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REPORT OF THE QUEBEC DEPARTMENT OF NATURAL RESOURCES 1968 / 69

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report of the québec department of natural resources

1968/69

report of the québec department of natural resources

1968 / 69

To His Honor
The Lieutenant-Governor HUGUES LAPOINTE, P.C., Q.C.,
Quebec

Your Honor:

I have the pleasure to submit to you the report
of the Department of Natural Resources
for the fiscal year ending March 31st, 1969.

Your respectful servant,

PAUL-E. ALLARD,
Minister of Natural Resources

Quebec, March 1, 1970

HONORABLE PAUL-E. ALLARD,
Minister of Natural Resources,
Quebec, Que.

Sir:

I have the honor to submit to you
the annual report of the Department
of Natural Resources covering the fiscal year
extending from April 1st, 1968, to March 31st, 1969.

It is made up of notes prepared
by the directors and the chiefs of services.

Your obedient servant,

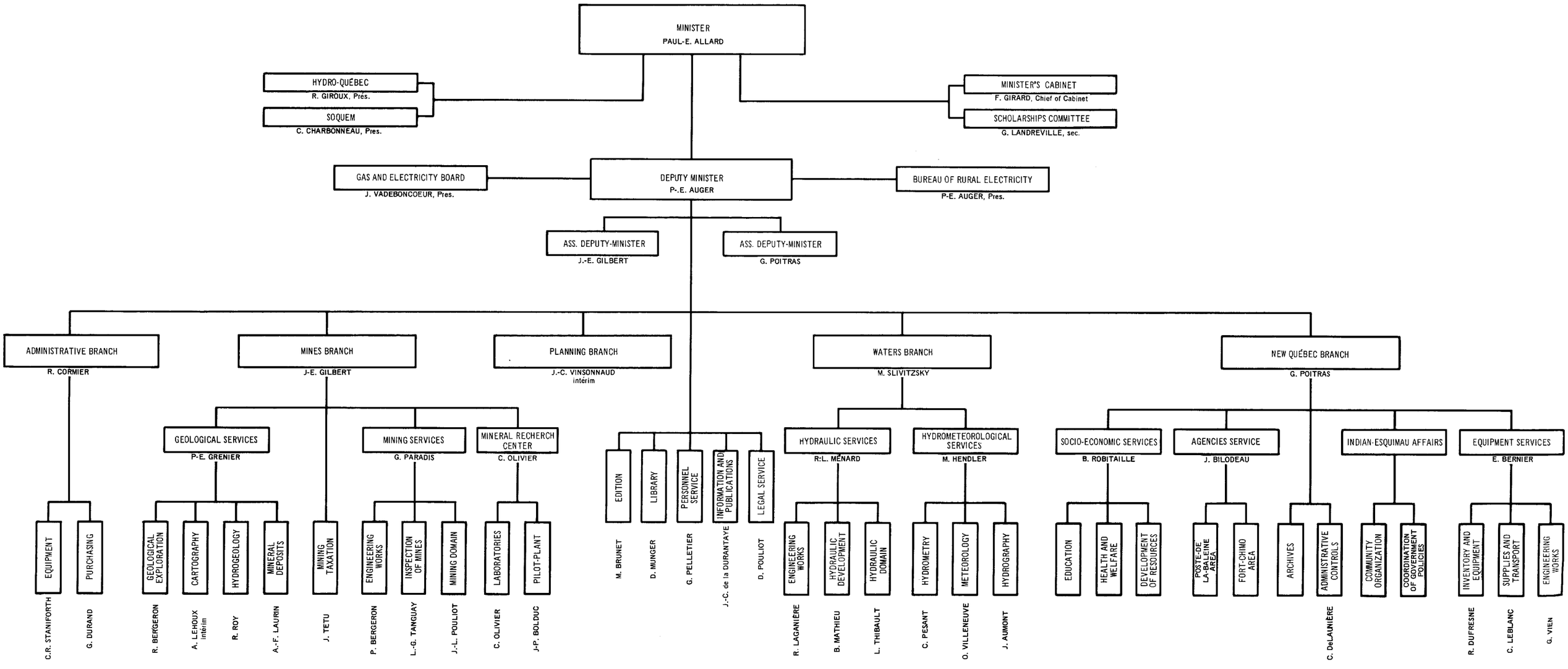
P.-E. AUGER,
Deputy Minister

Quebec, February 28, 1970

GOUVERNEMENT DU QUÉBEC

DEPARTMENT OF NATURAL RESOURCES

DIAGRAM OF UPPER ADMINISTRATIVE STRUCTURE



DECEMBER 1969

LIST OF BRANCHES AND SERVICES WITH NAMES OF CHIEFS

OFFICE OF THE MINISTER	
Chief of the Office	F. GIRARD
Scholarships Committee	G. LANDREVILLE
OFFICE OF THE DEPUTY MINISTER	
Assistant Deputy Minister	J.-E. GILBERT
Assistant Deputy Minister	G. POITRAS
Program Adviser	C.-E. DESLAURIERS
Information Service	J.-C. DE LA DURANTAYE
Personnel Service	G. PELLETIER
Legal Service (Department of Justice)	D. POULIOT
Editing	M. BRUNET
Library	D. MUNGER
ADMINISTRATION BRANCH	R. CORMIER
Accounting Service (Department of Finance)	R. PLANTE
Purchasing Service	G. DURAND
Equipment Service	C. R. STANIFORTH
PLANNING BRANCH	J.-C. VINSONNAUD (interim)
MINES BRANCH	J.-E. GILBERT
Mining Taxation Service	J. TETU
Geological Services	P.-E. GRENIER
Geological Exploration Service	R. BERGERON
Mineral Deposits Service	A.-F. LAURIN
Regional Geological Office:	
Rouyn-Noranda, at Rouyn	J. MACINTOSH
Val-d'Or – Matagami, at Bourlamaque	M. LATULIPPE
Chibougamau – Bachelor Lake, at Chibougamau	J. CIMON
Gaspesia, at Sainte-Anne-des-Monts	G. DUQUETTE
Hydrogeology Service	R. ROY
Cartography Service	A. LEHOUX (interim)
Mining Services	G. PARADIS
Mining Domain Service	J.-LS POULIOT

District Registrars at:	
Quebec	R. Langlois
Amos	D. Asselin
Chibougamau	R.-H. Lefebvre
Rouyn	T.-H. Théberge
Montreal Agency	R. Richer
Bourlamaque Agency	M. Roy
Inspection of Mines Service	Ls-G. Tanguay
District Inspectors at:	
Montreal	M.-O. Lafontaine
Noranda	G. Duchesne
Thetford	F. Cloutier
Quebec	G. Moscu
Chibougamau	D. Schnubel (Noranda)
Engineering Works Service (Mines)	P. Bergeron
Mineral Research Center	C. Olivier
Laboratories Services	C. Olivier
Pilot Plant Services	J.-P. Bolduc
WATERS BRANCH	M. Slivitzky
Hydraulic Services	R.-L. Ménard
Engineering Service (Waters)	R. Laganière
Hydraulic Domain Service	L. Thibault
Hydraulic Development Service	B. Mathieu
Hydrometeorological Services	M. Hendler
Hydrography Service	J. Aumont
Hydrometry Service	C. Pesant
Meteorology Service	G.-O. Villeneuve
NEW QUEBEC BRANCH	G. Poitras
Administrative Controls	C. DeLaunière
Archives	
Equipment Services	E. Bernier
Engineering Works (New Quebec)	G. Vien
Supplies and Transport	C. Leblanc
Inventory and Equipment	R. Dufresne
Indian-Esquimo Affairs Service	
Coordination of Government Policies	
Community Development	
Agencies Service	J. Bilodeau
Poste-de-la-Baleine District	
Fort-Chimo District	
Socio-economic Services	B. Robitaille
Resources Development	
Health and Welfare	
Education	

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OFFICE OF THE DEPUTY MINISTER

Information Service

During the fiscal year 1968/69, the Information Service participated in two main events which identified the period with Quebec's activity in the field of mining: namely — the Canadian Office on Coal, held in Quebec City, and the Annual Meeting of the Provincial Ministers of Mines, which also took place in Quebec.

In respect of these two meetings, the Information Service was responsible for bringing to the attention of the general public and specialized groups the message presented by these organizations during their sessions.

Occasionally, the Department of Natural Resources communicates with the public through exhibitions. In this domain, the general project that the Bureau of Information and Publicity must elaborate not having been completed, the Exhibitions Division conducted its work on a reduced scale. As in past years, the Department did, however, among other things, take a very active part in the "Geology Week" that was held at the École Polytechnique in Montreal.

The Information Service pursued the orientation campaign that it has been conducting in the high schools of Quebec during the past 3 years for the purpose of facilitating the recruiting of future geologists, mining engineers and other specialists for the mining industry of Quebec.

The Editing Division and the Distribution of Publications Division had another active year insofar as the number of printed and distributed publications was concerned. During the period under review here, the Editing Division published an important volume entitled: "Catalogue of Publications, by the Quebec Department of Natural Resources". This work is divided into two parts: the first consists of four chapters (Mines — New Quebec — Waters — Maps); the second contains four sections in alphabetical order (Authors — Areas — Substances — Miscellany). This volume provides an excellent reference for those wishing to consult the Department's publications dealing either with geological maps or with various published works.

The Library Division continued to further its expansion activity during the year 1968/69.

Editing Division

Following is a list of brochures edited and published by the Editing Division during the fiscal year 1968/69:

Preliminary Geological Reports

564 – Harricanna – Turgeon Area, by J. H. Remick
569 – Drummondville Area (East Part), by Yvon Globensky
570 – Drummondville Area (West Part), by Yvon Globensky
572 – Baskatong Reservoir Area (West Half), by R. S. Jacoby
573 – Northwest Quarter of McKenzie Township, by Gilles Duquette
574 – Lac des Chefs Area, by Richard Hardy

Final Geological Reports

128 – Squatec – Cabano Area, by P.-J. Lespérance and H. R. Grenier
136 – Grand-Détour – Village Lakes Area, by P. R. Eakins and T. Hashimoto

Hydrogeology Service Publications

H.G.P. – 1 – Levés hydrogéologiques ponctuels effectués entre 1954 et 1967, by Raymond Roy

Meteorological Service Publications

M.P. – 19 – Sommaire des intensités et des fréquences des pluies au Québec (1938–67)
M.P. – 20 – Bibliographie climatologique du Québec, by G.-O. Villeneuve

Hydrometry Service Publications

A.H. – 5 – Annuaire hydrologique (1966)

Hydraulic Development Service Publications

R – 5 – Rivière Chaudière, étude de l'atténuation des crues, by Bernard Harvey et al.
R – 5A – Idem, Annex "A": Hydrologie, by Bernard Harvey et al.
R – 5B – Idem, Annex "B": Barrages, by Louise Blais-Leroux et al.
R – 5C – Idem, Annex "C": Laminage des crues, by Bernard Harvey et al.
R – 5D – Idem, Annex "D": Rentabilité, by Yves Raymond et al.

Special Series Publications

S – 94 – Le guide téléphonique du ministère
S – 111 – Annual Report of the Department of Natural Resources

Special Papers Publications

S.P. – 1 – Siluro-Devonian Rocks of Lake Memphremagog, by Arthur J. Boucot and Georges Drapeau

S.P. – 3 – Study of the Erosion Phenomena and the Unconsolidated Rocks of the Baie-Saint-Paul – Saint-Urbain Area, by Jean-Yves Chagnon

Popular Geology Series Publications

P.G. – 2 – The Geologic History of the Percé Area, by H. W. McGerrigle
P.G. – 3 – Montmorency Falls, by R. Bureau and J. Riva
P.G. – 4 – The Geologic History of the Forillon Peninsula and Cap Bon Ami Provincial Park, by H. W. McGerrigle

Reprinted Publications

One final geological report
One final meteorological report
Six special series reports

Distribution of Publications

The following is a summary of the work accomplished by the personnel responsible for the distribution of publications in 1968/69:

Publications distributed free of charge: 46,068 (maps excluded);

Publications sold: 6,438 reports and 11,174 maps;

Notices and press releases announcing the publication of 4 geological reports, 3 preliminary geological reports, 5 separate brochures, 188 different maps and 5 communiqués of various types, for a cumulative total of 28,930 copies;

Collections of mineral and rock samples: 1,704 collections sold and 91 distributed free of charge;

Pamphlets and meteorological bulletins distributed free of charge: 38,537 copies.

Library Division

During the fiscal term under review here, the Library Division gave special attention to reviews. The inventory just completed shows that there are now some 700 reviews in the Department's library. A list of these periodicals will be published in 1969/70 for distribution among the principal user of this service.

The library received, during the year reviewed, 2,807 new publications. These volumes consisted of 1,480 books and 1,324 brochures. A large number of these publications were supplied to the Department free of charge. One might also mention that about 200 geological maps and other documents were received by the library without charge for the most part.

The number of volumes lent increased to 4,691, of which 45 were to sources outside the Department. On the other hand, 298 volumes were borrowed from

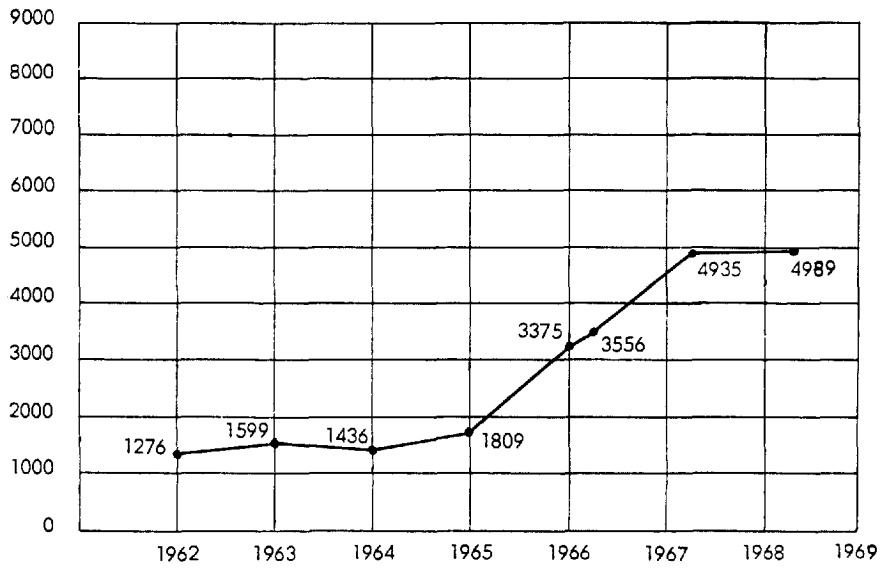
libraries other than that of the Library Division. Moreover, 3,386 visitors came to the library to consult its volumes.

The Library Division cancelled 535 subscriptions to periodicals, of which 130 were free. Moreover, 48 subscriptions of members of various organizations and associations were paid from the library's budget. It is worthy of note that the total number of books and brochures (not counting bound periodicals) in the library of the Department is now in excess of 36,000.

Activities of the library's lending section are demonstrated below.

STATISTICS

PUBLICATIONS LENT



NOTE :
The above totals do not include publications consulted in the library.

Personnel Service

1. ESTABLISHMENT AND CONTROL OF PERSONNEL

The Personnel Service was engaged firstly in establishing the personnel and then in assuming its control throughout the administrative units of the Department of Natural Resources. This was done in collaboration with the Administration Branch of the Department and the Personnel Analysis Service of the Treasury Council.

As of April 1, 1968, there were 810 regular employees in the various services of the Department, whereas, on March 31, 1969, this body comprised 832 civil servants and workmen. These persons were distributed according to the following employment categories:

DEPUTY MINISTER		1
OFFICIALS AND ASSISTANTS		33
PROFESSIONALS		187
Cultural officer	1	
Personnel administration officers	3	
Financial administration officers	4	
Research and socio-economic planning officers	13	
Land surveyors	3	
Administration staff	9	
Librarians	2	
Biologists	3	
Engineers	94	
Forestry engineers	2	
Specialists in the science of education	3	
Specialists in physical sciences	49	
Physicist (part-time)	1	
CIVIL SERVANTS		568
Administration officers	19	
Office agents	127	
Auditing officers	3	
Assistant technicians	31	
Research and information assistants	4	
Office clerks	36	
Typists	23	
Secretariate staff	90	
Nurse	1	
Inspectors with the Gas and Electricity Board	37	
Stock-keepers	9	
Polycopying machine operators	2	
Perforated-card operator	1	
Technicians in applied arts and graphics	2	
Technicians in electrical and mechanical equipment	9	
Laboratory technicians	32	
Mines technicians	16	
Technicians in hydric resources	70	
Technicians in topography	26	
Public works technicians	29	
Laboratory assistant (part-time)	1	

WORKMEN		43
Mobile equipment drivers	1	
Heavy vehicle drivers	5	
Camp cook	1	
Sampler	1	
Guardians	3	
Dam guardians	10	
Handyman	1	
Laborers	5	
Store-keepers	2	
Mechanics	3	
Carpenters	3	
Plant carpenters	2	
Shipper	1	
Supervisors of material	4	
Laboratory workmen (part-time)	1	
GRAND TOTAL		832

It should be noted here that the 221 officers and university graduates, who were distributed among 14 professional bodies, and the 261 technicians and specialists, who were allocated to 13 civil servant bodies, represent 58 per cent of the total personnel. This fact provides very convincing evidence of the high scientific, technical and specialized nature of the activities of the Department of Natural Resources.

2. PERSONNEL TURNOVER

During the fiscal year 1968/69, 12 professionals left the Department and 19 entered its employ. In the civil service group 34 departures were registered and 46 new employees were recorded. Among the workmen, three new employees were engaged and none left.

The following table indicates the personnel turnover by group with respect to the engagement and leaving of employees, as well as the reason for their actions.

ENTRY AND DEPARTURE OF EMPLOYEES

April 1, 1968 — March 31, 1969

	Prof.	*C. Ser.*	*Workmen*	*Total*
Number of Employees as of 1-4-68				810
Departures:				
resignations	8	25	0	
changes	2	3	0	
retirements	1	5	0	
deceased	1	1	0	
Total	12	34	0	
New employees	19	46	3	
Variation	7	12	3	22
Number of Employees as of 31-3-69				832

3. RECRUITMENT AND EMPLOYMENT

(1) *Regular employees*

As illustrated in the foregoing table, 19 professionals, 46 civil servants and three workmen were recruited and engaged in order to fill vacant posts.

Professionals are generally recruited directly by the chiefs of technical services. In such cases, the Personnel Service acts as liaison between the chiefs of services and the Civil Service Commission and transmits to this latter body all documents pertaining to the recruited candidates as submitted by the service chiefs. The Commission verifies the qualifications of the candidates in respect to the proposed employment and approves their eligibility.

In regard to civil servants and workmen, they are recruited from candidates who have been previously declared eligible by the Civil Service Commission.

(2) *Part-time employment*

(a) *Summer employment.* In order that the various services of the Department may be able to realize their program of activities as proposed for the summer season, 238 professors and students were hired in 1968. The following table shows that, of the number engaged, 210 were absorbed in the Department's technical services, the main employment being with the Geological Exploration Service (82), the Mineral Deposits Service (35), and the Hydrography Service (33).

It should be of some interest to point out here that, in addition to the 238 requests for employment that were accepted, the Personnel Service was obliged to study and refuse 530 other applications for work which were forwarded to it by professors and students in quest of summer employment.

(b) *Other part-time employment.* By virtue of Order in Council 1714, of October 5, 1966, the Department of Natural Resources was able to hire personnel other than on a full-time basis. These persons were engaged in work on a part-time basis.

Part-time employment becomes necessary when some specific work has to be carried out on certain occasions, such as in the construction and repair of a bridge, an access road, etc.

The Personnel Service also bas to call on part-time personnel in cases of urgency or in replacing certain employees absent because of illness or their annual vacation periods, or, again, to fill temporarily some posts that have become vacant because of the departure of an employee.

In this respect the Personnel Service was obliged to engage 4,493 part-time employees during the fiscal period 1968/69.

In the following table, the allocation of part-time employees hired during the 1968/69 fiscal term by the administrative body is recorded.

DISTRIBUTION BY THE ADMINISTRATIVE BODY OF THE PROFESSORS AND STUDENTS ENGAGED FOR THE SUMMER OF 1968

Administrative Body	*Number*
Office of the Minister	2
Office of the Deputy Minister	1
Administration Branch	3
Information Service	5
Personnel Service	2
Equipment Service	5
Laboratories Services	5
Pilot Plant Services	2
Geological Exploration Service	82
Mineral Deposits Service	35
Peat-bogs Division	9
Hydrogeology	7
Mining Domain Service	1
Archives Division (Mines)	3
Hydraulic Engineering Service	11
Hydraulic Domain Service	10
Hydraulic Development Service	2
Hydrometry Service	10
Meteorology Service	4
Hydrography Service	33
Archives Division (Waters)	3
New Quebec Branch	3
TOTAL	238

DISTRIBUTION BY THE ADMINISTRATIVE BODY OF PART-TIME EMPLOYEES IN 1968/69

Administrative Body	*Number*
Administration Branch	
Information Service	7
Secretariate	1
Personnel Service	1
Equipment Service	2
Legal Service	1
Mines Branch	3
Geological Exploration Service	148
Mineral Deposits Service	87
Cartography Service	
Hydrogeology Service	14
Engineering Works Service	50
Laboratories Services	4
Pilot Plant Services	9
Waters Branch	4
Hydraulic Engineering Service	338
Hydraulic Domain Service	10
Hydraulic Development Service	97
Hydrography Service	449
Hydrometry Service	551
Meteorology Service	1,705
Commission on the Legal Problems concerning Water	4
New Quebec Branch	983
Gas and Electricity Board	4
(French "coopérants")	12
(Students from the University of Sherbrooke)	8
TOTAL	4,493

4. IMPROVING QUALIFICATIONS

In 1968/69, the Department pursued its policy of improving the qualifications of its employees by granting them leaves of absence with half pay so that they could follow courses of studies in institutions of higher learning or in undertakings of a public nature either in Quebec or outside the Province or by recommending them to the Department of Education for scholarship grants.

In this respect, 14 employees of the Mines Branch, 12 from the Waters Branch, two from the Planning Branch, and two from the New Quebec Branch, for a total of 30 employees, were able to take advantage of improving their qualifications through study courses.

Moreover, upon the recommendation of the Department, 48 civil servants availed themselves of student bursaries, which made it possible for them to perfect themselves in their respective fields.

5. ADVANCEMENT

The fiscal period 1968/69 was, for the Government, a year for promoting advancement competitions as provided by the various regulations of the Civil Service Commission concerning professional and civil servant bodies.

Competition for advancement within the Department of Natural Resources were held for 102 candidates so that they could advance a class higher in the nine professional bodies.

On the other hand, 237 employees admitted to advance a class within the seven civil servant bodies were able to register for the tests.

The following table illustrates, by body and class, the professionals and civil servants admitted for advancement and it also indicates the percentage of success in the tests.

DISTRIBUTION, BY BODY AND CLASS, OF THE PROFESSIONALS ADMITTED AND RECOMMENDED FOR ADVANCEMENT

Body	Class				*Percentage of Success*
	III to II A.	III to II R.	II to I A.	II to I R.	
Cultural officers			1	1	100%
Financial administrative officers			4	1	25%
Research and socio-economic planning officers	3	3	2	1	80%
Land surveyors			3	2	67%
Librarians			1	1	100%
Biologists			1	1	100%
Engineers	11	7	29	29	90%
Specialists in the science of education			1	1	100%
Specialists in physical sciences	6	2	40	22	52%
TOTAL	20	12	82	59	70%

DISTRIBUTION, BY BODY AND CLASS, OF CIVIL SERVANTS ADMITTED AND RECOMMENDED FOR ADVANCEMENT

Body	Class				*Percentage of Success*
	II to I		I to Princ.		
	A.	R.	A.	R.	
Office agents	52	30	70	32	51%
Auditing officers	1	1	2	1	67%
Research and information assistants			1	1	100%
Secretariate staff *	21	10	37	18	48%
Nurses			1	1	100%
Stock-keepers			7	1	14%
Technicians	31	25	14	9	76%
TOTAL	105	66	132	63	54%

* **Steno-typist class considered as Class II**
Steno-secretary class considered as Class I
Secretary class considered as Principal Class

6. WORK RELATIONS

In this domain, it is virtually impossible to recount all the activities of the Personnel Service. The Service is obliged to interpret and manage four collective bargaining groups, which are the representatives intervening for the Government and the following syndicates:

the professionals' syndicate

the civil servants' syndicate

the workmen's syndicate; and

the teachers' syndicate (New Quebec)

Moreover, the Personnel Service has to act as liaison for the Department of Natural Resources and the central management units of personnel, such as the Civil Service Commission, the Treasury Council, the Work Relations Branch, the Advancement Branch, etc.

These various responsibilities imply that the members of the Service have to spend much of their time in private interviews or at general meetings with employees and the personnel of the management of the Department.

In addition to all these departmental activities, one might mention those that the three management officers of the Personnel Service have been obliged to exercise outside of the Department while taking part in the various inter-departmental study committees. These officers have been also called upon to offer their advice and suggestions to representatives of private counseling firms to which the Government has given the task of modernizing the system of management of its entire personnel.

Conclusion

The fiscal term 1968/69 was a very busy year for the Personnel Service.

Having at its disposition only two personnel management officers and six office employees up to November 1968, the Service was not able to meet its many duties and succeeded only with difficulty in responding to urgencies.

The arrival of a new personnel officer and another office employee in the middle of the year reviewed permitted the Service to improve considerably its effectiveness, both as to the quality and quantity of its work.

Not having as yet attained that efficiency that is judged indispensable to the Service so that it may be in a position to supply the management and employees of the Department all the services they have a right to expect from their Personnel Service, the coming year's activities are, nevertheless, viewed with optimism.

Legal Service

The Legal Service has the responsibility of studying problems of a legal nature with a view to solving them and of carrying out numerous other tasks relating to the application of the prescriptions of the Mining Act, the Mining Duties Act, the Watercourses Act, and pertinent Acts.

This Service provided assistance and counsel on all questions within its jurisdiction, especially those concerning the drawing up of leases and contracts, as well as the drafting of Orders in Council.

It made recommendations for the solution of a large number of conflicts and also started to plead cases before the Mining Tribunal.

The issuance of legal opinions constitutes an important part of the activities of the Legal Service.

These opinions are given upon request from the various directors of Branches and Services of the Department and deal with juridical problems which relate to these administrative units.

Legal opinions are also offered following requests from the general public.

SCHOLARSHIPS

During the university year 1968/69, the Legislature increased to $120,000 the amount to be placed at the disposition of the Department of Natural Resources for scholarships to students in mining engineering, geology, metallurgy, hydraulics, hydroelectricity, hydrology, and meteorology or other related sciences.

As in preceding years, the Minister appointed two separate selection committees to study the files of applicants for these scholarships.

Selection committees for the fiscal year 1968/69:

MINERAL SCIENCES

Eugène LAROCHELLE, Eng., chairman

Arthur DUBÉ, director, Department of Mines and Metallurgy, Faculty of Science, Laval University

Robert SABOURIN, director, Department of Geology, Faculty of Science, Laval University

Paul-E. RIVERIN, president, Corporation de l'École Polytechnique

J. S. STEVENSON, president, Department of Geological Sciences, McGill University

J.-E. GILBERT, director general of mines, Department of Natural Resources

Gisèle LANDREVILLE, secretary

HYDRIC SCIENCES

Yvon DEGUISE, commissioner, Hydro-Québec, chairman

Jacques-E. HURTUBISE, director, Department of Civil Engineering, École Polytechnique

Claude HAMEL, director, Department of Civil Engineering, University of Sherbrooke

Yves GIROUX, director, Department of Civil Engineering, Laval University

Swenn ORVIG, professor of meteorology, McGill University

Gisèle LANDREVILLE, secretary

From the beginning of the fiscal term 1968/69, it was decided that, in the hydric sciences section, only candidates holding a university degree would be eligible for scholarships.

There was no change in the regulations concerning the granting of scholarships in the mineral sciences.

The academic attainments and financial circumstances of the applicants play a major role in the selection of candidates for these scholarships.

In 1968/69, the Department of Natural Resources granted 124 scholarships to students enrolled in the following universities.

POST-GRADUATE GRANTS

	Mines	*Waters*
Laval University	38	7
École Polytechnique	22	—
University of Montreal	7	—
McGill University	10	—
Loyola College	1	—
Waterloo, Ontario	—	1
University of Manitoba	—	1
Purdue, Indiana	—	1
Harvard University	—	1
Colorado State	—	1
Bordeaux, France	—	1
	78	13
	91	

CANDIDATES IN REGULAR COURSES

	Mines	*Waters*
Laval University	13	—
École Polytechnique	4	—
University of Montreal	5	—
McGill University	3	—
Queen's University	2	—
Western Ontario	1	—
University of Toronto	1	—
Mass. Institute of Technology	1	—
University of Kansas	1	—
Grenoble, France	1	—
Sussex, England	1	—
	33	—
Total	124	

ADMINISTRATION BRANCH

The most important functions of the Administration Branch are the preparation of the budget and the control of the expenditures of the Department of Natural Resources.

This Branch includes the following Services: Equipment, purchasing and Secretariate. It also embraces the Maintenance Division. The Branch, in collaboration with the Department of Public Work, supervises the installation and maintenance of the various premises of the Department.

With the retrocession to the Government of Quebec of the assets of Metal Mines Limited in Chicoutimi, in December 1966, the Administration Branch was given the responsibility for the upkeep of that property.

Equipment Service

The Equipment Service supplied all the other Services of the Department of Natural Resources with office material, as well as the technical instruments and camping material used by the 47 field parties that were assigned to carry out explorations or work for the Department. The field trips are directed by geologists, engineers, and technicians in the mining, hydrological, and meteorological domains. The extent of these field trips and the amount of material supplied in 1968/69 were virtually the same as during the preceding year.

Moreover, the Equipment Service keeps an inventory of all types of vehicles belonging to the Department and attends to their maintenance. The number of these vehicles was increased from 187 to 208 during the fiscal year reviewed in this report.

A perpetual inventory of all the material in the Department's stores and warehouses is also made. The value of this stock is in excess of one million dollars.

PLANNING BRANCH

During the fiscal year 1968/69, the Planning Branch pursued such studies as were considered necessary to fulfil the mandate for which the Department of Natural Resources is responsible by virtue of the Act which instituted it for the development, exploitation and transformation of the resources of Quebec's territory. To this end, the Branch conducted two types of work: the first, known as long-term projects, dealt with the elaboration of a general policy for the resources sector, such as that of petroleum, whereas the second type of work was carried out upon request, in many cases in response to the administrative problems confronting the various units of the Department. In reality, these two types of duties correspond to the two divisions of the role that the Planning Branch has to follow within the Department in order to play an active part through its sectoral studies, which are conducted for the purpose of suggesting a governmental policy and for giving counsel or acting as coordinators with the other services of the Department or even other governmental organizations, so as to study the socio-economic problems inherent in the current management of resources. However, in practice, these two lines of action complement each other insofar as detailed or cursory analyses concern general works or result from them.

It is, therefore, understood that this body is continually conducting general studies or particular works or circumstances bearing on the activity of the Branch and its four sections, the divisions of which correspond to the major fields of endeavor by the Department of Natural Resources. These fields or divisions are the Mining Economy Section, the Waters Section, the New Quebec Section and the Energy Section.

At the close of March 1969, the personnel of the Planning Branch comprised, in addition to its director general and four secretaries, nine economists, one of whom was on leave to follow studies at École nationale d'Administration. It had also one electrical engineer, one graduate in sociology and one graduate in philosophy. Moreover, it included three French co-workers: an economist, an accountant and an engineer. These were stationed in Quebec during 14 months under the National Service and by virtue of cooperative agreements concluded between the governments of France and Quebec.

Mining Economy Section

One of the main duties of the Mining Economy Section during the fiscal period under review here consisted in maintaining and animating the secretariate of the Committee for Promoting Mining Activity, which was established at the

close of the preceding fiscal year with the cooperation of the various services of the Mines Branch in view of finding means for ensuring a continuous expansion of the mining industry in Quebec. Two types of measures for promoting this project became apparent from the outset. These had to do with exploration and exploitation. The members of the Committee examined, on the one hand, means for intensifying research, which is indispensable to the discovery of new mineral deposits (geological studies, geophysical, geochemical and geotechnical missions, etc.) and, on the other hand, the appropriate methods to be adopted for encouraging exploitation through mining, such as financial incentives, increase of substructural investments in mining regions whether marginal or promising, increasing emphasis on research in the field of identification and benefication of ores by means of creating a mineral research center, the setting up of which has already been made known by the Government, and promotion of studies directed toward the discovery of new outlets for the mineral substances of Quebec.

All these possibilities have been explored by the directors and chiefs of the services, members of the Committee for Promoting Mining Activity, who, during the course of their work have assembled and harmonized their views in such manner as to be able to present the Government, in 1969, with a list of concrete and logical proposals, having first examined the financial situations with officers of the Department of Finance. Whatever measures be advanced and adopted, their application, developed over several years, will always require constant adjustment to the conditions of the economic and financial harmony of Quebec.

Work by the Committee for Promoting Mining Activity is, moreover, related to the programs for Franco-Québec cooperation, which really commenced in the fields of geology and mining. The cooperative projects underway in this sector depend, in fact, on geochemical methods (ground prospecting), on geophysics, and on the exchange of specialists capable of translating this knowledge into geological research programs in Quebec, as well as on the stabilization of Quebec ores in quest of markets, such as vanadium from Chibougamau. The coordination between the Committee for Promoting Mining Activity and the Franco-Québec Cooperation Committee is, moreover, ensured by the chief of the Mining Economy Sector, who fills the role of secretary for both committees.

During the course of the two meetings of the Franco-Québec committee, the first held in Quebec on June 12, 1968, and the second, in Paris in November 1968, the methods of cooperation were defined and arrangements were adopted for research programs and an exchange of terms in the domains of geology and mining. To date, eight Quebec civil servants, familiar with geological activity, were able to profit from an advanced course in the field of their profession or in a domain related to their work, such as hydrogeology, petrography, the separation of heavy ores or fluorphosphorus geochemistry, within French organizations like the *Bureau de recherches géologiques et minières,* the *Commissariat à l'Énergie atomique,* the *Institut français du pétrole* or in university centers or private laboratories. In turn, French specialists in hydrogeology and geophysics have come to Quebec either to test the use of new apparatus or

processes, particularly the magnetoelectric processes by surface waves applied to the search for geological horizons favorable to the discovery of new orebodies, either to initiate research programs especially in geochemistry and hydrogeology. Mutual exchanges of knowledge regarding processes, from which France and Quebec can be equally enriched, would help the Department of Natural Resources to intensify its geological research programs through the most modern methods originating in Europe and North America.

Among the tasks that the Mining Economy Section undertakes from year to year, there is the search for markets for mineral substances. These analyses, many of which are conducted at the request of foreign firms in search of outlets or sources of supply, can facilitate the output of Quebec's mineral substances. To the list of the studies mentioned in the annual report for the preceding year, one might add, for 1968/69, those of the market for granite, recuperation of non-ferrous metals (copper, bronze, brass, nickel, zinc) and of scrap-iron. These detailed and attendant works have, moreover, resulted in more extensive studies of the cycle of production and sale, which will involve, commencing with zinc and copper, the principal substances of the mining industry of Quebec.

In respect to general works, it is likewise necessary to attend to those which are requested by the other services of the Department, such as economic advice, for the purpose of solving problems relating to every-day management. Herewith are a few examples of the tasks confided to the Mining Economy Section during the fiscal period under review: examination of projects dealing with proposed meetings between the *Société québécoise d'exploration minière* (SOQUEM) and various companies, for the formation of a mining exploration syndicate; search for means of a better distribution of licenses, of which the Department of Natural Resources would hold the title of ownership; the possibility of defraying by the Development Office and Eastern Quebec the cost of supplementary geological surveys which certain regional organizations would like to see accomplished by the Department of Natural Resources within the framework of the plan for the management of the lower reaches of Saint-Laurent river and Gaspesia; preparation of a file relating to the legal questions involved in dividing undersea mining rights between the governments of Quebec and Ottawa; finally, writing articles or speeches for the Minister, the Deputy Minister and officers of the Department.

It is also to this upper-echelon personnel that the *Bulletin de conjoncture* is especially addressed. The Mining Economy Section commenced to issue this brochure toward the close of the preceding fiscal year. The publication, which is now institutionalized, presents, from trimester to trimester, an analyses of the state of the mining industry of Quebec, that is to say the trend of production and the price of mineral substances, exploration and development works, fluctuations in employment and investments, as well as an outline on the foreseeable future. The distribution of this bulletin, at first limited to the officers of the Department of Natural Resources, has been progressively extended to members of other Departments or organizations who are interested in certain technical, economic or human aspects of the mining industry.

Waters Section

The work of the Waters Section during 1968/69 consisted in the continuation of the activity of the preceding year, the main efforts of which dealt with the elaboration of a global policy on water. Concerning this subject, it may be recalled that, among the phases of this policy, one concerned administrative formation of a group of Quebec specialists in the domain of water. It was toward formation of group of Quebec specialists in the domain of water. It was toward these objectives that studies conducted by the Waters Section were directed during the fiscal year reviewed here.

First of all, the Waters Section, in collaboration with the Waters Branch, drew up the statement of analysis or of an inventory of the activity of the Department of Natural Resources in the domain of water through the application of a questionnaire prepared for this purpose by the *Conseil d'Orientation économique du Québec* (now known as *l'Office de Planification du Québec*).

On the other hand, it will be remembered that, in the preceding fiscal period, the Waters Section proposed, as a master plan for a policy on water, the integrated management of the water resources of Quebec's hydrographic basins by way of harmonizing the many uses of water and of responding to the diverse needs of all users. In reference to this subject, this Section recommended that a governmental organization be given the responsibility of directing studies and preparing plans for management by having the Departments concerned contribute to these objectives and by organizing the meeting of a local consulting committee. Indeed, it would appear opportune to put this policy and these structures to the test in the Yamaska River basin where pollution, pecuniary and flood problems are particularly acute.

Such was the formula held by the Council of Ministers when this body adopted, on July 3, 1969, an Order in Council providing for the management of the waters of Yamaska river under the authority of an interdepartmental technical mission responsible for preparing the plan. Seven departments or governmental organizations are represented in this mission, which consists of nine members, the secretary of this group being also the chief of the Waters Section of the Planning Branch. It is the responsibility of this mission, after it has prepared a program and a work schedule, to channel the studies in such manner that the plan will be extended and recommendations drawn up for no later than the summer of 1972. In fact, the Waters Section's work program, published in 1969, contains no less than 22 studies to be conducted on all aspects of the Yamaska basin. The Waters Section has already taken an important part in these works, in addition to the work of liaison through its role as secretariate. It was occupied, at the close of the fiscal year 1968/69, especially with the preparation of a brochure of general information on Yamaska basin and it took part in the socio-economic study that was conducted on this subject.

The third point of policy, which was initiated in the preceding year, required some very intensive research during the fiscal period under review here. This research concerned the eventual founding of the *Institut des sciences de l'eau* under the aegis of the *Université du Québec*. Indeed, it appeared

necessary, for the support of this project, to make an inventory of the research work conducted on water in Quebec and to define the fields of research that this institute should promote, in such manner as advantageously to design its structures and its role when faced with the needs and problems of the environment obtaining in this Province. The Waters Branch, assisted by the Waters Section, carried out these tasks in collaboration with the Department of Education. The results of their studies were made known through the avenues of information, research and administration in order to form the basis for the advice and opinions submitted for the benefit of the directors of the *Université du Québec.*

It is necessary, moreover, while considering the activity of the Waters Section, to dwell on the part that this unit has played through circumstancial works which were undertaken specially in collaboration with the Waters Branch. For example, it carried out a profit-cost analysis of the work executed on certain rivers for the purpose of forestalling the flooding caused by spring break-up. It participated in two study projects launched by the Hydraulic Development Service: one on protection against flooding in Quebec and the other on the construction of a reservoir-dam on Bourbon river, at Plessisville. Moreover, it was made responsible for the preparation of a report entitled *Pour une politique d'aménagement des eaux au Québec* and presented at the colloquy of the Canadian Council of Ministers of Resources, which was held in Victoria on December 3, 4 and 5, 1968.

New Quebec Section

The New Quebec Section of the Planning Branch, which was established at the close of the preceding fiscal period, has deemed it proper to define, at the outset, its method of procedure or its manner of coping, in collaboration with the New Quebec Branch, with the managerial problems of northern Quebec. Two points seemed to present themselves from the very beginning: either to follow the socio-cultural standards in such manner as to lead the aboriginal population of New Quebec to direct their activities themselves in conformity with their traditions, desires and needs or to conform to preoccupations of a strict economic order, in view of integrating the development of Quebec's northern territory with the general economy of the remainder of the Province by promoting its physical and human resources.

In this connection, there was the problem of obtaining a proper balance between the two points of view. Evidently this position can be attained only through an extensive knowledge of the physical and human resources of northern Quebec, in view of proposing a development program which could ensure the economic growth of this region and, through the adaptation of mentalities, the participation by the aborigines in the progress proper to them.

In practice, the New Quebec Section of the Planning Branch has supported the advancement of the two projects which had been submitted to it by the New Quebec Branch. The first deals with the setting up of a sawmill at Nouveau-

Comptoir, where it was concluded that there would be a profit from such an enterprise, and of structures to be given to it in order to harmonize the financial contribution of the Government and the participation of the local Caucasian population. The second project, set down in the program of France-Québec cooperation in New Quebec, consists, for the Planning Branch, in assuming the role of the secretariate of the France-Québec committee on northern research.

