	Custom searches. Complete data set. Yearly update.	\$3.50 per occ. \$6,454 \$1,950	1.5p/y (prof.) .5 (sec.)	A. Archer 604-688-2568 R. Cathro 403-667-4415
		2. Northern Cordillera Min. Inven.	2,533	Exploration-oriented data file of mineral occurrences and work targets. (Location, work history, economic geology).	No	N/A	N/A	N/A	Hardcopy by request. Complete data set.	\$3.00 per occ. \$7,600	.5p/y (prof.) .25p/y (sec.)	(same as above)
B.C.	B.C. Ministry of Energy, Mines & Pet. Resources, Geological Branch	MINFILE	9,000	Location, names, mining div., geology incl. host rock, brief descrip., deposit types, genetic types, metamorphism, structure and references.	Yes	VAX 11-750	ULTRA/MANTIS	No (1986)	Hardcopy report Data tape. custom searches. per hit Indexes.	at cost \$300.00 \$10.15 \$30-\$50	2p/y	A. Wilcox 604-387-5975
		COALFILE	602	602 property summary records for each coal assess. report. Detailed exploration information (maps, trenches, boreholes, adits and pits)	Yes	IBM 3081 IBM-PC-XT	Batch PL1/Wylbur execs., Calcomp. Focus		Hardcopy report. Open file index. Custom searches. Custom plots. Diskettes or tape.	at cost \$5.00 \$5-\$10 \$20.00 at cost	1.5p/y	C. Kenyon 604-387-1301

PROVINCIAL AND NATIONAL MINERAL INVENTORY FILES - SUMMARY TABLE

Province	Organization	Name of File	Size of File (Number of Occurrences)	Summary of Data in File	Computerized (Yes/No)	Hardware	Software	Computerized Graphics	Information Available	Fees	Staff	Contact Person
Alberta	Alberta Research Council	1. Alberta Mineral Deposits and Occurrences	500 +	Commodity, location, size, geologic description, analyses, tests, economic use potential	No	N/A	N/A	N/A	Specific information provided upon request	no fee	.25p/y	W. Hamilton
		2. GEODIAL	6200	Bibliographic geo- science information on Alberta	Yes	Amhdahl 5860	SPIRES on MTS	No	Searchable on line, custom searches	no fee	1 p/y	J. MacGillivray
		3. Industrial and Metallic Mineral Resources Catalog	2000	Bibliographic reference with areal extent plotted on maps and tied into level of detail of report	No	N/A	N/A	N/A	Not yet publicly available	N/A	.25p/y	J. MacGillivray D. Edwards
Sask.	Sask. Energy & Mines, Mineral Dev. Section	Saskatchewan Mineral Deposits Index (SMDI)	1,858	Deposit name, ID, status, location, ownership, economic attributes, geology of deposit and host rock, references.	Yes	HP-9825 in con- junction with IBM 3081 mainframe	In-house software (Fortran & HPL)	Yes	Complete listing by NTS or commodity. Partial listings (min. 150 entries) Comp.gen.com.map. SMDI file on tape. SMDI cards.	\$100.00 .30¢/ entry \$15.00 \$150.00 \$1.00 ea.	1p/y	J. MacEachern 406-787-9180 T.I.I. Sibbald 306-787-2576
		Saskatchewan Mineral Assessment Files (SMAF)	6,000	Mineral exploration reports and maps.	No	N/A	N/A	N/A	Hardcopy of reports. Copies of maps.	.25/p at cost	2.3p/y	M.A. Fuzesy 306-787-9180 T.I.I. Sibbald 306-787-2576
Manitoba	Manitoba Energy & Mines	Manitoba Mineral Inventory File	994	Property names, location, commodities, geology, history, publication, & map references.	No	N/A	N/A	N/A	Hardcopy. Custom retrievals. Pubs. 851 cards on microfiche + loc. map to 1979. (ER79-6)	.25/p at cost \$20.00	1p/y	D.J. Richardson 204-945-6541 J.D. Bamburak 204-945-6534
Ontario	Ontario Geological Survey	Mineral Deposit Inventory (MDI)	7,000 manual 5,550 computer	Location, commodities, status, references	Yes	IBM mainframe	S2K	No	Hardcopy reports. Custom retrievals. Data on mag.tape. Min.Dep.Rep.O.F.5470	.15/p at cost \$100.00 \$20.00	2p/y	H.A. Groen 416-965-4641
Quebec	Ministere de l'Energie et des Ressources		5,650	Identification, location, history, regional geology, local geology structure, mineralization, deposit (with sketch), reserves & production, bibliography.	No	N/A	N/A	N/A	Deposit Information Forms	.80¢/ea	2p/y	M. Germain or L. Avramtchev 418-643-8167

PROVINCIAL AND NATIONAL MINERAL INVENTORY FILES - SUMMARY TABLE

Province	Organization	Name of File	Size of File (Number of Occurrences)	Summary of Data in File	Computerized (Yes/No)	Hardware	Software	Computerized Graphics	Information Available	Fees	Staff	Contact Person
N.B.	New Brunswick Dept. of Natural Resources, Min. Res. Div.	Mineral Occurrence File	?	Location, description history, geology, mine workings, drillhole locations, assays	No	N/A	N/A	N/A	Hardcopy	.15/p	.5p/y	D.T.T. Carroll
N.S.	Nova Scotia Dept. of Mines & Energy	Metallic Mineral Occurrences Data Base & Card File	894	Identification, location, commodities, production assay results, geology. (Both manual and computerized files)	Yes	PDP/11/23/73	GEOBASE	Yes	Custom searches. Card file (in departmental libraries) Plots by map sheet.	Fee for service basis at cost	1p/y	N.A. Lyttle 902-424-5060
		Industrial Mineral Occurrences Data Base & Card File	1,052	Identification, location, commodities, production assay, results, geology. (Both manual and computerized files.)	Yes	PDP/11/23/73	GEOBASE	Yes	as above	as above	1p/y	as above
		Drill Hole Data Base	8,300	Location of drill holes, associated exploration data	Yes	PDP/11/23/73	GEOBASE	Yes	as above	as above	1p/y	as above
Nfld.	Nfld. Dept. of Mines & Energy	Mineral Occurrence Data System (MODS)	3,000	Detailed manual summary. Brief summary (computerized) - ID, name, location, ownership, deposit description, geological setting, exploration and dev., bibliography	Yes	AMDAHL 5860	GRASP	No	Hardcopy. Microfiche. Mineral occ. maps. Custom searches (no fee structure as yet)	.15/p .50/p \$3.00	5p/y	C. O'Driscoll or P. Dean 709-576-2769
Canada	Geological Survey of Canada	CANMINDEX (Index to Canadian Mineral Occurrences)	15,000	Index-level: names, location, commodities, geology, references	Yes	CDC CYBER 730	IS/ATHENA in-house software (Cobol, Fortran, Pascal)	Yes	At present CANMINDEX is for internal GSC use only	-	1p/y	D. Garson 613-996-3399 R. Larmae 613-996-3413
	Energy, Mines & Resources	1. National Mineral Inventory 2. MINSYS	1. 19,498 2. 23,215	Name, owner, discovery year, method of discovery, province, geol. setting, location, deposit description, history, commodity, produc., cross-ref.	1. No 2. Yes	2. CYBER 730	2. S2K	Yes	1. Hardcopy 2. Printouts Tape	1. .25/ card 2. \$10 + .10/pg. \$62.50	5p/y	A. Sozanski 613-995-9466