Within the scope of the work of this committee, a socio-economic study of the Ungava Bay region was undertaken. In order to contribute to this study, the New Quebec Section of the Planning Branch prepared a statistical file, which indicated the sources of revenue of the natives of this region, as well as the value of the merchandise that they consume according to the types of products and villages.

Energy Section

Having established a sort of questionnaire while conducting a general tour of the energy supply problems in Quebec during the preceding fiscal year, the Energy Section extended its activities in two directions in 1968/69. At first, it assembled the elements of an energy policy; it then investigated certain phases or particular points dealing with petroleum, especially the method for verifying, through supporting vouchers, the justification of the proposed policy. According to this report, the two avenues of activity are complementary; the first attending to the statements of policy of a general and abstract analysis, and the second concluding statistically the profit of this or that very concrete project.

In considering an energy policy adapted to Quebec, there are the three following facts or considerations to be taken into account: (1) Today, energy is the motive force in modern economy, especially by reason of its alluring and novel effects; (2) The high rate and increasing consumption of energy in Quebec signify the need for a vigorous market which can be managed in the public interest; (3) The availability of the various forms of energy, as electricity, gas or petroleum, can result in the implantation of specialized enterprises to the advantage of all, as well as that of industry itself. It depends, therefore, on the policy, which the Government has the ability to adopt, whether the energy industry makes a rational contribution to the economic expansion of Quebec.

The Energy Section has chosen to pursue this goal. To this end, it has recommended legal and institutional management designed to create decision-making centers, to rationalize the production, distribution and sale of the various forms of energy and to have all share advantageously in these achievements. On the one hand, there is the question of proposing changes to the present laws in such manner as to supply the Minister of Natural Resources with the juridical and administrative instruments necessary for acquitting the obligations that the Act (Chapter 83) imposes on him, especially the supervision of "the production, transformation, distribution and sale of electricity and

gas''. On the other hand, there is the work of planning new industrial structures, capable of realizing for the Quebec population the greatest possible share in the exploitation of certain forms of energy. To this last item can be associated studies bearing on the refining of petroleum products in Quebec, on the profit from an eventual Quebec refinery, or on the sites proposed for its installation.

The Energy Section is orienting its work more and more toward the precise and detailed knowledge of the present situation and the energy industry, in view of preparing the way for reliable and practical policies suitable for guiding governmental decisions. Thus, the state of production and consumption of energy, the fiscal regime applied to petroleum companies and the conditions of profit from the eventual discovery of petroleum in the gulf of Saint-Laurent were, among others questions, the object of studies, for such considerations supply the indispensable elements for the knowledge of the petroleum situation, and, from this source, the promotion of interests in Quebec.

Counsel and Liaison Activity

In the role of giving counsel, which the Planning Branch is called upon to exercise within the Department of Natural Resources or in relation to the Department, the Branch is obliged to act as liaison between other governmental organizations and especially those concerning organizations coming under the authority of the Minister of Natural Resources.

The most outstanding example in this connection is that of Hydro-Québec, which submits its principal decisions for the approval of the Council of Ministers through the intermediary of the Minister of Natural Resources. The Planning Branch is thus responsible for examining certain projects of Hydro-Québec and for expressing its opinion to ministerial authorities concerning the economic aspect of the projects.

Regarding the activities as liaison for the Planning Branch, one should mention the part that the Branch plays in the work of interdepartmental or specialized committees. Thus, the director general of the Planning Branch served on the Interdepartmental Planning Commission which was established within the Planning Office for coordinating ministerial activity in the light of objectives to be defined and attained. In fine, the Planning Branch acts as spokesman for the Department of Natural Resources before the Department of Intergovernmental Affairs in order to open the way for exchanges and cooperation between France and Quebec. In this respect, it assembles the requests of French co-workers relating to the various units of the Department. The Branch is responsible for the secretariate of the France-Québec cooperation committees on the subjects of hydrology, geology and northern research and is engaged in facilitating exchanges or periods for further study, especially within the scope of the *Association pour l'organisation des stages en France* (ASTEF).

MINES BRANCH

The Mines Branch is responsible to the Department of Natural Resources by virtue of the powers conferred on it by statutes 9-10, Elizabeth II, Chapter 48, the administration of the Mining Act (13-14, Elizabeth II, Chapter 34) and the Mining Duties Act (13-14, Elizabeth II, Chapter 35).

In résumé, the Mines Branch is concerned with:

(*a*) the administration of the mining domain, through the issuance, registration and control of mining titles;

(*b*) the supervision and control of mineral exploratory works and the workings of mines and quarries, so as to ensure the safety and well-being of workers, to prevent pollution of water and air, and to see that holders of mineral rights carry out the work required of them in order to maintain their titles;

(*c*) aid to exploration, mining and utilization of the mineral resources of Quebec through the intermediary of geological and geochemical studies, analyses and laboratory research, the milling at the pilot plant, opening of access roads to resources, the founding of mining villages in isolated regions, etc.;

(*d*) collecting of duties on mines.

The responsibilities of each of the administrative units making up the Mines Branch are described in greater detail in the following text, as are also their main activities during the fiscal year 1968/69.

The personnel of the Mines Branch, at the end of March 1969, consisted of 323 persons, of which number there were 102 professionals. Most of these were men of science and engineers highly specialized in the fields of geological exploration, mineral deposits research, the beneficiation and identification of ores, and the exploitation of mines.

Disbursements of the Mines Branch during the fiscal term reviewed here was $5.2 million, of which nearly $800,000 was allocated to the construction of access roads to mineral resources. Of this amount, about $450,000 is recoverable from mining companies, mining municipalities and the ODEQ. Revenues are slightly in excess of $17.5 million, of which $15.8 million was collected by virtue of provisions of the Mining Duties Act.

The decline in the value of the mineral production of Quebec continued during the year 1968, despite a more or less general increase in the unitary price of the products of the mines of the Province. Although this decrease was less noticeable than that of the preceding year, the Minister formed a committee

to revive the mining industry by grouping members of specially qualified civil servants of the Mines Branch with those of the Planning Branch. This committee, which was presided by J.-E. Gilbert, general director of mines, has to present the proper government authorities with suitable recommendations relative to the measures that should be taken to promote mineral exploration within Quebec, since exploration is essential to the progress of the industry.

Mining Taxation Service

Mining companies exploiting Quebec's mineral deposits must pay, to the Minister of Natural Resources, an annual royalty based on their profits as the result of their operations. These companies are, therefore, subject to the Mining Duties Act, the administration and application of which are the responsibility of the Mining Taxation Service.

During the fiscal year ending on March 31, 1969, 66 mining companies were considered as being in operation, and of these 50 paid the cumulative total of $15,810,456 in mining duties. Sixteen companies were, therefore, exempt from duties as the result of losses incurred or of profits below the basic exemption of $50,000.

A program of verification of mining companies was completed during the fiscal period under review here by the collection of additional duties estimated at $1,037,396. This figure represents an increase in declared profits of $14,622,-556. These changes, which resulted from the profits declared by mine operators, were completed by the issuance of 71 assessment notices. Only three operators objected to the assessment and their cases will be brought before the Provincial courts. Up to the date of writing, the mining tribunal will have to render an interpretation of the Mining Duties Act through the Department in connection with the suit lodged by six operators.

In default of carrying out statutory work, 220 concession-holders were obliged to pay the sum of $66,665 in annual taxes on mining concessions during the fiscal period 1968/69. At the same time, 143 concession-holders, whose lands covered a global surface of 44,349 acres, were exempted from this annual tax because they conducted exploration or exploitation work.

Mining Conflicts Division

The most important work of the Mining Conflicts Division is conducting investigations deemed necessary for the settlement of conflicts arising from the staking of mining claims that were already recognized or are under development license. This Division is under the direction of J.-René Dallaire, who, in addition to carrying out investigations and inspections, summarizes various reports and makes recommendations to the Director General of Mines.

The Division has as its personnel, engaged on a full-time basis, two investigators stationed at Rouyn and two at Quebec. Moreover, it employs two

stenographers: one serving the Rouyn office and the other working in Quebec. During the year being reviewed here, the investigators studied 20 conflicts, all of which have been definitively settled.

The investigators at Rouyn were called upon to study seven conflicts that arose in the Amos and Rouyn agencies. They were obliged to travel about 1,240 miles by car and to walk 124 miles in forests in order to conduct their inquiries and make inspections of claims and certain statutory works that were reported for the purpose of obtaining development licenses or, in some instances, to keep these licenses in force.

The Quebec investigators worked on 13 conflicts originating in the Quebec agency. In order to carry out this work, the investigators had to travel more than 7,200 miles by car and walk about 210 miles through forests.

During the fiscal year 1968/69, the personnel of this Division studied a number of documents that were brought to its attention by the Mining Domain Service. It endeavored to give full cooperation to this Service so as to ensure the best possible results. The personnel likewise conducted inspections of sand and gravel deposits, visited tailings sites and studied requests for mining concessions.

GEOLOGICAL SERVICES

Paul-E. Grenier, director, submits the following summary report on the Geological Services for the fiscal year extending from April 1, 1968, to March 31, 1969:

The over-all role of the Geological Services is to study the geology and mineral resources of Quebec, and to make the results of the work available to all interested parties — this in order to foster the development and logical utilization of Quebec's minerals and like resources.

To this end, the four services that comprise this group work and cooperate. They are: (1) the Geological Exploration Service, (2) the Mineral Deposits Service, (3) the Hydrogeology Service, and (4) the Cartography Service. The last-named unit also serves other branches of the Department but, since its functions pertain mainly to the geologic work, it is grouped most properly with the Geological Services. The principal activities of each of the four services are given separately in the reports of their respective heads, which follow this summary.

One important change in the administrative ranks of the Geological Services took place during the year. In September, 1968, J. Robert Assad resigned as director of the Mineral Deposits Service, to accept a teaching post at the École Polytechnique de Montréal. He had ably headed this Service for about 3 years, prior to which he had served as resident geologist in Chibougamau and as geologist in Quebec city. Since Dr. Assad's departure, Ovide Maurice has administered the Service pending a replacement.

The group of services performs the following functions. It carries on geologic mapping at various scales; collects and compiles geological, mineralogical, geochemical, geophysical and similar data; makes special investigations in various fields, such as engineering geology, unconsolidated surface deposits (gravel, sand, clay, peat, etc.), industrial minerals, building materials, groundwater resources, mineral-water springs, natural gas and petroleum, bore-hole cores, fossils, etc.; does special research of diverse kinds; prepares for printing geologic, mineralogic and other maps, plans and figures; keeps up to date plans showing all mining claims, concessions, and other holdings within the Province; helps prospectors, developers, and the mining industry in general, through freely given information and advice; offers, as circumstances warrant, both elementary and advanced courses in prospecting; and assists in the training of geologists and mining engineers by providing summer employment on field parties for many university students (both undergraduate and graduate) enabling them to acquire invaluable practical experience, and often the basic material needed for masters' and doctoral theses.

The Services is also able to provide useful information and valuable assistance to other Departments and Branches of the Government, and does so when requested, if at all feasible. To illustrate, one example only follows.

During the summer of 1968, the Geological Services gave needed help to the Quebec Department of Education which, jointly with the *Office Franco-Québécois pour la Jeunesse* of France, had made basic arrangements for various groups of young students from France to tour in Quebec. One group of some 15 amateur paleontologists from Paris wished to visit fossil localities in the Province, but was ill prepared to do so on its own. Fortunately, two of our Services' geologists were able, on very short notice, to come to its aid. First, W. B. Skidmore of the Mineral Deposits Service guided this youth group for one week, leaving from Quebec city for a circuit tour of Gaspé Peninsula. During this trip the students were shown many fine exposures of fossiliferous rocks, and other interesting geologic features. The group was also able, courtesy of Gaspé Copper Mines Ltd., to visit that company's large underground mining operations, and associated mill and smelter facilities, at Murdochville. On the group's return to Quebec city, Y. Globensky of the Geological Exploration Service took over and, for a second week, escorted it on visits to the Lake Saint-Jean district and eastern parts of the St. Lawrence Lowlands to examine additional fossil-bearing strata. During the first stage, the group, through the courtesy of Aluminum Co. of Canada Ltd., toured its huge production plant at Arvida and also the Shipshaw hydroelectric power installations. It is believed that our Services' assistance was much appreciated, both by the touring French students themselves and by the sponsoring organizations.

A total of 50 projects comprised the 1968 field program of the Geological Services. The Geological Exploration Service undertook 19 projects, the Mineral Deposits Service was responsible for 22, and the Hydrogeology Service conducted eight programs. The final project was that carried out by H. W. McGerrigle, technical adviser in the Geological Services. Summaries of the results obtained from the geologic surveys and other projects carried out during the 1968 field

season appear in special booklet S-112, which is accompanied by index map N°. 1659.

It is of interest to note that during recent years the Geological Services has been widening the scope of its technical services, particularly in the fields of geophysics and geochemistry. Up to a few years ago the Services was providing the mining industry chiefly with geological targets, such as greenstone belts for base-metal and gold exploration, ultrabasic intrusive bodies for asbestos search, etc. Now, it is also attempting to supply the mineral exploration fraternity with geophysical and geochemical targets.

The Geological Services continued to support the program, begun in 1962, of aeromagnetic surveys of certain parts of the Province that is being carried out jointly by the Quebec Department of Natural Resources and the Federal Department of Energy, Mines and Resources. To give the results of these surveys, maps showing isomagnetic lines are published at the scale of 1 inch equals 1 mile. Such maps are very useful in aiding geologic interpretation, and are also valuable in indicating localities where mineral deposits might be found, following detailed ground investigations and diamond drilling. As soon as the maps are compiled and printed, they are made available to the public simultaneously by the two departments, which share equally in the cost of the program.

The Department has also entered the field of airborne electromagnetic (E.M.) surveying. An area of some 500 square miles lying mainly just north of Rouyn-Noranda was flown at an altitude of 400 feet above the ground, and covered by more than 4,000 line-miles spaced at ⅛ mile. The results of the survey should be available to the public in July, 1969. It is hoped that the information may lead to the discovery of new ore deposits in an established mining district where the Province would not be faced with the problem of building costly access roads, mining towns, and other facilities.

The Department also agreed recently to contribute to the testing, in collaboration with Barringer Research Ltd., of a new technique in geophysical exploration. In this program the forementioned area was selected for an airborne Radio Phase survey. The readings obtained are functions of the conductivities of the rock formations over which the aircraft passes. The survey was flown at an altitude of 400 feet above the ground, with a line spacing of 1 mile. An airborne scintillometer survey was also carried out at the same time.

The above area was chosen for the trial, since it would be over ground favorable for a reasonable appraisal of its merits — this because the geology was already fairly well known, it contained established ore deposits, it was covered by published aeromagnetic maps, and, as outlined above, was recently flown for an airborne E.M. survey. It is hoped that this new technique may prove useful as a mapping tool in tracing certain rock formations, major faults and shear zones, and even orebodies in some instances.

The Geological Services is also trying to provide the mineral exploration industry with geochemical targets, and also with particular information on the application of the most suitable techniques in geochemical exploration under various conditions.

Since 1965 the geologic mapping parties have been collecting systematically, for geochemical analysis, stream-sediment samples from small watercourses encountered on their traverses. These samples are analysed in the Department's laboratories for total copper, nickel, lead, zinc, molybdenum and uranium, and for various other metals in certain cases. On those parties mapping at the scale of one mile, or more, to one inch, the sampling is definitely of a reconnaissance nature. However, this research has already given some positive results, even in heavily glaciated areas.

The staff of the Laboratories Services is working in close cooperation with the field geologists in the geochemical program. This collaboration has led to the development of a new chromatographic method of analysis, which permits the quick detection in soils of uranium values down to 0.5 parts per million. The break-through in this domain is the rapidity of the method.

In addition to the reconnaissance geochemical sampling done by the geologic mapping parties, special geochemical programs and research projects are carried out in order to promote working hypotheses and methods. One example follows.

It is well established that standard geochemical soil-sampling methods are rather ineffective in areas of heavy overburden, especially clay. Several years ago the hypothesis was advanced that, if part of the unconsolidated deposits close to bedrock could be sampled with reasonable ease, even at depths of 50 feet or more, anomalies related to ore deposits might be outlined in glaciated regions covered by thick surficial deposits. However, at the time there was no suitable sampling tool for this type of work on the market. During 1965 initial tests were carried out by use of a portable sampling device designed in the Services. Since this beginning private industry has developed a satisfactory sampler which is being used by various exploration companies. It is now known that, by use of this method, certain geochemical anomalies have been outlined over mineralized bedrock, thus verifying the above-mentioned hypothesis.

It is gratifying to report that in December, 1968, the first three booklets in the new "Popular Geology" series of Departmental publications were issued. Considerable interest has already been shown in them, and they are receiving much favorable comment. The brochures (6″ x 8½″ in format) published up to March 31, 1969, are:

P.G. 2 – "The Geologic History of the Percé Area", by *H. W. McGerrigle* — 36 pp., insert map 1627 at 1″ = 1 mile;

P.G. 3 – "Montmorency Falls", by *R. Bureau* and *J. Riva* — 23 pp., figure map at 1″ = 1 mile (approx.);

P.G. 4 – "The Geologic History of the Forillon Peninsula and Cape Bon Ami Provincial Park, by *H. W. McGerrigle* — 34 pp., insert map 1628 at 1″ = 1 mile.

This series of geologic booklets was planned to describe, in an interesting and reasonably non-technical fashion, the geology, topography, geologic history, minerals, fossils, and other natural phenomena of selected localities in various

parts of the Province. They are intended to introduce to both residents of Quebec and visiting tourists — not only adults, but those of school age as well — some of the fundamentals of the long geologic history through which particular areas (and the Province as a whole) have passed before the present landscape was produced.

The description of each area is accompanied by a generalized geologic map, a glossary of technical terms used in the text, a geologic time-table, and by interesting photographs showing both land forms and geologic features.

During the year reviewed, H. W. McGerrigle, technical adviser in the Geological Services, completed the field investigations required for a geologic, circuit tour of Gaspé Peninsula, following Highway 6 clockwise around the peninsula, a distance of about 560 miles; he also prepared a voluminous manuscript text that covers this motor trip.

The Geological Services continued to participate in, and benefit from, the program of exchanges of scientific personnel between France and Quebec, begun in 1964 as far as the Services is concerned.

On April 26, 1968, Ovide Maurice of the Mineral Deposits Service returned from France on completion of a two-month program spent mainly in several French-speaking countries in West Africa.

On May 8, A. F. Laurin of the Geological Exploration Service returned from a two-month lecture tour in France, during which he gave a total of 13 lectures at seven different universities — all in France, with the exception of Munich, West Germany.

Additional information on the above two programs are given in the Department's annual report for 1967/68.

Between March 26 and May 15, 1968, Pierre St-Julien of the Geological Exploration Service made a study tour in France, sponsored by the *Association pour les Stages Techniques en France* (ASTEF). The program included periods at three universities — the Sorbonne, Université de Paris, the Université de Grenoble, and the Université de Bordeaux. His investigations pertained especially to tectonics and stratigraphy, and the research methods being employed in these fields by geologists in France.

Between November 17, 1968, and February 15, 1969, Raynald Dessureault of the Hydrogeology Service studied, under the auspices of ASTEF, at the Centre d'Hydrogéologie de l'Université de Bordeaux. Here, under the guidance of H. Schoeller, professor emeritus of Hydrogeology, he followed both theoretical and practical courses in hydrogeology and hydrochemistry. Mr. Dessureault also profited from visiting the regional offices of the Bureau de Recherches Géologiques et Minières (B.R.G.M.) at Bordeaux, where he acquired valuable knowledge concerning the various hydrogeologic projects being carried out in the district. Finally, he was able to meet and exchange scientific views with many specialists engaged in the field of hydrogeology in France.

On February 20, 1969, Bertrand Warren of the Geological Exploration Service began two months of studies in France, sponsored jointly by ASTEF

and the Quebec Department of Intergovernmental Affairs. The aim was for Mr. Warren to learn more about methods of alluvial prospecting for heavy minerals, with a view to his taking part in a program of investigating various eskers in Quebec. Mr. Warren began with a period at Rennes, where he participated in the gathering of samples in the field, the concentration of their content of heavy minerals, and the rapid identification of these minerals as done in the Vendée-Bretagne Division of B.R.G.M. About mid-March Mr. Warren began a second stage, spent in the B.R.G.M. laboratories at Orléans, where he studied the diverse methods used by their scientists to separate heavy minerals and to identify them precisely.

On March 12, Yvon Globensky of the Geological Exploration Service left for France to begin a two-month study program, sponsored jointly by ASTEF and the Quebec Department of Intergovernmental Affairs. Most of his time is being spent at the Institut français du Pétrole, at Rueil Malmaison, making a comparative study of various methods used in petroleum exploration. He will also visit the Société nationale des Pétroles d'Aquitaine, at Pau, to observe directly results being obtained in the search for oil presently underway in the Aquitaine basin. Finally, Dr. Globensky will visit the ESSO-REP (Recherche Exploration Pétrolière) and ESSO-EUROPE research center at Bègles, to compare methods used and results attained.

Still within the framework of the Franco-Quebec exchanges of scientific personnel, our Department's Hydrogeology Service received, from September 5 to October 19, 1968, H. Moussu, from France, a hydrogeologist with B.R.G.M. The purpose of his visit was to study the various hydrogeologic programs being carried out by Quebec. Through his observations, Mr. Moussu was able to contribute valuable suggestions concerning each project, which were much appreciated by our scientists.

Moreover, three geologists from France are at present holding temporary full-time positions in the Geological Services. Finally, four students from France were employed during the summer of 1968 as assistants on field parties. The Department receives the cooperation of ASTEF in making these engagements.

The director of Geological Services holds posts in several scientific organizations. He is the Department's representative on the "Comité franco-québécois de coopération géologique et minière". He is also the Department's representative on the "National Advisory Committee on Research in the Geological Sciences". He is a member of the Associate Committee on Geology and Geophysics of the "National Research Council of Canada". Finally, he is a director of the Quebec City Branch of "The Canadian Institute of Mining and Metallurgy".

During the year reviewed, the director, with Jean Dugas of the Mineral Deposits Service, coauthored the following communication: "Mining Exploration and Development in Quebec — Facts and Incentives" — paper (presented by J. H. Remick) to the 37th Annual Convention of the Prospectors and Developers Association, at Toronto, March 12, 1969.

Geological Exploration Service

Robert Bergeron, director, reports as follows on the activities of the Geological Exploration Service during the 1968/69 fiscal year.

At March 31, 1969 (the close of the fiscal year reviewed here), the professional staff comprised 16 geologists and geological engineers, one more than a year ago. In the autumn of 1968 one geologist, Serge Ochietti, joined the staff on a temporary basis. It is worth noting that for the first time in 10 years no officer left the Service. However, it should be mentioned that one staff geologist is still absent. Since January, 1969, Richard Grenier has been following a course of study at the "École Nationale d'Administration", Paris, France, and for the previous 15 months was on temporary transfer to the Planning Branch of the Department. Thus, the effective professional staff remains at 15, having held at this figure for the last 4 years. It should be noted, however, that the Government's freeze on the hiring by the Civil Service Commission of additional full-time personnel, established in the autumn of 1967, continues in effect.

Besides the professional group, the Service includes five office assistants and clerks, and six secretaries and stenographers — the same numbers as at March 31, 1968.

As the principal functions and general operations of the Geological Exploration Service are well summarized in the Department's Annual Report for 1967/68, they are not detailed herein.

Despite the continuing shortage in geologists, the Service had a reasonably active year in carrying on its main work, which is to map the geology and explore the mineral potential of Quebec.

The 1968 field program comprised 19 projects, unfortunately three fewer than in 1967 and 12 fewer than the all-time high of 31 set in 1961.

Only one party — that headed by A. F. Laurin — carried out reconnaissance geologic mapping, compared with four in 1967. It covered about 15,000 square miles (almost entirely in Saguenay county) at a scale that will permit the publication of maps at 1 inch = 4 miles.

A total of nine parties did regional geologic mapping, the same number as in 1967. Four of these groups (led by J.-P. Bassaget, E. H. Chown, M. M. Kehlenbeck and M. Rive) mapped a total of 1,850 square miles at scales that will allow the publication of maps at 1 inch = 1 mile. The other five parties (headed by Y. Globensky, R. Y. Lamarche, P. St-Julien, C. Hubert and M.-A. Léonard) covered about 1,000 square miles in enough detail to permit the publication of maps at 1 inch = ½ mile.

Two other parties (under G. Tremblay and M. L. Noiseux) studied unconsolidated surficial deposits in separate regions.

The remaining seven field projects were of a miscellaneous nature. They were:

(*a*) special studies in the Central Labrador Trough — including stra-

tigraphic and tectonic correlations, measurements of many stratigraphic sections, and detailed mapping in key localities, by E. DIMROTH;

(*b*) study of the Charlevoix Semicircular Structure, by J. RONDOT and D. W. ROY;

(*c*) special studies in the Southern Grenville — including microtectonic research, and the establishment, regionally, of stratigraphic, metamorphic and tectonic correlations, by J. MARTIGNOLE;

(*d*) investigations in alluvial prospecting methods, by P. LASALLE and J.-C. DUBÉ;

(*e*) a continuing program of drill-core logging, by B. WARREN;

(*f*) special geophysical tests, by B. WARREN;

(*g*) investigations of Mount Royal and vicinity, for a brochure in the 'Popular Geology' series, by T. H. CLARK.

Only 10 of the 19 field projects were headed by geologists of the permanent staff, and one officer was responsible for two projects. However, two other geologists of the present full-time staff — A. Franconi and S. Ochietti — acted as either subparty or assistant chiefs. The other nine project chiefs had again to be recruited on a short-term basis from outside sources — seven were professors from university staffs (or of similar status), and two were graduate students pursuing advanced research towards the obtainment of their doctoral degrees. The parties engaged 33 other graduate geologists, 38 students (mainly university students studying for degrees in geology or mining engineering), and 39 other men (for varying periods of time) as canoemen, packers, helpers and cooks.

Prof. F. F. Osborne of Université Laval, enlisted for many years on a part-time basis, spent most of his time in an office study of the geology of Quebec. The first object of this research is the preparation of a lexicon of names of stratigraphic and other rock units, established structures and other geologic features that pertain to the Province. Such an index is necessary in order to avoid duplication of names. Considerable research is required to determine the exact meaning attached to names in Quebec and, in some instances, in nearby regions. The lexicon is being compiled with a view to publication, and as part of a preliminary study applicable to a revised version of the general report on Quebec geology (Que. Dept. Mines, Geol. Rept. 20, Vol. II, 1944). In addition to this main assignment, Dr. Osborne was available for consultation on many diverse geologic problems.

During the year reviewed, J. Radziminska-LaSalle was engaged in office studies and laboratory research concerned principally with the separation and determination of heavy minerals, and related investigations.

J. H. Remick was occupied mainly in the preparation of reports and maps pertaining to his recent field mapping programs. He had originally been assigned to head a large-scale, reconnaissance mapping project tentatively planned for Abitibi and Mistassini territories; however, this was not approved for the present, owing to the Government's austerity measures.

B. Warren and M. M. Ritchie aided the director in administrative, editorial and other duties. Special mention is made of the administrative assistance given during the winter months by A. F. Laurin who performed many duties normally carried out by an assistant director and, during absences of the director, acted as his deputy.

During the field work, eight of the mapping parties collected systematically, for geochemical analysis, about 1,600 stream-sediment samples from small watercourses encountered on their traverses. These samples, along with pertinent data on locations, etc., have been submitted to the Mineral Deposits Service. They are being analysed by suitable methods for indicative values of the following metals: copper, zinc, lead, molybdenum, nickel, uranium, cobalt, tungsten, manganese, tin, gold and silver. It is foreseen that results of this research can sometimes indicate localities favorable for the discovery of certain types of mineral deposits.

The geologists also cooperate with the Mineral Deposits Service by examining, and reporting on, various mineral occurrences, prospects and showings in their respective areas.

During the course of the field work, some of the parties were visited by geologists, engineers, prospectors and others engaged in searching for mineral occurrences; all were given up-to-date data except for any that was confidential in nature.

Throughout the year, many persons connected with the mining industry (and also members of the general public, such as students, teachers, etc.) called at the Quebec office. They were able to obtain from the staff much valuable information on the geology of all parts of the Province, and other related knowledge. Moreover, many inquiries and requests for data were answered by phone or correspondence.

Although the various publications issued by the Department during the year are listed elsewhere in this volume, mention is made here of a new edition of the geologic map of Gaspé Peninsula, which was released in June, 1968. The geology was compiled by H. W. McGerrigle and W. B. Skidmore for the Geological Exploration Service. The map — a revised version of Dr. McGerrigle's map of 1953 — is printed in colors and is at the scale of 1 inch = 4 miles.

It is noteworthy also that the manuscript of a new, up-to-date, geologic map of Quebec was completed in 1968. This compilation is the result of work over a period of years by several officers and technicians of the Geological Exploration Service. Although many geologists of the Geological Services contributed information, the over-all coordinator for the project has been, during recent years, A. F. Laurin. Data from all available published and unpublished maps and reports were first assembled, correlated and condensed. In general, the results were then drafted on sectional, master base-maps at the scale of 1 inch = 4 miles; subsequently the data were reduced still further to suit the scale of the final manuscript. This important map will be printed in suitable colors, and issued at the scale of 1 inch = 16 miles.

Several of the Service's officers hold important posts in various scientific organizations. The director is a member of the "Commission de Géographie du

Québec", and is technical adviser to the "Centre d'Études nordiques de l'Université Laval". Within the "National Advisory Committee on Research in the Geological Sciences", he is a member of the Subcommittee on Storage and Retrieval of Geological Data, and chairman of its working group on Geological Field Data. He is also a member of the General Committee on Education of "The Canadian Institute of Mining and Metallurgy". Finally, he is a member of the National Organizing Committee for "The XXIV International Geological congress" (to be held in Canada in 1972, in Montreal); vice-chairman of its Excursion Committee; and assistant secretary of its Data Processing Section. Dr. Dimroth is a member of the Subcommittee on Research Geology of the "National Advisory Committee on Research in the Geological Sciences". Dr. Globensky is secretary of "La Société Géologique de Québec", and vice-president of the Eastern Division of the "Society of Economic Paleontologists and Mineralogists". Dr. Laurin is a director of the Quebec City Branch of "The Canadian Institute of Mining and Metallurgy", and a member of the branch's Education Committee. Mr. Remick is a member and secretary of the Membership Committee of "The Geological Association of Canada". Mr. Warren is treasurer of "La Société Géologique de Québec". In addition to the director, several of the Service's officers are assisting in the planification required for the International Geological Congress, scheduled for 1972.

During the year, staff members presented papers and lectures at universities and scientific meetings, or had them published in technical journals, and gave talks to various groups. The main contributions were:

By Robert Bergeron

"Quebec 1968 — Hopes in New and Old Mineral Districts" — paper published in Can. Min. Jour., Vol. 89, No. 4, pp. 78–81, April. 1968.

"Possibilités de la Côte Nord pour l'uranium" — talk to Chambres de Commerce de la Côte Nord, at Forestville, May 19, 1968.

"Main Prospecting Areas in Quebec for 1968" — talk to joint meeting of the Thetford Mines and Asbestos branches of The Canadian Institute of Mining and Metallurgy, at Asbestos, May 31, 1968.

"Stratigraphy and Structural Geology of the Proterozoic Belts of the Eastern Canadian Shield" — lecture at the University of Munich, Germany, Dec. 9, 1968.

By Erich Dimroth

"Sedimentary Textures, Diagenesis, and Sedimentary Environment of Certain Precambrian Ironstones" — paper published in N. Jb. Geol. Palaeont., Abh., Vol. 130, No. 3, pp. 247–274, Stuttgart, Germany, April 1968.

"The Evolution of the Central Segment of the Labrador Geosyncline — Part I: Stratigraphy, Facies, and Palaeogeography" — paper published in N. Jb. Geol. Palaeont., Abh., Vol. 132, No. 1, pp. 22–54, Stuttgart, Germany, Nov. 1968.

"The Evolution of the Labrador Geosyncline" — lecture to the Dept. of Geology, Loyola College, at Montreal, March 6, 1969; also presented in symposium on 'The Evolution of the Eastern Canadian Shield', to Congress of The Geological Society of America (Northeastern Section), at Albany, N.Y., March 13, 1969.

By Yvon Globensky

"Scolecodonts from the Windsor Group (Mississippian) of Nova Scotia" — paper published in Can. Jour. Earth Sci., Vol. 5, N°. 6, pp. 1397–1400, Dec. 1968.

By Pierre LaSalle, with *J. Terasmae* of the Geol. Surv. Can.

"Notes on Late-glacial Palynology and Geochronology at St. Hilaire, Quebec" — paper published in Can. Jour. Earth Sci., Vol. 5, N°. 2, pp. 249–257, April 1968.

By Pierre LaSalle, with *Jean-Yves Chagnon* of the Mineral Deposits Service

"An Ancient Landslide along the Saguenay River, Quebec" — note published in Can. Jour. Earth Sci., Vol. 5, N°. 3, Pt. 1, pp. 548-549, June 1968.

By Pierre LaSalle

"Excursion géologique du Quaternaire: Saguenay – Lac-Saint-Jean" — contribution to the 36th Congress of l'Association Canadienne-Française pour l'Avancement des Sciences, at Chicoutimi — conducting two-day field trip, Sept. 6-7, 1968.

By A. F. Laurin

Series of five lectures presented at three universities in France and Germany during April-May, 1968, as follows: (1) "Faciès granulite et ses relations avec la série de Morin" — at the Sorbonne, Université de Paris, April 2; at Université de Grenoble, April 18; (2) "Méthodes de cartographie géologique au Québec et utilisation des cartes aéromagnétiques" — at Université de Grenoble, April 19; at the Sorbonne, Université de Paris, April 25; at University of Munich, May 6.

By Jehan Rondot

"Nouvel impact météoritique fossile? La structure semi-circulaire de Charlevoix" — paper published in Can. Jour. Earth Sci., Vol. 5, N°. 5, pp. 1305–1317, Oct. 1968.

"La Structure de Charlevoix — The Charlevoix Structure" — contribution to Congress of The Meteoritical Society — conducting one-day field trip, Oct. 12, 1968.

By Pierre St-Julien

"Les 'argiles-à-blocs' du sud-ouest des Appalaches du Québec" — paper published in Le Naturaliste Canadien, Vol. 95, pp. 1345–1356, Dec. 1968.

"Les roches allochtones de la partie sud-ouest des Appalaches du Québec" — lecture to the Dept. of Geology, Université de Montréal, at Montreal, Feb. 1969.

Mineral Deposits Service

O.-D. Maurice, acting director of the Service, submits the following report on the activities of the Mineral Deposits Service during the fiscal year 1968/69.

The Service endeavors to centralize and place at the disposition of the public the greatest amount of information having to do with the exploration and exploitation of metalliferous deposits, industrial minerals, peat-bogs, petroleum, and natural gas.

The responsibilities of the Service are assumed by the main office in Quebec city and by the offices of the Department's resident geologists. The personnel, at the close of the fiscal year 1968/69, comprised 18 engineers and geologists, one agronomist, and 30 technicians and office clerks. These employees were stationed at offices in Rouyn (3), Val-d'Or (3), Chibougamau (3) and Quebec (40). J.-R. Assad and H. S. de Römer resigned from the Service during the year reviewed. On the other hand, Marc Germain, geologist, joined the Service in November. Moreover, by virtue of agreements between the governments of Quebec and France, the Mineral Deposits Service acquired the services, in September, of Georges Hirlemann, a graduate geologist from the Faculté des Sciences of Strasbourg University. Paul André, who joined the Service in September 1967, returned to France in November 1968.

Activities of the Mineral Deposits Service during the fiscal period 1968/69 are grouped under the following headings: Quebec Office, Regional Offices, and Participation in Scientific and Industrial Meetings.

Quebec Office

The personnel attached to the Quebec office is responsible for carrying out or for bringing about various field works, such as geological, geophysical and geochemical surveys, preparing and editing reports, classifying and filing documents relating to statutory works, studying various technical problems, and answering requests for information on the part of the public.

The Quebec office comprises four divisions, namely: Technical Documentation, Industrial Minerals and Building Materials, Peat-Bogs, and Natural Gas and Petroleum.

Technical Documentation Division

This Division, which is directed by Raymond Paquette, comprises a confidential section and a public section. In the confidential section are field reports on development work submitted by mining companies, reports dealing with visits to mining properties by the personnel of the Department, and sundry other documents; in the public section are kept reports on statutory work on claims reverting to the Crown. During the fiscal year reviewed here, the confidential section received 1,800 reports and 2,491 plans. In the same period, 1,045 files were closed and the 2,786 documents they contained were transferred to the public section. In order to meet requests from mining companies and persons interested in exploration, 28,162 pages of reports and 3,854 copies of plans were photocopied.

The preparation of index plans showing the areas covered by the documents was continued during the year reviewed. Apart from keeping up to date the plans already in existence, the Technical Documentation Division completed 97 new plans and thus brought the number of plans to a total of 626. It may be mentioned that each plan covers a township and is accompanied by a brochure giving a list and description of the documents indicated on each of the plans. In all, 1,201 copies of these plans were distributed during the fiscal year being studied here.

In addition to receiving 506 visitors, members of the archives' staff had to answer 416 written requests for documents.

The director of the Technical Documentation Division spent a period of 3 months with the Geological Survey of Canada in Ottawa in order to study the data-processing system as applied to earth sciences in use by this organization and recommended as a national system for the purpose of uniforming the possible exchange of information across Canada.

The first task undertaken toward the application of data processing of technical documents within the Division consists in preparing an index of the information compiled from geological maps published by the Department. This work was undertaken toward the end of October. Louise Leroux and Raymond Paquette analysed the information, which is transferred to perforated cards. At the close of the fiscal year being reviewed, 200 geological maps had been analysed and the data collected represented about 10,000 perforated cards. The thesaurus of concepts authorized for the purpose of retrieving information amounts to about 2,000 key words.

Upon the recommendation of the director of the Technical Documentation Division concerning the possibility of modernizing the procedure of indexing and classifying, a consulting firm was engaged by the Department of Natural Resources to study the various channels suitable for computerizing information within the Mines Branch. This study will commence toward the end of the fiscal period under review and will include the analysis of methods in use for documentation of technical information.

Industrial Minerals and Building Materials Division

This Division, which is directed by O.-D. Maurice, keeps an inventory of Quebec's industrial minerals and building material resources. It studies the possibilities of new uses for these resources and supplies information and technical advice to persons interested in the exploitation of these resources. The Division is also concerned with geotechniques.

For a part of the year reviewed, the Division was affected by the resignation of R. Assad, as his duties were taken over by O.-D. Maurice from the month of September. Dr. Maurice continued to direct the Division but was unable to devote all his time to it. Nevertheless, he visited several limestone quarries in Gaspesia and a few granite operators in the regions of Ville-Marie and Rivière-à-Pierre, as well as some in Papineau county. A great part of his time was likewise taken up in preparing a compilation of Quebec's industrial minerals resources.

Roger Sirois, who is in charge of the building materials section, was authorized by the Department to enroll as a student at Laval University in order to follow courses in economy. He has therefore been absent since the beginning of September. Before he left, he visited granite quarries in the Beebe, Mont Johnson, Labelle, and Lac Saint-Jean regions. During the month of June, he had occasion to visit granite and marble quarries in several European countries in company with members of the Granite Producers Association that he helped to establish during the preceding year.

Jean-Y. Chagnon, who is responsible for the geotechnical section, conducted research relating to soil conditions at Desbiens, the site of a few landslides. One crew under his direction took numerous samples of clay, measured the resistance of the shearing soil at several places, and carried out a seismic survey. Laboratory studies completed this work.

Moreover, at the request of the Waters Branch, Dr. Chagnon studied the soil at the sites of five dam projects on Sainte-Anne river in Gaspesia and of a dam on Yamaska-Nord river at Savage Mills. Two soil studies, at Yamachiche and Sainte-Monique-de-Nicolet, were related to erosion problems. He likewise examined several landslide sites (Baie-Saint-Paul, Saint-David, Saint-Vallier) and conducted a series of drillings on the deposit of Quebec Clay Mining at Château-Richer.

Dr. Chagnon undertook the testing of the industrial properties of clay from the Desbiens region. This work necessitated the installation of a special laboratory.

During the summer months of the fiscal year reviewed here, Marcel Tiphane, professor at the University of Montreal, made a complete inventory of the asbestos resources of Quebec with special emphasis on the work and discoveries subsequent to the report by B.-T. Denis in 1930 (Report of the Department of Mines for the Fiscal Year 1930/31, Part D).

Peat-bogs Division

The Peat-bogs Division, which is directed by Antoine Simard, agronomist, comprises a technician, a clerk, a typist and a draftsman. The man occupations of the Division were the taking of the inventory of peat-bogs, surveying the drainage network of exploited peat-bogs, conducting certain scientific research, and improving the output and sale of peat.

Inventory

During the year under review, the peat-bog inventory comprised:

1. topographic surveying of the peat-bogs of Pointe-Lebel, Buissonnette, Baribeau-Nord, Baribeau-Sud, Du Cimetière, Range VI and Range VII, in Manicouagan township, Saguenay county;
2. study of peat-bogs situated on Mingan islands and of a peat-bog designated as Havre-Saint-Pierre peat-bog on the mainland;
3. preliminary examination of the following peat-bogs: Eaton Corner, Compton county; Raymond Berger peat-bog, Saint-Eugène-de-Ladrière, Rimouski county; Saint-Ludger-de-Milot peat-bog, Lac-Saint-Jean-Ouest county; L'Ascension peat-bog, Lac-Saint-Jean-Est county, and Saint-Ambroise peat-bog, Dubuc county.