SURVEY OF FEDERAL—PROVINCIAL MINERAL DEVELOPMENT AGREEMENTS

Province or Territory	Total \$ Value of Agreement (\$ million)	Cost Sharing Formula	Time Period	Delivery % Canada % Province	Major Components/Projects			Industry Involvement (e.g. Tech.Comm.)	Contact Person & Tel. No.
					Project Name	Budget (\$,000's)	Delivery (Prov. or Canada)		
B.C.	\$10	50/50	1985-1990	96% B.C. 4% Canada	Geoscientific Surveys - mapping - geochemistry - industrial minerals investigations Gescience Data Systems - MINFILE update Market, Technical & Feasibility Studies Financial Assist. for Mine Development - Engineering Studies Management, Public Info., Evaluation	6,750 450 750 1,800 250	90% B.C. 94% B.C. 100% B.C.	Industry Technical Liaison Committee advises on projects	G. McKillop (604) 387-5975
Sask.	\$6,380	N/A	1984-1989	50% Can. 50% Sask. Parallel Work Delivery	Geoscience Geophysics Mineral Deposits Geochemistry Gold Belt Geology Industrial Minerals Biogeochemistry Minerals Technology Mineral Development Public Information	5,340 1,000 500 700 2,690 50 400 400 400 240	41.2 Can. 51.8 Sask. 100 Can. 100 Can. 100 Sask. 100 Sask. 100 Sask. 100 Can. 100 Can. 79.2 Can. 20.8 Sask.	Sask. Geological Liaison Committee	J.E. Christopher
Manitoba	24.7	60% Fed. 40% Prov.	1984-89	60% Canada 40% Man.	Sector A Geoscientific Activities Sector B Research & Technology Sector C Development Studies Sector D Public Information, Evaluation and Administration	13,000 7,430 1,770 2,500	38.5% Man. 37.2% Man. 50% Man. 50% Man.	Mineral Exploration Liaison Committee Mining Liaison Committee	W.D. McRitchie (204) 945-6559
Ontario	\$30	50/50	1985-1990	63% Ont. 37% Can.	Geoscience Program Information Exchange Productivity & Technology Economic Development Public Information, Evaluation and Administration.	18,350 3,500 4,500	64% Ont. 100% Ont. 100% Ont. 96% Ont.	Program planning Review with Tech. Liaison Comm. prior to work plans submission. Discussion with industry groups prior to project proposals. Ongoing discussion with industry groups.	R. Watson (416) 965-1546

SURVEY OF FEDERAL—PROVINCIAL MINERAL DEVELOPMENT AGREEMENTS

Province or Territory	Total \$ Value of Agreement (\$ million)	Cost Sharing Formula	Time Period	Delivery % Canada % Province	Major Components/Projects			Industry Involvement (e.g. Tech.Comm.)	Contact Person & Tel. No.
					Project Name	Budget (\$,000's)	Delivery (Prov. or Canada)		
Quebec	\$100	50/50	1985-1990	96% Que. 4% Can.	5 Volets				
					1. Activités géoscientifiques	34,750	Quebec		J.L. Caty 643-1803
					2. Recherche et développement sur l'amiante	8,000	Quebec-Canada		a déterminer
					3. Infrastructure de développement minéral	42,000	Quebec		A. Jean 643-4896
					4. Désenclavement de l'industrie québécoise du minéral de fer	15,000	Quebec		G. Richard 643-4410
					5. Information au public	250	Quebec		M. Lecours 643-1803
N.B.	\$22.3		1984-1989	30% N.B. 60% Can.	GEOSCIENCE				
					Metallic Mineral Dep.	3,020	26% N.B.		ADM-R.R. Potter
					Regional Geology	3,590	39% N.B.		North-
					Geochemistry	300	0% N.B.		J.J. Davies
					Geophysics (Gravity Surv.)	2,110	11% N.B.		Central-
					Surficial Geology and Till Geochemistry	1,900	0% N.B.		L.R. Fyffe
									South-A.A. Ruitenberg
					Geoscience Compilation	1,153	100% N.B.		GSC-F.D. Anderson
					Drill Hole Core Mgt.	300	100% N.B.		W.H. Poole
					MINING & MINERALS TECH.				
					Ferric Chloride Leach Process	1,700	0% N.B.		G. Greer or D. Barnett (506)
					Manganese Processing	200	0% N.B.		
					Evaluation of Aggregates	500	0% N.B.		
					Potash Mineralogy	200	0% N.B.		
					Backfill-Potash Mines	400	0% N.B.		
					Dewatering in Coal Min.	125	100% N.B.		
					Peat Geochemistry	150	100% N.B.		
					ECONOMIC DEVELOPMENT				
					Manganese Market Review	100	0% N.B.		G. Greer or D. Barnett
					Processing Opportunities	400	0% N.B.		
					Commodity Studies	850	30% N.B.		
					Resource Manag. Str.	2,511	100% N.B.		
					Metall. Assist.-Small Firms	1,000	0% N.B.		
					PUBLIC INFORMATION, EVALUATION, ADMIN.				
					Public Awareness	117	100% N.B.		D. Carroll (506)
					Prospecting Courses	181	100% N.B.		
					Evaluation, Administration	1,500	0% N.B.		453-2206
Nova Scotia	\$26.945	60/40	1984-1989	60% Can. 40% N.S.	GEOSCIENCE	14,507	62% Can. 38% N.S.	Technical Liaison Committee (902) Programs	J.D. Keppie MDA Coord. 424-4700
					- Regional Surveys				
					- Mineral Deposits				
					- Metallogeny		Reviews		
					- Tectonics				
					- Geochemistry				
					- Pleistocene				
					MINERAL TECHNOLOGY	4,982	66% Can. 33% N.S.		
					- Commodity Studies				
					- Minerals Testing				
					DEVELOPMENT STUDIES	1,841	48% Can.	52% N.S.	
					- Market Studies				
					- Inventory Files				
					- Core Library				
					MINERAL INVESTMENT STIMULATION PROGRAM (MISP)	1,600	80% Can. 52% N.S.		
					PUBLIC INFORMATION	1,215	37% Can. 63% N.S.		
					ADMINISTRATION	2,800	47% Can. 53% N.S.		