During this work, 212 samples were taken for analysis in order to learn the absorption qualities of peat, its acidity, percentage of ash, botanical composition, and its degree of decomposition. The number of laboratory determinations was increased to 860.

The Division submitted inventory reports for publication. At the close of the fiscal period reviewed here, it had presented five reports, namely:

1. Peat-bogs of Villeroy, Mer Bleue and Francœur, in Lotbinière county;
2. Sainte-Marguerite-Marie peat-bogs, in Lac-Saint-Jean-Ouest county;
3. Saint-Charles-Borromée peat-bog, in Dubuc county;
4. Saint-Jean Île d'Orléans peat-bog, Montmorency county;
5. Peat-bogs of Mingan islands and Havre-Saint-Pierre, Duplessis county.

The Peat-bogs Division also prepared a preliminary report on the Eaton Corner peat-bog for a resident of Coaticook who wished to develop the deposit for production purposes.

Drainage

During the year reviewed, the drainage network of 38 peat-bogs under exploitation was surveyed and plotted on work maps in the office of the Division. This work is necessary for controlling the distribution of grants. As in past years, these grants totalled $20,000 and were allocated to 26 operators of peat-bogs in Bellechasse, Charlevoix, Kamouraska, Lévis, Portneuf, Rimouski, Rivière-du-Loup, and Yamaska counties.

Scientific Research

The Division continued its interest in the two principal studies undertaken on the Deschambault and Les Buissons experimental farms in 1964. No research was conducted on the Les Buissons farm during the summer of 1968, owing to the presence of disease (apple mildew) in the soil of the orchards. The study will be resumed during the summer of 1969, if circumstances are favorable.

Experiments on the Deschambault farm were continued into their fifth and final year. They have shown that peat litter is superior to straw-litter from the point of view of absorption of liquids and gases, thus lessening labor and increasing general cleanliness. In spite of these advantages, the cost of peat litter remains a little higher than that of straw litter. However, manures containing peat-litter are slightly richer in fertilizing elements than those containing straw litter.

Production and Marketing of Peat

Mr. Simard continued to work in collaboration with the Peat Producers Association of Quebec toward advancing the mechanization of the peat industry. Most of the important producers are now using harvesting machines which cut the peat into briquettes and pile these on the side of the trenches by the Peterson method, which is a vacuum process whereby the peat is dried to its requisite percentage of humidity and then transported from the field.

Special Work

In collaboration with Auguste Mailloux, director of the Classification of Soils Section at La Pocatière, Antoine Simard worked toward the establishing of an international classification of peat-bogs or organic soils as proposed by the Federal Government. Along with Gaétan Lussier, agronomist from the Richelieu region, he also studied, for agricultural purposes, a development project for the Canrobert peat-bog in the parish of Saint-Ange-Gardien, Rouville county.

Natural Gas and Petroleum Division

The personnel of the Natural Gas and Petroleum Division includes W. B. Skidmore, geologist, and Paul-P. Simard, engineer.

The Division is responsible for the application of the Act and regulations concerning research, exploitation and underground storage of petroleum and natural gas. It also has the task of gathering and compiling technical information relating to these resources and of being ready to advise, and to give technical assistance to, interested companies.

During the fiscal year under review in this report, seismic surveys were conducted by Shell Company in the St. Lawrence Lowlands, by Gulf Company in Gaspesia, and by SAREP Company in the Gulf of St. Lawrence. The Shell Company drilled one hole during the winter of 1968/69, about 5 miles east of

Saint-Hyacinthe. The well that Sun Québec Limitée started to the west of Lake Matapédia was abandoned at a depth of 5,990 feet.

During the year 1968/69, the personnel of this Division was mainly concerned with:

1. completing amendments to the Mining Act in what relates to natural gas and petroleum;
2. completing new regulations concerning research and exploitation of natural gas and petroleum;
3. following closely all work conducted toward the search for natural gas and petroleum and classifying samples and information resulting from this work;
4. satisfying itself that work was done according to standards conforming to those of the petroleum industry;
5. verifying the presence of presumed discoveries of natural gas on private lands and seeing to the blocking of holes drilled during engineering works or in search of water in places where natural gas was encountered;
6. assisting in detailed geological works in eastern Gaspesia (These works were carried out by G. D. Mason, graduate student from Carleton University, Ottawa);
7. conducting seismic surveys in the Pointe-du-Lac and Sorel regions (This work lasted 2 months and was carried out by Marc Germain); and
8. preparing geological and geophysical research programs for 1969/70.

In addition to the above-mentioned accomplishments by the Division, the Quebec office was engaged in the activities listed below.

Detailed Geological Surveys

The Mineral Deposits Service conducted geological surveys in the following regions:

— Northwest quarter of McCorkill township, Chibougamau district — A. Mathieu * and G. Duquette *;

— Northwest quarter of Lemoine township, Chibougamau district — G.-O. Allard;

— Southwest quarter of Verneuil township, Val-d'Or district — M. van de Walle *;

— Southwest quarter of Baby township, Rouyn-Noranda district — L. Imreh *;

— North half of Clericy township, Rouyn-Noranda district — J. A. MacIntosh *;

— Roquemaure township, Rouyn-Noranda district — P. R. Eakins.

* Full-time staff member.

Geochemistry

During the summer of 1968, L. Kish * visited some of the opaque oxide deposits of the geological Grenville Province. This work is the beginning of a systematic study of the genetic, chemical and economic aspects of the iron and titanium concentrations associated with anorthosite masses as well as basic and ultrabasic rocks.

In May and September 1968, B. Gunn collected 200 samples of volcanic rocks in the Chibougamau district and analysed them for major elements (Na, Mg, Al, Si, P, K, Ti, Mn, Fe) and also for Rb, Sr, Ba, Cu, and Zn. These analyses were carried out in the hope of finding a certain relationship between the various volcanic formations of the district and of identifying diverse types.

The geological field parties continued to gather sediment samples from streams for analysis of their content in copper, zinc, lead, molybdenum, nickel and uranium, and some other specific elements of special regions. In all, 600 samples were taken by field parties of the Mineral Deposits Service and 1,607 by crews of the Geological Explorations Service. As in preceding years, these samples were entrusted to Georges Boiteau, who directed them to laboratories of the Department and later to its archives.

With a view to acquiring a better knowledge of the chemism of the formations encountered by the geological field parties, geologists have undertaken the collecting of samples from formations and of having them analysed in the laboratories of the Department for the oxides of Si, Al, Ca, Mg, K, Na, Ti, and Fe, as well as for trace elements of Cu, Pb, Zn, Au, Ag, Mo, U, V, Cr, Ni, Pt, Sn, W, and Hg. In all, 451 samples were sent to Mr. Boiteau so that they would be given an examination similar to that received by sediment samples from streams.

At the end of March 1969, the results of the geochemical surveys carried out, in 1967, in the Kipawa Lake area by R. Kelly * and L. Imreh * were put at the disposition of the public in the form of a preliminary document comprising a geological map and an interpretation map for each of the elements of Cu, Co, Zn, Ni, Pb, Mo, U, Ag, Mn, and Sn.

Airborne Geophysics

During the year under review, the Mineral Deposits Service caused airborne geophysical surveys to be carried out over an area of about 500 square miles in the Rouyn-Noranda mining district. The program comprised two distinct phases: an electromagnetic survey, in which the INPUT method was used and an experimental survey, which combined an electromagnetic technique called "Radiophase" and a "Radiometric" technique. Steps were also taken by the Service to bring about the aeromagnetic survey of another block of ground in the Province, this jointly with the Federal Government.

INPUT Survey

The INPUT (INduced PUlse Transient) system, developed by Selco Explorations of Canada, became operational in 1959. This system constitutes a radical departure from the usual E.M. systems. Based on the study of the decay of eddy currents produced in the ground by short and powerful electromagnetic pulses emitted from an aircraft, it permits the observer to gain information on the conductivity of the ground.

The general principle of the INPUT method is the same as that attendant to other electromagnetic systems in which a transmitter and a receiver are used. In the absence of an electrically conductive body nearby, the receiver senses the "primary field" generated by the transmitter. If, on the other hand, a conductive body happens to be in the vicinity, the field produced by the transmitter generates an electromotive force and a current in the body; this current causes in turn a "secondary field", superimposed on the primary field, which can be recorded by the receiver. Study of the secondary field, after compensation for the primary field, thus affords the detection of conductors located in the neighborhood of the apparatus. The originality of the INPUT system lies in the transmission of a signal of short pulses instead of harmonic modulations at a given frequency and in the study by the receiver of the time-varying decay of the secondary field.

The decay curve is analyzed by means of six sampling windows whose centers and widths are spread in time in relation to an origin which corresponds to the cessation of the primary pulse. The signals picked up at each sampling point are processed in a six-channel receiver and recorded by means of six analogic traces, each trace representing the integration of values obtained at a point of the decay curve of the secondary field.

The results of the INPUT surveys are presented on photomosaics by means of symbols condensing a number of data. Those shown on the maps for the Rouyn-Noranda area comprise the number of affected channels and the coincident and flanking anomalies.

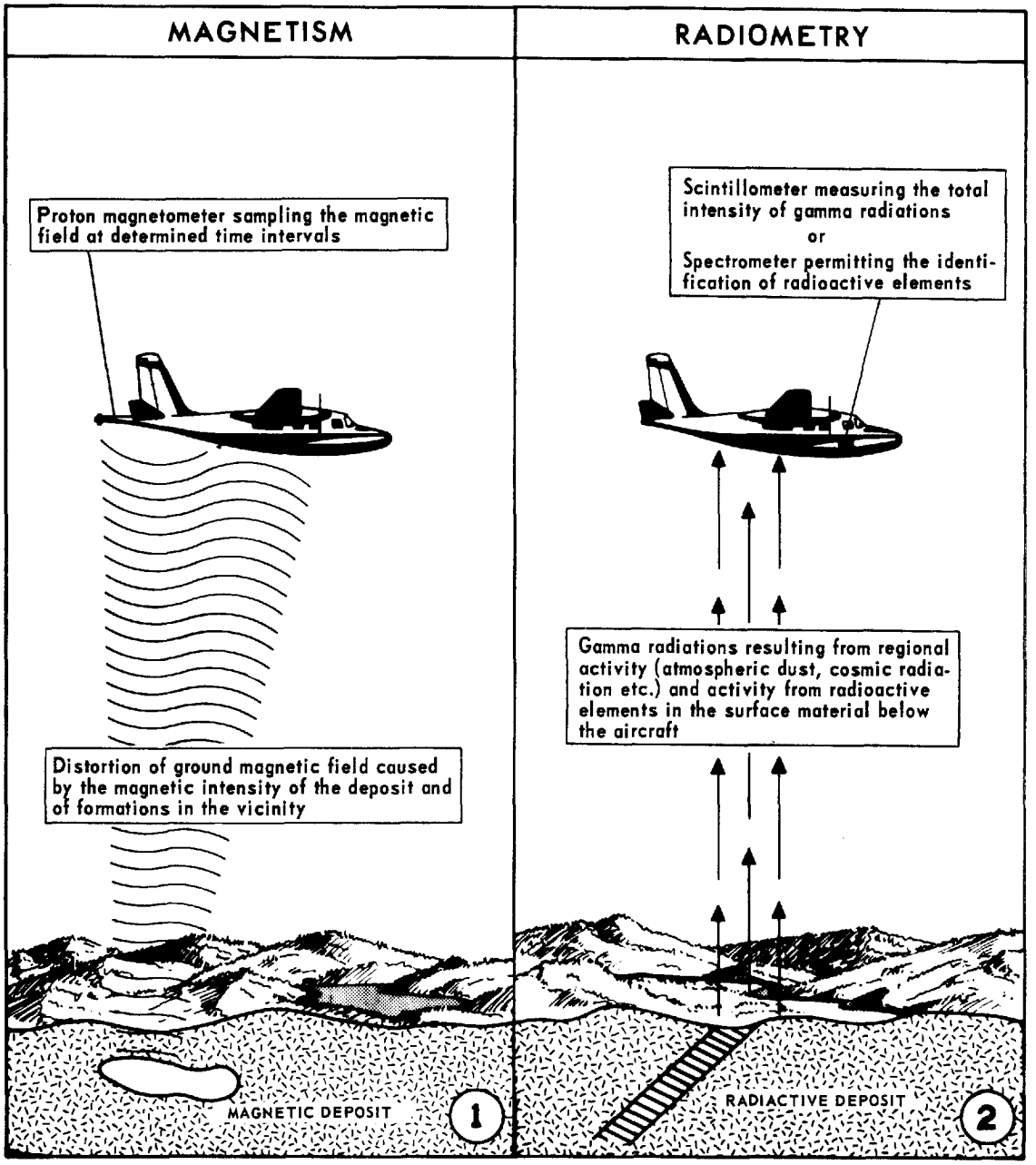
Radiophase Survey

This system measures the variations of a very low frequency radio wave. It is based upon the fact that the electric field component of radio waves is only slightly affected by variations in conductivity of the underlying terrain. Thus, the vertical field serves as a reference against which variations in both phase and amplitude of the horizontal magnetic field components of the transmitted field are measured.

The equipment used in radiophase surveys senses four variables. The first of these is the vertical electric field strenght, which is measured with a small vertical whip antenna. The phase of this signal is used to control the operation of three synchronous detectors: a trailing antenna and two coils located so as to be orthogonal to each other. The trailing antenna is used to

AIRBORNE

METHODS NOW USED



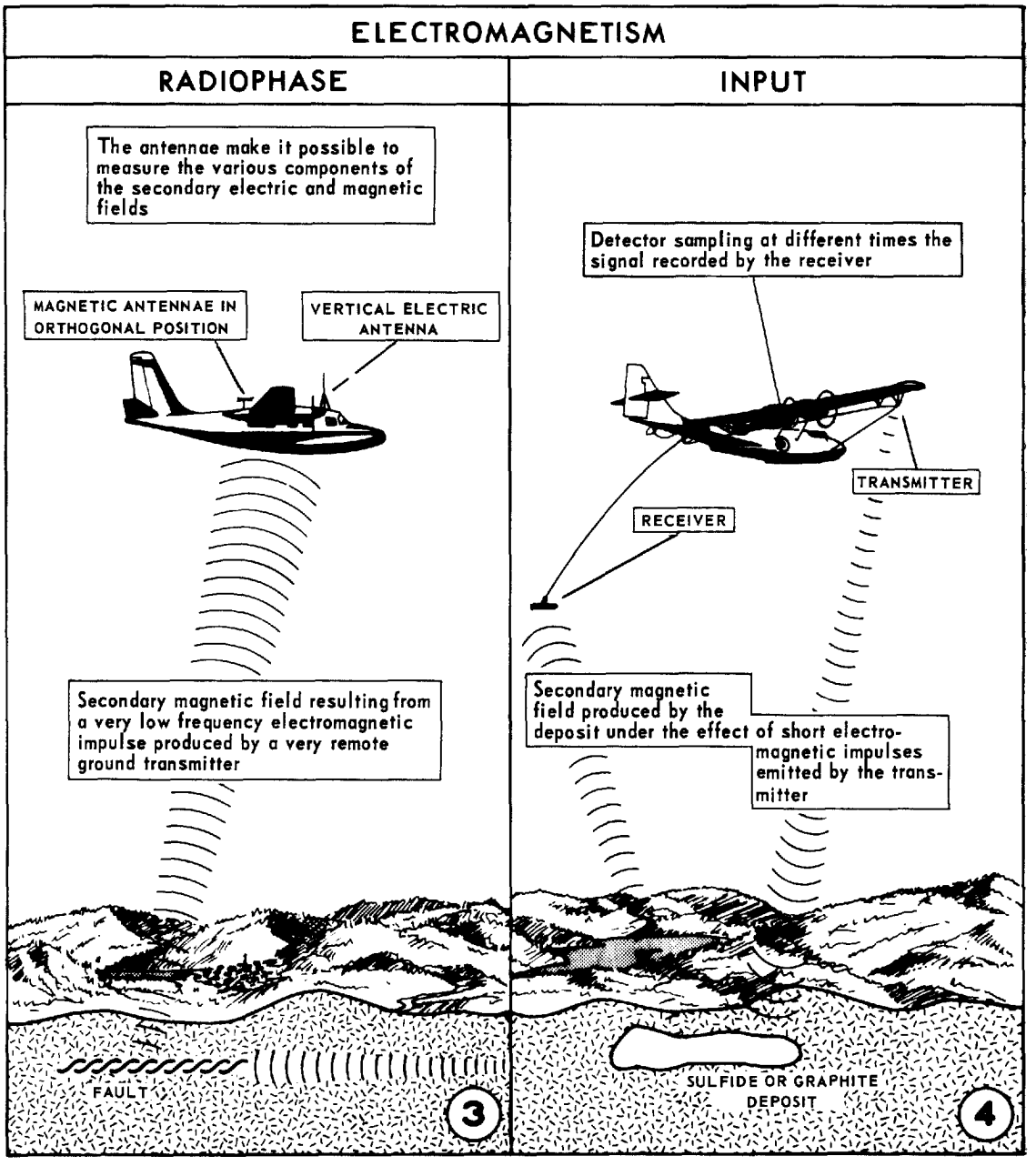
REMARKS

1- All these systems are equipped with positioning cameras and altimeters.

2- Systems 1,2,3 and 1,2,4 are theoretically compatible, but the heights, spacings and speeds of flight are not necessarily the same in each systems for optimum efficiency.

GEOPHYSICS

BY THE DEPARTMENT



measure the quadrature phase of the horizontal electric field, whereas the coils measure the transverse and longitudinal components of the quadrature magnetic field, that is the secondary field produced in a conductor rather than the primary field. The output of the two coils can be RMS summed to give the magnitude of the resultant magnetic field; the vector direction can be determined from the knowledge of the two components, yielding the strike of the conductor.

The results of the survey carried out in the Rouyn-Noranda area are shown on two photomosaics: a contoured map giving the longitudinal component of the secondary magnetic field and a vector map showing the direction of the resultant of the same field.

Radiometric Survey

A radiometric survey was carried out along with the radiophase survey. As for radiophase, the intention was to test the possible use of the technique in mining exploration.

The purpose of an airborne radiometric survey is to obtain a continuous space recording of the intensity of the gamma radiations expressed in counts per second. The speed and height of the aircraft influence the data. To keep the recorded anomaly relatively undeformed, the product of the speed of the aircraft (meter/second) by the integration constant (second) must be less than the flying height or equal to it. In the Rouyn-Noranda survey, readings were taken with a calibrated AV-4 McPhar scintillometer at an average height of 350 feet above the ground. The instrument was equipped with a thallium-activated NaI crystal (4″ x 6″). The time constant was 1 second. No distinction was made between the radiations due to potassium, uranium, or thorium and no correction was made for variations in flying height.

Isorad maps resulting from radiometric surveys are useful for the detection and delimitation of granitic intrusions and radioactive rock formations overlain by vegetation.

The usefulness of radiometric surveys remains tied to the thickness of overburden, since the radiation from the ground is almost entirely concentrated in the first 18 inches below the surface, be it loose material or solid rock. In areas where the unconsolidated material is shallow, the radiation emitted by this material corresponds roughly to the radiation of the underlying rock. This relationship is probably fortuitous in areas where the loose material is on the thick side. What in fact is measured by an airborne scintillometer is the radiation emitted by insoluble salts fixed at shallow depth in the ground. These salts constitute a geochemical aureole which can be studied directly by sampling. Considering that airborne radiometry is tied to geochemistry, the overburden has comparable effects. It should be observed however that the irregularities encountered in ground measurements are attenuated by the fact that the airborne detector integrates the data; generally speaking, the detector measures the average instantaneous radioactivity of an area about 4 times the square of the flying height.

Aeromagnetic Surveys

A contract was awarded to Aéro Photo Inc., at the end of the year under review, for the survey of about 124,000 square miles in the course of the fiscal years 1969/70, 1970/71 and 1971/72 (see Fig. 1).

The aeromagnetic method of prospecting depends for its utility on the fact that most rocks contain small but significant quantities of ferromagnetic minerals, the amount varying widely with rock types. The rocks therefore have a weak magnetization which modifies the earth's field to an extent that can be detected at the surface with sensitive instruments.

The magnetometers carried aboard the aircrafts for the present survey are proton magnetometers (nuclear precession) which sample the total magnetic field (Z) at predetermined time intervals. They have a range of 20,000 to 100,000 gammas, a sensitivity of 1 gamma, and an integration constant of close to 1 second.

Magnetic surveys are very useful in the field of mining exploration. Ores such as magnetite and pyrrhotite are strongly magnetic and thus may be directly detected with an airborne magnetometer. Many ores which are not in themselves magnetic are associated with magnetic rocks. For example, gold is found in places associated with certain intrusive igneous rocks which may be traced with the magnetometer.

On a larger scale, magnetic surveys are used for mapping geological structures. In areas where the sedimentary sequence is thick, it is sometimes possible to delineate the major structural features because the succession includes magnetic horizons. In such circumstances anticlines will produce positive and synclines, negative anomalies, faults being indicated by linear belts of sharp gradient or by sudden swings in the trend of the contours. The configuration of the crystalline basement can also be studied with the magnetometer. Where the basement rocks are brought nearer to the surface, the magnetic anomalies are characterized by strong relief; conversely, deep sedimentary basins are likely to show low values of the anomaly and gentle field gradients. The limits of rock formations with different magnetic intensity can easily be detected with the magnetometer.

Ground Geophysics

In the fall of 1968 (September 5, to October 24), Jean Duroux and Michel Zahaczweski, both from the "Bureau de Recherches Géologiques et Minières" of France, carried out experiments in Quebec with a magnetoelectric apparatus while studying surface waves.

This prospecting technique, known as MELOS, is based on the study on the surface components of the electromagnetic field produced by a transmitter operating in the very low frequency range. It affords an idea of the distribution of the resistivity of the terrains directly under the site where the components are measured. The prospecting apparatus comprises a transmitter and a

receiver separated by a distance ranging between one hundred and a few thousands of feet with no liaison between the operators other than radio communication. Transmitter and receiver are entirely transistorized and of about the same weight and volume; with all accessories, the total weight of the system is of the order of 400 pounds.

The setting up of the apparatus is relatively simple. From a fixed transmitter, a loop is laid out the diameter of which is so chosen as to be compatible with the order of magnitude of the desired depth of investigation and the resistivity of the underlying formations. The transmitting dipole being symmetrical about its vertical axis, a series of readings can be taken by a receiver all around it. In practice, over a normal sedimentary sequence, the distance between the transmitter and the receiver may range between 5 and 10 times the diameter of the loop, this distance representing 2 to 6 times the penetration depth.

While in Quebec, Messrs. Duroux and Zahraczweski performed a total of 185 readings (145 new stations and 40 repeat stations). The experiments were made over graphite and sulfide conductors in the Abitibi region; various tests were also carried out in the captured-waters basin of the Montmorency Forest, in the Yamaska basin, over the gas structure at Pointe-du-Lac, and in the Saint-Jean Lake basin. In the case of the mining experiments, each anomaly or conductor was the object of one or more profiles. Although the results are not yet definitive, it can be said that the various conductors were all detected and that the experiments promise to be instructive. The problems studied in the course of the second series of tests can all be likened to one or two low-to-medium resistivity formations overlying a high resistivity substratum. The results were generally conclusive. The operators noted in particular that the contact between conductive clays and resistant substratum constitutes a good marker, that the salt waters of the St. Lawrence lowlands can be detected wherever they are present, and that the penetration in the types of ground under study reached 400 feet without major difficulty.

Technical Revision

During the year reviewed here, Jean Dugas and Roger Gagnon revised manuscripts and forwarded them to the Editing Division for publication. A list is given at page 2.

From time to time the Mineral Deposits Service makes available to the public for consultation or obtaining at its offices certain documents containing information of immediate interest. During the fiscal year reviewed, the preliminary map, by L. Kish, of part of Blondeau township (GM-22595), as well as the Kipawa Lake area, was prepared and made available to the interested public.

Courses in Prospecting

Courses in prospecting, which are given annually under the auspices of the Department of Natural Resources and which are the responsibility of the

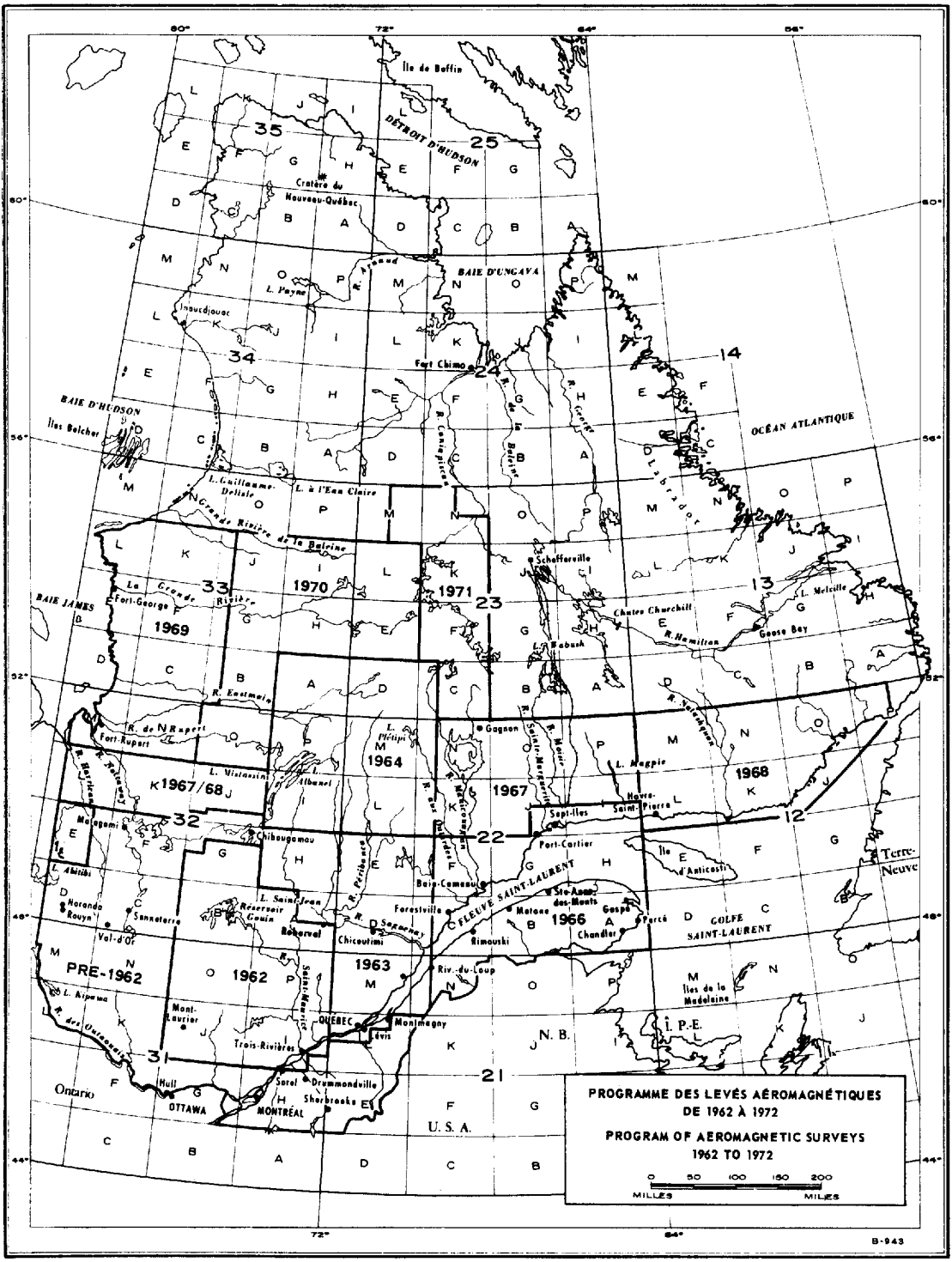

PROGRAMME DES LEVÉS AÉROMAGNÉTIQUES
DE 1962 À 1972
PROGRAM OF AEROMAGNETIC SURVEYS
1962 TO 1972
0 50 100 150 200
MILLES MILES
PRE-1962
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1967/68
Île de Baffin
DÉTROIT D'HUDSON
BAIE D'UNGAVA
BAIE D'HUDSON
BAIE JAMES
OCÉAN ATLANTIQUE
Cratère du Nouveau-Québec
Fort Chimo
Schefferville
Fort-George
Gagnon
Fort-Rupert
Chibougamau
Chicoutimi
Baie-Comeau
Port-Cartier
Sept-Îles
Havre-Saint-Pierre
Rimouski
Riv.-du-Loup
Matane
Gaspé
Chandler
Forestville
Roberval
Sanmaterre
Noranda
Rouyn
Val-d'Or
Mont-Laurier
Trois-Rivières
Sorel
Drummondville
Sherbrooke
Lévis
Monmagny
Hull
OTTAWA
MONTRÉAL
QUÉBEC
Ontario
U. S. A.
N. B.
Î. P.-E.
Îles de la Madeleine
Îles Belcher
Goose Bay
Terre-Neuve
GOLFE SAINT-LAURENT
FLEUVE SAINT-LAURENT
B-943

Figure 2

Mineral Deposits Service, were held at École Polytechnique and Laval University. These courses are of six weeks' duration. At École Polytechnique, 47 persons attended the course and 30 of these received certificates. At Laval University the course was offered to 27 students and each received a certificate. The study program consisted in instruction in mineralogy and petrography, chemistry, general and economic geology, geophysics, prospecting, and analysis and treatment of ores. It also included the study of maps and photographs, the showing of films, and field excursions.

Mineralization Maps

Within the scope of the inventory of the mineral resources of Quebec, the Mineral Deposits Service published maps at the scale of one inch equals 4 miles showing the mineralization of various localities. The Appalachian region (Maps B-790, B-791 and B-792), the Noranda – Mattagami – Val-d'Or – Chibougamau region (Map 1600), and the Labrador Trough (not yet published) have already been covered. During the fiscal year being reviewed, J. Dugas continued the compilation of the mineralization of the land zone lying between Cape Smith and Wakeham Bay in the extreme north of Quebec.

Mineral Deposits and Metallogenic Maps

The Mineral Deposits Service has been interested in the production of mineral deposits and metallogenic maps for the past four years. The first stage consisted in preparing files on deposits, that is files containing principal data of a geological nature. During the year 1968/69, 168 files were completed which brought the total to 355 units. Moreover, about 150 production sheets were prepared or revised.

Dr. Dugas continued, on an experimental basis, the preparation of metallogenic maps of the region northwest of Quebec and also the Gaspesia region. He prepared a metallogenic map of Quebec at the scale of 1 : 5,000,000 for use in the compilation of a preliminary metallogenic map of North America that was presented to the International Geologic Congress of Prague in August 1968.

Revocation of Mining Rights

It is the responsibility of the Service to carry out surveys and to proceed with inquiries relating to the revocation of mining rights on mining concessions by virtue of Section 206 of the Mining Act. During the fiscal term reviewed here, Raymond Paquet examined nine of these properties in Weedon township.

Regional Offices

An indispensable part of the work of the Mineral Deposits Service was accomplished by the resident geologists of the regional offices. It is the responsibility of each of these geologists to keep himself informed concerning the mineral exploration and mining development works being carried out within the limits

of his particular district. They have to compile geological data, correlate these facts, and answer all requests for pertinent information coming from mining companies and prospectors. These resident geologists have to visit mining properties and prepare a report on the geology, economic value and stage of development of each property in their respective districts. Moreover, they supervise the issuing of maps that show, on a detailed scale, the geology of their districts. Mention may be made here also that these geologists collaborate in the preparation and carrying out of research projects organized by the Government or universities. As an aid to the resident geologists in their work, they are provided with as complete a collection as possible of reports, maps and other documents related to the geology and mining activity of the district for which they are responsible.

Gilles Duquette, resident geologist for the Chibougamau district, visited mining properties and helped in the detailed geological mapping of the northwest quarter of McCorkill township. Dr. Duquette, moreover, prepared a geological report subsequent to the detailed mapping of the south half of Obalski township. In addition to this he received at least 300 visitors at his office.

J. A. MacIntosh, resident geologist for the Rouyn-Noranda district, continued the geological mapping of part of Clériçy township, undertook a lithological study of the Delbridge mine, and visited several mining properties. Some 750 persons visited his office during the year under review here.

The resident geologist for the Val-d'Or district, Mr. Latulippe, supervised the mapping of the Quévillon area, visited certain mining properties, and did geological traversing in Senneterre township. Mr. Latulippe received 875 visitors who came to his office for information.

Participation in Scientific and Industrial Meetings

Geologists of the Mineral Deposits Service were present at or gave their assistance to various scientific and industrial undertakings during the fiscal term being reviewed.

In the autumn of 1968, Gilles Duquette spent a month and a half in France for the purpose of visiting mines in the Massif central and in the Pyrénées.

Jean Dugas prepared an article on copper, which was published in the March number of "Le Naturaliste" (Vol. VI, 1968/69). He also wrote an article for the "Northern Miner" (issued March 6, 1969) on the exploration to be undertaken by the Department of Natural Resources during the summer of 1969. Moreover, Dr. Dugas, in company with Gilles Duquette, sojourned for a month and a half in France, during which time he visited the principal stratiform deposits of lead and zinc, as well as sites of some recent ore discoveries in that country. He likewise prepared, in collaboration with P.-E. Grenier, a paper entitled: "Mining Exploration and Development in Quebec — Facts and Incentives". This paper was presented in March 1969 at the meeting of the "Prospectors and Developers Association".

Jean-Y. Chagnon published an article on clay flowage, which was issued in the review "Le Naturaliste Canadien" (Vol. 95, N°. 6, 1968, pp. 1327-1343). Dr. Chagnon also published, in collaboration with Pierre LaSalle of the Geological Exploration Service, an article on an old landslide in the Saint-Jean-Vianney region, Saguenay river, in the "Canadian Journal of Earth Sciences" (Vol. 5, N°. 3, 1968, pp. 548-549). He, moreover, took part in the meetings of the special committee for the study of earth sciences geotechnic section, an, at the University of Montreal (February 1969), he presented a conference on clay flowage.

In the spring of 1968, Roger Sirois visited the principal quarries and stone-dressing works in Europe, as well as some research centers, in company with a delegation from the "Granite Producers Association of Canada". The object of this industrial mission, which was initiated by the Department, was to orientate Quebec granite producers toward a better use of Quebec's resources and to give them an occasion to learn European methods of extracting and dressing stone, related research work, and the application of granite in modern construction.

A conference was given by Antoine Simard, agronomist, presenting conclusions of scientific research at the International Congress on Peat which was held at Laval University from August 18 to 23, 1968.

W. B. Skidmore contributed two scientific articles: "Stratigraphic Evidence for the Taconic Orogeny in the Northern Appalachians" (published in Studies of Appalachian Geology, Northern and Maritime; Interscience Publishers) and "Lower Llandovery of the Northern Appalachians and Adjacent Regions" (published in Geo. Soc. Ann. Bull., Vol. 80, pp. 459–484). Moreover, Dr. Skidmore presented a paper on the geology of Gaspesia at the University of Montreal and also at McGill University.

Hydrogeology Service

Raymond Roy, director of the Hydrogeology Service, reports as follows on the program of work conducted by his Service during the fiscal year 1968/69.

As of March 31, 1969, the personnel of the Hydrogeology Service comprised six hydrogeologists, three technicians, one technician assistant, one office administrator and two typists.

As in past years, the Service continued to take an inventory of underground waters on a regional and local scale. The eight projects undertaken are listed below: (1) hydrogeological study of Eaux Volées Creek basin, Montmorency forest; (2) hydrogeological study of Aylmer Lake and Saint-François Lake district; (3) hydrogeological study of Eaton River basin; (4) inventory of aquiferous formations in six rural municipalities of Quebec; (5) reconnaissance drilling in Lake Saint-Jean – Saguenay district; (6) inventory of underground waters of Saint-Hyacinthe and Rouville counties; (7) hydrogeological study of Orléans island and the region north of Quebec; (8) spot hydrogeological surveys.

The Service completed a cumulative total of 19,339 feet of drilling in the areas studied during the year reviewed here.

PROJECT N°. 1: *Hydrogeological study of Eaux Volées Creek basin, Montmorency forest* — F. Rochette.

This study, which is carried out jointly with the Waters Branch of the Department, is a contribution to the International Hydrological Decade and is in its second year of operation. It may be recalled that the purpose of the study is to determine the hydrogeological cycle and the influence of forest cover.

The basin covers 3.54 square miles and is situated at the intersection of the coordinates of longitude 71°09'10" and latitude 47°16'20", which is some 45 miles north from Quebec city.

In the fiscal period 1968/69, the field work consisted in exploratory drilling, a seismic survey, and the installation of piezometers. Ten drill-holes were bored and piezometers of 1¼-inch diameter were installed. This work represented 612 feet of drilling, of which 324 feet was in overburden and 288 in bedrock. Observers have already begun to follow aquiferous fluctuations, but it will be necessary to study them for another full year before they can be interpreted.

During the course of the fiscal period 1969/70, the Service plans to install about 15 additional piezometers, some in overburden and others in rock, and, if possible, to sink two test wells in order to determine the aquiferous potential of the formations.

PROJECT N°. 2: *Hydrogeological study of Aylmer Lake and Saint-François Lake district* — G. Simard.

The district covers 265 square miles and is contained within longitudes 71°05' and 71°25' and latitudes 45°45' and 46°00'. It is situated 70 miles south of Quebec city, occupying a part of Frontenac and Wolfe counties. As recorded in reports S-103 and S-112, this work consists in searching for the pervious localities of the basin's northeast drainage system and in delimiting the seepage zones.

A seismic survey conducted during the fiscal year 1968/69 revealed the presence of four preglacial valleys. Moreover, the thermometry survey enabled searchers to identify anomalies along Aylmer lake, which led them to presume the presence of an outlet of these valleys into the lake. Drilling (465 feet in all) was also used to advantage in verifying the nature and thickness of surficial deposits.

The first stage of this study having been completed, there remains but to intensify the drilling, install a piezometric network, and sink test wells in order to learn the hydrogeological characteristics of the aquifers. A study project was also undertaken through the infra-red process, which might enable one to pinpoint the anomaly zones that were discovered in the thermometry survey.

PROJECT N°. 3: *Hydrogeological study of Eaton River basin* — G. Simard and D. Croteau.

This study, which was conducted jointly with the Waters Branch of the Department, is a contribution to the International Hydrological Decade. It is, at the time of writing, in its fourth year of operation. The purpose of this study is to estimate the contribution of underground waters in relation to the hydrological cycle in the representative basin and to determine the hydrogeological parameters.

The basin is situated in the Appalachians, to the south of Sherbrooke, and occupies the tract between longitudes 71°10′ and 71°45′ and latitudes 45°10′ and 45°30′. It comprises an area of 250 square miles.

During the year under study in this report, exploration of the valleys of Eaton and Clifton rivers was continued. For this purpose a stratigraphic drilling campaign (5,774 feet) was undertaken in the preglacial valleys that underlie the present valleys. The study revealed alluvions on surface and sand and gravel at depth underlying a till and extending for a distance of about 10 miles. This aquiferous formation makes it possible to develop wells having a strong flow. Hence, at Saint-Isidore-d'Auckland, a test well was drilled which supplied, after a pumping test during a fairly long period, a flow of 100 gallons a minute, which is 55 gallons more than that required by the municipality. A well properly developed at this place could certainly supply a flow in excess of 100 gallons a minute. Moreover, two other piezometric stations were installed and from these it was possible to study the fluctuations of the aquifers throughout the year.

Phenomena such as observed in the basin occur elsewhere in the Eastern Townships, and it is, therefore, important to verify the presence of preglacial valleys favorable to the impounding of underground water.

During the fiscal period of 1969/70, more stratigraphic drilling is planned for the purpose of defining more accurately the axes of the valleys and of installing additional piezometric stations.

PROJECT N°. 4: *Inventory of aquiferous formations in six rural municipalities of Quebec* — C. Grenier.

This study, identified as ARDA project N°. 765, was undertaken in 1966 and concluded in 1968. Its purpose was to discover aquiferous formations capable of supplying water of acceptable quality and in sufficient quantity in 11 rural municipalities of Quebec. During the fiscal term being reviewed, work was carried out in the following six municipalities: Saint-Augustin (Portneuf), Saint-Justin (Maskinongé), Sainte-Emélie (Joliette), Saint-Damien (Berthier), Saint-Cléophas (Joliette), and Notre-Dame-du-Nord (Témiscamingue). At these localities, the Hydrogeology Service put down 1,635 feet of drill-holes and made some test wells.

The study having been completed, the following conclusions are evident:
— Of the 11 municipalities visited, seven have had their water supply problem

definitively solved and the results obtained in three municipalities are satisfactory. However, hydrogeological conditions at Saint-Justin are unfortunately of little value toward the development of a well with a strong flow.

PROJECT N°. 5: *Reconnaissance drilling in Lake Saint-Jean and Saguenay district* — R. Dessureault.

This study, which is known as ARDA project N°. 1017, was conducted jointly with the Geological Services of the Department. It was started in 1967 and pursued during 1968/69. Its purpose was to study the nature and depth of surficial deposits and to facilitate the work of the Service when detailed hydrogeological surveys have to be made in the district.

During the year reviewed here, the Hydrogeological Service carried out a seismic survey, the interpretation of which was based on control drilling, and did 6,627 feet of drilling. The following municipalities profited from these studies: Roberval parish, Roberval and Lac-Bouchette (Lac-Saint-Jean-Ouest) and Saint-Cœur-de-Marie (Lac-Saint-Jean-Est). Although this project has not been completed, the work up to the time of writing confirms the presence of favorable aquifers.

The Hydrogeological Service will concentrate its activity during the fiscal period 1969/70 on two regions: one situated west of Kénogami lake; the other, north of L'Ascension. It is believed that there is at this latter locality some 350 feet of surficial deposits.

PROJECT N°. 6: *Inventory of underground waters in Saint-Hyacinthe and Rouville counties* — J.-M. Prévôt.

This project, which was undertaken jointly with the Quebec Water Board in 1967, was continued during the course of 1968/69. It is known as ARDA project N°. 1053.

The work accomplished consisted in completing the inventory of 250 wells located in two counties. A certain number of water samples were collected for analysis. The results obtained enabled the service to trace an isochlore variation map and to present evidence of existing aquifers of fresh water in Rouville county. Moreover, the Service had 150 electrical soundings and a number of seismic profiles made. This study was followed by a campaign of stratigraphic drilling (3,055 feet, of which 604 feet was drilled by private enterprise). Two test wells were completed and 14 piezometers were installed.

Although this work is not yet completed, the following observations at the date of writing may be mentioned: — Saint-Hyacinthe contains more or less salt-water aquifers, whereas Rouville county impounds fresh-water aquifers.

Advantage was taken of the presence of the Service's personnel while in the field to conduct spot studies at Saint-Paul-d'Abottsford, Saint-Césaire, Rougemont, and Saint-Jean-Baptiste-de-Rouville. At the three first-mentioned places

the hydrogeological conditions are excellent. In the fourth locality, however, no favorable aquifer was discovered.

PROJECT N°. 7: *Hydrogeological study of Orléans island and the region north of Quebec* — C. Grenier.

The purpose of this study was to determine the regime of underground water and to delimit, if possible, the different aquiferous formations. Work was especially concentrated on study at Orléans island, where it consisted in making an inventory of the existing wells and of taking water samples from these wells.

It may be pointed out that the unconsolidated deposits are in general not very abundant, except in a few glacial valleys. The consolidated rock consists mainly of schists, limestones, conglomerates, and quartzites in beds steeply inclined toward the east and interrupted by faults. The regime of underground water appears to be controlled by cleavages, joints, fractures and beds of partially dissolved limestone. The role of the valleys has not been determined.

Drilling, a seismic survey and, if necessary, the installation of piezometers are foreseen for the summer of 1969.

PROJECT N°. 8: *Localized hydrogeological surveys*

The professional personnel of the Service, aided by Antoine Marot, military collaborator with the Service until October, visited about twenty rural municipalities of the Province. The work consisted in acquiring a knowledge of existing problems and suggesting solutions in some cases. A total of 1,171 feet of drilling was completed.

OTHER WORK

During the fiscal period under study here, the Hydrogeological Service attended to the application of the Act Respecting Ground Water. To this end, it issued 113 permits to drill for water to an equal number of drillers in various parts of Quebec. The object of the Act and of the regulations relating to it is to gather all the hydrogeological information on wells that have been sunk, such as depth, nature of material encountered, flow, quality of water, etc. This source of information added to what is already on file in the Service will enable the Service to publish a list of the wells and the drilling that have been made by region, municipal county, or any other geographical, economical or administrative division. Some 2,000 reports on drilling for water by private enterprise were received by the Hydrogeology Service.

Two hydrogeologists of the Service, Claude Grenier and Jean-Michel Prévôt, each presented a paper at the Annual Conference of the ACFAS, which took place in Ottawa on November 7, 8 and 9. M^r. Grenier spoke on "localized hydrogeological research" and M^r. Prévôt, on "regional hydrogeological prospecting".

LIST OF GEOLOGICAL FIELD PROJECTS — 1968

Following is a list of the 1968 field projects, including the title of each and the name of the chief. Summaries of these projects are given in special booklet N°. S-112, which is accompanied by Index Map 1659.

Mapping Projects

1.	Natashquan Area: Duplessis County (1″ = 1 mi.)	J.-P. Bassaget *
2.	Manicouagan and Outardes Rivers Area: Saguenay, Dubuc and Charlevoix Counties (1″ = 4 mi.)	A.-F. Laurin *
3.	Conflans Lake Area: Mistassini Territory and Dubuc County (1″ = 1 mi.)	E. H. Chown
4.	Lac Rouvray Area: Dubuc County (1″ = 1 mi.) ..	M. M. Kehlenbeck
5.	Isle Maligne Area: Dubuc, Lac-Saint-Jean and Roberval Counties (Quaternary Geology)	G. Tremblay
6.	Dolbeau Area: Roberval County (Unconsolidated Deposits)	M.-L. Noiseux
7.	Rowanton Area: Témiscamingue and Pontiac Counties (1″ = 1 mi.)	Maurice Rive *
8a.	Grondines Area: Champlain, Portneuf, Nicolet and Other Counties (Revision Mapping)	Yvon Globensky *
8b.	Lyster Area: Mégantic, Lotbinière and Other Counties (1″ = ½ mi.)	Yvon Globensky *
9.	Disraeli Area: (West Half): Wolfe and Mégantic Counties (1″ = ½ mi.)	R.-Y. Lamarche
10.	Québec – Chaudière Area: Québec, Lévis, Lotbinière, Dorchester and Other Counties (1″ = ½ mi.)	Pierre St-Julien *
11.	Saint-Malachie Area (West Half): Bellechasse and Dorchester Counties (1″ = ½ mi.)	Claude Hubert
12.	Saint-Modeste Area (West Half): Rivière-du-Loup County (1″ = ½ mi.)	M.-A. Léonard

Miscellaneous Projects

A)	Central Labrador Trough — special studies	Erich Dimroth *
B)	Charlevoix Semicircular Structure — special study ..	Jehan Rondot * and Denis W. Roy
C)	Southern Grenville Studies	Jacques Martignole

* Indicates full-time staff officer.

D) Alluvial Prospecting Methods	Pierre LaSalle * and J.-C. Dubé
E) Drill-core Logging — continuing program	Bertrand Warren *
F) Geophysical Tests	Bertrand Warren *
G) Mount Royal and Vicinity — Popular Geology Series	T. H. Clark

Cartography Service

Gérard Côté, director, submits the following report on the activities of the Cartography Service for the fiscal year 1968/69.

As of March 31, 1969, the Service had the following personnel: one compiler, one co-ordinator, 13 topography technicians, one technician in graphic arts, two polycopy operators, one secretary, and one messenger clerk — 21 persons in all. Armand Blanchette, a former director, died in the summer of 1968, and Mrs. Renée Piché-Roy resigned from the Service in the autumn of the same year.

The Cartography Service consists of three specialized divisions, — namely, the Geological Maps Division, the Claim Maps Division, and the Polycopy Division.

Geological Maps

The Geological Maps Division is engaged in the most important work of the Service. It prepares the thematic or special maps which accompany geological reports and it also supervises their lithographic printing. The surveys carried out by the Geological Exploration, Mineral Deposits, and Hydrogeology services are illustrated on these maps, which, in addition to geology also give topographic indications, cadastral divisions, geochemical analyses, and the locations of mining properties. Two series of maps accompany respectively the preliminary reports and the final reports. The preliminary maps are printed in colored lines only, whereas the final maps, completed after more detailed geological research and prepared for the purpose of putting a definitive geological study in concise form, are presented on separate sheets so as to facilitate their printing by the use of several solid colors, screens, and lines.

The 16 preliminary geological maps published during the fiscal year reviewed covered the areas listed below:

No.	
1651	– Drummondville-West Area
1652	– Drummondville-East Area
1652-A	– Drummondville-East (geochemical analyses)
1653	– Rouyn-Noranda Area (mineral deposits maps)
1654	– De la Brèche Lake Area

N°

1654-A – De la Brèche Lake (geochemical analyses)
1655 – Mistamisk Lake Area
1655-A – Mistamisk Lake (geochemical analyses)
1656 – Lace Lake Area
1656-A – Lace Lake (geochemical analyses)
B-901 – Alder and Uvé Formations (Castignon lake)
1661 – Northwest Quarter of McKenzie Township
1668 – Alma – Saint-Ambroise Area
1669 – Malbaie-Nord River Area
1670 – Malbaie-Sud River Area
1670-A – Malbaie-Sud River (geochemical analyses)

Listed below are the 22 final maps published during the fiscal period reviewed. They are in color and present detailed geology.

661 – Upper York River Area (reprint)
662 – Dartmouth River Area (reprint)
663 – Gaspé Area (reprint)
664 – Saint-Jean River Area (reprint)
665 – Malbaie River Area (reprint)
692 – Vertical Sections (Gaspesia, reprint)
693 – Vertical Sections (Gaspesia, reprint)
1578 – Squatec Area
1579 – Cabano Area
1622 – Hart-Jaune River Area
1631 – Part of the East Half of Daniel Township
1632 – Part of the West Half of Isle-Dieu Township
1633 – Part of the East Half of Isle-Dieu Township
1634 – Northwest Quarter of Galinée Township
1635 – Northeast Quarter of Galinée Township
B-883 – Northwest Part of the Igneous Complex (Matagami)
B-884 – General Geology, Matagami Area
B-885 – Sulfur Deposits, Matagami Area
1642 – Gaspé Peninsula
1645 – Pivert Lake Area
1646 – Grand-Détour Area
1647 – Village Lakes Area

There were 12 aeromagnetic maps published in black and white as follows:

5346 – Perron-Rousseau Area
5347 – Collet-Laberge Area
5348 – Récher-Raymond Area
5349 – Turgeon River Area
5350 – Martigny Area
5354 – Vanier Area

N°.

5355 – Mistaouac Lake Area
5356 – Néwiska Lake Area
5357 – Gaudet Area
5358 – Jérémie Area
B-910 – Index Map of Aeromagnetic Maps
B-917 – Index Map of Aeromagnetic Maps

Mention may be made here of two special maps, — namely:

1672 – Mineral Map of Quebec, 1968
1690-68 – Mining Activities North of the 50th Parallel

Moreover, the Geological Maps Division drew up 45 plans for use by the Hydrogeology Service, as well as 97 figures or plans for the purpose of publication. At the close of March 1969, there were six geological maps in press; six other maps were ready for the printer; and six additional maps were being traced by the cartographers. If one counts the maps traced and published, the total annual production rose to 70 maps for the Division. One might also mention the care that the compiler was obliged to exercise in order to supply the planimetric or topographic base maps, the most recent aerial photographs and mosaics, the cadastral maps, the mining property maps, and the claim-staking maps required by the 31 geological field parties that will be carrying out surveys during the summer of 1969. In fine, the staff responsible for topography had to answer 503 requests for toponymy texts, legend texts, forms, graphs, vignettes, and report covers.

Claim Maps

The Claim Maps Division attends to a type of work that does not attract much publicity but, nevertheless, is of top priority. The technicians of this Division compile, prepare, and publish two series of maps on tracings at the scale of one inch to the half mile. On one series of maps are recorded the locations of mining claims and mining concessions, and on the other are plotted the limits of mining properties. During the fiscal year under review here, the cartography technicians prepared 125 new maps and modified or corrected 129 other maps of the first series. They also recorded, on the 1,550 maps already printed in the same series, a total of 19,109 new claims and brought up to date the boundaries of the mining properties delimited on the 560 maps of the second series. It was necessary to run-off 22,193 copies of the maps in order to meet the requests of interested persons.

Polycopy

The third and last unit of the Cartography Service, that is the Polycopy Division, makes tracing copies of sketches prepared by engineers of the Mines Branch, the Waters Branch, and the New Quebec Branch. During the fiscal term reviewed, this Division produced 39,343 Ozalide copies, 1,547 polyester

copies and 1,205 sepia copies of various plans for distribution as technical information in concise form. This Division has recently acquired a photocopier, an instrument that greatly aids the work of polycopying.

MINING SERVICES

The Mining Services comprises the following three administrative units:

(*a*) the Mining Domain Service;

(*b*) the Inspection of Mines Service;

(*c*) the Engineering Service (Mines).

Each of these units has the responsibility of seeing to the application of certain sections of the Mining Act by controlling the various stages of mining activity and more particularly by:

1. The granting of mining titles on Crown lands. This consists in the registration of mining claims, the issuance of development licenses or of special permits, the selling or the renting of lands for mine operating purposes, as the case may be. The Services also ascertains whether holders of mining rights meet the obligations inherent in their titles.
2. The carrying out of inspections in order to ensure that work in mines, quarries and ore-milling plants is done in conformity with prescriptions of the Mining Act and regulations pertaining to the safety of workers.
3. The preparation and execution of engineering works necessary to the opening of new mining districts or new mining installations. These works include construction of access mining roads, founding of mining villages, etc.

Mining Domain Service

Jean-Louis Pouliot, director of the Mining Domain Service, submits the following report on the activities of the Service under his charge during the fiscal year 1968/69.

The Mining Domain Service is responsible for granting mining titles, as well as their renewals and transfers, on Crown lands. It also has the task of seeing that those having titles to mining right fulfill the obligations that are inherent in these rights and of studying requests addressed to the Department of Natural Resources relating to the rental of lands for the purpose of mining operations. The Service, moreover, examines exploration and development work reports, and also receives and compiles the statistical reports that all operators must supply each year. In addition to this, it supervises the application of the "Unwrought Metal Sales Act".

During the fiscal year under review here, the personnel of the Service comprised two engineers, one geologist, one research agent, three administrative

agents, three technicians, four claim-recorders, and 37 office clerks and stenographers. This personnel carried out the work of the various offices of the Service situated at Quebec, Amos, Rouyn, Chibougamau, Montreal, and Bourlamaque.

The tasks of the Mining Domain Service are allocated to five divisions: Claims Division; Licenses, Leases and Concessions Division; Economy of Laws Division; Mining Operations Division; and Mineral Statistics Division.

Claims Division

The Claims Division, which is directed by Félix Turcotte, attends to all operations relating to the issue of prospector's licenses, the recording of mining claims, and the transfer of mining rights, by virtue of Divisions II to V, inclusive, and Division XVIII of the Mining Act (13-14, Elizabeth II, Chapter 34).

The regional offices of Quebec, Amos, Rouyn, Chibougamau, Bourlamaque and Montreal issue prospector's licenses and collect the fees for the issuance of various mining titles and for the recording of transfers of mining rights. Moreover, certain members of the personnel of these offices have to answer the various requests for information that are made to them.

At all these regional offices, with the exception of those of Bourlamaque and Montreal, claims are registered according to the district in which they are situated. In the centers of Hull and Campbell's Bay, prospector's licenses are issued by authorized agents.

It is, however, important to note that the Quebec office is the only one where the recording of transfers of mining rights and of all related transactions takes place, and this is done in conformity with Sections 195 and 196 of the Mining Act. It is, therefore, the Quebec office that has charge of compiling and publishing the semi-weekly list of lapsed claims. These lists are thus very useful for the efficient administration of the offices and to persons interested in the staking out of claims. The Quebec office, moreover, sees to the supply of claim maps for those requesting them. The personnel of these offices likewise answers various requests relating to mining rights.

The schedule of operations for the Claims Division during the fiscal year under review here may be set fourth as follows:

Issuances of 19,103 prospector's licenses;
Acknowledgement and recording of 59,395 mining claims covering an area of about 2,942,251 acres;
Claims allowed, abandoned or annulled: 31,724;
Registration of 2,247 transfers of mining rights and other documents;
Supplying 19,750 copies of claim maps;
Answering 2,500 requests for information;
Issuance of 16,720 analysis coupons pursuant to the prescriptions of Section 26 of the Mining Act.

It is worth-while mentioning that the claims recording office in Quebec

was again very active owing to the favorable mineralized showings found in the regions of Sainte-Anne-du-Lac, Mont-Laurier, Cape Smith – Wakeham bay, Eastmain river, Béthoulat lake and Marie-Victorin (Otish) mountains. As a result of these discoveries, 39,208 mining claims were acknowledged and recorded at the Quebec office. Moreover, it may be pointed out that, out of this number, about 15,000 claims were staked out in the regions of Sainte-Anne-du-Lac and Mont-Laurier.

By virtue of Section 29 of the Mining Act, the Minister of Natural Resources granted, during the fiscal period reviewed here, 17 authorizations for staking of mining claims within the limits of six different towns. The Lieutenant-Governor in Council likewise authorized, in accordance with Section 30 of the Mining Act, three stakings for gold and silver only in Weedon, Egan, and Ascot townships. Pursuant to Section 202 of the Mining Act, the Lieutenant-Governor in Council revoked, because of default of payment of the tax prescribed under Section 119, five mining concessions.

Finally, it may be stated here that, during the fiscal year 1968/69, one request for withdrawal of land from staking was approved by the Lieutenant-Governor in Council, pursuant to Paragraph 1, Section 268 of the Mining Act. Moreover, in accordance with the same Section, an area of approximately 500 square miles in the region of Otelnuc and Chakonipau lakes was opened to staking.

Licenses, Leases and Concessions Division

The responsibilities of the Licenses, Leases and Concessions Division are assumed by a personnel engaged exclusively in the Quebec office under the direction of Adélard Fortin. This Division has the task of issuing or renewing development licenses, exploration licenses, special licenses, exploration permits, mining leases, and operating leases. It is likewise responsible for preparing and recommending the issuance of letters patent. These functions are carried out by virtue of Section 62, 68, 136, 189, 210, 89, 117, and 160 of the Mining Act (13-14, Elizabeth II, Chapter 34).

It is also the responsibility of the Licenses, Leases and Concessions Division to see that holders of mining titles abide by the prescriptions of the Mining Act and fulfill all the obligations laid down for the retention of their titles.

In respect to the duties briefly described above, the operations of this Division for the fiscal year being reviewed here may be divided as follows:

Issuance or renewal of 8,518 development licenses;
Granting of six mining leases upon the recommendation of the director of the Mining Services by virtue of Section 89 of the Mining Act.

It is worthy of note that, according to solemn declarations submitted by claim-holders, in conformity with the provisions of Sections 62 and 68 of the Mining Act, development work on the lands concerned amounted to 6,997,274 hours during the fiscal period of 1968/69.

The Licenses, Leases and Concessions Division is obliged to issue the exploration licenses authorized by the Minister of Natural Resources, by virtue of Division XVI of the Mining Act.

During the fiscal period 1968/69, the Minister authorized the issuance of 14 exploration licenses for petroleum and natural gas in the Saint-Laurent valley on the following lands:

(*a*) a tract of 56,000 acres in the electoral districts of Chambly, Taillon, Napierville – Laprairie, Saint-Jean, and Verchères;

(*b*) a tract of 58,000 acres in the electoral district of Verchères;

(*c*) a tract of 36,800 acres in the electoral districts of Saint-Jean, Verchères, Iberville, and Rouville;

(*d*) a tract of 32,000 acres in the electoral districts of Rouville, Saint-Hyacinthe, and Verchères;

(*e*) a tract of 30,000 acres in the electoral districts of Nicolet and Yamaska;

(*f*) a tract of 57,700 acres in the electoral districts of Verchères and Saint-Hyacinthe;

(*g*) a tract of 55,000 acres in the electoral districts of Verchères, Richelieu and Saint-Hyacinthe;

(*h*) a tract of 59,800 acres in the electoral districts of Richelieu and Saint-Hyacinthe;

(*i*) a tract of 55,400 acres in the electoral district of Richelieu;

(*j*) a tract of 39,000 acres in the electoral district of Nicolet;

(*k*) a tract of 29,400 acres in the electoral district of Yamaska;

(*l*) a tract of 56,600 acres in the electoral districts of Yamaska and Richelieu;

(*m*) a tract of 19,900 acres in the electoral district of L'Assomption;

(*n*) a tract of 55,000 acres in the electoral districts of Richelieu, Yamaska, and Nicolet.

Moreover, pursuant to the prescriptions of Section 210 of the Mining Act, the Lieutenant-Governor in Council also authorized the issuance of ten special licenses as follows:

(*a*) The first, in Duhamel township, electoral district of Témiscamingue, is valid for all mining rights belonging to the Crown, except those of natural gas, petroleum, sand, and gravel;

(*b*) The second, in Ascot township, electoral district of Sherbrooke, is valid for all mineral substances belonging to the Crown, except gold, silver, petroleum, natural gas, sand, and gravel;

(*c*) The third, in Brome township, electoral district of Brome, is valid for all mineral substances belonging to the Crown, except gold, silver, petroleum, natural gas, sand, and gravel;

(*d*) The fourth, in Brompton township, electoral district of Richmond, is valid for all mineral substances belonging to the Crown, except gold, silver, petroleum, natural gas, sand, and gravel;

(*e*) The fifth, in Lingwick township, electoral district of Compton, is valid for all mineral substances belonging to the Crown, except gold, silver, petroleum, natural gas, sand, and gravel;

(*f*) The sixth, in Bousquet township, electoral district of Rouyn-Noranda, is valid for all mining rights belonging to the Crown;

(*g*) The seventh, in Ascot township, electoral district of Sherbrooke, is valid for all mineral substances belonging to the Crown, except gold, silver, petroleum, natural gas, sand, and gravel;

(*h*) The eighth, in Chester township, electoral district of Arthabaska, is valid for all mineral substances belonging to the Crown, except gold, silver, petroleum, natural gas, sand, and gravel;

(*i*) The ninth, in Duverny township, electoral district of Abitibi-East, is valid for all mining rights belonging to the Crown;

(*j*) The tenth, in Duhamel township, electoral district of Témiscamingue, is valid for all mining rights belonging to the Crown.

Economy of Laws Division

The Economy of Laws Division, which is under the direction of Camille Thibault, is responsible for examining the documents submitted in proof of work declared by claim-holders. In order to conform with the obligations incident to his titles and to comply with the prescriptions of Divisions VIII and IX of the Mining Act, claim-holders must, within the allotted delay, carry out certain work, and declare and submit exploration and development reports of work on lands for which they wish to keep their titles. Each study necessitated the preparation of a memorandum for the purpose of formulating recommendations.

During the fiscal period 1968/69, this Division approved 118 geological surveys, 53 geochemical studies, 448 geophysical land surveys, 73 airborne geophysical surveys, 230 reports on diamond drilling work, and 11 statements submitted on laboratory research work, metallurgical assays and treatment of ore. Moreover, the Division had to refuse nine geophysical land surveys, one airborne geophysical survey, two geological surveys, and two diamond drilling reports.

This Division was, moreover, given the task of studying six reports in support of requests for mining leases, in compliance with prescriptions of Division X of the Mining Act.

As in previous years, the Department of Natural Resources continued to study requests for information relating to the reports that every mining company has the obligation of supplying under the provisions of "regulations made under the Quebec Securities Act" (3-4, Elizabeth II, Chapter 11, and its amendments) for obtaining the issuance or renewal of its registration as a security issuer. During the year under study here, the Department received, from the Quebec Securities Commission, 47 requests for information bearing on mining companies that had submitted reports to it.

In collaboration with the Legal Service, this Division worked toward elaborating amendments to the Mining Act in order to facilitate the control of claims and to encourage mining exploration.

As in preceding years, all documents submitted in support of the work declared, and examined by this Division, as well as those that are sent to the Department voluntarily, are directed to the technical archives of the Mineral Deposits Service.

Mining Operations Division

The Mining Operations Division is under the direction of Clément Tremblay and is concerned with studying requests submitted to the Department of Natural Resources for the approval by the Lieutenant-Governor in Council and related to the locating of installations necessary for mining operations and tailings sites, as well as with requests presented to the Minister for the granting of mining leases and for exploitation operating permits for sand and gravel deposits. This Division operates in virtue of the provisions of Sections 99, 133, 223, and 243 of the Mining Act (13-14, Elizabeth II, Chapter 34).

At the present time, eight mining companies hold leases on Crown lands which were consented to under the former Quebec Mining Act at prices and rates and upon conditions established by Order in Council entitling them to deposit their waste or tailings on these lands. One of the companies works a sand and gravel deposit; another has obtained a sub-rental on a strip of land for the right of way of a pipe-line.

During the course of his 12 inspection trips, the chief of this Division visited 32 active or abandoned mines and gathered from these sites samples for the purpose of studying the effects of effluence from mine waste dumps into adjacent hydrographic basins. Because of particular circumstances, certain mines were visited several times, in order to cooperate as directly as possible with the Régie des Eaux du Québec. It happened on many occasions that, during these visits, the engineer of this Division carried out an inspection of the claims so as to verify and control the declared development work, in conformity with Sections 64 and 69 of the Mining Act.

It is likewise the responsibility of the Mining Operations Division to dispose, in conformity with conditions determined by regulations, of the right of working sand and gravel deposits. All requests made to the Department are studied by this Division and, for the most part, these requests necessitate inspection visits to the lands making the object of the inquiry. If there is no objection relating to public interest, the requested permit is then granted. In this respect, 16 new sand and gravel pits were inspected during the fiscal period under review here, and two others were, moreover, the object of a legal settlement. The Department of Natural Resources, in collaboration with the Department of Roads, issued or renewed, during the fiscal period 1968/69, 33 operating permits for sand and gravel deposits on the public domain in conformity to Section 129 of the Mining Act.

Mineral Statistics Division

The Mineral Statistics Division, which is directed by C.-O. Beaudet, is concerned with keeping up to date the list of mine and quarry operators of the Province. This work is carried out to conform with Section 250 of the Mining Act. The Division collaborates with the Quebec Bureau of Statistics in the compilation of Quebec's mineral statistics.

The main sources of information which help in adjusting and keeping up to date the list of operators are notices to the Minister submitted in conformity with Section 249 of the Mining Act, reports from inspectors of mines, and press releases from newspapers. This list, which is sent to the Quebec Bureau of Statistics, is very useful to the Bureau for dispatching, to the operators of mines and quarries, questionnaires pertaining to the preparation of their annual reports.

Since 1963, the Quebec Bureau of Statistics has charge of gathering and compiling statistics pertinent to the mining industry. However, as the result of an agreement with the Mining Domain Service, the Bureau must transmit, to the Department of Natural Resources, a copy of all reports that it receives and supply the Department with all the compilations needed.

As its contribution, the Mineral Statistics Division notifies the Quebec Bureau of Statistics concerning the corrections or additions to be inserted in reports from mining companies and it assists the Bureau in the compilation and interpretation of the information these reports contain. During the fiscal year reviewed here, this Division examined approximately 4,200 annual reports and 800 monthly reports relating to the activities of mining companies for the years 1965 to 1968 inclusive.

Finally, it may be mentioned that the Mineral Statistics Division was responsible for answering numerous requests for information concerning statistics on the mining industry of Quebec.

Inspection of Mines Service

The Inspection of Mines Service is responsible for the application of regulations governing the health and safety of workmen in mines, in conformity with Sections 256 to 267 of the Mining Act. Its work involves the obligation of regular inspections of mines, open-pit operations, quarries, sand-pits, clay-pits and peat-bogs. It also includes inspections of electrical and mechanical installations, as well as ore-dressing plants; it tests the cleanliness of the air in mining workings, investigates accidents and other abnormal occurrences which may affect the lives of workmen in the mining industry, and directs the annual training program relating to mine rescue.

During the carrying out of their regular inspections of mines and quarries,

engineers of the Service gather information on current and future mining operations that is useful in governmental administration.

Engineers of the Service proceeded, in 1968/69, to carry out 554 safety inspections in mines and quarries. These inspections, conducted during working hours, enabled the engineers to examine working conditions and work in progress and to ascertain whether safety regulations were being duly observed as to disposition of working premises, condition of machines, methods employed, and protection of workers.

Moreover, engineers of the Inspection of Mines Service conducted inquiries into 13 fatal accidents and investigated other unusual events, following which reports were issued on these circumstances.

For their part, electrical engineers of the Service conducted 128 inspections of electrical installations, verifying whether these conformed to regulations of the Mining Act. Moreover, they examined detailed plans of new or modified electrical installations that had been submitted to the Department of Natural Resources for approval.

It is also the responsibility of the Department to approve and to inspect mechanical installations, such as hoisting machines used in mines, compressors, diesel engins, etc. The engineer in charge of the Mechanical Division of the Inspection of Mines Service examines, by means of tests, all new mining hoists and other types of heavy machinery used in mines and quarries and conducts periodic verifications to ensure that the equipment in use conforms to safety regulations and that it is kept in a satisfactory condition.

During the fiscal year under review here, 20 special inspections of hoisting equipment were made, and, in addition to this work, several mines and quarries were visited by the Service's engineers in order to conduct investigations into mechanical accidents or to discuss various specific problems. The Division received 221 hoist-cable registration reports, after which 106 cables were put into service and 115 were removed. It also received 288 rope-breaking test reports; 146 steam-boiler inspection reports and 275 vouchers of medical certificates granted to potential hoist operators. The study of these documents enables engineers of the Service to exercise a strict control over all hoisting cables and steam boilers used in mines and quarries.

For several years now, some mines have voluntarily adopted the electromagnetic method of cable testing. During the 1968/69 fiscal year, 165 tests of this type were carried out.

Air cleanliness is an indispensable condition to the health of miners. Because of this, engineers of the Service regularly control the ventilation and the dust in mine workings. They conducted 77 control inspections and made microscopic analyses of air samples that contained dust in order to determine the degree of dust saturation in various places of work.

Order in Council N° 887, dated August 30, 1956, requires that workers exposed to dust while employed in mining operations in the Province, including groups one, two and three of class five of the tariff table of the Workmen's

Compensation Commission, hold a medical certificate renewable each year. The Inspection of Mines Service thus received 18,766 radiographic examination certificates submitted by miners in the course of the fiscal period under review.

In fine, it is the common practice that miners, chosen by aptitude, be trained in rescue and first-aid work in all underground mines of any importance. The mining companies defray the cost of the courses or exercises, which are organized and directed by the Inspection of Mines Service. During the year reviewed, 35 mines benefited from these exercises, which have trained, since 1948, 1,656 first-aid attendants, of whom 379 are, at the date of writing, available in case of emergency. Interest in rescue training is stimulated by competitions and tests between teams from various mines. There was no annual mine-rescue competition in 1968, but one is planned for May 10, 1969, at Noranda. Only six teams will take part and these will represent the following districts: Noranda, Val-d'Or, Matagami, Chibougamau and two teams for Thetford Mines, one of these representing asbestos mines and the other, metal mines and also Canadian Refractories.

In conformity with the second paragraph of Section 266 of the Mining Act, an inspector may require a labor union's representative to accompany him when carrying out his safety inspections.

In order to become more directly involved in the field of accident prevention, the Service acquired a movie projector for presenting films pertaining to safety for workers. *This projector is at the disposition of mining companies and labor unions.* Through this aid, it is hoped that the Service can contribute to the common effort for diminishing the number of accidents afflicting workmen, which is already too high. The main office of the Inspection of Mines Service is in charge of making requests for these films. It keeps a supply of them on hand and returns the films to the Association for the Prevention of Accidents in Industry (APAI) or to the Quebec Film Board (QFB). It may be recorded here that requests have been received by the Quebec central office for films from the Noranda and the Chibougamau districts.

In the domain of statistics on mining accidents, in addition to fatal and compensable ones, accidents classed as non-compensable, that is those that do not cause an absence from work for three days, but which nevertheless necessitate a visit to a doctor and the use of Form S-1 of the Workmen's Compensation Commission, are analysed, classified and processed by a computer which provides the following information:

1. the location, type and registration of the enterprise;
2. the age of the accident victim;
3. the marital status of the accident victim;
4. the date of the accident;
5. the period of time the accident victim was employed;
6. the place where the accident occurred;
7. the cause and material agent;

8. the kind of injury sustained and the part of the body affected;

9. the class of accident: fatal, compensable, non-compensable.

During the year 1968, the Inspection of Mines Service classified 5,862 accidents, of which 13 were fatal, 1,011 compensable, and 4,838 non-compensable.

Engineering Service (Mines)

Mining Roads Division

Under the provisions of Section 235 of the Mining Act (13-14, Elizabeth II, Chapter 34) the Minister of Natural Resources, with the consent of the Lieutenant-Governor in Council, has the authority to open, construct, improve, and maintain, after a manner that he may judge appropriate, in whole or in part at the expenses of the Province, roads, bridges, or other public works that he considers necessary for promoting the development of mining in Quebec.

(A) CONSTRUCTION OF MINING ROADS

Funds allocated in 1968/69 to the Mining Roads Division amounted to $1,695,000 and, for reasons which will be given farther on in this report, disbursements were only $781,076.

During 1968/69, a general agreement on Federal-Provincial cooperation for the development of eastern Quebec was signed on May 28, 1969. In virtue of this agreement, the Federal Government consents, through the ODEQ enterprise, to share 75 per cent of the costs of carrying out the program of construction of access roads to resources to the total amount of $7,200,000. This program, which was drawn up by the Department of Natural Resources, is at present limited to the construction of a road encircling Monts McGerrigle, in Gaspé park, for the purpose of promoting mining exploration and exploitation of this more or less inaccessible region.

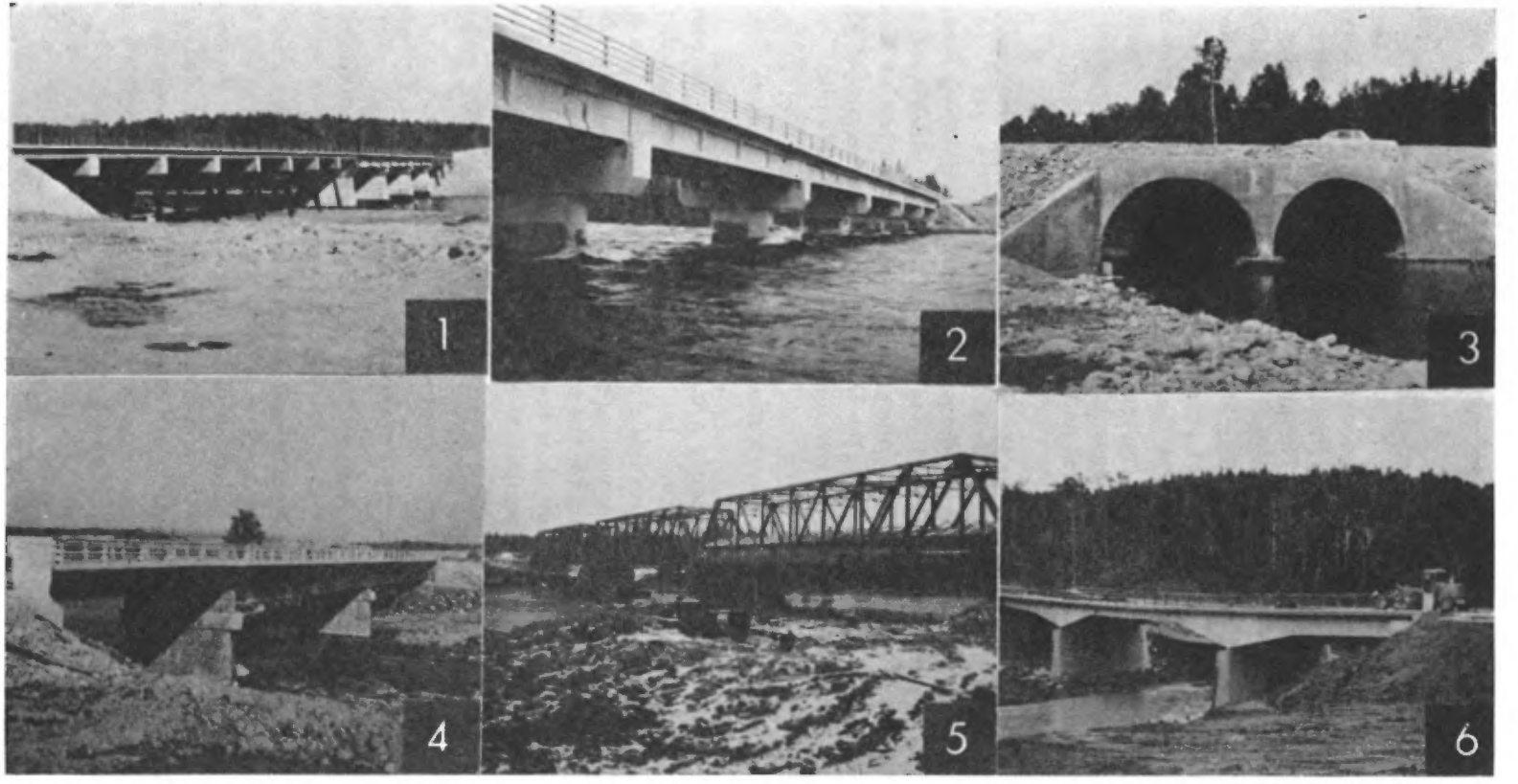
The principal achievements, in the construction of mining roads during the year reviewed here, are given below:

I – Works Carried Out with the Financial Assistance of the ODEQ

1. *3.9-mile section — road encircling Monts McGerrigle*

After the signing of the Federal-Provincial agreement, the Engineering Service called for tenters for the construction of the first section of this road, and, on July 11, a contract was signed for the execution of the work. Since the summer season was already advanced and because some time was necessary for the contractor to make his installations, a delay

PLATE I



The six bridges above were built by the Engineering Works Service of the Department of Natural Resources between 1960 and 1966.

AMOS-MATAGAMI ROAD :
1. Allard river – (Mile-post 92),
4. Harricana river – (Mile-post 19),
6. Coigny river – (Mile-post 48) ;

SENNETERRE-CHIBOUGAMAU ROAD :
2. Chibougamau river – (Mile-post 162),
5. Waswanipi river – (Mile-post 130) ;

JOUTEL ROAD : 3. McClure river.

occurred with the result that the work was not completed and, of the $470,000 provided in the budget, only $266,901 was spent.

2. *7.9-mile section — road encircling Monts McGerrigle*

During the fiscal terms reviewed here, the personnel of the Service completed the preparation of this road project, and, on December 18, 1969, tenders were received. The purpose of this road is to connect the road encircling Monts McGerrigle to the Murdochville – Lac Sainte-Anne road, in addition to aiding the mining company of Terra Nova, which is conducting important operations in that region. The sum of $625,000 has been provided in the budget for the completion of this project. However, since the contract was not authorized until April 9, 1969, it therefore became impossible to undertake the construction of this road during the fiscal term under review here.

3. *Preparation of the project for the third section — 31 miles long*

During the winter of 1968/69, the personnel of the Engineering Service did survey work for localizing the route along 31 miles, which work was necessary in order to complete the encircling road to the east of Monts McGerrigle. For this purpose, the Department allocated a sum of $53,-504 for the two-stage projects covering a total distance of 17 miles.

4. *Preparation of plans and specifications: bridge over Sainte-Anne river*

Since the bridge crossing Sainte-Anne river was located along the course of the first section (3.9 miles) that was already being constructed, the building of a bridge to cross this river became urgent, and, to this end, the Division requested a consulting-engineers firm to prepare the plans and specifications. Tenders for the realization of this project were open on December 18, 1969, but, since the contract was signed only on April 3rd, it was therefore impossible to complete the work during the year reviewed here.

II – Works Carried Out with the Financial Assistance of Mining Companies

1. *Access road to the property of Les Mines Madeleine Ltée (3.4 miles)*

This road lies along the extension of the first section of the encircling route and gives access to the mining property of Les Mines Madeleine Ltée. An amount of $500,000 had been provided for this project, but, as work was commenced late in the year, it could not be completed, and the amount allocated for this work remains at $304,096.

2. *Access road to the property of Le Granit Lecarme Inc. — Milot township*

Construction of this road, which had been undertaken during the preceding fiscal year by this mining company, was completed in the fiscal period reviewed here. The Department made a contribution of $4,484 toward the cost of this road.

III – Works for Which the Province Paid the Entire Cost

1. In view of the funds available in the budget, the Department decided to improve the road leading from the village of Joutel to the property of Mines de Poirier Inc., for a distance of 5 miles in Joutel township. Disbursements for these works rose to $125,887.

2. *Various roads*

The payment of certain outstanding accounts for the expenses of surveying and of fees relating to various projects required a disbursement of $803.

(B) UPKEEP AND REPAIR OF MINING ROADS

In 1968/69, the Department was obliged to maintain the following roads:

Road leading to Joutel township — 5 miles	$ 4,950.00
Access road to the property of Eagle Gold Mines — 3.3 miles	3,788.40
Lac Waconichi – Lac Albanel road — 5 miles	23,798.13
Marsoui road to Candego mines — 14 miles	20,078.43
Total	$52,614.96

Mining Villages Division

PURPOSE

The Mining Villages Division was organized in 1936 for the purpose of promoting the rational development of urbain communities constructed in the mining districts of Quebec and to ensure that persons who settle in these centers have the same advantages as those enjoyed in the small towns located close to large cities.

PRESENT ROLE

In addition to exercising a control over the subdivision of lands into building lots and to establishing the manner and the price of the ceding of lots on mining

concessions, the Mining Villages Division is becoming more and more involved, since the past few years, owing to the fact that it has occupied itself with the founding of towns and villages on Crown lands in order to ensure that persons who choose to live in these new mining centers have from the very beginning adequate municipal, cultural and educational services.

ACCOMPLISHMENTS

The first two mining towns to be entirely established under the direction of the Department of Natural Resources were those of Chibougamau in McKenzie township, by Order in Council N^{o}. 436, dated April 19, 1950, and Matagami

PLATE II

Aerial view of the mining village of Joutel, 1969. – Construction of municipal services of this village commenced in 1965. The plans and estimates of this 450-foot bridge (illustrated in the inset) were prepared by the engineering firm Pelletier & Associés. The use of a special steel of the A-242 type which does not require painting represented a Canadian "first" when the bridge was completed at the beginning of 1966.

in Isle-Dieu township, by virtue of Order in Council N°. 1495, dated June 30, 1961. The respective populations of these two towns were, as of January 1, 1969, 10,000 and 3,100.