SURVEY OF FEDERAL—PROVINCIAL MINERAL DEVELOPMENT AGREEMENTS

Province or Territory	Total \$ Value of Agreement (\$ million)	Cost Sharing Formula	Time Period	Delivery % Canada % Province	Major Components/Projects			Industry Involvement (e.g. Tech.Comm.)	Contact Person & Tel. No.
					Project Name	Budget (\$,000's)	Delivery (Prov. or Canada)		
Newfoundland	\$22	50/50	1984-1989	45% Nfld. 55% Can.	Geoscientific Surveys	16,400	52% Nfld	Technical Liaison Comm. (Indus. & Univers.) advises on projects	B. Greene (709)
					Mining & Mineral Tech.	2,100	29% Nfld		576-2763
					Economic Develop. Studies	1,500	17% Nfld		
					Public Information, Evaluation and Administration	2,000	30% Nfld		
Yukon	\$3.9	90/10 Can/Yukon	1985-1990	100% Can.	Geochemistry	2,200	100% Can. (GSC)	Yukon Ch. of Mines on all Management and Technical Advisory Committees	A. Clark, Min. Policy EMR, Ott. (613) 995-9466
					Geological Mapping	1,100	100% Can. (DIAND)		J. Morin (403) 668-5151
					Placer Mining Technology	600	100% Can. (DIAND)		C.H. MacDonald DIAND (403) 668-5151

TABLES SUMMARIZING MINING RIGHTS LEGISLATION IN THE PROVINCES AND TERRITORIES

Mining rights (dispositions) are the legal vehicles through which the owners of the minerals, the Provinces and Canada, grant to the public exclusive rights to search for, develop and mine those minerals.

Figures 1 to 5 are tables of data that summarize selected elements of mining right legislation in the ten provinces and two territories. Elements selected are those that deal with obtaining and maintaining a mining right.

Figures 1, 2 and 3 contain the raw data as specified in each provincial and territorial piece of legislation. The data is organized under the three stages of progression of a mineral showing to a producing mine, i.e. exploration, development and production, with some overlap. These three stages are correlated with the advancing levels of mining rights, as follows:

STAGE	MINING RIGHT
1. exploration and development	claim
2. development and pre-production	early lease (licence in eastern provinces) — production not a condition of the lease
3. production	late lease (lease in eastern provinces) — production generally a condition of the lease

Because of varying claim sizes and use of both Imperial and metric measure, Figures 1 to 3 have limitations in their usefulness for comparisons between jurisdictions, especially with respect to required work and fees. Thus, Figures 4 and 5 have been constructed to provide for direct comparison of these two elements. Part A of Figure 4 repeats the raw data for required work while Part B shows the same data mathematically averaged, based on a 40 acre (16 ha) claim. In Figure 5, the fees for recording and renewing claims are also converted to a 40 acre (16 ha) claim size and licence and lease rentals are expressed as \$ per ha per year.

The reader is advised that, because of the on-going process of amendment to legislation, some data may be obsolete by the time of publication of these tables. The reader is also cautioned that these tables are not a substitute for actual legislation nor should they be used as such.

In order to accomplish completeness of data in a convenient size, it is necessary to make considerable use of the following abbreviations and symbols:

ft	feet	L	length
m	metres	W	width
ac	acres	≤	not greater than
ha	hectares	max	maximum
t	tonnes	min	minimum
mos	months	ug	underground
yr(s)	year(s)		

Figure 1. Exploration and development

	YUKON	NWT	B.C.	ALBERTA	SASKATCHEWAN
Enacted (last amend)	1952 (1984)	1977 (1979)	1977 (1982)	1984	1961
Ground/map staking	ground	ground	ground	map	ground
Name	mineral claim	claim	(a) mineral claim of 1 to 20 units (b) 2-post claim (by indiv. only)	metallic minerals exploration permit	mineral claim
Basic claim	How staked	2 posts, line between marked, max 8 claims/yr within 10 mi. rad.	4 corner posts and at 1500 ft on ext bndry, bndry marked before recording	(a) legal corner post and at 500 m on ext bndry, bndry marked (b) 2 posts, line between marked	(a) surv. area: legal subdivision (b) unsurv. area: 4 corner posts, bndry marked
Size	L \times 1500 ft W \times 1500 ft 51.65 ac (20.9 ha)	\times 2582.5 ac (= 50 at 1500 ft), sides are mult. of 1500 ft. L \times 5W	(a) unit: 500 m (25 ha) (b) 2-post claim: 457.2 m (1500 ft) 20.9 ha (51.65 ac)	16 to 9216 ha.	(a) 40 ac (b) \times 40 ac side \times 1980 ft
Block	Size		25 to 500 ha \times 8 units in one direction		L \times 6W (a) 1½ to 24 sect. (b) 960 to 15,360 ac
Bearing of boundaries	any	astronomic	(a) astronomic (b) any	astronomic	astronomic
Time marked on no. 1 post	date only	placing of post and compl'n of claim	(a) commencement and completion (b) date only	N/A	claim: commenc't block: completion
Max. time to affix tags	as soon as reas.poss. after recording	when staking (write on tags)	when staking (write on tags)	N/A	1 yr from recording
Max. days to record	15 + extra dep. on distance	60	30	N/A	(a) - (b) 30
Recording fee (\$)	10/claim	0.10/ac	5/unit	25/permit	5/claim 0.15/ac for block
Term length x number	1 yr x unlim.	2 yrs plus 1 yr x 8	1 yr x unlim.	3 yrs, plus 2 yrs plus 2 x 1 yr	1 yr x 10
Renewal fee (\$) * Filing work	* 5/claim	* 0.10/ac	* 5/100 work	1st - 100, 2nd - 200 3rd - 250	0
Annual work \$/claim unless otherwise specif.	100	yrs (1 + 2) \$4/ac 3 + \$2/ac	yrs 1-3 100/unit 4 + 200/unit	First term \$10/ha Second term \$20/ha third and fourth term \$15/ha	claim: yrs 2-10 100 block: yrs 2-10 \$2.50/ac
Cash for work — Refund if work done	yes - no	yes - yes	yes - no	Deposit Refund - yes	yes - no
Limit for grouping work	16 claims/yr	5165 ac/yr (= 100 at 1500 ft)	100 claims/yr	1 claim per term	36 contiguous claims/yr
Limit for excess work credit	\$400/cl/yr	unlim.	10 yrs.	Credited towards primary lease term.	unlim.
Time after anniv. to file work rpts	6 mos (fee)	30 days	90 days	at anniversary date	90 days
Confidential period for work reports	lapse + 6 mos	upon lapse or 3 yrs	1 yr	1 yr after term or permit expiry	none with consent or upon lapse or 6 yrs
Prod'n permitted	yes	\times \$100,000/yr	if surveyed or \times 1000 t/yr	no	no
Other exploration rights	-	permit to prospect	reverted Crown-granted claim	none	permit, agreement