Order in Council N°. 565 of March 23, 1965, authorized the Minister of Natural Resources to undertake construction works, the opening of streets and the setting up of municipal services in the village of Joutel, in the township of the same name, 80 miles north of Amos and 50 miles southwest of Matagami. Present municipal services can accommodate more than 300 families in this new mining village, which is soon to be incorporated into a town according to the provisions set forth in Chapter 194, R.S.Q., 1964, entitled "Mining Villages Act".

METHOD OF CEDING LOTS

(A) On Mining Concessions

Mining-concession holders may now, according to conditions determined by the Minister of Natural Resources and the Minister of Municipal Affairs, cede lands for building lots by an ordinary deed of sale. The conditions, as fixed by the two departments, are the following:

(*a*) Approval, by the two departments, of the subdivision of building lots and the selling price of these lots.

(*b*) For each lot, the concession-holder shall pay, into the consolidated fund of the Province, a sum representing 1 cent per square foot of the land surface.

(*c*) After the deduction of dues payable to the consolidated fund, the mining company shall remit to the Department of Natural Resources, to be deposited in the municipal fund, an amount usually representing 70 per cent of the balance of the transfer price of each site. The balance of the selling price is retained by the mining company in compensation for the expense of division into lots, surveying, legal fees, and administration costs involved in the transfer of the sites.

(*d*) In the case of transfers brought about for cultural, educational, municipal, or religious purposes, or for other ends relating to public interest, it is the current practice to authorize the transfer of lots acquired at a nominal price of $1, and the company retaining the mining concession is not obliged to pay the amount to the consolidated fund of the Province, nor has it to pay the cost of land surveying and cadastration of the lot or the expense of the deed of sale.

(B) On Crown Lands

In mining towns and villages constructed on Crown lands, the sale of lots is made by the Department of Natural Resources and the revenue from the sale of lots, less a sum representing 1 cent per square foot of surface, which

is payable to the consolidated fund of the Province, is deposited in the municipal fund of the municipality concerned.

The method of ceding lots is as follows:

(a) *Option contract*

Upon payment of the sum of $100 for each residential lot and of $1,000 for every commercial or industrial lot, the Department of Natural Resources consents to a 12-month option. This option, which is non-transferable, gives the right of ownership and is renewable for another period, which may not exceed 12 months, upon the additional payment of an amount equal to the initial sum mentioned above.

(b) *Letters patent*

The future holder must, before the expiration of his option or of its prolongation, pay the total cost of the transfer. Once all the conditions of an option are fulfilled, the sale is concluded and this transaction is effected through letters patent.

From April 1, 1968, to March 31, 1969, the Department of Natural Resources ceded, by letters patent, 358 lots situated in mining towns and villages built on Crown lands.

MUNICIPAL FUND

The municipal fund is designed as capital created by means of revenue provided from the sale of lands situated in mining concessions or from the sale of lands under the jurisdiction of the Department of Natural Resources.

The main purpose for the existence of a municipal fund is the sharing of the revenues derived from the transfer of lands in favor of the municipal corporation in order that it may be able to reimburse more rapidly the Province for the financial help given toward the setting up of permanent municipal services such as the construction of water-mains and sewers, the opening of streets, the building of sidewalks, and the landscaping of streets. Moreover, the various moneys of the municipal fund serve as payment of subsequent municipal works carried out by the municipalities.

The municipal fund is held in trust by the Minister of Finance and administered by the Minister of Natural Resources and the Minister of Municipal Affairs.

Since the municipal fund system was first set up, the sum of $3,167,181 has been paid to mining towns and villages. During the fiscal year ending March 31, 1969, payments to municipalities totalled $272,412.

WORKS DURING THE FISCAL YEAR 1968/69

During the course of the fiscal period reviewed here, the sum of $20,484 was spent on development works in the industrial and residential zones of the village of Joutel, Joutel township, Abitibi-East county.

MINING TOWNS AND VILLAGES

Population — Letters Patent — Municipal Fund

April 1, 1968, to March 31, 1969

Municipality	*Approximate Population on January 1, 1969*	*Lots Held by Letters Patent, March 31, 1969* [1]	*Amount Deposited in Municipal Fund April 1, 1968, to March 31, 1969*	*Balance in Municipal Fund as of March 31, 1969*	*Amounts Drawn from Municipal Fund and Applied to Municipalities for Municipal Works*
BELLETERRE	700	—	nil	$ 686.28	nil
CADILLAC	1,300	4	$ 5.00	225.60	$ 6,645.30
CHAPAIS	3,000	—	794.36	586.42	9,000.00
CHIBOUGAMAU	10,000	133	21,992.39	61,944.56	205,000.00
JOUTEL	1,150	10	32,655.30	48,607.35	66.56
MALARTIC	7,000	—	2,351.43	5,284.12	nil
MATAGAMI	3,100	244	57,491.10	141,653.93	nil
MURDOCHVILLE	3,050	—	nil	10,325.59	nil
NORANDA	11,400	—	8,820.00	15,994.71	nil
ROUYN	18,900	88	14,864.25	10,112.13	8,700.00
SCHEFFERVILLE	3,500	395	5,648.79	8,944.16	35,000.00
VAL-D'OR [2]	18,300	41	12,379.38	12,789.80	8,000.00
	81,400	915	$157,002.00	$317,154.65	$272,411.86

[1] These totals take in only lots on Crown lands under the jurisdiction of the Department.
[2] The municipality of Val-d'Or now embraces the former city of Bourlamaque.

Since the incorporation of the village of Joutel into the municipality of a town with a municipal council, the Department of Natural Resources had to assume the responsibility of operating the water filtration plant, which has a daily capacity of 300,000 U.S. gallons, and also to look after the maintenance of the various municipal services of that village. For these works, the amount of $93,465 was disbursed during the fiscal year under review here.

The cadastration of new subdivisions on Crown lands in the mining towns and villages of Chibougamau, Joutel, and Matagami involved an expenditure of $21,289.

Disbursements by the Department of Natural Resources during the fiscal year 1968/69 attained $136,314 for both mining towns and villages.

LABORATORIES SERVICES

The Laboratories Services comprises two units, — namely, the Analysis Service and the Metallurgical and Mineralogical Research Service. The purpose of these two services is to assist the general public and more especially those interested in mining exploration and exploitation by continuing to supply them with more and more adequate analytic facilities and, moreover, to carry out the research necessary for the beneficiation and the transformation of ores and concentrates into finished or semi-finished products.

Personnel Statistics

As of March 31, 1969, the Laboratories Services had as its personnel the following:

Professional personnel	21
Technical personnel	26
Clerical and administrative personnel	10
Total	57
Positions vacant	2

Analysis Service

The Analysis Service is subdivided into three divisions. These are the Chemistry Division, the Physics Division, and the Mineralogy-petrography Division.

The work done by these divisions is most diversified and results mainly from requests by mining companies, prospectors, the Department of Natural Resources, — the Department's Pilot Plant, the Geochemistry Division of the Mineral Exploration Service, the Geological Services, — and other departments.

Table I gives the distribution and source of the requests for elementary analyses:

TABLE I

Mining companies	8.9%
Prospectors	4.2%
Research	1.8%
Pilot Plant	3.2%
Geochemistry (Mineral Deposits)	68.2%
Other services of the Department	13.4%
Other departments	0.3%
Total	100.0%

This table does not present an exact quantitative picture of the requests. However, one can, in fact, estimate that about 75 per cent of the work of the Analysis Service comes from the Department of Natural Resources.

A résumé of the work of the Analysis Service appears in Table II:

TABLE II

Quantitative analyses	81,427
Semi-quantitative analyses	548
Mineralogical and petrographical determinations	2,605
Determinations by X-ray diffraction	448
Radioactivity analyses	170
Total	85,198

Samples received	14,400
Moneys received	$4,637.50
Analysis coupons received	9,811

Chemistry

The Chemistry Division comprises three laboratories, — namely, those of general chemistry, industrial chemistry, and geochemistry. The principal components of minerals are determined in the laboratory for general chemistry by such methods as gravimetry, titrimetry, colorimetry, and pyro-analysis. The laboratory for industrial chemistry uses more particularly flame photometry and atomic absorption. The geochemistry laboratory determines the most minute forms of elements in soil and rock samples by colorimetric methods.

Distribution of the work in these three laboratories appears in Table III:

TABLE III

	Determinations
General chemistry	9,693
Instrumental chemistry	24,836
Geochemistry	37,908
Total	72,437

These determinations comprise precision analyses made on aluminosilicates (50 samples) and nearly 5,000 analyses of precious metals. The Chemistry Division likewise worked toward the development of new methods of analyses with a view to increasing the efficiency of the personnel. Whenever it was possible, the personnel adopted instrumental methods of analyses, which are generally more precise and rapid. Owing to the exiguity of the Division's quarters, a certain amount of cooperation was established among the various laboratories, and, therefore, the figures given in the above table do not always represent the work accomplished.

Physics

The Physics Division comprises three laboratories: those of spectrography, X-ray diffraction, and X-ray spectrometry. The X-ray spectrometry laboratory also carries out radioelement determinations.

During the fiscal year 1968/69, these laboratories made 10,077 analyses. These are listed in Table IV:

TABLE IV

Spectrography	quantitative	8,222
	semi-quantitative	558
X-ray diffraction	quantitative	157
	semi-quantitative	291
X-ray spectrometry		679
Radioelements		170
	Total	10,077

The Physics Division completed its equipment for X-ray diffraction during the fiscal year reviewed. The new apparatus will advantageously replace the old equipment that had been installed about 20 years ago and was no longer capable of giving the precision constantly required from an X-ray diffraction laboratory.

Mineralogy-petrography

The functions of the Mineralogy-petrography Division were the following: (1) identification of the minerals and rocks submitted to the laboratory; (2) directing the samples to the proper laboratories after observing their mineralogical nature; (3) attending to requests for general information, especially those from the public, and collaborating with the Research Service and the Pilot Plant Services in determining the mineralogical and petrographical nature of minerals; and (4) preparing rock and mineral collections (controlling the supply and supervising the quality of samples).

The work accomplished by this Division during the fiscal year 1968/69 is demonstrated in the following table.

TABLE V

Mineralogical determinations	2,605
Various analyses for research purposes	89
Letters conveying information	18
Letters giving determinations	455
Thin-sections and polished-sections prepared	63
Mineral collections:	
— regular	400
— small chips	700
Rock collections:	
— regular	100
— small chips	400

During the year reviewed here, there was an increased demand for collections of rocks and minerals, with the result that, at present, production cannot meet requirements.

Research Service

Owing to lack of space in the laboratories on Saint-Augustin Street, the Research Service was obliged to take up temporary quarters in the Pilot Plant. This division affects the planning of the Service's future quarters for the Scientific Complex.

The Research Service has started to focus its attention on a systematic study of projects before undertaking the technical work in such manner as to avoid working on problems that have not been shown to be profitable once they are solved. On this score, the Service studied, during the fiscal year being reviewed, the possibility of conducting research on titaniferous magnetites. With the help of market forecasts for the products that might be derived eventually from such ores, one can determine whether or not a project warrants undertaking.

In addition to certain special studies which do not deserve the term "research projects", the Service pursued the following projects during the year 1968/69:

Number of Research Project	*Object and Work Accomplished*
154	Charles-E. Beaulieu gave special attention to the influence of the specific area of hydrated iron ore on kinetic reaction. It was observed that the specific area has relatively little importance and, as such, the eventual industrial conditions can be more easily attained.
154–560r	J.-J. Panneton, in collaboration with the Pilot Plant, started semi-industrial tests of the process developed by Dr. Beaulieu for the treatment of hydrated iron oxides.
158	J.-L. Caouette and B. J. Kieller conducted a study of the distribution of nickel in asbestos wastes. The purpose of this study was to determine the proportion of nickel capable of being recovered.
159	J.-L. Caouette and F. Simonyi worked on the purification of certain substances that might be recovered from asbestos wastes in view of their industrial use as base material.
159a	J.-L. Caouette, F. Simonyi, and R. Ouellet were engaged in the elimination of brucite from asbestos fibers. The process which they discovered could eventually have an industrial application and increase the value of the fiber of certain asbestos producers.
160	J.-L. Caouette and R. W. Allen carried out the preliminary tests required for delimiting a process project relative to a pyrometallurgical and hydrometallurgical treatment for the purpose of extracting the principal constituents of titaniferous magnetites.
161	Yves-G. Bérubé commenced a study of specific metallic oxide collectors. This project involves mainly the study of various chelating agents which might eventually be used in flotation.
162	J.-L. Caouette and R. W. Allen completed the work relating to the causes of calcining of iron ore concentrates in a reducing medium. The results obtained have contributed to the solution of the problem.
163	B. J. Kieller started to study the quality of a sand deposit. The purpose of this work was to determine how the sand could be used. The results of this investigation should make it possible to determine the value of a deposit.
164	F. Abesque conducted a study, especially by means of X-ray diffraction, for the purpose of determining the mineralogical nature of Quebec soil so as to learn its industrial potential.

PATENTS

The following patents were obtained during the fiscal year reviewed:

Canada

807,609 – Carbonating roasting of lithium ores:
Maurice Archambault and Charles-A. Olivier,
March 14, 1969

793,233 – Pyrometallurgical treatment of iron ores:
Charles-E. Beaulieu,
August 27, 1968

United States

3,380,802 – Carbonating roasting of lithium ores:
Maurice Archambault and Charles-A. Olivier,
April 30, 1968

Germany

1,266,253 – Pyrometallurgical treatment of iron ores:
Charles-E. Beaulieu,
August 9, 1968

2,274,567 – Carbonating roasting of lithium ores:
Maurice Archambault and Charles-A. Olivier,
November 28, 1968

Great Britain

1,130,897 – Pyrometallurgical treatment of iron ores:
Charles-E. Beaulieu,
February 12, 1969

Japan

517,459 – Carbonating roasting of lithium ores:
Maurice Archambault and Charles-A. Olivier,
May 2, 1968

During the fiscal term under review here, Charles-A. Olivier took part in two meetings of the France-Québec Committee of Mining and Geologic Cooperation. One of these meetings took place in Paris and the other was held in Quebec.

J.-L. Caouette followed an intensive course at Queen's University on "Statistical Design".

J. Plamondon took part in a "Uranium Workshop" held at Purdue University.

PILOT PLANT SERVICES

The Pilot Plant Services constitutes, along with the Laboratories Services, a group of scientific and technological services that the Department of Natural Resources puts at the disposition of the mineral industry for the purpose of promoting the development of the mining domain and the economic expansion of Quebec.

Essentially, the activity of the Pilot Plant is oriented toward applied research, mainly in the field of metallurgy. The general objectives of the Services are to promote, through studies in laboratories and plants, the development of Quebec's mineral research, the bringing into production of new deposits, and, moreover, the advancement of the technical evolution of the mines and quarries already in production. These objectives are attained by the application of acquired knowledge, the development of new milling processes, and the perfecting of new concentration methods.

Because of its essential role, the Pilot Plant must have a highly competent personnel. The Pilot Plant Services is understaffed, yet its employees are fully aware of the imposing contribution they make to the economic growth of Quebec. They nevertheless deplore the fact that the Services is unable to extend greater benefits, owing to its lack of professional personnel and facilities. Indeed, considering that the number of employees is limited to 37 persons, of whom only eight are professionals at university level and of these merely five are directly involved in studies and research, the Pilot Plant Services is barely able to meet the demands imposed on it and must, in consequence, neglect many of the research programs expected of it. This scientifically qualified but reduced crew, directed by Jean-Paul Bolduc, engineer, and assisted by Gérard Castonguay, engineer, is the motive force of all activity at the Pilot Plant.

The personnel is allocated as follows:

Scientific and administrative personnel

2 engineers, respectively director and assistant
5 engineers directly engaged in research
1 professional chemist
4 secretary and office employees

Technical personnel

6 laboratory technicians
5 plant technicians
4 technicians in electrical and mechanical equipment
2 assistant technicians

Maintenance personnel

8 employees (store, vehicle, care-taker, etc.)

During the fiscal year 1968/69, nearly 940,000 pounds of ore was submitted for study. The shipments of ore involved 36 different projects.

Table I gives, in alphabetical order, the names of the shippers, lists these projects, and indicates also the weight of samples submitted during the year, as well as showing the nature of the ore.

TABLE I

Shipper	*Weight in Pounds*	*Nature of Ore*
Abitibi Asbestos Mining Company Ltd.	89,375	Asbestos
Authier, Magnan and Authier	200	Spodumene
Bau-Val Construction Inc.	15	Tailings
Carey Canadian Mines Limited	398,817	Magnetite, Ni
Coderre, Ivanhoe	557	Gold
Duff, Graham H., consulting engineer	27	Asbestos
Federal Wire and Cable Limited	25	Asbestos
Freeport Sulfur Company	101	Asbestos
GAF Industrial Products Division	110	Asbestos
General Mineral Exploration & Mining Development Company (Greece)	52,848	Asbestos
Golden Age Company Limited	372	Asbestos
Goldrim Mining Company Limited	2,036	Uranium
Industrial Engineering Products Limited	495	Calcite
Labelle Graphite Limitée	12	Graphite
Laviolette Mining and Metallurgical Corporation	50	Mica
McAdam Mining Company	227,600	Asbestos
Department of Mines and Hydrocarbons of Venezuela	8,674	Asbestos
Department of Industry and Commerce (Red Mill Co.)	400	Iron oxide
Department of Natural Resources (Hydraulic Development)	1,660	Gravels
Department of Roads (Laboratories)	2,727	Aggregates
Montréal Terra-Cotta Limitée	37	Schist and clay
Morin, Marcel (geologist)	33	Sands
Morin, Marcel (geologist)	18	Sands
Porter, H. K. Co. (Pittsburgh)	3,252	Asbestos
Quebec Clay Mining	80	Feldspar, kaolin
Quebec Iron and Titanium Corporation	51,540	Ilmenite
Quebec Iron and Titanium Corporation	2,026	Ilmenite
Richore Gold Mines Limited	900	Uranium
Séguin, Emilien	65	Uranium
St. Lawrence Columbium and Metals Corporation	510	Pyrochlore
SOQUEM (Bickerdike)	230	Cu, Ni
SOQUEM (Louvicourt)	658	Copper
SOQUEM (Magpie)	5,000	Fe, Ti
SOQUEM (13-777)	1,515	Nickel
Wayne, Keith and Associates	2,368	Asbestos
White Asbestos (Australia)	85,432	Asbestos
Total	939,765	

Table II indicates the projects studied according to the nature of the ores or the elements the ores contain:

TABLE II

Nature of Ore	*Number of Projects*	*Weight in Pounds*
Ferrous metallic minerals	4	58,966
Non-ferrous metallic minerals	9	405,288
Non-metallic minerals:		
Asbestos	12	470,184
Others	11	5,327
Total	36	939,765

To the 36 projects undertaken during the year reviewed here, one should mention the 14 other projects that were not completed during the fiscal term 1967/68. This would make a total of 50 projects studied during the period reviewed. This work resulted in concluding 37 important projects and in the preparation of 32 engineering reports presented with diagrams illustrating treatment processes. Certain studies of lesser importance were also carried out, and, at the close of the fiscal year 1968/69, 13 projects were in the process of being completed.

TABLE III

Reports issued during the fiscal year 1968/69:

Project N°

464 *Ungava Copper Corporation Limited*
"An investigation on the recovery of copper and zinc"
G. Castonguay, Eng.

526 *Department of Natural Resources*

–4 *Mineral Deposits*
"Study of the recovery of vanadium"
G. Delisle, Eng.

–7 *Mineral Deposits*
"Test on rutile concentration containing columbium"
G. Castonguay, Eng.

534 *Abitibi Asbestos Mining Company*
"Extraction and evaluation of asbestos fibers from drill samples derived from the Abitibi region"
G. Foy, Eng.

539 *St. Lawrence Columbium and Metals Corporation*
"Milling of a columbium ore"
G.-H. Cloutier, Eng.

Project N°

548 *White Asbestos Mining Company (Australia)*

"Extraction and evaluation of asbestos fibers from drill samples"
G. Foy, Eng.

549 *Department of Mines and Hydrocarbons of Venezuela*

"Treatment of 19 samples of asbestos ore"
G. Foy, Eng.

550 *Wayne, Keith and Associates*

"Physical determinations of three asbestos fiber samples"
G. Foy, Eng.

551 *Société Corgemines Limitée*

"Production of 50 tons of concentrated magnetite"
G. Castonguay, Eng.

558 *Gulf Titanium Limited*

"Beneficiation tests on an iron titanium apatite ore"
N. Richard, Eng.

559 *Société Québécoise d'Exploration Minière*

"Tests on a concentration of an ore containing magnetite, ilmenite and apatite"
N. Richard, Eng.

564 *Golden Age Company Limited*

"Extraction and evaluation of asbestos fibers"
G. Foy, Eng.

565 *McAdam Mining Corporation*

"Extraction and evaluation of asbestos fibers from the Chibougamau region"
G. Foy, Eng.

567 *Industrial Engineered Products Limited*

"Granulometry and colorimetry tests and pH measuring of calcium carbonate"
P. Bélanger, Eng.

568 *E. Séguin, engineer-geologist*

"Preliminary tests of a magnetite concentration"
G. Castonguay, Eng.

Project N°

570 *Carey Canadian Mines Limited*
"Studies of the recovery of nickel in asbestos tailings"
G.-H. Cloutier, Eng.

572 *Graham H. Duff, consulting engineer*
"Extraction and evaluation of asbestos fibers"
G. Foy, Eng.

573 *Labelle Graphite Limitée*
"Granulometric and chemical analyses of various primary graphite-based products"
P. Bélanger, Eng.

574 *Marcel Morin, geologist*
"Granulometric tests and chemical analyses on sand samples"
P. Bélanger, Eng.

576 *Industrial Engineered Products Limited*

–1 "Mineralogical, chemical, and colorimetric analyses; pH measuring of calcite samples"
P. Bélanger, Eng.

–2 "Magnetic separation tests on iron; verification of impurities contained in limestone products"
P. Bélanger, Eng.

577 *Department of Industry and Commerce (Red Mill Company)*
"Crushing tests of various substances"
G.-H. Cloutier, Eng.

578 *General Mineral Exploration and Mining Development Company (Greece)*
"Evaluation of asbestos fibers from Greece"
G. Foy, Eng.

579 *Société Québécoise d'Exploration Minière*
"Physical concentration tests of the Magpie deposit"
G.-H. Cloutier, Eng.

580 *Freeport Sulfur Company*
"Extraction and evolution of asbestos fibers from Mexico"
G. Foy, Eng.

581 *Goldrim Mining Company Limited*
"Sampling and analysis of a uranium mineral"
G. Castonguay, Eng.

582 *I. Coderre*
"Tests on gravimetric separation and extraction of gold"
P. Bélanger, Eng.

Project N°

584 *Bau-Val Construction Inc.*
"Various determinations on a sample derived from Canadian Electrolitic Zinc Co."
G. Castonguay, Eng.

585 *Société Québécoise d'Exploration Minière (Louvicourt)*
"Copper concentration"
G. Delisle, Eng.

588 *H. K. Porter Company Limited (Federal Wire & Cable Ltd.)*
"Extraction and evaluation of asbestos fibers derived from drill cores from the Thetford region"
G. Foy, Eng.

593 *H. K. Porter Company Limited*
"Complete treatment of three asbestos ore samples from California and measurement of their physical properties"
G. Foy, Eng.
GAF Corporation
"Calibration of Quebec Standard Testing Machine"
G. Foy, Eng.

One might mention that, in relation to the number of projects undertaken during the preceding fiscal year, the study projects dealing with ferrous metallic minerals are reduced to half and have been replaced by tests on non-metallic substances, particularly those of fibrous minerals. As to the number of projects and the volume of samples received, asbestos held the limelight. Considering the classification of non-ferrous metallic minerals, attention might be drawn to the importance of a study which related specially to the recovery of the nickel contained in tailings from asbestos mines. This project had not been completed at the close of the fiscal period under review here, but it had progressed sufficiently to permit one to foster the hope that the milling process being perfected at the Pilot Plant laboratories will, in the near future, engender an important industrial enterprise, which might well have the effect of becoming advantageous to several asbestos producers.

Moreover, the work required for developing an important asbestos deposit in the Chibougamau region was completed in 1968, and it is eagerly expected that the installation of a new mill in that region will not be long delayed.

The Analysis Service of the Pilot Plant is directed by Robert Cloutier. This professional chemist carried out 5,135 element determinations during the 12-month period. The Laboratories Services, for its parts, conducted 2,570 other element determinations and 26 mineralogical studies for the Pilot Plant Services. The excellent collaboration of the Laboratories Services is gratefully acknowledged.

The fiscal term 1968/69 could be recognized as the best year experienced by the Pilot Plant. There is reason to hope that two important mining ventures will result from the sedulous efforts of the Pilot Plant's employees in carrying out the role entrusted to them.

WATERS BRANCH

HYDRAULIC SERVICES

The Hydraulic Services, under R.-L. Ménard, Eng., comprises three main administrative units, which engage some 125 permanent members — civil servants and workmen, as well as about ten part-time employees.

(A) *Hydraulic Domain Service*

The Hydraulic Domain Service is responsible to the Hydraulic Services for the administration of the rights of the Crown on domanial surface waters and for the application of the Water-courses Act in what pertains to the three new divisions sanctioned on May 28, 1968.

The new Division IX states that henceforth any dam or works destined to impound water in a natural stream shall be subject to approbation by the Lieutenant-Governor in Council.

The new Division X provides that, in an emergency, it is permissible for a judge of the Superior Court to require that a proprietor make the necessary changes to a dam in view of safety to persons or property.

The new Division XI gives certain rights to civil servants authorized by the Minister of Natural Resources to make inspections.

From the time of the sanctioning of the above-mentioned amendments, an inventory of the existing dams was undertaken. In fact, in order that the Act be applied effectively, it is necessary to know as quickly as possible the number of dams already constructed so as to determine the ones that might be unsafe and to have on hand the necessary information for knowing whether a certain dam was built before or after May 28, 1968.

This inventory, which was undertaken jointly by civil servants and consulting officers, was taken especially in Portneuf county, in L'Assomption River basin and in Du Nord River basin. It was readily noticed that this inventory alone was extremely expensive. Therefore, upon recommendation of the director of the Hydraulic Services, the Minister of Natural Resources requested that the Study Commission on Legal Problems Relating to Water investigate the most effective means of conducting this inventory. During the fiscal year reviewed, the Commission presented a report on the subject to the Minister, who approved the document, and an amendment to the Act concerning this subject is now in preparation.

(B) *Hydraulic Development Service*

The principal work of the Hydraulic Development Service consists in the elaboration of general plans for the development of hydrographic basins and sub-basins.

This Service also attends to the network of reservoirs both for the increase in hydraulic energy and for satisfying recreative conditions.

Moreover, the Service conducts long-term studies on means for controlling flooding both by ice-free water and ice-floes and, to this end, it has especially introduced a campaign for collecting data and information on the evolution of ice conditions on rivers in Quebec.

(C) *Hydraulic Engineering Service*

As in past years, the Hydraulic Engineering Service saw to the conducting of projects and works favorable to the conservation or development of Quebec's hydric resources.

Other Activities

Upon the invitation of the Ministère des Affaires étrangères of France, the director of Hydraulic Services spent the period from May 1 to 23, 1968, in order to complete a study session in that country. This session, which was slightly disturbed by certain known events, nevertheless produced excellent results. On that occasion, the director met officials of the Secrétariat permanent for the study of problems relating to water, as well as authorities of Agencies de bassin Seine-Normandie et Rhin-Meuse. One of the main objectives of the session being to take due account of the difficulties involved in, and the results of, the application of the statuate of December 16, 1964, which created basin agencies throughout France.

The information gathered at this session is very useful for the work of the Study Commission on Legal Problems Relating to Water, of which the director is a member since its inception on July 3, 1968. Moreover, since that date, the director devoted a goodly part of his time to the work of the Commission. The work of this body is progressing in a very satisfactory manner.

Concerning this Commission, one may note that, upon the recommendation of the authorities of the Department, its mandate has been increased by virtue of Order in Council dated November 7, 1968, for the purpose of including the study of the juridical implication resulting from changes of time and climate. The Commission undertook its work concerning this matter and has even recommended that a preliminary statute be introduced to settle the question of attempting to induce artificial precipitation. This recommendation was accepted by the Minister of Natural Resources and the statute project will likely be presented in the near future.

As was his custom in past years, the director of the Hydraulic Services took an active part in numerous committees during the fiscal period reviewed here.

A detailed account of each of the three services making up the Hydraulic Services follows.

Hydraulic Engineering Service

During the fiscal year 1968/69, the Hydraulic Engineering Service comprised four divisions, the activities and accomplishments of which for this period are described below.

This Service received 186 requests for intervention during the period reviewed here. These requests came from various municipalities of the Province and from different organizations, both governmental and other bodies. Of this number, 113 requests resulted in inspections. Recommendations presented, after a study of each case, are given below as follows:

Sixty-four requests were rejected because they did not meet the norms for intervention laid down by the Department of Natural Resources.

Nineteen requests were set aside until additional information could be obtained by the Service before it will be in a position to give a final decision as to intervention by the Department. Of this number, eight requests could not be attended to by the Service because it was impossible to carry out inspections owing to the winter season and, consequently, these were transferred to the program for the next fiscal year.

About 15 requests have still to be studied, and these will eventually be the object of a recommendation for work or a refusal, depending on whether or not certain criteria safeguarding the public domain will have been established.

Fifteen requests were granted, and work relating to them will be included in the program for the next fiscal year.

Finally, 15 requests were attended to during the course of the year reviewed because of their urgency.

In order to complete the projects described below,the Service made use of local manpower insofar as it was possible to do so. The engineer or the technician in charge of organizing this work applied at the regional Provincial Manpower Center so as to obtain a list of the persons available in the regions concerned.

All the manpower employed was paid in accordance with the recommendations of the Department of Labor of the Province of Quebec and in conformity with the Fair Wage Scale established for the various zones of the Province.

Remedial Works Division

During the fiscal period reviewed here, the Remedial Works Division had as personnel the following: one engineer as chief of the Division, three other engineers, and seven public works technicians.

Achievements

The program carried out by the Remedial Works Division consisted of 12 completed works at the cost of $254,219. In addition to this amount, the Service disbursed the sum of $2,327 for the purchase of lands bordering Bras Saint-Victor river and $25,397 for the settlement of an expropriation case that was left in suspension for two years, while awaiting a judgment of the Court.

Most of these interventions were made in Charlevoix county within the fromework of a series of urgent remedial works rendered necessary because of the flood at the end of April 1968 in that county.

A summary description of each of the projects that were concluded during the fiscal year 1968/69, as well as a recapitulative table (N^{o} I) showing the costs of these works, is given farther on in this report.

LIST OF REMEDIAL WORKS ACCOMPLISHED IN 1968/69

BEAUCE COUNTY

1. *Bras Saint-Victor:* Saint-Joseph parish:

   This project, which is under contract, was undertaken during the fiscal period reviewed but could not be completed because the water level of the river was too high and also because of the winter season. Parts of two ditches in sediment remain to be excavated. The Service will be in a position to finish this work during the fiscal period of 1969/70.

2. *Bras Saint-Victor:* Saint-Joseph parish:

   The Service undertook the acquisition of lands bordering Bras Saint-Victor river so as to be able to carry out the work of recalibrating its mouth with Chaudière river. Not all these projects could be settled in a definitive manner because of disagreement among the parties involved. The Service foresees that a final settlement will be reached during the next fiscal period.

CHARLEVOIX COUNTY

3. *Bras Gariépy river:* correction of the bed and construction to two sills at Baie-Saint-Paul:

   These works were recommended after the exceptional flood that occurred unexpectedly at the end of April 1968. The Service corrected the bed of the river and protected the banks by creating gabion retaining walls. The Service likewise built two sills in the river for the purpose of creating basins of sedimentation. These works, which extend from the road bridge on Route 15 to Saint-Jean-Baptiste street, were not completed, owing to the winter season, but will be finished during the fiscal term 1969/70.

4. *Des Mares river:* cleaning of the river bed at Baie-Saint-Paul:

   As a result of the flood in the month of April 1968, the river bed was obstructed by all sorts of debris. The Service, therefore, was obliged to clean the bed so that a normal flow of the water would result.

5. *De l'Église brook:* making a channel for the brook at Saint-Urbain:

   These works were recommended after the flood of April 1968. They consisted in the installation of a 42-inch pipe for a distance of 260 feet. The work was stopped because of the winter season, but will be continued in the spring as soon as weather permits.

6. *Des Boudreault brook:* cleaning the brook and building a concrete wall at Saint-Joseph-de-la-Rive:

   This work was likewise recommended after the flood of April 1968. During the winter, the Service also made preparations to build a concrete retaining wall along the left bank downstream from the bridge in order to protect the highway against erosion.

7. *Petite river:* cleaning of the bed and construction of a revetment at Petite-Rivière-Saint-François:

   This work, like that mentioned above, was necessitated after the flood of April 1968. At this place, the Service started to clean the river bed and to construct a concrete revetment downstream from the road bridge, so as to prevent erosion of the retaining walls on each side.

8. *Jean-Noël river:* cleaning of the bed and protection of an aqueduct at Saint-Irénée:

   The flood of April 1968 caused the Service to clean the river bed. Moreover, the aqueduct conveyance required adequate protection. This fortifying was afforded by the Service, which placed bags of cement crosswise along the aqueduct at regular intervals in such a way as to ensure the necessary protection to the water pipe.

GASPÉ-NORD COUNTY

9. *Saint-Anne-des-Monts river:* protection of the banks at Sainte-Anne-des-Monts:

   At this place, the Service provided protection to an embankment by placing only stones along its length. This was done to protect works which the Service carried out in this municipality in 1960.

GATINEAU COUNTY

10. *Gatineau river:* protection of the banks at Bouchette:

    Work was recommended with a view to providing the highway with protection from erosion caused by Gatineau river. This protection consists of a wall built of stone only.

SAGUENAY COUNTY

11. *Des Roches river:* cleaning of the river bed and protecting the banks at Saint-Paul-du-Nord:

    The work of cleaning and fortifying the banks was carried out for the purpose of protecting the approaches of road bridge 15.

SAINT-MAURICE COUNTY

12. *Petite Yamachiche river:* cleaning of bed and construction of a retaining wall at Yamachiche:

    The Service built a gabion wall at this place in order to protect Sainte-Victoire street against the numerous erosions taking place there. Moreover, the Service cleaned the river bed so as to permit a freer flow of the waters.

Dams Division

During the fiscal period reviewed here, the Dams Division had as personnel one engineer as chief of the Division, four other engineers, and one public works technician.

STUDIES

Among the studies necessary for the completion of the program of work described below, this Division undertook or concluded studies relating to seven projects, the realization of which involves short or long terms.

The most important study, undertaken within the budgetary provisions of 1969/70, involving an amount of $895,500 and requiring 5 years of preparation, consists in the installation of a large-sized sluice-gate segment in Kruger dam at Bromptonville, on Saint-François river.

Studies pertaining to six other projects, elaborated to various degrees, are summarized thus:

River	*Locality*	*Description*
Yamaska	Savage Mills	Control dam
Matane	Matane	Reconstruction of dam
Famine	Morisset Station	Control dam
Bourbon	Plessisville	Control dam
Aux Pins	Lac Saint-Joseph	Reconstruction of dam
Du Loup	Saint-Alexandre	Movable dam and water conveyance

ACCOMPLISHMENTS

The work program carried out by the Dams Division, during the fiscal period reviewed here, consists in the completion of 20 projects at the cost of $396,144.

Given below is a summary description of each of the works completed, as well as a recapitulative table (N°. II) showing the cost of these installations.

BEAUCE COUNTY

1. *Linière river* — examination of the foundations in view of constructing a dam:

   This work program, which was designed to control the Chaudière, includes the construction of a dam on Linière river. To this end, the Service made a survey of the foundations during the year under review in order to determine the composition and resistance of the soil.

2. *Chaudière river* — repairs to the electric system of Sartigan dam:

   The material used was found to be defective. The Service, therefore, gave immediate attention to the necessary repairs.

3. *Chaudière river* — Sartigan dam: construction of the dam (2nd stage):

   As provided in the construction program, the contractor completed the work which was started in the summer of 1967 but suspended during the winter season and the spring flood. All work was terminated in the month of August.

4. *Chaudière river* — Sartigan dam: metallic sluice-gates and screens:

   In accordance with the general contract, the contractor for the mechanics followed his schedule and made the final adjustment of the equipment such as was provided for in the Service's program.

5. *Chaudière river* — Sartigan dam: expropriations of lands:

   Certain expropriation cases that were in suspense were finally settled. This settlement involved lands that were submerged after the construction of Sartigan dam.

BELLECHASSE COUNTY

6. *Lake Saint-Charles* — construction of a dam at Saint-Charles-de-Bellechasse:

   The Service constructed a dam at this place so as to exercise a better control of the level of the lake. The work was also carried out to attract tourists.

CHICOUTIMI COUNTY

7. *Chicoutimi river* — repair to the aqueduct and the sewer system at Portage des Roches dam:

Following an inspection made by the Service at these sites, the Service observed that the pump used to supply drinking water was defective and that the sewer system warranted certain repairs and improvements. The Service, therefore, dispatched one of its engineers to the site in order to carry out the necessary work.

8. *Chicoutimi river* — installing of gates on the Portage des Roches dam:

As recommended by the Hydraulic Development Service, the Hydraulic Engineering Service undertook the installation of gates at both extremities of the dam, so as to prevent unauthorized automobile traffic. This will reduce the cost of upkeep, as well as lessen the risk of accidents.

COMPTON COUNTY

9. *Eaton river* — Sawyerville dam: protective wall:

The addition of a wall was found to be necessary in order to protect the right abutment of the dam from erosion.

DORCHESTER COUNTY

10. *Famine river* — geological examination at the Morisset site:

In view of the construction of an arched dam at this place, it was necessary for engineers to know the composition and resistance of soil before drawing up plans for the project. The Service, therefore, entrusted this survey work to a firm specialized in this field.

JONQUIÈRE-KÉNOGAMI COUNTY

11. *Au Sable river* — minor repairs to Pibrac dam:

At this dam, the Service also conducted repair work on the drinking water supply system and the sewer system. Moreover, the Service supplied the dam guardian with the material necessary for him to make some repairs inside his house.

MÉGANTIC COUNTY

12. *Saint-François river* — restoration of the facing downstream from Allard dam:

The contractor completed the restoration of the facing downstream from the dam, as well as other minor work so as to ensure a better protection for the installation.

MONTMORENCY COUNTY

13. *Des Neiges lake* — reconstruction of Lac Des Neiges dam in Montmorency forest:

These works, which were under contract, were commenced during the fiscal term 1967/68. However, because of the winter season, they were postponed and only resumed after the flood of last spring. All is now finished and working to the complete satisfaction of the Service.

RICHMOND COUNTY

14. *Saint-François river* — examination of the foundations of Kruger dam at Bromptonville:

Before installing a sluice-gate in this dam, the Service had to know the composition and resistance of the soil prior to studying and preparing plans for the project. The Service, therefore, gave the task of making these investigations to a firm specialized in that field.

15. *Saint-François river* — seismic tests of Kruger dam:

These surveys were carried out within the framework of the above-mentioned project and served to assure the Department concerning the risk of damage that might result from dynamiting rock at that place.

16. *Saint-François river* — installation of flash boards to the Kruger dam at Bromptonville:

Such as was understood at the time of purchase of Kruger dam by the Department, the Service agreed to maintain the upstream head-bay at a minimum level, which could be achieved only by using wooden flash boards. These are carried away every spring by the descent of drift-ice. It was necessary, therefore, for the Service to reinstall new flash boards. The Service has to do this until such time as a sluice-gate will have been installed in this dam for the purpose of lowering the water level when required.

17. *Saint-François river* — dynamiting ice fields at Kruger dam:

After the purchase of this dam by the Department, it became necessary to carry out this dynamiting annually so as to lessen the risk of inundations.

ROBERVAL COUNTY

18. *Des Commissaires lake* — minor repairs to the guardian's house:

Following an inspection which the Service made at this place, it was noted that the chimney of the house had to be rebuilt and that the sewer system needed repairs. The Service, therefore, carried out the necessary works.

19. *Des Commissaires lake* — excavation upstream from the dam:

The Service removed the remains of a coffer dam at that place which obstructed the drainage operations of the lake.

WOLFE COUNTY

20. *Saint-François river* — repair and improvement to the heating system of the guardian's house at Aylmer dam:

Upon a request made by the guardian of this dam concerning this subject, the Service undertook the necessary repairs. This work was done by a firm experienced in this domain.

Topometry Division

The Topometry Division had as its personnel, during the fiscal year 1968/69, one land-surveyor as chief of the Division, one first-class technician, and six public works technicians. Throughout the summer of 1968, it had at its disposition ten students who, under the direct supervision of the technicians, helped with the surveying.

ACCOMPLISHMENT

The Topometry Division carried out topographic surveys in response to the needs of the Hydraulic Engineering Service and it also worked in direct collaboration with the Hydraulic Development Service, as well as with the Hydraulic Domain Service.

During the fiscal year reviewed here, this Division completed 30 topographic surveys in different parts of the Province.

Further mention of these surveys is given in Table III, which shows the different places where these investigations were carried out and also the cost of each survey.

Technical Assistance Division

This Division comprises two public works technicians and two technicians skilled in topography.

It is the responsibility of this Division to prepare plans relative to construction projects starting from sketches and to see to the drawing up of these plans in the smallest detail.

The Division is also responsible for making plans of topographic surveys, beginning with notes taken in the field by surveying parties.

Table No. 1 — REMEDIAL WORKS CARRIED OUT DURING THE FISCAL YEAR 1968/69

County	*River*	*Place*	*Description*	*Amount*
Beauce	Bras Saint-Victor	Saint-Joseph Parish	Gauging of lower section	$ 68,980.91
Beauce	Bras Saint-Victor	Saint-Joseph Parish	Expropriations	2,327.04
Beauce	Chaudière	Beauceville	Final settlement of an expropriation case	25,397.18
Charlevoix	Bras Gariépy	City of Baie-Saint-Paul	Protection of banks and construction of sills	77,735.25
Charlevoix	Des Mares	Baie-Saint-Paul Parish	Cleaning of bed	5,686.76
Charlevoix	De l'Église	Saint-Urbain	Making a brook channel	28,437.30
Charlevoix	Jean-Noël	Saint-Irénée	Cleaning of bed and protection of an aqueduct	26,682.32
Charlevoix	Des Boudreault	Saint-Joseph-de-la-Rive	Cleaning of bed and construction of a concrete retaining wall	15,715.95
Charlevoix	Petite Rivière	Petite Rivière Saint-François	Cleaning of bed and construction of a concrete revetment	7,032.07
Compton	Eaton	Sawyerville	Construction of a concrete retaining wall	569.52
Gaspé	Sainte-Anne	Sainte-Anne-des-Monts	Construction of an embankment	11,911.13
Gatineau	Gatineau	Bouchette	Construction of a retaining wall of stone	4,878.27
Saguenay	Des Roches	Saint-Paul-du-Nord	Protection of banks	977.95
Saint-Maurice	Petite Yamachiche	Yamachiche	Retaining wall of gabions	5,611.13
			Total	$281,942.78

Table No. 2 — WORKS PERFORMED DURING THE FISCAL YEAR 1968/69

Dams Division

County	*River*	*Place*	*Description*	*Amount*
Beauce	Linière	Saint-Georges	Examination of foundations	$ 3,272.00
Beauce	Chaudière	Sartigan Dam	Repairs to electric system	155.80
Beauce	Chaudière	Sartigan Dam	Construction of the dam (2nd phase)	215,142.71
Beauce	Chaudière	Sartigan Dam	Metallic sluice-gates and screens	14,028.40
Beauce	Chaudière	Sartigan Dam	Expropriation of lands	20,563.80
Bellechasse	Lac Saint-Charles	Saint-Charles	Construction of a dam	7,305.41
Chicoutimi	Chicoutimi	Portage des Roches	Repairs to aqueduct system	1,552.75
Chicoutimi	Chicoutimi	Portage des Roches	Installation of gates	598.56
Compton	Eaton	Sawyerville Dam	Protecting wall	569.52
Dorchester	Famine	Morisset	Examination of foundations	17,295.94
Jonquière	Au Sable	Pibrac Dam	Repair to guardian's house, aqueduct and sewer systems	2,618.07
Mégantic	Saint-François	Allard Dam	Rebuilding facing downstream	77,271.73
Montmorency	Lac des Neiges	Montmorency Forest	Reconstruction of the dam (2nd phase)	18,140.15
Richmond	Saint-François	Bromptonville	Examination of foundations, Kruger dam	7,289.44
Richmond	Saint-François	Bromptonville	Seismic tests, Kruger dam	2,710.56
Richmond	Saint-François	Bromptonville	Installation of flash boards, Kruger dam	2,713.44
Richmond	Saint-François	Bromptonville	Dynamiting of ice field, Kruger dam	3,273.44
Roberval	Ouiatchouane	Des Commissaires Lake	Repairs to the chimney of the guardian's house	650.00
Roberval	Ouiatchouane	Des Commissaires Lake	Excavation upstream from the dam	786.24
Wolfe	Saint-François	Aylmer Dam	Improvement to heating system	206.32
			Total	$396,144.28

Table N°. 3 — WORKS DONE DURING THE FISCAL YEAR 1968/69

Topometry Division

County	*River*	*Place*	*Amount*
Arthabaska	Bourbon	Plessisville	$ 1,600.07
Beauce	Le Bras	Beauceville	1,957.63
Beauce	Linière	Armstrong	1,399.25
Beauce	Linière	Armstrong	
Beauce	Gosselin	East Broughton	600.00
Bellechasse	Saint-Charles	Saint-Charles	52.98
Brome	Saint-François	Bromptonville	393.67
Charlevoix	Des Mares	Baie-Saint-Paul	1,724.24
Charlevoix	Du Gouffre	Baie-Saint-Paul	661.45
Charlevoix	De l'Église	Saint-Urbain	781.14
Charlevoix	Gros Bras	Saint-Urbain	727.63
Dorchester	Famine	Morisset	896.70
Joliette	L'Assomption	Saint-Charles-Borromé	18.05
Kamouraska	Du Loup	Saint-Alexandre	1,339.10
Laval	Montmorency	Sainte-Brigitte	6,200.00
Lévis	Etchemin	Saint-Henri	2,838.17
Lévis	Etchemin	Saint-Jean-Chrysostome	99.44
Lévis	Etchemin	Saint-Anselme — Sainte-Claire	672.83
Matane	Matane	Matane	393.60
Matapédia	Matapédia	Matapédia	1,692.41
Matapédia	Bécancour	Black Lake	340.53
Montmorency	Sainte-Anne	Beaupré	2,191.41
Nicolet	Nicolet	Sainte-Brigitte-des-Saults	497.23
Portneuf	Portneuf	Portneuf	460.20
Portneuf	Blanche	Saint-Casimir	1,099.00
Terrebonne	Du Nord	Manitou Dam	460.68
Yamaska	Saint-David	Saint-David	605.26
Yamaska	Yamaska	Yamaska	179.33
Yamaska	Yamaska	Cowansville	80.00
Yamaska	Yamaska	Savage Mills	1,039.05
		Total	$31,001.05

Hydraulic Domain Service

The Hydraulic Domain Service is responsible mainly for supervising the application of the Water-courses Act (R.S.Q. 1964, Chapter 84) and its amendments (Bill 8), as well as of the Timber-driving Companies Act (Chapter 96).

Moreover, this Service conducts studies and makes recommendations concerning the rental of lands needed for the rights of way for electrical power transmission-lines, substations, log-flumes, and waterworks.

Appendix I gives comparative statements of revenue for the fiscal year under review here and of the preceding fiscal term of 1967/68.

(A) Main Activities of the Hydraulic Domain Service Pertaining to the Administration of the Water-courses Act.

(*a*) By the provisions of Section 2 of Division I of the Water-courses Act and certain Orders in Council, the Hydraulic Domain Service issues leases covering parts of the beds of domanial streams, lakes and rivers, or particular parts of the foreshores of the ocean.

Leases issued under Division I include all uses of domanial properties on watercourses not covered by Division III and subsequent provisions of the Act.

The Hydraulic Domain Service administered the total of 1,366 leases issued in virtue of this Division I. During the fiscal period reviewed here, 346 new leases were drawn up by the Service.

Moreover, during the 1968/69 period, the Hydraulic Domain Service sanctioned, by Order in Council, the tariff to be applied for all works done on river beds before the actual leasing. Thus, for works of lesser importance, the Service may now issue, in virtue of a new Order in Council, work permits for the parts of streams affected by such works. During the year 1968/69, 237 work permits were prepared and sent to those responsible for the works.

Upon receipt of requests for rental of large surface areas of river beds to be used for industrial or special purposes, the Service prepared the particular Orders in Council.

Fifteen Orders in Council were thus approved. Upon the advice of the Legal Service of the Department, each rental had to be the object of specifications written out and approved by the Lieutenant-Governor in Council. In this respect, 25 Orders in Council, covering 823 items, were sanctioned.

Revenue from the administration of all leases of this nature issued by the Hydraulic Domain Service amounted to $110,392 during the fiscal period under review here, compared with $71,937 for the preceding fiscal year of 1967/68.

(*b*) Division III of the Water-courses Act provides for the approval of plans and specifications concerning the harnessing of hydraulic power and the rental of Crown rights and lands needed for such works.

During the course of the year under review, one dam was given the pre-cited approbation. Since most of the leases issued under Division III provide for the payment of an annual royalty based on the production of each plant, in addition to a fixed rental, the Hydraulic Domain Service must attend to the control and inspections necessary to evaluate this royalty.

Moreover, technicians of the Service supervise the royalties paid by the various companies concerned on profits resulting from the use of storage dams built and maintained by the Department. The cumulative revenue, during the fiscal year reviewed, from storage-dam prifits, whether maintained by the Department or by private concerns, amounted to $494,128, compared with $471,112 for the preceding fiscal period.

During the same period, the Hydraulic Power Division verified, on site or at the head offices of companies and at Hydro-Québec, production from all the stations.

Technicians and engineers of the Hydraulic Domain Service also carried out the verifications and controls necessary in order to determine the additional dues payable by owners of hydraulic power plants under the provisions of clauses (c) and (d) of paragraph 3 of the Act to Ensure the Progress of Education (10, Geo. VI, 1946, Chapter 21).

During the year reviewed here, revenue from the leasing of hydraulic power sites on the public domain amounted to $2,642,930, and revenue from the Act to Ensure the Progress of Education totalled $2,350,260.

Since January 1, 1964, all rental fees and royalties payable by Hydro-Québec were replaced by a single royalty amounting to 50 cents per thousand kw.-hrs. produced. Under this arrangement Hydro-Québec paid, during the fiscal year 1968/69, a total of $22,212,480, compared with $22,179,172 for the preceding fiscal period.

(*c*) Division IV of the Water-courses Act deals with the approval of plans and specifications of dams and other works needed for log-driving, as well as with rentals of the Crown lands necessary for the maintenance of these dams.

Work relating to all dams maintained by companies carrying out log-driving operations on the streams of the Province has been brought up to date, as well as the legalization pertaining to this work.

During the course of the year under review here, 17 Orders in Council sanctioned by the Executive Council authorized the approval of plans and specifications, as well as the rental of lands needed for maintenance of 42 log-driving dams.

The program set up last year to legalize log-driving works (pillars — booms — head bays) was continued and 13 Orders in Council, which embraced 20 requests, were sanctioned.

Revenue derived from all leases issued by virtue of this Division of the Water-courses Act amounted to $162,063 for the fiscal year 1968/69.

(*d*) Division VII of the Water-courses Act provides for the approval of plans and specifications, as well as the rental of lands needed for the establishment of reservoirs for municipal and industrial waterworks.

During the course of the year, an inventory of all dams used for aqueducts was undertaken. This work involved visiting each of the sanitary units operated by the Department of Health, and it revealed that, in the Province, there are 260 storage dams for the pre-cited purposes, 37 installation projects on an aqueduct system bearing on the construction of a dam, and 268 intakes on the beds of streams, rivers and lakes.

Moreover, initial work of inspections, surveys, draughts, and calculations of the stability and capacity of the pre-cited works were undertaken in Portneuf county, and similar work is now being conducted throughout the Province.

This Division submitted nine projects for Orders in Council with a view to having the approval of the plans and specifications of dams, the Orders in Council of which had already been sanctioned.

(B) Other Activities of the Hydraulic Domain Service:

(*a*) As mentioned previously, the Hydraulic Domain Service is responsible for the rental of rights of way on lands belonging to the Crown for power transmission-lines and all other related purposes.

In this respect, the Service has, at the time of writing, 95 cases to be legalized, 23 of which originated in 1968/69.

Work undertaken in 1967/68 in order to determine the various jurisdictions of the Laflèche Township territory ceded in 1934 was pursued, and an agreement between the interested company and the Department of Natural Resources was tabled so as to bring about a definitive solution to this problem. This agreement was approved by the Lieutenant-Governor in Council.

Revenue derived from the above-mentioned rights of way amounted to $20,005, compared with $21,288 for the preceding fiscal period. This decrease was due to the replacement of the rental fees and royalties to be paid by Hydro-Québec to the Government by the said commission in accordance with the fixed general royalty.

(*b*) A program of supervision by the Hydrauile Domain Service relating to the conservation and protection of the public domain was conducted throughout the Province.

Inspectors assigned to this work accomplished the following:

1° 247 inspections more especially concerned with technical surveys and with studying plans and reports following complaints or with attention to new requests relating to beach and deep-water lots;

2° 62 inspections for the surveying of dams intended for the purpose of sport;

3° 159 inspections for verifying the demolition of dams that had formerly served for log-driving operations;

4° 529 inspections and verifications of reports with the systematic study of works carried out on the bed of streams during 1964, 1965 and 1966.

In addition to the work cited above, there was also work of a technical nature, as well as that of planning for future years.

(*c*) An amendment to the present legislation concerning the approval of dams was brought about. In fact, Bill 8 was given official sanction on May 28, 1968. After the adoption of this amendment, the Hydraulic Domain Service started an inventory of existing dams that were not formerly subject to the approval of the said amendment. Most of this Work was, moreover, entrusted to a consulting engineering firm. This part took in half the territory of the basin of Nord river.

At the date of writing, this work was pursued only by the officers of the Hydraulic Domain Service. To date, inspectors and engineers of the Service have studied an area of 1,300 square miles in Portneuf and Quebec counties and along part of L'Assomption river. In all, this inventory revealed the presence of 445 dams.

Furthermore, during the course of the year being reviewed here, the general census of hunting and fishing clubs maintaining dams was continued. These dams are used and maintained by these sportive organizations and were built by them or acquired by the clubs from companies which had them for their forestry operations.

Five Orders in Council were approved, thus legalizing the presence of 33 dams.

(*d*) The Service pursued its work relating to the general project for Montréal-Nord. This project consisted in encouraging riverside dwellers to protect their lands up to the permissible encroachment line as fixed by the Department. This line would logically be determined from the state of encroachment as found when these sites were entrusted to the Hydraulic Domain Service.

This project involves about 100 riparian peoperties, for which the Department outlined a settlement.

In this respect, the Service submitted, and had approved, an Order in Council by which the proprietor of riverside land, in default of purchase of the parcel of land lying between the limits of his property and the permissible encroachment line, could rent the said land from the Department.

This new method of procedure will become effective during the course of the next fiscal year (1969/70).

(*e*) In order to permit the Federal Government to continue its policy of managing port facilities for navigation or protection of riparian lands, the Quebec Government transferred, by virtue of ten Orders in Council, the control and management of 25 beach and deep-water lots during the fiscal year 1968/69.

STATEMENT OF INCOME, 1967/68 AND 1968/69

	1967/68	*1968/69*
(*a*) Sundry fees (Hydraulic Service)	$ 2,589.00	$ 2,735.00
(*b*) Beach lots	71,936.76	110,392.49
(*c*) Land sales	2,502.05	9,708.20
(*d*) Log-driving works	182,765.00	162,063.25
(*e*) Power transmission-lines	21,288.23	20,005.28
(*f*) Water storage reservoirs	471,111.59	494,127.88
(*g*) Hydraulic power rent and income ...	2,526,198.97	2,642,930.31
(*h*) Income on kilowatt-hours of electrical energy	2,552,485.09	2,350,260.13
(*i*) Hydro-Québec contribution	22,179,172.29	22,212,480.05
Total revenue	$28,010,048.98	$28,004,702.59

Hydraulic Development Service

The fiscal period 1968/69 coincides with the sixth year of existence of the Hydraulic Development Service, which was known as the Studies and Research Service before November 1967.

It was pointed out in the annual report for 1967/68 that the main function of the Service is to promote, within the limits of the budget allotted to it, any phase having as object the development, conservation and control of hydric resources, in the interest of the Department of Natural Resources and, in consequence, for the benefit of the general population, as well as for the protection of communities beset with diverse problems arising from the baneful behavior of the rivers of Quebec.

The cycle of activities realized during the year 1968/69 is in harmony with these objectives. They consist in the pursuit of several long-term studies undertaken formerly and other initiatives particularly associated with the efforts of the Waters Branch in what concerns the coordination of projects and the supervision of inventories related to the Hydric domain.

During the fiscal period under review here, the Hydraulic Development Service was mainly engaged in the following undertakings:

Introducing studies relating to the preparation of an integrated development plan for the drainage basin of Yamaska river;

Intensifying contacts with the Agricultural Hydraulic Service of the Department of Agriculture and Colonization, which sent the Hydraulic Development Service the plans of 33 basins of the streams studied by that organization or by consulting engineering firms before proposing drainage projects;

Giving technical advice to the Department of Roads, which commenced systematic consultations with the Hydraulic Development Service while referring to it 57 pre-projects of bridges;

Negotiating with the Parks Service of the Department of Tourism, Fish and Game for providing future recreative installations along projected or already used reservoirs and with the Fauna Service of the same Department in what relates to the method of use of certain dams that have been taken over by this organization and of several others which will be progressively transferred to the Hydraulic Development Services.

PERSONNEL

As of the end of March 1969, the Hydraulic Development Service had 39 regular employees. This is an increase of seven compared with the total for the preceding year. These employees were classified as follows:

Sixteen professionals, two administration agents, eight technicians, three employees attached to the secretariate, nine guardians of dams, and one workman.

During the greater part of the fiscal period reviewed in this report, the Service benefited from the services of three French collaborators and a post-graduate student from the University of Sherbrooke.

ACTIVITIES IN 1968/69

LONG-TERM PROJECTS

CHAUDIÈRE RIVER, GENERAL PLAN

(Beauce and Dorchester Counties)

The technical and economic implications of the second part of the general Chaudière plan were pursued during the period under review here. The purpose of this second phase was the prevention of floods in ice-free waters, which, each year, expose to danger several urban and rural communities situated between Saint-Maxime-de-Scott and Beauceville.

The studies carried out within the framework of this second stage were directed toward the search for basic information before establishing methods of operation for reservoir-dams already chosen on Famine and Linière rivers, tributaries of the Chaudière, at Saint-Georges. The Hydraulic Development

Service likewise continued to examine other possibilities for controlling the Linière, near Armstrong and on the branch of the Saint-Victor near East Broughton, an affluent on the west bank of the Chaudière, midway between Saint-Joseph and Beauceville.

The hydrometeorologic data registered during this supplementary year have increased the personnel's knowledge of the hydrologic character of the river. With the receipt of new photogrammetric plans, the Service was able to adjust its figures on storage dimensions after having localized the contours of the perimeter of those reservoirs which more specially occupied the Service's technicians. Moreover, negotiations with representatives of the Department of Tourism, Fish and Game have resulted in an exchange of views that favored the eventual delimiting of suitable zones for recreative installations along the shores of reservoirs. Owing to the classification of this additional information, the personal made corrections to the Service's program relating to the influence of flood-control projects on lessening the damages resulting from inundations and on the related advantages that might be drawn from these data.

At the close of the fiscal period being considered, the Service, upon the recommendations of the authorities of the Waters Branch, started the revision of a project that was planned several years ago. This is a program for lowering a control section situated at Saint-Bernard-de-Dorchester which influences the water lever as far as Beauceville. Once the cost estimates of this project have been established, a comparison will be made between the benefits anticipated from this last alternative and the economic aspects relating to the management of one or two reservoir-dams on the tributaries, in order finally to formulate a profitable undertaking adapted to the circumstances obtaining at that locality.

With the completion of one of the projects now in preparation, it is hoped that the Service will be able to ensure more adequate protection against flooding by ice-free water in those similar riparian zones which have already motivated the construction of Sartigan dam and the execution of several control installations on the bed of Chaudière river, within the framework of the first phase of the general plan designed to control the regime of ice. Both phases of the plan are related to the same region; they complement each other and have a common object.

As in the preceding year, there was, during 1968/69, an occasion to observe the efficacy of Sartigan dam, which has played a prominent role toward protecting the riparian municipalities of Beauce by preventing the invasion of water and ice during periods of break-up. Without its presence, there would be cause to deplore appreciable damage upstream where the river frees itself from its ice-floes. On the other hand, the absence of works designed to prevent flooding by ice-free water was felt, since, after the break-up, a precipation of average intensity gave rise to rapid melting of the snow that was still abundant at the close of the preceding winter season, especially in the territory drained by the river. This situation explains in some measure the flooding at that time of the lowlands within the limites of the towns and rural municipalities situated between Sainte-Marie-de-Beauce and Saint-Joseph-de-Beauce.

YAMASKA RIVER

(Eastern Townships)

At the beginning of the fiscal year reviewed here, one of the field parties of the Service was occupied in evaluating the consequences of changes in the configuration of the bed of the southeast branch of the Yamaska, immediately downstream from Cowansville, for the purpose of lowering the high-water level, which affects certain residential quarters of the town during periods of floods. This task is greatly simplified through the use of a computer program developed for determining the specifications of the most adequate channel from various possible options.

The same field party likewise explored the choice of favorable sites for the construction of reservoir-dams in the drainage basin of the Yamaska, downstream from Farnham. The upper part of the drainage basin of the Yamaska upstream from Farnham was already the object of an intensive study by the firm of Shawinigan Engineering, which published a report on that subject entitled "Study of the Hydric Resources of the Upper Part of Yamaska River".

In regard to the north branch, the Service received a summary description of the surveying carried out at the dam site of Savage Mills, about 5 miles upstream from Granby. This work was done by the Hydraulic Engineering Service along a predetermined axis. However, the Mineral Deposits Service supplied the Hydraulic Development Service with a preliminary geological report in which it was disclosed that conditions for the erection of a reservoir-dam were unfavorable at that place.

In addition to this information, the Service also received photogrammetric plans prepared by the Department of Lands and Forests upon request from the Service. These plans will make it possible for the personnel to commence the determination of basic norms and specifications which will follow the introduction of plans and estimates of the work in question. Eventually, the study of methods for operating this reservoir-dam will be conjugated with those relating to other projects already proposed by Shawinigan Engineering on one or any of the three branches of the Yamaska, upstream from Farnham. This work will take into account the needs and restrictions related to the particular conditions met in the lower part of the basin.

Order in Council N^{o}. 2006, which was ratified on July 3, 1968, designated the drainage basin of Yamaska river as "a special zone for the management of water" and assigned the preparation of a plan for the use and conservation of the waters of this basin to an interdepartmental technical commission under the presidency of the director of the Waters Branch. From the promulgation of this Order in Council, the Service formed, from its personnel, a group of professionals and technicians, and they commenced the preparation of various documents, maps, mosaics, etc., so as to meet the needs of this commission. This group also took part in the preparation of a study program and in the description of tasks concerning all the government services assigned to collaborate in this work.

Among the 23 studies making up this work program, seven come directly under the responsibility of the Service, which is likewise called upon to collaborate in the completion of eight other studies entrusted to other services of the Water Branch or with other departments.

PRINCIPAL STUDIES PROMOTED BY THE HYDRAULIC DEVELOPMENT SERVICE

Review of available studies and reports (Study N°. 1) :

Having identified the sources of information and established the availability of the documents likely to be of interest to the services that are engaged in the preparation of the plan, the Service commenced a bibliography by compiling all literature and documents that are connected to one or the other of the phases related to the work program.

Exploitation of inundation plains (Study N°. 7) :

Along with this study there was collected a great deal of information on inundations that have affected riparian zones in the past. Some zones that have been subjected to periodic flooding were delimited following the campaign of observations conducted in sections where the presence of break-up had already been recorded, such as at Saint-Michel-d'Yamaska, Adamsville, Granby, and Cowansville. The installation of temporary water-level recorders at the limits of the principal zones of inundations already detected made it possible to obtain recordings which will eventually serve to verify the back-water curves in relation to critical flows. Special research has already been undertaken in order to discover the basis of a solution apt to improve the regime of ice-floes at Adamsville and Saint-Michel-d'Yamaska, whereas, in the case of Cowansville, the Service recommended that the municipality take steps to acquire the inundated lands upstream from the limit of the impounded waters of the dam that it operates for its water supply.

Navigation for pleasure (Study N°. 8) :

The lower section of Yamaska river, between the mouth and Saint-Césaire, was taken over, during the preceding centuary, by commercial navigation. Today, the presence of numerous obstacles, which occupy the bed of the stream, and of bridges, which reduce the transversal and vertical clearance of several sections, especially in the region of Saint-Hyacinthe, limit navigation to much shorter expanses. The Service, therefore, began to take account of these obstructions and considered various means of clearing them with the small boats currently used for pleasure. Changes and improvements to this navigation network will continue to occupy the Service's attention. Moreover, the Hy-

draulic Development Service will continue to take an inventory of navigation facilities in other sections which offer this possibility.

Fauna (Study N°. 13) :

As a complement to this study, which is derived from the responsibility of the Department of Tourism, Fish and Game, a work plan was submitted to the representatives of this organization. That Department approved the plan in view of initiating a biological campaign on the land, between June and September 1969, along the principal course of the river and its three branches in its upper reaches. In all, 32 sampling stations were chosen and these will be visited at least once a month in order to determine, through biological detection, the degree of pollution of sections where the quality of the water has become harmful to the normal reproduction of aquatic fauna and for other essential uses toward the development of the region concerned.

Control of the level of lakes and reservoirs (Study N°. 15) :

The Hydraulic Development Service, in direct collaboration with the Hydrography Service, launched a research program into standards pertaining to the control of the level of Brome lake, while taking into account the present situation created by the occupation of the shores of the lake and by the needs that could be satisfied through a rational exploitation of this reserve which lies at the head of the central branch of Yamaska river.

An inspection carried out at the beginning of the spring flood of 1969, at the site of the dam exploited at the discharge of the lake, by the city of Bromont, has shown that the dam does not influence the high-water level any more than a tranversal section situated farther upstream has to do with this control. During this same inspection, the Service's inspector discovered several encroachments. This problem cannot be regulated, however, until the Service concerned will have established the demarcation line between Crown property and private property at the periphery of the lake.

Coextensively with studies conducted concerning the reservoir-dam project at Savage Mills, the personnel of the Service examined the consequences that the operation of this work would have on the fluctuations of Boivin lake. This lake is itself controlled by a dam located in the city of Granby, which is the proprietor. It serves as a source of water supply to that city.

Pre-projects and evaluation of multi-purpose works or of works for a particular object (Study N°. 18) :

Having defined certain propositions of the project formulated by Shawinigan Engineering for the upper part of the drainage basin, the Service completed the examination of the possibilities of installing reservoirs within the territory concerned. Thus, the staff considered 16 sites which, according to a preliminary verification from suitable topographical maps, might possess characteristics that would be favorable to the installation of reservoir-dams.

Subsequent inspections on the land have made it possible for one to eliminate some of them. Of those that have been retained, the Service undertook the evaluation of their hydrologic and hydraulic consequences, starting with available hydrometeorological data. The sites selected were, moreover, made the object of requests for land surveys to the Hydraulic Engineering Service and for geological surveys to the Mineral Deposits Service.

For each of the pre-projects, the Service made preliminary calculations for the purpose of determining the dimentions of the storage capacity of the reservoirs and traced the curves of the storage volume in relation to the different heights of impounded water. The approximate perimeters of the reservoirs, the roads, railways, public services, etc. situated within their boundaries were plotted on maps and then catalogued. Most of these fundamental works will be completed when the Hydraulic Development Service will have received the photogrammetric plans that it has requisitioned from the Department of Lands and Forests.

RIVERS DRAINING INTO JAMES BAY

Commencing with available hydrological data, the Service, from April to July 1968, prepared a schedule which makes it possible to take into account all factors likely to influence operation projects of dams already chosen within the drainage basin of Harricana river. During the same period, the Service initiated a statistical study with a view to establishing a relation between the average monthly flow and maxima flows with the recordings in the vicinity of the hydrometric station of Amos, which has been in operation for 43 years.

Since August 1968, the Service interrupted the studies introduced during the preceding fiscal year for examining the possibilities of diverting, toward the south, the rivers flowing into James bay. This suspension of work is attributed to the fact that negotiations between the Federal Government and the Department of Natural Resources on this subject came to a dead-lock and it became necessary for the Service to allocate part of its personnel to other priorities.

L'ASSOMPTION, MASKINONGÉ, ROUGE AND DU NORD RIVERS

(Laurentides Region North of Montreal)

Upon representations from the municipal council of the city of Joliette, the Hydraulic Development Service started an inventory of available information concerning the territory drained by L'Assomption, Maskinongé, Rouge, and Du Nord rivers, in view of preparing a summary of the potential and use of the hydric resources of this area. Because of difficulties beyond the Service's control, this body was forced to limit itself only to the available documents of the Department as a source of information. This limitation prevented the Service from covering several aspects of the problem, and caused this body to terminate the undertaking.

ETCHEMIN RIVER

(Dorchester County)

After the spring flood of 1968, the municipal corporations of the parish and village of Saint-Anselme presented the Department with a resolution in which were formulated propositions for projects and works for the purpose of preventing damages of a nature similar to those which several of their administrators remedied at that time.

Owing to the fact that the Service was already preoccupied with problems created by the accumulations of frazil, which were especially aggravated during the first half of the winter at the water-intakes of the village of Saint-Anselme and the cooperative of Sainte-Claire, the Service sought a solution for the whole section concerned, which is between Sainte-Claire and Saint-Anselme, rather than confine itself exclusively to local investigations.

At the same time as inspections were being conducted in the field in order to verify the urgency of the recommendation of the two municipal councils, the Service carried out an inventory of works such as dams, bridges, etc. likely to affect the regime of ice-floes when they are in motion. Several sites favorable to the installation of works for the retention of ice-floes were likewise studied from maps and then inspected. Moreover, the most critical zones were detected and investigated during the annual campaign of observing ice conditions on rivers.

An internal report prepared after this preliminary analysis shows that the reasons abvanced for proceeding with the work recommended by these two municipalities were inadequate under present conditions. The adpotion of one or the other of the proposed alternatives was unwarranted either because the cost of the work involved was excessive, for their might be a simple solution to the problem, or the work might even aggravate the situation in some cases. It is evident that research into an economic solution must be inserted in the program of studies with a view to specifying development along the many avenues capable of meeting the needs of the numerous users of the resource within the basin. The problems of use of the resource are more important to the Service than those created by flooding in periods of break-up through the accumulation of frazil, which are intermittant. One may note that flood damage equal to that registered in 1968 had not occurred since about 50 years in the two localities mentioned above.

Sampling of frazil accumulations by the Hydrography Service made it possible for the Hydraulic Development Service to locate check points more accurately and to observe the volume and movement of the frazil. The temperature having been in general below normal during the winter of 1968/69, this problem appears in consequence much less acute than that of the two preceding years. Moreover, the results of the last soundings carried out toward the close of the season indicated that the frazil had completely disappeared from the critical zones before the actual break up. It should be noted, however, that the cooperative of Sainte-Claire worked on the bed of stream at the end of its water-intake, during the autumn of 1968, in order to change the course of the river by way of directing the solid material to the opposite bank.

SAINTE-ANNE-DES-MONTS RIVER

(Gaspé-North County)

From a pre-project proposed by a consulting engineer commissioned by the Department of Tourism, Fish and Game to study the development of Sainte-Anne-des-Monts river for salmon fishing, the Hydraulic Development Service draw up a program of studies to be shared among the various services of the Department for pursuing its preliminary stage for elaborating each of the various phases of the project. This program was approved by the Department of Tourism, Fish and Game, which subsequently abandoned the program for one of pisciculture near the mouth of the river. That Department, however, requested that control be exercised over the quality of the waters in order to ensure that mining residue deposited along the banks of some tributaries of the upper part of the basin does not become a cause of pollution such as would be absolutely baneful to the hatching and growth of salmon in the lower reaches of the river.

After studying the report of the firm of Kilborn Engineering, which was engaged by Mines Madeleine Ltée, the Service recommended to the Quality of Waters Division of the Hydrometry Service that certain supplementary surveys be carried out for the purpose of verifying effectively an anti-pollution system that has to be installed by the company so that salmon will not be hindered in their ascent by this residue. In cases where these surveys indicated that mining operations have a deleterious effect on the upstream migration of salmon, the Mining Domain Service was informed so that steps could be taken by the operators in order to keep the waters in an acceptable condition.

BOURBON RIVER AT PLESSISVILLE

(Mégantic County)

The purpose of the reservoir-dam project at Plessisville was defined in the annual report of the Department of Natural Resources for 1967/68. The various stages completed in the preparatory work of the project during the fiscal period under review are described as follows:

(*a*) Adjustment of the storage curve in relation to the elevation of the impounded waters after correcting the surface of the reservoir from new topographic plans provided by the Department of Lands and Forests;

(*b*) A project for sharing the financial responsibilities among the Department, the city, the agriculture cooperative, and ARDA, in conjunction with the Planning Branch, while taking into account former contracts entered into by the city for the water supply for the cooperative mill, as well as for the total domestic and industrial consumption and all future needs;

(*c*) Revision of the specifications of the initial project in such a way as to reduce the estimates to within the means of the municipality in what

concerns that part of the project pertaining to financial responsibilities. A summary study showing the water needs of the city, the problems created by the present regime of Bourbon river, and the main features of the solution as conceived by the Hydraulic Development Service has been submitted to ARDA. This organization later informed the Department that it was impossible for it to obtain the budgetary funds necessary for the realization of this project.

DU SUD RIVER AT MONTMAGNY

(Montmagny County)

After considering a memoir presented to the Department, in August 1968, by the municipal authorities of the city of Montmagny, the Service undertook the study of technical documents available on the subject of this river and its principal tributary — Bras Saint-Nicolas river.

This undertaking made it possible to define accurately the two main problems created by Du Sud and Bas Saint-Nicolas rivers within the city limits of Montmagny, — namely: the inundations resulting from the formation of ice-packs in the upstream reaches of the dam located near the bridge on Highway 2; and the annual springtime flooding of the agricultural zones immediately upstream from the city limits.

Insofar as the first problem is concerned, the Service, acting within the scope of its annual campaign of observing ice conditions on rivers, carried out inspections of the section downstream from Du Sud and Bras Saint-Nicolas rivers, at the moment of freeze-up, during the autumn of 1968. Results of this first series of observations show that work undertaken by the Service at this locality helped the normal process of ice-cover formation at the head-bay limit created by the impounded waters of the dam.

Before the advent of the spring of 1969, the Service recommended that the city weaken and break up the largest possible area of ice by dynamiting, so as to effect a channel opening in the upstream head-bay of the dam before the ice-floes started to move. The city carried out this work in March 1969 and, as a consequence, the break-up took place without inconvenience.

Inundations that affect agricultural zones are attributed to the drainage network of the land rather than to the overflow of Du Sud and Bras Saint-Nicolas rivers. The agricultural lands invaded by water are in the form of a wash-basin and are drained by small brooks, tributaries of one or the other of the rivers referred to above. In spring, water from melting snow cannot run off through the natural drainage system when the water level of rivers is too high. This is essentially a drainage problem, which will be considered in direct collaboration with the Agricultural Hydraulic Service of the Department of Agriculture and Colonization, which has jurisdiction in this domain.

At the present stage of the study, the Hydraulic Development Service is not in a position to recommend the undertaking of works or projects of a permanent character designed to give adequate protection to the city against

invasion of water during periods of break-up. The topography of these sites, the development of the lands, and the occupation of the banks, which have changed normal flow conditions, make it difficult to carry out research for an adequate means for controlling the region of ice-floes at this place. Only after systematic observations conducted over a period of several years during winter will the Service be ready to set forth the basis for a solution designed to ensure effective protection to the sections menaced by inundations during periods of break-up.

SAINT-FRANÇOIS RIVER AT BROMPTONVILLE

(Richmond County)

After the break-up in the spring of 1968, the Hydraulic Development Service contacted the LaSalle hydraulic laboratory, which supplied it with additional information pertaining to the future operation of the sluice-gate that has to be installed in the Bromptonville dam after a study of the particular ice-floe conditions observed during that time. After November 1, 1968, the small-scale model used for the study was demolished.

After the meeting of the Legal Service, certain clauses of the proposed deed of transfer that the Service had previously prepared were revised, while consideration was given the proposals drawn up by lawyers of the pulp and paper company of Kruger Ltée. Finally, on February 10, 1969, the deed of transfer making the Department of Natural Resources the proprietor of the Bromptonville dam was signed. At the same time, Kruger Ltée presented the Service with a written agreement assuring the Department of its collaboration for allowing it to carry out the necessary changes to the dam.

At the end of March, the Hydraulic Engineering Service maintained a channel in ice-free water across the ice field in the head-bay of the dam, in view of aiding the circulation of ice-floes during periods of break-up. This channel cleared a path about 100 feet wide from the overflow axis to approximately 300 feet downstream from the bridge road which spans the upper extremity of the head-bay. This work produced good results, for no damage was recorded during break-up.

STUDIES AND PROJECTS OF LOCAL INTEREST

MACAMIC LAKE AT LA SARRE

(Abitibi County)

The hydroelectric station located in the discharge of Macamic lake has been out of use for several years and the dam which controls this head-bay is being gradually abandoned by Hydro-Québec to such a degree that in times of low water it has no influence on the water level. The municipal council of La Sarre and the local Chamber of Commerce have made recommendations to the Department concerning the situation.

An evaluation of the use of the dam showed that its concrete structure is in a state of advanced deterioration. The estimated cost of the repair work necessary to put the dam back in good condition represents an investment greatly in excess of the profits that can be derived from the installation. The Service therefore recommended that the Department should not undertake this work.

As an alternative, the Service studied the possibility of constructing a weir sill near the discharge of the lake for the purpose of maintaining a level favorable to those using the lake. The Service plans to contact interested parties in order to gather more information and to determine whether, with a given storage capacity, it can satisfy the other requirements before assessing the economic factors of this project and the advantages thereof.

AU RENARD RIVER

(Gaspé-South County)

The storms which have swept the shores of Gaspesia in the region of Au Renard river in the beginning of the winter of 1968/69 have interfered with the free discharge at the mouths of several streams. After an inspection of these places, an engineer of the Service recommended the immediate execution of work destined to clear the outlets of Petite Au Renard river, which was completely blocked by banks of gravel and debris from the wharf that was destroyed by the storm. This work was undertaken for the purpose mainly of giving the river a sufficient flow channel in view of the spring floods and also to avoid destruction of part of Highway 6.

DU NORD RIVER AT SAINT-JÉRÔME

(Terrebonne County)

Two dams within the city limits of Saint-Jérôme, which are owned by Regent Knitting and Uni Royal, were the object of an inspection and of a meeting with the municipal authorities who requested the Department to acquire and exploit these dams. It was impossible for the Service to recommend that the Department comply with the request because the maintenance of these dams does not adequately answer the municipal needs. The Study Commission on the Legal Problems Relating to Water gave an opinion bearing on cases of this sort which now obtain in several municipalities of the Province.

OBSERVATIONS OF ICE-FLOE CONDITIONS IN RIVERS

The Hydraulic Development Service conducted a systematic observation campaign and an evaluation of the freezing, evolution and melting of ice-fields in various rivers of Quebec during the winter season of 1968/69. The purpose of these investigations was either to verify the efficacity and results of work and

installations already in operation or to define exactly the nature of future interventions for the protection of some riparian communities regularly subjected to ice-floe problems. The completion of this program made it possible in certain cases to finish the compilation of information before suggesting solutions or of undertaking the gathering of data relating to several sections of the streams concerning which the Service was consulted. The following places were the object of inspections and studies during the season of 1968/69:

Matane river between its mouth and Hammermill dam, located about 5 miles upstream from the city of Matane;

Du Sud river at Montmagny;

Etchemin river at Saint-Henri-de-Lévis and the section between Sainte-Claire and Saint-Anselme in Dorchester county;

Chaudière river at Charny and the section between Saint-Maxime-de-Scott and Saint-Georges-de-Beauce;

Famine river (tributary of the Chaudière) in the section skirting the Saint-Georges golf club course;

Bécancour river, between its mouth and the residential center of the city of Bécancour;

Saint-François river at the limit of the head-bay of Hemmingfalls, at Saint-Nicéphore, Drummond county, and upstream from Kruger dam at Bromptonville;

Yamaska river at Saint-Michel-de-Yamaska, Adamsville, Cowansville, and Granby;

Châteauguay river at its mouth and in the section between Huntingdon and Powerscourt;

Mille-Îles river at Saint-Jean island, near Terrebonne, and at Locas island close to the bridge on the Laurentides auto-route;

Des Prairies river upstream from the dam operated by Hydro-Québec and in the lower section between its mouth and Notre-Dame-des-Prairies church;

Sainte-Anne-de-la-Pérade river at Saint-Raymond.

From December 1968, direct collaboration was introduced with Hydro-Québec for studying streams presenting problems at places where this organization has hydroelectric installations. The Service thus profited from certain information particularly from data relating to Chaudière river at Charny, the Saint-François at Hemmingfalls, and the Des Prairies.

Among the parties who have collaborated with the Service in this observation campaign, mention should be made of the Technical Service of the city of Laval in the case of Des Prairies river.

The Hydraulic Development Service forwarded, to the director of that Technical Service, the compilation on the results of the observations and studies completed by this Service since the dynamiting operations conducted on Des Prairies river in February 1967. At the same time the Hydraulic Development Service prepared a preliminary estimate of the cost of eliminating excessive

flooding in places where surveys showed the presence of break-up in 1967. On this score, the Service concluded that such works would have only a minor influence on the regime of ice-floes and that, under certain conditions, this type of intervention might even aggravate the situation. Following the recommendation from representatives of the Technical Services of the cities of Montreal, Laval, and Montreal-North, this Service planned, by way of an experiment, to open a channel between the mouth of the river and the basin at the foot of Des Prairies rapids from the beginning of freeze-up. This plan having been acceptable to all interested parties, the Service immediately undertook the first phases of the work so that this experiment would be carried out from the beginning of the winter season of 1969/70.