MANITOBA	ONTARIO	QUEBEC	N.B.	N.S.	P.E.I.	NFLD.
1975 (1981)	1960	1965 (1982)	1962 (1981)	1975	1978	1977 (1983)
ground	ground	ground	ground	map	map	(a) ground (b) map
mining claim	mining claim	claim development licence after yr 1 (yr 2 N of 52°)	mining claim	claim exploration licence for 1 to 80 claims	claim exploration licence for 1 to 80 claims	mineral claim
(a) surv. area: 1 + leg. subd'ns (b) unsurv. area: 4 corner posts and at 400 m on bdry, bndry marked	4 corner posts, bdry marked	4 corner posts, bdry marked, special rules in surv. area	4 corner posts in clockwise order, bdry marked	map selection	map selection	(a) 4 corner posts, bdry marked (b) map selection
16 to 256 ha L > 4W side > 400 m	(a) 1320 ft (40 ac) (b) aliquot part of subdivided lot	400 m (16 ha) in unsurv. area. other sizes in surv. area	400 m (16 ha)			(a) 400 m (16 ha) (b) 500 m (25 ha)
		dev. lic. > 90 ha		40 to 3200 ac	40 to 3200 ac	(a) 16 to 64 claims (256 to 1024 ha) L > 4W
astronomic	astronomic	astronomic	astronomic	astronomic	astronomic	astronomic
completion	commencement (compl'n proposed)	commencement	commencement	-	-	completion
at staking if pre- purch., 1 yr from rec'ding if purch. at rec'ding	6 mos. from recording	when staking	3 mos. from recording	-	-	during staking
30	31	15 + max 30 extra dep. on distance	30	-	-	30
5/claim	10/claim	0	4/claim	4/claim	5/claim	5/claim
2 yrs plus 1 yr x unlim.	1 yr x 5	cl.-1 yr, 2N of 52 lic. 1 yr x unlim.	1 yr x 4	1 yr x 8	1 yr x 5	1 yr x 5
*2/claim	0	.60/ha	2/claim	4/claim	5/claim	-
yr 2-10 \$12.50/ha 11+ \$25.00/ha	yr 1 20 days 2-4 40 days 5 60 days	yr 1 \$5/ha 2+ \$10/ha N of 52° yrs (1+2) \$15/ha	25 days/yr (day = \$5)	10 days/yr (day = \$20)	\$5/ac	yr 1 (a)200 (b)300 2 250 375 3 300 450 4 350 525 5 400 600
yes - yes	no	yes - no	any yr: yes - yes yr 1: \$10 - no	any yr: yes - yes	yes - yes	no but ext'n up to 1 yr with deposit
1600 ha/yr	4000 days/appl'n (more for drilling)	480 ha	contiguous claims	an expl. licence (80 claims)	an expl. licence (80 claims)	contiguous claims
unlim.	unlim.	unlim.	10 yrs.	unlim.	unlim.	unlim.
60 days	10 days	30 days	10 days	15 days	15 days	60 days
none with consent or upon lapse	none	discretionary on request	none (2 yrs for reg'l work on req)	2 yrs	2 yrs plus 1 yr on request	upon lapse or 3 yrs
no (without consent)	no	no	no	no	no	no
permit agreement	agreement	exploration permit in New Quebec	agreement	agreement	agreement	reserved area licence

(a) ground staked; (b) map staked

Figure 2. Development and pre-production (production not a condition)

	YUKON	NWT	B.C.	ALBERTA	SASKATCHEWAN
NAME	lease (of claim)	lease (of claim)	mining lease	lease (1st & 2nd terms)	(a) lease (b) developed area (by expenditures)
Boundary survey	yes	yes	yes	no	(a) marked or surveyed
Other conditions for obtaining	certif. of improvements (\$500 spent, min. dep. found, post notice)	\$10/ac spent (\$4 tren. strip, drill, ug); undertake to commence prod'n	post & publish notice of intent	approved assess. report on permit	(b) \$100/ac spent, min \$50.00 ug
Size limits	1 claim	1 claim (max 2582.5 ac)	max 40 units or 2-post claims	min 16 ha	(a) none (b) max 1440 ac
Term renewal conditions	21 yrs. renewable if satisfy Min. that cond'ns of lease complied with	21 yrs renewable indef. subj. to prescr. condn's	max 21 yrs. renewable indef	Primary term - 10 years renewable to 15 years	(a) max 21 yrs renewable indef. (b) as per dis'p'n
Rent (ann. unless otherwise spec.)	\$50/1st term \$200/2nd term	\$1/ac less red'n to 50% for tren, strip, drill, ug	0	\$2.50/ha	(a) 0 (b) \$1/ac, min \$200
Annual work	none		\$400/unit or 2-post claim	\$10/per year prior production	(a) \$5/ac (b) none