Unlike the flooding in the spring of 1968, there was no important inundation at the end of March 1969 at the critical points studied with a view to carrying out corrective work. Following procedures similar to those undertaken by the Service with respect to the reports dealing with the Service's observations for 1967/68, the results derived from observations of ice-floe conditions conducted during 1968/69 will be summarized and will be the subject of a publication in which all results will be compiled and interpreted.

Apart from preparing a publication on the events of the winter season of 1967/68, the Service was occupied in the study of resolutions, secretarial work, and correspondence for the Interdepartmental Committee on Floodings, which is responsible to the Executive Council for studying claims submitted to the Government of Quebec by several municipalities that experienced damage from inundations during the spring of 1968. The report forwarded by the Committee shows that at least 22 riparian municipalities in six counties of the Province were affected by these floodings and it contains recommendations as to the method which the Service might adopt for reimbursing the claimants by way of compensating for this damage.

OPERATION OF DAMS OWNED BY THE DEPARTMENT

The Division responsible for exploiting dams has, as it first duty, to provide for the operation and ordinary maintenance of the 28 dams for the upkeep of 25 reservoirs located throughout nine hydrographic basins in Quebec. The following synoptic table gives a summary of the distribution of these reservoir-dams and also some of their main characteristics.

It may be noted that the object of operating these dams is to regulate the discharge flow for one or several of the following reasons:

to ensure a sufficient flow for certain hydroelectric energy installations on one or the other of the rivers mentioned in the summary tables;

to control floods and the regime of ice-floes;

to give extra assistance in log-floating operations;

to increase the low-water discharge for the purpose of cleaning the channel and of improving the appearance of riparian lands.

It should be mentioned that, during the fiscal period under review here, the number of dams and reservoirs increased by two as the result of the construction, in November 1968, of Lac des Neiges dam in Laurentides Park, on Montmorency river, and the acquisition, in February 1969, of Kruger Company dam on Saint-François river, at Bromptonville.

Inspections were carried out at each of these dams for the purpose of verifying the state of the structures and their ancillary buildings. Moreover, dam guardians were instructed as to the maintenance of the property, buildings, and material for which they are responsible. This Division, in addition to attending to its principal duties, completed the following work:

put the Matane River dams in operation so as to meet the needs of the Department of Tourism, Fish and Game and the necessary requirements for salmon fishing;

held discussions with representatives of the Department of Lands and Forests for completing the transfer of the dams in Matane River basin and for determining the parcels of land necessary for their operation and maintenance;

revised the methods of exploitation of several reservoirs in view of improving the flow while regulating it to the advantage of those using hydraulic energy and for the purpose of lessening fluctuation in level of the reservoirs;

prepared appropriate topographic maps of the properties of the Department along the borders of the more important reservoirs;

made an inventory of the equipment, tools and machinery stored in the annexed buildings of the Department's dams;

worked, to this end, toward the preparation of a computer program which will facilitate the progress of this inventory (Obsolete or unusable material was transferred to warehouses of the Department at Quebec, and more supervision was given to the guardians so that they would be attentive to the material entrusted to their care);

drew up a list of the material and equipment to be acquired so as to conform to the regulations and specifications issued by the Fire Protection Service of the Department of Municipal Affairs after it had conducted, at the request of the Service, a general inspection of the dams held by the Department of Natural Resources;

inspected dams which have been the object of continued correspondence with the Department of Tourism, Fish and Game (Before the close of the fiscal year 1968/69, that Department transferred to the Hydraulic Development Service the 10 dams mentioned in the list accompanying this report).

The Service finally took possession of these installations at the beginning of the summer of 1969. At this time, it commenced an exploitation and maintenance program in direct collaboration with biologists of the Department of Tourism, Fish and Game, which had previously made recommendations to the Service pertaining to this subject.

Basin	*Stream*	*Reservoir*	*Dam*
Matane	Matane	Price	Price
Matane	Matane	Hammermills	Hammermills
Matane	Matane	Matane	Gr. Lac Matane
Matane	À la Truite	À la Truite	À la Truite
Chaudière	Chaudière	Saint-Georges	Sartigan
Saint-François	Saint-François	Saint-François	Allard
Saint-François	Saint-François	Aylmer	Aylmer
Saint-François	Saint-François	Bromptonville	Kruger
Du Loup	Fourchue	Morin	Morin
Du Nord	Aux Mulets	Théodore	Théodore
Du Nord	Doncaster	Masson	Masson
Du Nord	Du Nord (trib.)	Des Sables	Des Sables
Du Nord	Du Nord (trib.)	Manitou	Manitou
Du Nord	Du Nord (trib.)	Cornu	Cornu
Du Nord	Du Nord (trib.)	Brûlé	Brûlé
Du Nord	Du Nord (trib.)	Ludger	Ludger
Du Nord	Du Nord (trib.)	Papineau	Papineau
Du Nord	Du Nord (trib.)	Montagne Noire	Montagne Noire
Du Lièvre	Du Lièvre	Rapide des Cèdres	Des Cèdres
Du Lièvre	Kiamika	Kiamika	Kiamika
Du Lièvre	Mitchinamekus	Mitchinamekus	Barrage Principal
Du Lièvre	Ruisseau à La Loutre	Mitchinamekus	Broderick
Jacques-Cartier	Aux Pins	Saint-Joseph	Lac Saint-Joseph
Montmorency	Montmorency	Lac des Neiges	Des Neiges
Saguenay	Chicoutimi	Kénogami	Portage des Roches
Saguenay	Au Sable	Kénogami	Pibrac-Ouest
Saguenay	Au Sable	Kénogami	Pibrac-Est
Saguenay	Ouiatchouane	Des Commissaires	Des Commissaires

Station N°.	*Drainage Basin (sq. mi.)*	*Height of Dam (in feet)*	*Capacity 10^9 cu. ft.*	*Beginning of Operations*
021603	656.3	10	*	July 1967
021606	652.8	*	*	July 1967
021604	56.4	14	0.27	July 1967
		14	*	July 1967
023430	1,190.0	40	0.14	January 1968
030201	465	39	12.22	April 1968
030202	654	21	3.60	October 1940
030244	3,130	35		February 1969
022505	103	50	0.52	October 1943
040109	31	10	0.12	January 1944
040108	13.2	12.5	0.47	January 1927
040107	15.6	8	0.15	October 1944
040106	9.4	6	0.16	October 1944
040105	4.9	7	0.06	January 1944
040104	27.5	7	0.16	January 1944
040103	15.4	8	0.14	January 1927
040102	11.0	5	0.03	January 1944
040101	5.1	10	0.23	January 1927
040602	2,310	66	22.13	April 1930
040608	280	47	13.40	April 1954
040609	348	65	18.62	May 1941
040610	348	65	18.62	
050805	82	10	0.57	April 1967
015008	15.19	12		November 1968
061001	1,270	80	13.57	October 1923
061002	1,270	50	13.57	October 1923
061002	1,270	63	13.57	October 1923
061601	225	20	4.9	

* Studies underway to determine this information.

INTERDEPARTMENTAL COLLABORATION

STUDY PROJECT OF THE DEPARTMENT OF AGRICULTURE AND COLONIZATION

The Department of Agriculture and Colonization supplied the Service with drainage-basin plans of 33 streams which the Agricultural Hydraulic Service intended to study for the purpose of preparing work projects designed to improve the drainage of the lands which these streams cross. The Hydraulic Development Service undertook a preliminary examination of these plans so as to make recommendations, at the opportune time, and thereby to avoid the possibility of carrying out final drainage works in a manner baneful either to the hydrological and hydraulic regimes of these streams or to the varied interests that could obtain in the hydric field of other departments, such as:

domestic and industrial supply;
erosion, inundation, and sedimentation;
management for recreation, fauna development, etc.

Examinations conducted up to the close of the fiscal period reviewed here reveal that most avenues of the study lie in regions that are essentially agricultural in character. Moreover, the Service took note of the streams on which the Department has already intervened and it also pointed out to the Agricultural Hydraulic Service the important problems that the Hydraulic Development Service was called upon to consider in the past regarding certain streams.

DAMS ACQUIRED FROM THE DEPARTMENT OF TOURISM, FISH AND GAME DURING THE FISCAL YEAR 1968/69

River	*Dam*	*Place*
Petite Malbaie	Carré Lake	Laurentides Park
Milieu (Launière)	Warbonne Lake	Laurentides Park
Milieu (Launière)	Roy Lake	Laurentides Park
Milieu (Launière)	Mabile Lake	Laurentides Park
Milieu (Launière)	Valois	Laurentides Park
Mont Louis	Mont Louis Lake	Gaspé Park
Cascapédia	Berry Mountain	Gaspé Park
Du Diable	Croche Lake	Mont Tremblant Park
Du Diable	Bois Franc Lake	Mont Tremblant Park
Du Diable	Stair Lake	Mont Tremblant Park
Rouge	Rouge Lake	Mont Tremblant Park
Rapide	Des Loups Lake	Vérendrye Park

PRE-PROJECTS ON BRIDGES OWNED BY THE DEPARTMENT OF ROADS

The Service examined the 57 pre-projects given in the accompanying list, which was submitted to it through the Service of Bridges of the Department of Roads. In each case, the Hydraulic Development Service inspected the project plans to see whether these new structures will be provided with sufficient transversal and horizontal clearance, at the sections where they cross the stream, so that they will not be the cause of inundations or interference with flow conditions in the rivers at the localities where they are constructed.

For some of these pre-projects which involved works on streams or diversion of waters, the Service carried out inspections so as to be in a position to draw up adequate recommendations concerning precautions to be taken and to know the particular circumstances to be considered after taking into account the nature of the problems that the Service has to foresee on these rivers from a study of the classified information of its files.

SUBCOMMITTEE ON UNDERMINING

Bernard Harvey, the engineer representing the Department of Natural Resources on the Subcommittee on Undermining (at bridge pillars) of the Canadian Good Roads Association, was engaged in translating a text on hydrology. This text is to be inserted in a guide, for the hydraulics of bridges, destined to standardize the estimation methods employed regarding this subject by the different Provincial governments.

OTHER INFORMATION

BUDGETARY PROGRAMS

Upon his return from L'École Nationale Administrative de France, André Marcoux, engineer, was released from his current activities with the Service in order to commence a study project dealing with the implantation of a budgetary program technique within the Department.

On the one hand, he developed a new analysis technique different from the analysis process of the Planning Branch in what pertains to activities within the jurisdiction of the services of the Waters Branch.

Owing to this work, all activities proper to each of the administrative units have been defined and classified in terms of a program.

On the other hand, a new technique for preparing a budget had to be studied. This study will be conducted during the year 1969 in view of arriving at an integrated administrative and financial management.

PRE-PROJECTS OF BRIDGES EXAMINED FOR THE DEPARTMENT OF ROADS

County	*Municipality*	*River*	*Tributary*	*Road concerned*
REGION N°. 1				
Bonaventure	Saint-Jules	Grande Cascapédia	Des Chaleurs Bay	Secondary road
Bonaventure	New-Richmond	Petite Cascapédia	Des Chaleurs Bay	
Gaspé-Sud	Barachois	Petite Fourche	Saint-Laurent Gulf	Route 6
Gaspé-Sud	Grande-Rivière	Brèche à Manon	Des Chaleurs Bay	New Route 6
Matapédia	Sainte-Marie-de-Sayabec	Saint-Pierre	Matapédia Lake	Secondary road
Témiscouata	Sainte-Rose-du-Dégelis	À la Perche	Madawaska River	Trans Canada Highway
REGION N°. 2				
Bellechasse	Saint-Charles-Borromée	Boyer	Saint-Laurent River	Route 25A
Bellechasse	Saint-Dominique-de-Buckland	Aux Billots	Etchemin River	Route 25A
Beauce	Ville Saint-Georges	Chaudière	Saint-Laurent River	New Bridge
Dorchester	Sainte-Claire	Des Aulnaies	Etchemin River	Secondary road
Dorchester	Saint-Anselme	Etchemin	Saint-Laurent River	New Taschereau bridge
Frontenac	Saint-Augustin-de-Woburn	Clinton	Mégantic Lake	Secondary road
Frontenac	Audet	Chaudière	Saint-Laurent River	Audet – Saint-Samuel road
Kamouraska	Saint-Pacôme	Ouelle	Saint-Laurent River	Trans Canada Highway
Kamouraska	Sainte-Anne-de-la-Pocatière	Saint-Jean	Saint-Laurent River	Trans Canada Highway
Kamouraska	Ixworth Township	Ouelle	Saint-Laurent River	Rg. II, Secondary road
Lotbinière	Saint-Patrice-de-Beaurivage	Fourchette	Beaurivage River	Petit Lac Concession, Secondary road
L'Islet	Saint-Jean-Port-Joli	Trois Saumons	Saint-Laurent River	Rg. II, Secondary road
Montmagny	Cap Saint-Ignace	Bras Saint-Nicolas	Du Sud River	Guimont road
Matane	Capucins	Petits Capucins	Saint-Laurent River	Secondary road

PRE-PROJECTS OF BRIDGES EXAMINED FOR THE DEPARTMENT OF ROADS (Continued)

County	*Municipality*	*River*	*Tributary*	*Road concerned*
Matane	Matane	Matane	Saint-Laurent River	Bridge, route 6, projeted
Matane	Saint-Jérôme-de-Matane	Matane	Saint-Laurent River	Secondary road
Mégantic	Plessisville	Blanche	Bécancour	Saint-Jean-Baptiste street
Nicolet	Lemieux	Gentilly	Saint-Laurent River	Secondary road
REGION N°. 3				
L'Assomption	L'Assomption	Point du Jour	L'Assomption River	Pont des Rochers
Arthabaska	Saint-Rémi-de-Tingwick	Nicolet	Saint-Laurent River	Secondary road
Berthier	Saint-Damien	Matambin	Maskinongé Lake	Secondary road
Brome	Abercorn	Ruisseau Blanc	Missisquoi River	Route 13, range III
Montcalm	Notre-Dame-de-la-Merci	Dufresne	Ouareau River	Secondary road
Montcalm	Rawdon Township	Burrough	Ouareau River	Route 18, range X
Maskinongé	Chutes Lessard	Des Écorces	Du Loup River	Dam-bridge
Maskinongé	Saint-Justin	Maskinongé	Saint-Laurent River	Petit Trompe Souris Range, Secondary road
Missisquoi	Stanbridge Township	Aux Brochets	Missisquoi Bay	Route 25, projeted
Missisquoi	Farnham	Yamaska	Saint-Laurent River	Road skirting Farnham
Stanstead	Stanstead-Est	Niger	Magog Lake	Route 50
Terrebonne	Saint-Pierre-de-Blainville	Aux Chiens	Des Mille Îles River	Route 11
Yamaska	Saint-Michel-d'Yamaska	Sainte-Catherine	Yamaska River	Smith Conc. East Bridge
Yamaska	Saint-Pie-de-Guire	Ruisseau	Saint-François	Sainte-Marguerite Range
REGION N°. 4				
Gatineau	Northfield Township	Gatineau	Outaouais	Gatineau Bridge, Range C
Gatineau	Cameron Township	Cameron	Gatineau	
Gatineau	Delage Township	Joseph	Gatineau	Hardis bridge

PRE-PROJECTS OF BRIDGES EXAMINED FOR THE DEPARTMENT OF ROADS (Continued)

County	*Municipality*	*River*	*Tributary*	*Road concerned*
Drummond	Grantham-Ouest	Saint-Germain	Saint-François	Secondary road
Papineau	Montpellier	Scryer	Petite Nation	Secondary road
Terrebonne	Val-David	Ruisseau	Du Nord	Sainte-Agathe road
REGION N°. 5				
Champlain	Saint-Maurice	Champlain	Saint-Laurent River	Rg. Saint-Martin, Secondary road
Charlevoix	Baie-Saint-Paul	Du Gouffre	Saint-Laurent River	Bridge N°. 1, Route 15A
Charlevoix	Saint-Urbain	Du Gouffre	Saint-Laurent River	Secondary road
Charlevoix	Les Éboulements	Du Moulin	Saint-Laurent River	Bridge N°. 3, Route 15A
Charlevoix	Saint-Joseph-de-la-Rive	Boudreault (Seigneurs)	Saint-Laurent River	Secondary road
Charlevoix	La riv. Malbaie	Comporté	Malbaie River	Nord-Est Range, Secondary road
Chauveau	Lac-Saint-Charles	Saint-Charles	Saint-Laurent River	Bridge N°. 2, Jacques Bédard road
REGION N°. 6				
Dubuc	Boileau Township	Discharge of Petit Lac Ha ! Ha !	Des Ha ! Ha ! River	Route 56
Dubuc	Tremblay Township	Caribou (Tremblay) Saguenay	Saguenay	Chicoutimi-Nord and Tadoussac road
Roberval	Saint-Prime (Parish)	Aux Iroquois	Saint-Jean Lake	Range III, Secondary road
REGION N°. 7				
Duplessis	Riv.-au-Tonnerre	Sheldrake	Saint-Laurent River	Route 15, projeted
Duplessis	Havre-Saint-Pierre	Petite Rivière	Saint-Laurent River	Route 15
Saguenay	Saint-Luc-de-Laval	Aux Pins	Laval River	Route 15, Range 6

INUNDATION INSURANCE

Documentary research carried out by the economists of the Planning Branch, as well as that recorded in many libraries, in view of proposing a preliminary plan for a system of inundation insurance applicable to Quebec has made it possible to make a compilation of the literature published following research work into similar enterprises in the United States in this domain. The internal report prepared on this subject and entitled "Preliminary Study on Inundation Insurance" relates the policies followed up to the present in Quebec and the United States on the subject of inundation. It points out the main causes for America's failure in this field and presents evidence of the principal objectives to be pursued in the fight against damage resulting from inundations in Quebec. It likewise mentions some advantages that might be drawn from such an insurance plan in Quebec.

FREQUENCY OF HIGH WATER TO BE CONSIDERED FOR THE SIZE OF HYDRAULIC WORKS

Upon the request of the Waters Branch, a preliminary outline of rules to be followed was prepared for the purpose of establishing the maximum flow to be used for determining the dimensions of hydraulic works. This work was interrupted at the beginning of 1969 so as to allow the engineer responsible for this work to undertake certain studies required by the Study Commission on Legal Problems Relating to Water.

ADVANCED COURSE FOLLOWED BY THE PROFESSIONAL PERSONNEL OF THE SERVICE

After studying for two years at Colorado State University in the United States, José Llamas, engineer, received his doctorate (Ph.D.), in December 1968.

André Marcoux, engineer, terminated a one-year term at L'École Nationale d'Administration de France, in December 1968.

Claude Triquet, engineer, sojourned in Paris during 4 months, starting from February 1968, in order to follow an international course in hydrology and management of waters that was organized by the International Hydrological Decade.

From August 11 to September 6, 1968, Jacques Desjardins, engineer, took part in the third colloguy destined to familiarize students with the principles of hydrology. These sessions were held at Halifax under the aegis of the Canadian Committee of the International Hydrological Decade.

Commencing September 1968, André Harvey, engineer, pursued studies during 1 year at the University of Waterloo, Ontario, in order to obtain the degree of Master of Science.

Publication

Report (R. 5) entitled: "Étude sur l'atténuation des crues de la rivière Chaudière" was followed by four annexes: hydrology, dams, checking floods, and the advantage of projects.

Resumé of similar Acts applicable to river hydraulics;

Preliminary study on critical zones of the drainage basin of Gouffre river;

Preliminary study relating to inundation problems caused by Du Sud river;

Preliminary study relating to problems from ice as observed on Etchemin river;

Biological problems involved in hydraulic management.

HYDROMETEOROLOGICAL SERVICES

The Hydrometeorological Services comprises three units, — namely, the Hydrography Service, the Hydrometry Service, and the Meteorology Service. Its role within the Department of Natural Resources is to acquire a knowledge of water in all phases of its natural cycle. In order to gain this knowledge, the Services is responsible for gathering, studying and supplying basic data on the nature of water and information relating to the size and relief of drainage basins. Fundamental or applied research in hydrology requires an extensive and greatly diversified information, which is obtained through the operation by each of the Services' networks of stations that cover the territory of Quebec.

Observed phenomena comprise precipitation and other meteorological factors, the fluctuations of the level of lakes and rivers, the variability of stream flow, and the quality of surface waters. All this information is compiled and analysed for a better knowledge of the water resources of the Province.

Mortimer Hendler, director of Hydrometeorological Services, continued to represent the Department on the Hydrology Subcommittee, an associate committee of geodesy and geophysics of the National Council of Research, which aims to encourage, promote and coordinate the development of hydrology and hydrological research across Canada.

Mr. Hendler assisted at two meetings of the Great Lakes Commission. This commission is made up of representatives of the eight American States bordering the Great Lakes and of the provinces of Ontario and Quebec. Representatives from these provinces attended the meetings as observers only.

The director of the Hydrometeorological Services was one of the Canadian delegation at the third meeting of the Hydrometeorological Commission of the World Organization of Meteorology at Geneva. At this meeting, he was made a member of a work-group having as mandate the standardization of methodology and instrumentation in the field of hydrometeorology.

Mr. Hendler is a member of an advisory group among the Canadian representatives in the International Hydrological Decade, which studies the global hydric cycle and publishes the world-wide daily observations of water.

Hydrography Service

The role of the Hydrography Service in the extensive program of acquiring knowledge of the resource confided to the Waters Branch pertains especially to inventory as determined from surveys in the field and to data processing as the result of analyses of basic facts relating to the nature of water and information bearing on the shape and relief of drainage basins.

1 - INVENTORY

The task of the personnel of the Inventory Division is to see to the organization and execution of work in the field. Such undertakings may be comprised within the scope of long-term programs or carried out in response to some specific needs, generally as the result of requests on the part of other services for promoting their studies.

During the fiscal year 1968/69, the surveys conducted by the Hydrography Service may be summarized as follows:

(a) *Profile of northern rivers*

A program for determining the profile along the principal rivers in northern Quebec has been followed for several years past in order to prepare an inventory of the hydraulic resources of this part of the Province. During the summer of 1968, these works were carried out on the rivers flowing into Ungava bay and on some of the rivers along the North Shore.

The surveying is done by personnel engaged from time to time especially for this work, such as students, canoemen, woodcutters and cooks. Since the rivers and lakes of the northern territories are free from ice only at the end of June, two parties were sent into the Sept-Iles region and six into the Yamaska River basin during the period of May and June. The eight parties were later united at Schefferville during the months of July and August for the purpose of working on the rivers of Ungava bay. These field crews comprised 50 persons, of whom 26 were students.

Surveying was carried out along the following rivers:

Magpie Ouest river	61 miles
Traverse between Sainte-Marguerite and Moisie rivers	31 miles
Tie-in of the geodesic datum line from Schefferville to De Pas river	90 miles
Tie-in of the geodesic datum line from Schefferville to Swampy Bay river	99 miles
Traverse between Sérigny and Caniapiscau rivers	41 miles
Caniapiscau river upstream from Caniapiscau lake	96 miles
Caniapiscau river downstream from Eaton canyon	145 miles
Total	563 miles

At the beginning of September, the field parties disbanded, and members of the permanent staff returned to their offices, where, during the winter months, they were occupied in verifying surveying notes, calculating altitudes, and determining the profiles of watercourses.

(b) *Rivers of Yamaska basin*

Within the scope of the work program of the Mission Technique for the management of the waters of Yamaska basin, one of the tasks of the Hydrography Service is the collection of hydraulic data. As mentioned previously, six field parties were sent into Yamaska basin before going to work on the rivers of Ungava bay. As the first stage, the parties were assigned to make determinations of the profile along Yamaska river and its main tributaries. Permanent markers were installed along the course of the stream. The altitude of each was established commencing with the datum lines of the Geodesic Service of Canada.

During the months of May and June, surveying was carried out along the following rivers:

Yamaska river	92 miles
Noire river	39 miles
Yamaska Nord river	28 miles
Yamaska Sud-Est river	15 miles
Total	174 miles

This data-collecting program will be pursued during the coming years.

(c) *Ice and frazil surveys*

Upon request of the Hydraulic Development Service, which is conducting studies on the formation of frazil in rivers, technicians of the Hydrography Service carried out surveys on Chaudière, Etchemin, and Bécancour rivers during the months of January, February and March of 1969. These surveys consist in measuring at different sections the depth of the river bed, the thickness of the ice and frazil, and the depth of the water, and in tying-in, through surveys, all the sections between these points. Measurements are retaken regularly at the same sections throughout the winter in order to learn the evolution of frazil formation and to discover its causes. The results of surveying are afterward forwarded to offices of the Hydraulic Development Service where they are analysed.

(d) *Morphometry of lakes*

During the fiscal term 1968/69, the program for the morphometric study of lakes was initiated. This work consisted in preparing bathymetric maps of lakes and in determining certain physical properties of water. There was no lake studied during this first year, which was given over to the development of a working method for the summer of 1969, to the selecting and purchasing of the necessary scientific apparatus, and to determining which lakes should be studied. For the purpose of conducting this work, the Service acquired a 30-

foot boat with an interior cabin, a tellurometer system for determining distances, an echo depth sounder, and instruments for measuring temperature, dissolved oxygen, conductivity, acidity, and visibility.

2 – DATA PROCESSING

The Data-processing Division is responsible for gathering, compiling and supplying information on the water level of rivers and lakes and on the geomorphology of drainage basins. Its activities are given below.

(a) *Network of limnometric stations*

The first network has been in operation for several years and has been increased annually to about ten new stations. The purpose of the network is for observing the variations of the water level of rivers and lakes, which is necessary for the study of the regime of waters, the control of floods, the operation of dams, and the determination of the rights of riparian property owners. The network consists of two types of measuring apparatus: manual apparatus, which are read regularly by observers, and recording apparatus, which give a continuous record of water-level variations. About 30 per cent of the network is fitted with recording apparatus. Technicians of the Service see to the installation and proper function of the stations by making regular visits to them three or four times a year in order to verify the work of the observers and to keep the recorders in good working condition.

During the fiscal year under review here, nine new stations were put into service at the following places: Trois Saumons lake, Pohénégamook, Long Lake, Au Saumon lake, Villebon lake, D'Argent lake, Brompton lake, Gentilly river, and Nicolet Sud-Ouest river.

A second network was introduced recently for observing natural high waters. For the administration of the public domain, it is necessary that the natural high-water line be known. To this end a network of stations provided with maximum gauges was established. These gauges show the maximum level attained by the water since the last visit to the station. Technicians visit these stations about twice a year — after the spring flood and after the autumn rains — but a special visit is made should there happen to be precipitation heavy enough to cause a flood.

In the course of the year reviewed, 57 stations were installed in the following localities:

Hydrographic region	01:	3 stations
Hydrographic region	02:	15 stations
Hydrographic region	03:	5 stations
Hydrographic region	04:	20 stations
Hydrographic region	05:	8 stations
Hydrographic region	06:	6 stations
	Total	57 stations

In all, the Hydrography Service controls 161 stations. The following table shows the equipment used at the different stations:

Equipment	*Stations in Operation* March 31, 1968	March 31, 1969
Limnometric scale	50	58
Limnograph	27	28
Perforated tape recorder	3	3
Limnophone	1	1
Without equipment	3	3
Maximum gauge	11	68
Total	95	161

All the information gathered at these stations is verified, compiled and plotted on graphs. Each year, in collaboration with the Hydrometry Service, two publications are prepared: the "Annuaire hydrologique", in which the variations of water level of certain stations are presented, and the "Répertoire des stations en opération", in which the stations of the Hydrometeorology Services are listed and described.

(b) *Geomorphology of drainage basins*

This activity consists in studying the topographical, physical and morphological characteristics of a drainage basin.

The main characteristics are the surface area, the perimeter, the dimensions of shape and relief, the altitude and incline of basins, the length, and the gradient and classification of streams. The first stage of this study consisted in taking an inventory of characteristics that could be determined by starting with the various methods generally employed, by applying these methods to the study of the basins of Yamaska river and Sainte-Anne river, and then, after carrying out a detailed analysis of the results, by developing a method of procedure as simple and as rapid as possible in order to be able to apply it to a systematic program in the study of all the basins of a region. The second stage will be simply to obtain the geomorphological characteristics of drainage basins by following the established procedures. This work will be undertaken during the fiscal period of 1969/70.

Within the scope of the study of drainage basins, a program introduced a few years ago for determining the areas of all basins and sub-basins of the Province is just about completed. During the fiscal year being reviewed, the region of the south shore of the Saint-Laurent was concluded and the results of that survey have been published in the report designated "H-1". The two other regions — New Quebec and the north shore of the Saint-Laurent — have been almost finished and reports H-2 and H-3 will be published during the fiscal period of 1969/70.

(c) *List of lakes*

Since the Hydrography Service has the responsibility of expressing opinions on the navigable character of watercourses, it has gathered, over the past years, a great deal of information concerning lakes. This information includes the location of the lake according to its co-ordinates, ranges, lots, townships and counties, the area of the lake and its drainage basin, the reference to the plan of the depth of the lake, its navigable character, its file number and all other available information. During the fiscal period 1968/69, all this information was compiled and classified in view of publishing a brochure containing these factual items. This booklet will likely be issued during the year 1969/70. After the initial publication, these data will be brought up to date regularly.

Hydrometry Service

The work of the Hydrometry Service is to study the regime of surface waters. This work is essential for the rational exploitation of the hydric resources of Quebec. The Service's activities are orientated mainly to the knowledge of this renewable resource, and this under two forms — quantity and quality.

The network of gauging stations is used to keep the service posted on the seasonal and annual fluctuations of flow of Quebec's streams and to supply the data necessary to the study of regional variability of the stream and flow-level of watercourses in periods of high and low water. In order to study the quality of surface waters, a program was introduced in the spring of 1968 for the systematic collecting of data, and, during the fiscal period reviewed here, the Service installed 20 stations for the purpose of learning the principal physico-chemical properties of certain streams.

The knowledge of these two aspects of this resource is motivated, on the one hand, by the present use of water for purposes of consumption, navigation, and leisure and, on the other hand, by the execution of various engineering works pertaining to the development of river basins for multi-technical ends, such as control of floods, construction of bridges, hydroelectric energy production, etc.

A detailed explanation of the work carried out by the Service during the year 1968/69 is presented in the following paragraphs.

HYDROMETRIC DATA

The Service continued to follow the program initiated in the fiscal year 1965/66. However, during the fiscal term 1968/69, a few gauging stations were added to the present network, and particular attention was given to perfecting stations already installed. Insofar as making use of the hydrometric data was concerned, the technical personnel was occupied with the preparation, in view of publication of the hydrometric data for the calendar years 1966 and 1967, and with the revision of the flow at certain gauging stations.

In what concerns the operation of the network, the technical personnel took 1,061 measurements and made 2,148 inspections of instruments in use at hydrometric stations. Flow measurements were made at every station during the year reviewed. These measurements serve to define the height-flow ratio, which is the basis for daily flow calculations. A certain number of gaugings were carried out to determine the flow of small streams. This information was requested by municipalities and general contractors and related to the size of diversion conduits or, again, to the use of these streams as a source of supply of drinking water.

During the fiscal year 1968/69, eight new gauging stations were installed and improvements were made on 63 others. Of the eight new stations, five were installed within the framework of the expansion program and for improvement of the hydrometric network, two were set up at the request of Laval University for a special study and one station was installed in Mont Tremblant park within the scope of a long-term project for the purpose of observing the variability of hydrologic weather conditions of this studied basin where there are no changes in the natural environment attributed to human activity. The Parks Service of the Fish and Game Branch of the Department of Tourism, Fish and Game collaborated directly in this project. The improvements made on stations already established were mainly related to the permanent installation of hydrostatic pressure detectors, which are placed in deep water and register variations in water level. The Service also installed 19 perforated tape recorders attached to the servo-manometers. This makes 126 gauging stations thus equipped out of the total of 218 units. In the following table the number of gauging stations in service as of March 31 of each year mentioned is shown, as well as the distribution of stations according to the type of equipment used for observing the level of water.

NETWORK OF GAUGING STATIONS
OPERATED BY THE DEPARTMENT OF NATURAL RESOURCES

Type of Equipment	*1965*	*1966*	*1967*	*1968*	*1969*
Non-recording gauges	60	46	33	18	10
Limnographs	74	84	88	83	82
Perforated tape recorders .	5	34	68	112	126
Total	139	164	189	213	218

At the beginning of August, two gauging stations were installed in the representative basin of Knob lake at Schefferville. This research basin is a project of the International Hydrological Decade and is the responsibility of Mr. Thom of the Arctic research laboratory of McGill University. The Department of Natural Resources has made a grant for the study of this basin and supplied the necessary technical assistance for conducting the program of hydrometeorological surveys.

A new method of gauging rivers based on dilution was introduced in Quebec at the beginning of the summer of 1968. The method consists essentially in injecting into the stream a solution (sodium bichromate) and then calculating the flow of this stream by determining the dilution of the solution through the calorimetric analysis of samples of water taken at a proper distance downstream from the point of injection. This method has demonstrated its usefulness especially on certain rivers where, because of turbulent flow conditions, the conventional method of measurement by paddles (observation of the speed of flow) gives results that are not too accurate. The method of measuring by dilution is used extensively in France. During March and April of 1968, Marc Desruisseaux, the engineer responsible for the operation of the hydrometric network, spent some time in Grenoble in order to become familiar with this method and, following this sojourn, a technician from Électricité de France came to Quebec for 2 months in order to assist M[r]. Desruisseaux in establishing the method and in training of technical personnel. The first measurements were carried out in June 1968, and, at the end of March 1969, 83 gaugings were made by this method. In general, the results of the method are very satisfactory. During the winter of 1968/69, experimentation of the method gave encouraging results. This work will be pursued during December of 1969.

Insofar as the use of hydrometric information is concerned, in addition to gathering data for the hydrologic annual of 1966 and 1967, the personnal was engaged in the preparation of the report on the flood of April 1968 on the rivers draining the north shore of the Saint-Laurent. This work was conducted jointly with the Meteorology Service and the Hydrometry Service. Moreover, a certain number of programs were elaborated in order to computerize further the study of unsorted data and the calculation of the daily flow at the gauging stations that were in use.

Quality of Water

The Quality of Water Division continued, during the year under review here, to put into operation the program for installing a network of stations.

By the expression "quality of water" one should understand all aspects affecting the use of water. These include dissolved substances, solids in suspension, temperature of the water, etc., in other words, the physical properties of water, its chemical properties, etc. These properties are derived from contact with environment.

The Division for promoting the quality program is under the direction of Yvon Turcotte, chemical engineer. It comprises two sections: the network and the laboratory. As of March 31, 1969, each section had four employees. One of these was a professional.

During the course of 1968/69, the Division was mainly occupied in selecting and training its personnel, in obtaining necessary equipment and material, in completing the setting up of a laboratory, in putting into operation the primary stations of the network, and in establishing a system for compiling

data. These data will be published regularly and, during the fiscal period 1969/70, the Division plans on preparing the first publication of all data available up to December 31, 1968.

The first 20 stations of the quality network were installed during the fiscal year reviewed here, and they are used on a daily basis. These stations are located along various streams south of New Quebec.

As a contribution to certain priority studies conducted by the Waters Branch, the transportation of sediments in suspension was determined during the spring flood of 1968 along Chaudière, Linière, Du Gouffre and Du Loup rivers.

Moreover, project stations are in use in the river basins of Sainte-Anne-des-Monts, Eaton and Eaux Volées and the basin of Knob lake, Moreover, monthly surveys are made on the Saint-Laurent and the Saguenay for the study of radioactivity of flowing waters, and surveys are taken every 2 months at ten different places in order to determine the quantity of deuterium present in streams chosen for a study undertaken by the Atomic Energy Company of Canada.

It may be mentioned here that 50 other sampling points were visited during the year 1968/69 in order to obtain a satisfactory index of the quality of the water in a large number of other streams throughout Quebec.

In summary, it may be recorded that 6,450 water samples were taken during the year under review here, and about 30 observers were given the responsibility of sending them to the laboratory of this Division for analysis. There were 1,095 analyses completed at the laboratory from 17 physico-chemical parameters. The laboratory also studied 1,004 sediment concentrations and made 5,443 determinations of water conductivity.

With reference to the operation of the network, it may be pointed out that two "quality" stations have been equipped with a "Fairchild" monitor that records, on a perforated tape, the data of ten distinct parameters. One of these is in operation on Saint-Charles river and the other, on the Yamaska. Moreover, a transporter-bridge was erected over Yamaska river, at Farnham, to aid in taking daily samples.

STUDIES

The personnel of the Studies Division is in charge of carrying out the research and hydrological studies necessary for meeting the requests originating with the services of the Department and other government and private organizations. Studies were also undertaken within the framework of the International Hydrological Decade by this Division's personnel.

Some of the work concluded by the Studies Division is listed below:

1. Revision of the flow at four gauging stations: Bell, Mégiscane, Harricana and Nicolet rivers.

2. Study of the drying up of Bell and Harricana rivers during winter. After this is done, a study of the drying up of the rivers flowing into Ungava, James and Hudson bays will be made.
3. Study by simulating the regularization of flow of the Outaouais river in relation to the use of the total electricity generated at the hydroelectric stations along this river while taking into account the possible diversion of waters from the Harricana into the upper Outaouais.
4. Preparation of an inventory of all the hydrometric stations controlled by Quebec. In each case, the location, duration of exploitation of the station and other available information were recorded.
5. Study of summer floods at gauging stations for the years 1964, 1965 and 1966. Initiation of a program of scrutiny and analysis of all important floods at stations equipped with recorders.
6. Statistical study of the flow of Eaton river. Study of the maximum, minimum, annual, seasonal, monthly and daily flows for the purpose of determining one or several statistical constants for each data group.
7. Models drawn to scale. The first model simulated floods from meltwaters, whereas the second dealt with summer floods. After construction of a working model, a study was made of the characteristics of the data obtained in order to define better the parameters of each model. This work was conducted on a short-term basis to observe the seasonal run-off in drainage basins.

INTERNATIONAL HYDROLOGICAL DECADE

Within the scope of this global program of scientific hydrological research, the activities of the Hydrometry Service were orientated toward the scrunity and analysis of data gathered at stations established for this purpose and toward studies already underway. In this connection, there is a brief description of the five projects undertaken by the Department of Natural Resources in its report for the fiscal year 1966/67.

PUBLICATIONS AND REPORTS

The Hydrometry Service regularly publishes a hydrological year book containing data on the water level and flow of several streams in the Province. Moreover, various reports are prepared during the course of each for the benefit of interested organizations. These weekly, monthly or yearly reports contain a variety of information.

The hydrological yearbook presents a general description of the drainage basins of the Province and gives the hydrometric information gathered at gauging stations, non-recording stations and dams. On the other hand, the list of hydrometric stations shows the number of stations in service, their location in the territory, the years of documentation, the name of the operator, etc.

Two weekly reports and eight monthly reports are prepared and sent to various government and private organizations. The transmitted information pertains to the level and flow of certain watercourses in Quebec.

By way of information, the reader will find on page 2 a list of the publications and reports prepared, during the fiscal year 1968/69, by the Hydrometry Service in collaboration with other units of the Hydrometeorological Services.

A report concerning a study of the regularization of flow of Outaouais river (Diversion of Harricana river) was published in January, 1969.

PERSONNEL

As of March 31, 1969, the personnel of the Hydrometry Service comprised 58 persons. These consisted of 17 professionals, 37 technicians and assistant technicians, one laborer and three employees connected with administration. During the year reviewed, there were eight appointments and one transfer. Besides this, one technician and one person from the secretariate left the Service.

During the summer of 1968, nine students were hired for the purpose of helping with projects and work in progress.

In August 1968, Messrs. Fortin, Morin and Théorêt, engineers with the Service, went to Halifax for an initiation course in the principles of hydrology. This course was organized by the Canadian International Committee for the International Hydrological Decade and is part of the educational program within the scope of scientific research in hydrology.

Within the framework of the technical cooperation program under the direction of the Department of Intergovernmental Affairs and the Consulat général de France, three successive periods of 4 months each were devoted to the study of engineering.

In September 1968, Jacques Déziel spent 2 months in Montpellier, where he joined a group of hydrologists from Électricité de France for the purpose of becoming familiar with the techniques as used in analysing and interpreting the hydrometeorological data observed in representative river basins.

Pierre Desforges, an engineer, went to Paris at the end of January 1969 in order to participate in the international course on hydrology and the control of waters. This course, which was of 4 months' duration, was conducted within the International Hydrological Decade. Moreover, in February, Yvon Turcotte, an engineer, visited France in order to meet the people responsible for perfecting an automatic sampler that was recently developed by the Secrétariat permanent pour l'Étude des problèmes de l'eau. During his sojourn of 2 weeks, Mr. Turcotte was able to meet representatives of various organizations in France and Holland who were especially concerned with water problems.

At the end of March, Gilles Bélanger, an engineer, went to the Fairchild training center in New York in order to follow a course on the function and maintenance of SM-900 monitors.

Within the framework of the activity program of the Comité franco-québécois d'hydrologie, the Hydrometry Service acquired the services, in August 1968, of Georges Girard, director of research at O.R.S.T.O.M. Mr. Girard will be in Quebec for at least one year and his work will be mainly concerned with the hydrology of Quebec streams and more especially with the study of floods caused by melting snow.