MANITOBA	ONTARIO	QUEBEC	N.B.	N.S.	P.E.I.	NFLD.
lease (1st & 2nd terms)	lease (of mining rights)	development licence (cont'd)	mining licence	development licence	development licence	extended licence
yes - unsurv.area ? - surv.area	yes - unsurv.area ? - surv.area	no	yes	no	no	no
\$625/ha spent, lesser am't subj. to geol. & econ.		see Stage 1		suff. work to prove up a min'l deposit	suff. work to prove up a min'l deposit	compliance with terms of initial licence
max 800 ha L > 6W	none	max 90 ha	none	max 80 claims	max 80 claims	none
21 yrs. renew once without prod'n if \$1250 spent or prod'n on adj. lease or fully explored or prod'n unwarr.	21 yrs renewable indef.	1 yr renewable indef.	1 yr renewable indef.	1 yr renewable indef.	1 yr renewable indef.	one term max 5 yrs
\$7.50/ha, min \$80	term 1, yr 1 \$1/ac yrs 2+ .25/ac terms 2+ .50/ac	\$.60/ha	\$.62/ha	\$1/ac	\$1/ac	\$3/ha
none, unless needed for renewal	none	\$10/ha	25 days/16 ha (day - \$5)	as prescribed by Minister	as prescribed by Minister	(a) 1600/claim (b) \$900/claim

(a) ground staked; (b) map staked

Figure 3. Production (production generally a condition)

	YUKON	NWT	B.C.	ALBERTA	SASKATCHEWAN	MANITOBA
NAME	lease (3rd term +)	lease (of claim)	certified mining lease	lease	developed area (by production)	lease (3rd term +)
Boundary Survey	done previously	yes	yes	done	developed area (by production)	done previously
Other conditions for obtaining	as prescr. by Gov. in Council	\$10/ac spent (4\$ tren, strip, drill, ug); undertake to commence prod'n	in production	none	mandatory if in commerc'l prod'n	mining or on standby
Size limits	1 claim (per stage 2)	1 claim (max 2582.5 ac)	max 40 units or 2-post claims	min 16 ha	max 1440 ac	max 800 ha L & 6W (per stage 2)
Term. renewal cond'ns	21 yrs. renewable indef. per cond'ns prescr. by Gov. in Council	21 yrs. renewable indef. subj. to prescr. cond'ns	to 21 yrs renew. indef., decert'd upon appl'n by lessee if prod'n ceases	15 years renewable	to 21 yrs. renew indef. as long as in prod'n treat ore in Sask.	21 yrs renewable indef. if in prod'n or on standby. treat ore in Canada
Rent (ann. unless otherwise spec.)	\$200/term	\$1/ac less red'n to 50% for tren, strip, drill, ug	\$10/ha	\$2.50/ha	\$1/ac min \$200	\$5/ha min \$80
Annual work	none		none	none	none	none

	ONTARIO	QUEBEC	N.B.	N.S.	P.E.I.	NFLD.
	patent (= grant)	mining lease	mining lease	mining lease	mining lease	mining lease
	yes - unsurv.area ? - surv. area	yes - unsurv.area ? - surv. area	yes	yes	yes	yes if ground- staked
	1 yr continuous prod'n	reas. indic'n of economic min. dep. prod'n within 2 yrs	plans for mining & reclam'n	prod'n plans for mining & reclam'n	prod'n plans for mining & reclam'n	prod'n within 5 yrs
	none	max 90 ha/yr granted (to 400/yr with gov. appr'l)	min - 1 claim max - none	min - 1 claim max - 16 claims	max 12 claims	none
	grant in fee simple, treat ore in Canada	1st - 5 to 20 yrs; 3 ren'ls to 10 yrs each if mining 1/10 prev. term; ex- tension possible	21 yrs renewable to 84 yrs	20 yrs renewable so long as mine operated	20 yrs renewable so long as mine operated	1st - to 25 yrs renewable for terms to 10 yrs each
	-	\$2.50/ha	\$2.47/ha	\$1/ac	\$1/ac	\$40/ha
	-	none	25 days/16 ha (day = \$5)	work or mining or both	work or mining or both	none

Figure 4. Summary of required work, years 1 to 10

	YUKON	N.W.T.	B.C.	ALTA.	SASK.	MAN.	ONT.	QUE.	N.B.	N.S.	P.E.I.	NFLD ⁴
Max. claim life	unlim.	10 yrs	unlim.	7 yrs	10 yrs	unlim.	5 yrs	unlim.	4 yrs	5 yrs	5 yrs	10 yrs
Basic claim size	51.65 ac	variable	25 ha	variable	40 ac	variable	40 ac	16 ha	16 ha	40 ac	40 ac	16 ha ⁴

PART A

	YR 1	100		100		0	0	20 days	\$5/ha	125	200	\$5/ac	200
	2	100	\$4/ac	100	\$10/ha	100	\$12.5/ha	40 days	10/ha	125	200	5/ac	250
	3	100	2/ac	100		100	12.50/ha	40 days	10/ha	125	200	5/ac	300
Required work as prescribed	4	100	2/ac	200	20/ha	100	12.50/ha	40 days	10/ha	125	200	5/ac	350
	5	100	2/ac	200		100	12.50/ha	60 days	10/ha	125	200	5/ac	400
\$/claim unless otherwise spec.	6-10 per yr	100	2/ac	200	15/ha	100	12.50/ha	0 ¹	10/ha	125 ¹	200 ³	5/ac ³	600

PART B

	YR 1	77.5	80	64		0	0	200 ²	80	125	200	200	200	108.9
	2	77.5	80	64	160	100	200	300 ²	160	125	200	200	250	153.0
	3	77.5	80	64		100	200	400 ²	160	125	200	200	300	165.5
Required work converted to \$/40 ac or 16 ha	4	77.5	80	128	320	100	200	500 ²	160	125	200	200	350	183.4
	5	77.5	80	128		100	200	600 ²	160	125	200	200	400	195.9
	6-10 per yr	77.5	80	128	240	100	200	600 ²	160	125	200 ³	200 ³	600	209.2
AVERAGE, YRS 1-10		77.5	80	108.8	103	100	180	500 ²	152	125	200 ³	200 ³	450	186.1

1. Where maximum claim life exceeded, required work for next stage is used.
2. As proposed in Discussion Paper, Ontario Ministry of Natural Resources, 1982.
3. Estimated (not specified in legislation).
4. Ground staked claim.

* 7 years total

Figure 5. Summary of Fees

	YUKON	N.W.T. ¹	B.C. ¹	ALTA. ¹	SASK.	MAN. ¹	ONT.	QUE.	N.B.	N.S.	P.E.I.	NFLD.	AVG.
Individual Prosp. Licence \$/yr		5.00	25.00				5.00	10.00	10.00	-		-	11.00
Corporate Prosp. Licence \$/yr		50.00	500.00				25.50, 100		25.50, 100				150 to 187.50
Set of claim tags \$/claim	0	1.00	2.00		1.00	2.00	0	0	1.00			2.00	1.00
\$ per 40 ac or 16 ha	Record grnd. claim (unit)	7.77	4.00	3.20	5.00	.625	10.00	0	4.00			5.00	4.40
	Grant map permit (lic.)			0.4		-	-	-	-	2.00	5.00	4.80	3.89
	Renew grnd. claim (unit)	0	0	0	0	0	0	9.60	2.00				
	Renew map permit (lic.)			0						2.00	5.00	0	2-.65
	File work	3.87	4.00	4.48 5 yr av.	0.48	.25	0	0	0	0	0	0	-
Rent: licence or lease \$/ha/yr	non-prod. tms 1&2	.28	-	0	2.50*	(a) 0 (b) 2.47	7.50 tms 1&2	.97 tms 1&2	.60	.62	2.47	2.47	3.00
	prod. tms 3+	.46 tms 3+	2.47	10.00	2.50	2.47	5.00 tms 3+ (grant)	-	2.50	2.47	2.47	2.47	40.00
													6.62

1. In these jurisdictions a claim (permit, licence) ranges in size. The middle of the range is used where appropriate.

* lease only

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