Meteorology Service

By Order in Council No. 584 dated April 3, 1962, the Government of Quebec centralized within the Quebec Department of Natural Resources all the meteorological activities that were previously entrusted to various departments, chiefly those of Lands and Forests, Trade and Commerce, Agriculture and Natural Resources.

From its inception, the new Meteorology Service assumed the tasks of reorganizing the Province's meteorological network, uniforming the directives to observers, and collecting the data necessary to all phases of its activity. It then concerned itself with verifying, compiling, and analysing the data gathered during many years by various organizations. Since its founding, the Service has attended to the spacing of observation stations in strategic places, the installation of new units in regions where observations are absolutely necessary, the putting into operation of automatic apparatus in uninhabited regions of the far north, and collaborating with different government services in what concerns general plans.

During the fiscal year under review in this report, the Meteorology Service was occupied with the improvement of the network of meteorological stations, by ensuring the observation of phenomena, the publication of information, and the study of meteorological and climatological problems, as well as in participating in the elaboration and realization of inventory and research programs in collaboration with other services of the Department.

Inspection Division

The seven technicians of the Inspection Division continued to make new installations, to re-equip stations that had become obsolete, and, insofar as possible, to pay regular visits to the observers throughout the Province. During the fiscal term being reviewed here, apart from supervising the Eaton network within the context of the International Hydrological Decade, these technicians visited the special meteorological network in Gaspesia, which was installed for the purpose of a climatological study of the Chic-Chocs, as an objective within the program of ARDA and, moreover, they drew up plans for a hydrometeorological study of the Sainte-Anne River basin. From the beginning of thermo-nivo-pluviometric observations of the Chic-Chocs, a supplementary crew, consisting of a technician and two helpers, took up general quarters at Cap-Chat, from which point they conducted regular visits to the automatic stations of the special meteorological network.

In 1968, the network consisted of 403 permanent stations and 98 seasonal stations. Observations are made on the first group of stations throughout the year; visits are made to the second group only during part of the year. Seasonal stations are either pluviometric and are observed only during a minimum number of years and serve special needs, either stations of the nivometric network for determining the thickness of the snow cover and the equivalent of water in this snow or, again, snow stations, the purpose of which is to survey the conditions of the snowfall for out-door winter sports, especially for skiing. The annual supplement of "Bulletin Météorologique" each year lists the exact number of the stations of the categories mentioned above. The meteorology Service is likewise responsible for 25 climatological and nivometrical stations in the Montmorency forest within the framework of the International Hydrological Decade and an experimental agrometeorological station at the agronomic depot of Laval University at Saint-Augustin, Portneuf county.

The inspectors keep continually up to date a map of the meteorological stations of Quebec and, for each station visited or newly installed, they prepare a report designed to serve as a guide for a program of action on the station concerned.

During the fiscal year 1968/69, the inspectors made 765 visits to 390 stations. They replaced 58 old stations by 56 new ones, and added apparatus to 17 posts. The number of visits is accounted for by the activities occasioned within the International Hydrological Decade program and by those having to do with studies of Sainte-Anne river.

Verification and Compilation Division

The Verification and Compilation Division was created to gather all the regular weekly and monthly station reports. It employs eight technicians and technician assistants and is responsible for verifying, transcribing, and compiling on monthly forms such information as temperature, sunshine, precipitation, relative humidity, evaporation, wind, cloudiness, etc., reported on forms filled in each day by the observers. The Division has also the task of verifying data from nivometric surveys and of recording the intensity and duration of precipitation. It also returns to observers notes concerning corrections and directives relative to their work. The Division, moreover, has the responsibility of preparing climatic summaries. During the fiscal term 1968/69, it was also given the work of preparing information in view of having it transcribed on computer cards.

In 1968/69, technicians of this Division verified and compiled 5,060 monthly reports of temperature and precipitation, 800 monthly reports on sunshine, 91 monthly reports on soil temperature, 109 monthly report on evaporation, 39 monthly reports on the intensity of the sun's rays, and 678 reports of nivometric surveys. All this information was supplied to the Meteorological Service of Canada. The Division completed the inventory of all the meteorological recorders up to the present and prepared a climatic summary of Montmorency Forest stations and of the agronomic station of Laval University.

Studies and Information Division

The Studies and Information Division is staffed by three engineers, three meteorologists, one physicist, four technicians and one technician assistant. Since the close of the fiscal year 1968/69, this Division profited from the services of an engineer in agronomy from France who, as a collaborator, spent some time with the Meteorology Service.

As in preceding years, the Studies Section of this Division analysed and studied climatic information in relation to the needs, firstly, of the Department of Natural Resources and then of the various other departments of the Provincial Government and also of the general public, while preparing for publication annual and monthly summaries of observed meteorological characteristics. These research workers likewise conducted several different undertakings in hydrometeorology, climatology, and agrometeorology during the year reviewed.

The Meteorology Service supplied information in the following manner:

Recipients	*Number of meteorological certificates*
Claims agents	107
Lawyers	20
Insurance companies	186
Engineers	17
Total	330

Recipients	*Number of photocopies of monthly reports of observations*
Claims agents	70
Land surveyors	9
Forest fire protection associations	360
Lawyers	14
Biologists	15
Technical counselors	26
Students	40
Foresters	93
Engineers	2,093
Petroleum merchants	962
Meteorologists	72
Professors	201
Technicians	1,057
Total	5,012

Recipients	*Number of photocopies of climatic summaries*
Claims agents	1
Agronomists	24
Students	12
Engineers	28
Meteorologists	1
Total	66

These figures do not include the issues of "Bulletin Météorologique" sent out. This bulletin is a monthly publication. It has an annual supplement published regularly at 3,200 copies and containing approximately 400 pages of climatic information, as well as an annual list of the network of stations in Quebec.

A list of publications by the Meteorology Service during the fiscal year under review here is given in the Edition chapter.

The following articles by members of the Meteorology Service appeared in various publications during the same period:

FERLAND, Michel: "Les régimes de température accompagnant les chutes de neige" — "Cahiers de Geographie de Québec", 12th year, No. 25, pp. 145–152, April 1968.

FRÉCHETTE, Jean-Guy: "Accumulation de la neige sous divers types de couverts forestiers" — "Cahiers de Geographie de Québec", 12th year, No. 25, pp. 141–144, April 1968.

GAGNON, Raymond-M.: "Les pluies maximales sur les rivières Linière et Famine" — Internal report integrated into the "Étude des modalités d'aménagement du site Morisset". Hydraulic Development Service, Quebec Department of Natural Resources.

GAGNON, Raymond-M.: "Le climat du Saguenay – Lac Saint-Jean" — In "Le Jeune Scientifique", Vol. VII (3), pp. 78–83, December 1968.

GAGNON, Raymond-M.: "Température minimale au niveau du sol" — "Cahiers de Géographie de Québec", 12th year, No. 25, pp. 67–79, April 1968.

VILLENEUVE, G.-Oscar: "La limite nord du climat tempéré québécois" — In "Le Naturaliste Canadien", Vol. 95 (2), pp. 235–240, March-April 1968.

VILLENEUVE, G.-Oscar: "Le climat estival du Cap Jaseux sur le Saguenay" — In "Le Jeune Scientifique", Vol. VI (7), pp. 164–169, April 1968.

Owing to important changes in the directives to observers, a new instruction manual is being presented which supplies the observers with up-to-date data. It contains information requested by bio-climatologists and hydrologists. The booklet, designed for the meteorological observers, is therefore prepared in relation to the new directives.

NIVOMETRIC SURVEYS

During the year under review, the Service attended to the preparation of perforated cards for the registration of data of snow samples from all points of Quebec. These cards, through use of a computer, make it possible to register in tabular form all the data gathered to date. There remains then to prepare these data for publication during the next fiscal period for the benefit of hydrologists.

INTERNATIONAL HYDROLOGICAL DECADE

The installation of instruments has now been completed in Eaton basin and Montmorency forest. Observations can be made in the usual manner. The data obtained are verified and compiled by the Meteorology Service.

COLLABORATION WITH THE METEOROLOGICAL SERVICE OF CANADA

As in preceding years, the Meteorology Service of Canada contributed to the installation of Quebec stations by supplying a certain number of heliographs, by installing two evaporation vats of class "A", and by obtaining a thermometer and a pluviometer for the Meteorology Service.

For its part, the Meteorology Service supplies the Meteorology Service of Canada with a copy of all the climatic data gathered in Quebec. The data forwarded this year took the form of more than 7,000 monthly reports. The Federal Government publishes the daily meteorological data of all stations in a periodical entitled: "Monthly Record of Meteorological Observations", and the Provincial Government distributes, to more than 3,000 recipients, a monthly periodical presenting the monthly figures of the meteorological data of Quebec.

METEOROLOGY SOCIETY

The Meteorology Society of Quebec forms part of the Canadian Meteorology Society insofar as it is the Quebec Center. During the fiscal year 1968/69, Raymond Perrier, Michel Ferland, and Jean-Guy Fréchette of the Meteorology Service took part in the administration council of the Quebec Center, and G.-Oscar Villeneuve was the representative of that Center at the national executive activity. In this capacity, D^{r} Villeneuve participated in the annual meeting of the Canadian Meteorology Society held in Calgary from June 2 to 7 of the year reviewed.

METEOROLOGY COMMITTEES

The Department of Lands and Forests and the Department of Agriculture and of Colonization formed two meteorology committees during the fiscal year

under review: the first for studying forestry needs; the second for evaluating the requirements incident to agriculture. Jean-Guy Fréchette and Michel Ferland were invited to attend the first and G.-Oscar Villeneuve took part in the deliberations of the second.

HYDROLOGY SYMPOSIUM

Jean-Guy Fréchette participated in the hydrology symposium held at Saskatoon in mid-November. This colloquy dealt with the humidity of soil.

AGRONOMIC DAYS

During the agronomic days of December 12 and 13, 1967, held in Montreal. G.-Oscar Villeneuve spoke on "climatology" within the principal theme that related to "agriculture and water". An account of these days appeared in "Feuillet Météorologique in February 1968.

SKI-METEOROLOGY

Since the beginning of its activities, the Meteorology Service has continued its participation by supplying information on the snowfall at winter sports centers in the interest of skiers. During the last winter season, regular daily reports were provided by six collaborators stationed respectively in the regions of the Saint-Laurent valley, the Saint-Maurice valley, the Laurentides, the Eastern Townships and the Bois-Francs regions, the Saguenay region, and the Gatineau valley. As in the past, the Meteorology Service was engaged in the technical part of the program, that is to say concerning observations and reports, and the Department of Tourism, Fish and Game saw to the spread of the information through the "HORLOGE DES NEIGES", the main office of which is located with the Provincial Service of Tourism in Montreal.

CLIMATOLOGICAL STUDY OF THE CHIC-CHOCS

The first report of the climatological study of the Chic-Chocs prepared for the Quebec ARDA appeared in "Feuillet Météorologique" of January 1969. It deals with the difficulty of making observations in mountainous country, especially because of wind, hoar-frost, and thin ice. The text, signed by Raymond Gagnon, who is responsible for the study, is accompanied by photographs demonstrating the observations of the author. It might be mentioned that the meteorological observations, made especially in connection with this study, will terminate in July 1969, and, eventually, an analysis of the information will be undertaken.

NEW QUEBEC BRANCH

During the fiscal year 1968/69, the New Quebec Branch continued to expand the governmental services of Quebec in the northern territories. This work was conducted in conformity with the mandate given to the Branch by virtue of an Order in Council dated April 8, 1963, whereby this Branch was made responsible for the administration of all Provincial governmental action within the New Quebec territory, except such spheres as come under the jurisdiction of the Department of Justice, Provincial Police and the Department of Lands and Forests.

The New Quebec Branch completed and reorganized its structure during the period under review here. It established an Agencies Section and also an Indian and Esquimo Affairs Section.

The Branch now has four large sections namely:

1. Socio-economic Services, which comprises the Education Service, the Health and Social Security Service, and the Development of Resources Service;
2. Agencies Services, which divides, for administrative purposes, the New Quebec territory into two major districts: that of Porte-de-la-Baleine and that of Fort Chimo;
3. Indian and Esquimo Affairs Services, comprising, at present, the Co-ordination of Governmental Policies Service and the Community Development Service;
4. Equipment Services, which groups the Engineering Works Service, the Supply and Transport Service, and the Inventory and Equipment Service.

The Activities of these four large sections are recorded in the following paragraphs of this report.

At the close of the fiscal term under review, that is, on March 28, 1969, Guy Poitras, director-general of the New Quebec Branch, was promoted to the office of Assistant Deputy Minister of the Department of Natural Resources. Mr. Poitras, however, continued to direct the New Quebec Branch.

SOCIO-ECONOMIC SERVICES

The Socio-economic Services made use of the theoretical and practical knowledge of specialists of the various spheres in the immediate application of governmental action dealing with northern Quebec and native communities.

Education Service

During the fiscal period reviewed, the Education Service worked toward the expansion and improvement of its scholastic system. In this respect, kindergarten teaching in the language of the aborigines was ensured in all the Esquimo villages of New Quebec in the autumn of 1968, except at Baie-aux-Feuilles. The first-year class was available to the natives of the Esquimo tongue at all Esquimo posts in New Quebec, with the exception of Koartac, Port-Nouveau-Québec and Baie-aux-Feuilles.

To the second-year classes already being conducted in the language of the aborigines at Ivujivik, Wakeham, and Fort Chimo, there were added those at Poste-de-la-Baleine, Inouedjouac, Povungnituk, Saglouc, and Payne. At the two centers, Fort Chimo and Wakeham, a fourth-year class was included in the elementary course. It is in this fourth-year class that the student is introduced gradually from the Esquimo language to the French tongue as a medium of instruction.

The French language classes designed for children of the government personnel at Poste-de-la-Baleine and Fort Chimo were in progress during the school year of 1968/69.

While increasing its responsibilities at the first-year level of the elementary school where teaching is conducted in the Esquimo tongue, the New Quebec Branch, during the fiscal term 1968/69, continued to give instruction in the trades and household arts to the Esquimos of New Quebec.

At the opening of the school year in the autumn of 1968, the trade school at Poste-de-la-Baleine registered 41 male pupils who came from the various Esquimo and Indian posts of New Quebec. These students were enrolled in one or the other of the following sections: carpentry, timber-work, mechanics, electricity, welding, and administration training.

At the same time, at the trade school at Fort Chimo, seven boys residing at this post were registered in the two options offered at this place, namely: carpentry and mechanics.

These trade schools, in addition to offering specialized instruction adapted to the present and future needs of New Quebec, make it possible for the young who avail themselves of these classes to receive also an academic training adapted to the skills they already possess. On the other hand, the New Quebec Branch continued to offer, at Poste-de-la-Baleine, instruction in household arts designed for the young girls of New Quebec. These young girls (numbering 20) came from different Esquimo and Indian villages of New Quebec and were able to follow courses in domestic science and certain preparatory courses in office work, such as typing and bookkeeping.

During the year 1968/69, the household arts school at Fort Chimo accommodated ten young Indians who were residents of that village. Moreover, the Education Service of the New Quebec Branch at Fort George commenced, in January 1969, a permanent course of studies designed for adults. These courses

were followed by 20 registered students and was supported by a grant from the Canada Manpower Center. Moreover, 25 Indian women from Fort Chimo pursued courses in cutting and sewing, cooking, and handicrafts during the fiscal term under review here. These courses were given by professors of the Education Service at the household arts school, but were held outside the regular teaching hours.

In its desire to give the Esquimos more and more responsibility in various channels of activity, the New Quebec Branch has introduced a school for the training of Esquimo teachers with a view to preparing them to teach in the Esquimo language in first- and second-year kindergarten classes. This school opened in January 1969 at Poste-de-la-Baleine and brought together six students who wished to devote themselves to teaching. Ever since the Education Service was able to train aboriginal professors for the teaching of the first three years of the beginners course in the Esquimo language, the Service has always made use of the services of qualified professors who, owing to their limited knowledge of Esquimo, had to be helped by Esquimo assistant teachers.

During the month of August 1968, this Service assembled, at Poste-de-la-Baleine, all the assistant teachers engaged for the scholastic year 1968/69, in order to give them a chance to become familiar with the science of teaching while under the supervision of qualified professors.

The Education Service also gave a 3-week course to the full-time teachers who had been engaged by the Education Service for the academic year 1968/69. These courses were conducted in the summer of 1968 and were designed to acquaint the titular teachers with the language and culture of the Esquimos.

Health and Social Security Service

During the fiscal year 1968/69, the Health and Social Security Service devoted its energies toward perfecting the multi-purposed activities of the Ungava Health Center, namely: curative medicine, preventive medicine, health school, socio-medical aid, and social security.

This first Health Center, which has been responsible for curative medicine since the fiscal year 1966/67, is situated at Fort Chimo and serves the Ungava Bay district. In 1968, it was given charge of preventive medicine, which, up to that time, was assumed by the Federal Government. A district nurse of the New Quebec Branch worked for several months in concert with a nurse of the Federal Government in the hygiene sector and studied tuberculosis among the Esquimos of all posts in the Ungava Bay area, that is, in addition to Fort Chimo, Port-Nouveau-Québec, Baie-aux-Feuilles, Payne, Koartac, and Wakeham.

After this investigation, several tuberculosis patients were sent to Quebec for treatment. The Hygiene sector of the Ungava Health Center has been conducting an elaborate health program in this region since that time.

Through the application of the preventive medicine (hygiene, tuberculosis detection, hospitalization of chronic cases) and of curative medicine (hospitalization, external clinics, laboratories, and radiology), the Health and Social Security Service, which has thus assumed complete medical responsibility in the posts of the Ungava Bay district, was obliged to increase the number of its nurses. Four new nurses, as well as nurses previously engaged, received a professional training of 3 months' duration at the Ungava hospital. This brief specialized course on medical conditions in the north was part of the training school activity of the Health Center.

During the fiscal period 1968/69, the resident physician at the Fort Chimo hospital registered 201 house calls and 4,630 consultations in the external clinic. He also admitted 278 patients to the Fort Chimo hospital.

Moreover, the physician at the Health Center made periodical medical visits to each of the posts of the Ungava Bay district. As a result of these visits, it was found that certain patients from Fort Chimo had to be hospitalized at the Ungava hospital, whereas others were sent to hospitals in Quebec.

The new administrative structure providing for the hospital at Fort Chimo progressed during the year reviewed here. Known as "L'hôpital de l'Ungava" the letters patent, dated March 1968, make this hospital a non-profit organization. On July 1, 1968, a contract between the Corporation de L'hôpital de l'Ungava and the Department of Health provided for the participation of this hospital in the Hospitalization Insurance Plan. It was only on January 1, 1969, however, that the legal procedures were concluded and that the hospital had the financial help necessary to operate within the framework of the hospital insurance plan mentioned above.

PLATE III

Unloading of a ship by means of a transfer barge – Wakeham, 1968.

PLATE IV

Rear view of the 40-bed hospital being built at Fort George.

The organization of a second multi-purposed health center was commenced, during the course of the fiscal period reviewed here, with the construction of a new hospital having a 40-bed capacity at Fort George on James bay. The edifice will be virtually completed only in the autumn of 1969 or the winter of 1970. However, the hospital will not be endowed with all its equipment until the summer of 1970. Being part of the Service's regional health plan, this hospital will be managed by a non-profit organization which is already at that locality, namely: La Corporation de l'Hôpital Sainte-Thérèse de Fort George. It will provide the population of the district with the same many-channeled services as are available in the Ungava Health Center.

With the complete withdrawal of the health services of the Federal Government from the posts of the Ungava Bay district, the Health and Social Security Service was obliged to grant its Social Security Division socio-medical aid, which is dispensed by the administrative and local medical staff and the office personnel of Quebec.

The Social Security Division of this Service continued, during the period under review here, to attend to all the needs of the aborigines of New Quebec wishing to benefit from the social assistance measures established in Quebec, such as allocations under the title of assistance to the aged and aid to the blind, invalids, needy mothers and widows, as well as student grants provided for scholars of the 16- and 17-year-age group.

During the fiscal term 1968/69, a total expenditure of $154,226 was allocated to persons of Northern Quebec under the title of social allowances, that is, $6,216 for old-age assistance, $9,150 as aid to the blind, $6,180 to help invalids, $35,604 for family assistance, $9,564 for elderly unmarried women, and for widows, $79,512 for aid to needy mothers, and $8,000 as aid to students.

Development of Resources Service

The Development of Resources Service, formerly known as the Research and Documentation Service, has been identified from its inception by its work of supplying the information necessary to the orientation of the administration and to the elaboration of policies of the New Quebec Branch.

The Development of Resources Service now exceeds its former role and is becoming more and more involved in the development of the natural and human resources of New Quebec.

While pursuing their search for information, the employees attached to this Service were engaged in experimental undertakings designed to put into concrete form certain possibilities for absorbing the economic potential of the new Quebec milieu. Indeed, the research and development activities are often closely connected, one depending on the other, in the context of the revitalized socio-economy which obtains in New Quebec today.

In the field of research as such, monographic studies concerning the past and present of the Esquimo communities were conducted. The work is nearly completed in what relates to Povungnituk, whereas, the editing of reports on Ivujivik and Inoucdjouac progressed normally during the year under review here. A bibliography on the littoral regions of Ungava bay and the hinterland adjacent to it was prepared within the scope of a Franco-Quebec cooperation project for northern research. Also attached to this publication is an introduction to a specialized card-index on northern Quebec.

The Service also continued to support the work of several anthropologists who are making a study of Esquimo communities and their environment under certain aspects, such as family structure, demography, language, toponymy, etc.

The New Quebec Branch, through the Development of Resources Service, undertook, at its expense, the task of evaluating the potential of commercial fishing, on the schools of fish in Ungava bay, which work was formerly made under contract.

The breeding of muskox, commenced last year (1967), progressed normally, except for a slight accident due to a parasitic infection, which temporarily interrupted the growth of the government's 14 animals. The number and frequency of visits to this farm at the old Fort Chimo site show that the Esquimos are becoming more and more interested in muskox, which is an encouraging sign.

The library of the New Quebec Branch, which was formerly a distinct unit from that of the Department of Natural Resources, was integrated with

the latter for the purpose of economizing space and personnel. This library, which had been, up to that time, under the Research and Documentation Service, became, during the fiscal year 1968/69, the responsibility of the present Development of Resources Service.

In fine, the personnel of the Development of Resources Service took part in meetings, colloquies, exhibitions, and other manifestations where, on the one hand, the orientations of the New Quebec Branch were made known, whereas, on the other hand, useful information was gathered for the elaboration of new policies and for adjustments to be made to old ones.

Articles were prepared for local and foreign publications on the various aspects of the activities of Caucasians in New Quebec. Mention is made here of three of the principal publications prepared during the fiscal period under review in this report by officers of the New Quebec Branch. These were:

Benoît ROBITAILLE — Tasiujaq, New Esquimo Village in Ungava — INTER-NORD, 1968 (10) : pp. 122–125.

Roger LE JEUNE — Commercial Fishing along the Shores of New Quebec — INTER-NORD, 1968 (10) : pp. 122–129.

Roger LE JEUNE and Vianney LEGENDRE — Extension of the Fresh-water Salmon Area (Salmo salar) in Quebec — LE NATURALISTE CANADIEN, 1968, 95 (5) : pp. 1169–1173.

AGENCIES SERVICES

During the fiscal period reviewed here, the New Quebec Branch launched its reorganization program, and the Agencies Services was made responsible for this work with the nomination of a director of agencies, at the close of the fiscal year 1968/69.

Although the first steps in this reorganization of agencies were modest, it is, nevertheless, a fact that the objectives are great and that, during the term reviewed here, the Services introduced all the elements necessary for making giant strides toward obtaining these goals.

The Agencies Services was formed from a unit that was formerly part of the Socio-economic Services and the Administrative Services. At the close of the fiscal period 1968/69, the personnel employed by the agencies comprised 68 persons divided as follows: three employees at the Quebec office; 13 agents, each in charge of a post in the New Quebec territories; and 52 persons employed in offices and works throughout the various posts of the territory.

The role of the Quebec agent in the northern post was defined in the annual report for the preceding year (1967/68), but, with the introduction of the Agencies Section, this role will be modified and defined in a subsequent annual report. Indeed, it is planned, for the next fiscal period, to reconsider the qualifications and responsibilities of the Services' agents and to define a policy for their recruitment and training. This re-assessment of the role of the

agent is motivated by a constant increase in the responsibilities at the administrative level of the posts, as well as by sympathy on the part of the personnel relating to the aboriginal population in the social sphere and also the economic field.

In the next fiscal period (1969/70), it is planned to appoint two regional agents who will share the territory of New Quebec in what concerns the responsibilities of the Agencies Section.

The Poste-de-la-Baleine region comprises all the western district of New Quebec, including the posts of Nouveau-Comptoir, Fort George, Poste-de-la-Baleine, Inoucdjouac, Povungnituk, Ivujivik, and Saglouc. The Fort Chimo district embraces all the posts of the east part of New Quebec, namely: Wakeham, Koartac, Payne, Baie-aux-Feuilles, Fort Chimo, and Port-Nouveau-Québec.

The Services expects that these regional agencies, by their direct contact with the administration of the posts under their jurisdiction, will contribute to a more effective governmental action in each of the localities of New Quebec, while ensuring the local agents a constant link with the administration at Quebec. Indeed, these regional agents will make periodical prolonged visits to the various posts under their jurisdiction for the purpose of returning to Quebec afterward and thereby ensuring communication between the agents working in the territory and the administration establishing, at Quebec, the policies in the various fields of action of the Services.

INDIAN AND ESQUIMO AFFAIRS SECTION

The Indian and Esquimo Affairs Section was founded by the Lieutenant-Governor in Council during the fiscal year under review here or, more precisely, on July 3, 1968. This section is directly related to the New Quebec Branch and was established to meet the following objectives:

(*a*) to ensure that the presence of Quebec is felt among the Indian and Esquimo peoples of the whole Province;

(*b*) to see that the Indians and Esquimos of Quebec have the possibility of becoming citizens with full Quebec rights;

(*c*) to work in collaboration with the Department of Interprovincial Affairs in negotiations with the Federal Department of Indian Affairs and of the Canadian North in what concerns the administration of Indians and Esquimos, as well as the revision of the Act Respecting Indians;

(*d*) to elaborate and establish a global policy relating to Indians and Esquimos of Quebec, this being done in direct collaboration with the other interested Quebec departments and organizations.

During the second half of the fiscal year 1968/69, the civil servants of the other services of the New Quebec Branch assisted in the elaboration of

structures and programs of the new Section which will have its own budget only from April 1, 1969.

It was determined that this Section is to introduce a Coordination of Governmental Policies Service and a Community Development Service. The latter was immediately engaged in preparing a program of market-gardening culture on an experimental basis at Fort George for the summer of 1969. Moreover, the Section collaborated in the preparation of a forestry exploitation program by the Indian Cooperative of Wimindji (Nouveau-Comptoir) to comply with a request from the Indians of that place. To this end, a forestry inventory of the region was carried out by a forestry engineer of the Waters Branch who was lent to the New Quebec Branch to study this project.

On the other hand, a study in relation to the adaptation of Indians settling in the mining village of Schefferville was conducted for the purpose of foreseeing, insofar as possible, the effects that the locating next to mining villages in poor surroundings could have on the territory of New Quebec.

EQUIPMENT SERVICES

The Equipment Services is devoted to ensuring, for the territory of New Quebec, all the support required by the other services of the Section in the exercise of their mandates. Given below is an account of the activities of each of the services grouped under this Section.

Engineering Works Service

The revision of the structures of the New Quebec Branch now places the Engineering Works Service under the direction of the Equipment Services Section.

The main task of this Service during 1968/69 was to build the foundations of the hospital at Fort George, in addition to the construction or remodelling of several other buildings in different localities in New Quebec. The construction of this 40-bed hospital began in the summer of 1968, although the project received its required authorization only on July 10, 1968. It is believed that the construction of this building will be completed during the fiscal year 1969/70.

Moreover, the Engineering Works Service undertook the construction of an aqueduct in the same locality. This aqueduct, which eventually will serve all the village of Fort George, should be in operation, at least a part of its course, at the close of 1969.

Listed below are the works accomplished by this Service in the various posts of New Quebec during the fiscal period 1968/69:

at Fort Chimo, construction of three buildings was completed, namely: a 13-room residence for lodging the single personnel of the Section, as well as occasional visitors, a storage garage for housing the vehicles of the

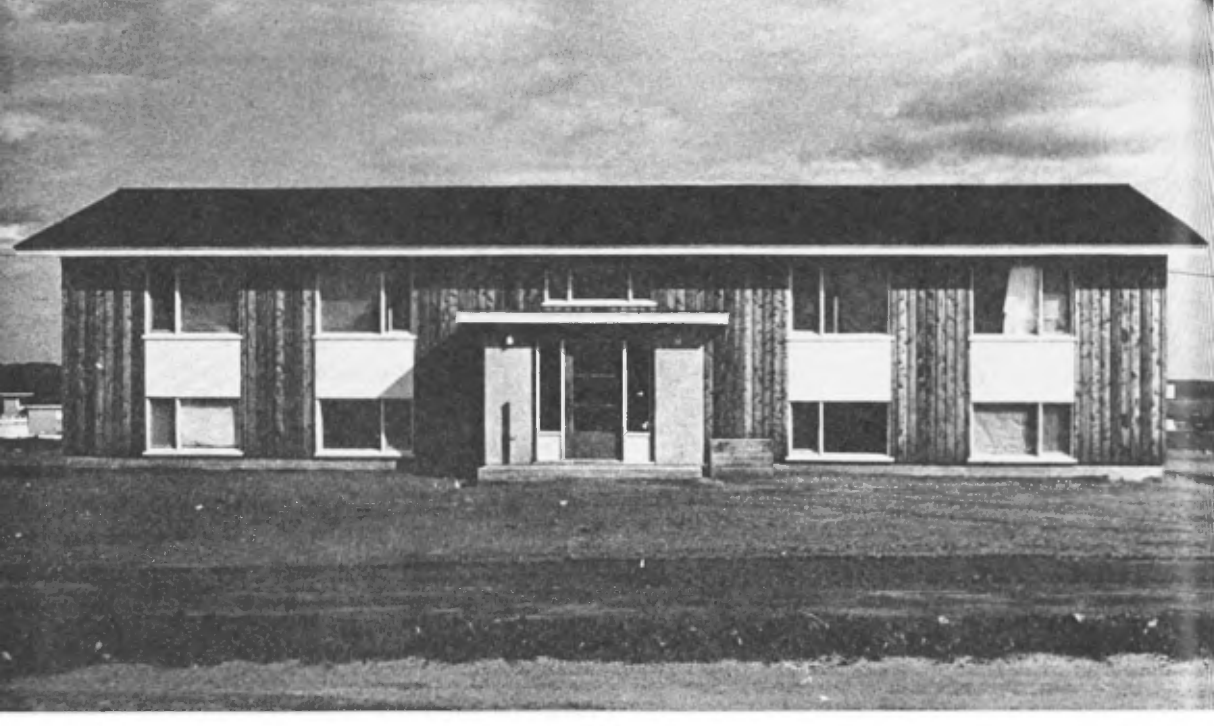


PLATE V

Residence used for lodging the single personnel of the government at Fort-Chimo.

Department, and a residence designed to lodge the family of an employee of the Branch at this place;

at Baie-aux-Feuilles, a community cold-storage was installed, and the Service completed the building of a local store;

at Koartac, improvements to the landing field made it serviceable, at least in cases of emergency;

at Saglouc, the Service enlarged and rearranged the residence of the government's local agent;

at Ivujivik, the surveying of a possible site for the construction of a landing field was carried out;

at Poste-de-la-Baleine, the Service transformed a building so as to accommodate the lodging of four families. Two houses were also constructed: one to lodge an agent of the Provincial police and his family; the other for a family employed by Hydro-Québec. In fine, the Engineering Works Service built a sanitary center consisting of washers and dryers, which have been put at the disposition of the Esquimo and Indian populations of the poste;

at Nouveau-Comptoir, the Service completed the clearing away of trees at the site of a future landing field.

In the carrying out of construction works in the New Quebec territory by the Engineering Works Service, more and more use was made of local labor.

In so doing the Service was able to economize by not having to pay the transportation and lodgment of workers from the south. Nevertheless, this economy is not unique but planned, for, Esquimo manpower being in general less experienced than labor imported from the south, it follows that much of the work takes longer to complete. What seems more important, however, in the opinion of the personnel of the Service is that local labor be used as much as possible, for it does not find much of an outlet in the local labor market. The Branch's efforts in this domain, through its arts and trade schools, will supply the Service with an ever-increasing Esquimo manpower of excellent quality.

Supply and Transport Service

The Supply and Transport Service assumes the responsibility of supplying the personnel of the New Quebec Branch stationed in the villages of New Quebec with the food and equipment necessary to its work relative to the aboriginal population. As in years previous, for economic reasons most of the foodstuffs and materials, as well as furnace and motor fuels, were shipped by boat. This was done during the 3 months of summer navigation, when it was possible, if not to reach the banks, at least to transport into the bays the provisions destined for the villages, which are, for the most part, situated on the shores of waterways.

PLATE VI

Residence of the Quebec Government agent at Nouveau-Comptoir.

Since all the shipments by boat destined for New Quebec leave from Montreal, the Service has, at this place, a warehouse and also a personnel, whose task is to verify the deliveries at the source of the suppliers, then to prepare the maritime packing, and finally to fit a boat for the trip to New Quebec.

Considering the very short period of navigation, it is sometimes necessary for the Service to transfer to the following year the completion of a project if, despite the efforts of the Supply and Transport Service, a considerable quantity of material has not been delivered on time to be shipped by the last boat.

Moreover, during the fiscal period reviewed here, the Service pursued certain studies of comparative costs of transport between the boat and the airplane. It is evident that freight rates by plane are higher than the rates by boat, but, taking into account the expense involved in shipments by boat, such as the building of maritime fittings, the upkeep of a storehouse in Montreal, etc., it is possible that, in the over-all venture, the shipment of freight by airplane would be more economical. Indeed, it is not necessary, for the trip by plane, that the transports be provided with special fittings. Moreover, the material or provisions shipped are delivered close to the villages without the risk of being damaged in the unloading process, this unloading being necessary when the shipments arrive by boat. The possibility of shipments by air throughout the entire year would certainly result in an efficiency in favor of the Service's work in the New Quebec territory. It is necessary, therefore, to adopt policies in the field of transportation that conform to conclusions arrived at by the Service, once the study is completed.

Inventory and Equipment Service

The main task of the Inventory and Equipment Service is the control, at Quebec, of the immovables and buildings, the vehicles, machinery and tools, as well as the food supply and general material stored in the 13 posts of New Quebec. The Service is, moreover, responsible for the distribution of the cost of the material or the provisions used and for the control of accounts receivable by the New Quebec Branch in relation to this use. The Service is also obliged to keep a control account of the operations of two government stores: one at Baie-aux-Feuilles and the other at Koartac, on Ungava bay.

During the fiscal term which closed on March 31, 1969, special attention was given to the internal organization of the Service and to its expansion into the various localities of New Quebec. An accounting method has been adopted and transmitted to the officials recording the material in the various posts of New Quebec, as well as to the administrative personnel of the Quebec office. An auditing agent was appointed during the year to complete the efficiency of the Service.

During the fiscal period under review here, the Inventory and Equipment Service devoted much of its time to the taking of an inventory of the regional posts of Fort Chimo and Poste-de-la-Baleine, as well as of those of Wakeham, Koartac, Ivujivik, and Saglouc.

The Service likewise gave special attention to the operations of the two government stores of Baie-aux-Feuilles and Koartac. Control of the accounts receivable was also the object of a very close supervision.

In general, the Service, during the fiscal term 1968/69, completed and perfected the plan of accounting procedure, the control of accounts receivable, and the supervision of the operations of two stores at Koartac and Baie-aux-Feuilles.

FRANCO-QUEBEC COOPERATION

FRANCO-QUEBEC COMMITTEE ON NORTHERN RESEARCH

During the fiscal year 1968/69, the New Quebec Branch was occupied, through the intermediary of the Franco-Quebec Committee on Northern Research, in various studies judged necessary within the framework of governmental action in relation to the Esquimos of New Quebec.

Given below is an account of the activities in this context during 1968/69.

Origin of the Committee

Upon the request of the director-general of foreign relations with the Quebec Department of Intergovernmental Affairs, a Quebec mission composed of Messrs. Louis-Edmond Hamelin, director of the Centre d'Études Nordiques at Laval University, Gérard Gardner, director of Centre de Recherches Arctiques of École des Hautes Études Commerciales of Montreal University, and Benoît Robitaille, chief of the mission and director of the Socio-economic Services at the N.Q.B., met, from March 4 to 14, 1968, representatives of the various French organizations that Quebec wished to contact in order to ensure their collaboration for promoting research related to the economic development of northern Quebec.

Since it was evident that a large number of French organizations were in a position to make an important contribution to the knowledge of northern Quebec, the mission recommended the setting up of a Franco-Quebec Committee to carry out research in New Quebec.

Considering the large number of French organizations concerned with this project, the Ministère des Affaires étrangères de France proposed the founding of a limited committee composed of a few members of the scientific upper-échelon personnel representing the following organizations: the Institut National de la Recherche agronomique, the École Pratique des Hautes Études, and the Centre d'Études glaciologiques des régions arctiques et antarctiques. The Centre d'Études arctiques et finno-scandinaves would act as secretariate for the French.

Exploratory Mission of Messrs. Malaurie, Bauer and Victor

Messrs. Malaurie, Bauer and Victor came to Quebec in the summer of 1968 for the purpose of investigating the possibilities of Franco-Quebec cooperation in the field of applied research respecting the economic and social development of New Quebec. These gentlemen conferred with M^r^ Robitaille, who suggested to them that research be carried out on the following subjects:

(*a*) a socio-economic study preliminary to a development policy for the Esquimo and Indian communities of New Quebec, requested by M^r^ Malaurie;

(*b*) the integrated study of the agglomeration type of New Quebec, which would be conducted by the Department of Photogrammetry of Laval University, the Department of Lands and Forests, and the New Quebec Branch;

(*c*) the inventory of the forest and fauna of different parts of New Quebec, which work would be confided to the same group as above;

(*d*) the inventory of the tourist possibilities of New Quebec, confined to the collaboration of the Department of Tourism, Fish and Game;

(*e*) the study of transportation and communications of New Quebec;

(*f*) study of a governmental financial policy for New Quebec
(Studies (e) and (f) would be directed jointly by the New Quebec Branch and the Planning Branch.);

(*g*) finally, a pilot study of the role of photogrammetry in the surveys for integrated studies, eventually confided to the Department of Photogrammetry at Laval University.

All these exploratory studies should remain confidential until the preparation of reports, which work would be confided exclusively to M^r^ Bauer for the physical sciences, to M^r^ Malaurie for the economic and social sciences, and to M^r^ Victor for the coordination.

Foundation of the Committe and Definition of its Mandate

Upon the presentation of the reports, the calling of an initial meeting of the Franco-Quebec Committee on Northern Research that had been formed in Paris on October 21, 1968, was decided on for defining the operating and financing regulations of the committee, as well as for determining its mandate.

The mandate of the committee, as in force for the fiscal year 1968/69, has five points — namely:

inventory of available documentation;

inventory of renewable natural resources;

a socio-economic study of the development conditions and the organization of markets for the Ungava Bay district;

a study of the placing and use of a herd of sheep;

financial and technical study of provisioning, by winter landing fields, of certain posts of the Ungava Bay and Hudson Bay districts.

Structure of the Committee

The permanent committee (lawful members) is made up as follows:

FRANCE

Ministère des Affaires étrangères — Direction de la Coopération technique

École pratique des Hautes Études, 6th section : Sciences économiques et sociales (Centre d'Études arctiques et finno-scandinaves) : Jean MALAURIE

Centre d'Études glaciologiques des régions arctiques et antarctiques : Albert BAUER

Institut national de la Recherche agronomique — Inspection générale de la Recherche agronomique chargée de la coopération technique : René PÉRO

QUEBEC

Department of Intergovernmental Affairs

Department of Natural Resources — Planning Branch : André MARIER

Department of Natural Resources — New Quebec Branch ; Director-general : Guy POITRAS

Department of Natural Resources — New Quebec Branch ; Director of Socio-economic Services : Benoît ROBITAILLE

Department of Natural Resources — New Quebec Branch ; Director of Equipment Services : Edmond BERNIER

Department of Natural Resources — Planning Branch : Michel BUSSIÈRES

QUEBEC'S DEPARTMENT OF NATURAL RESOURCES AND FUTURE IN THE MINING INDUSTRY

Quebec's importance and reputation as a mining territory has prompted the Department of Natural Resources to make a special effort to discover new mineral resources. Moreover, for the past several years, other parts of Canada (mainly the northwest) have been confronting Quebec with a veritable and constant challenge by imposing finds of additional mineral wealth, natural gas, petroleum and, in Saskatchewan, potash, as well as by the exploitation of nickel deposits in Ontario, etc. Under these conditions, Quebec, which is experiencing inevitable depletion of its traditional resources after more than 50 years of intensive mining, must soon uncover new deposits if it is to maintain and, above all, improve its present position in relation to the rest of Canada or its world competitors. Indeed, it is evident that most of the readily localizable deposits have been identified in Quebec, except in regions of difficult access, such as those of New Quebec, for which the Department of Natural Resources plans special activities. Moreover, the tendency to exhaust deposits is not unique to Quebec but is common throughout the world. At a recent conference in Sudbury, P.-E. Auger, president of the Canadian Institute of Mining and Metallurgy, confirmed this when he stated:

> "New mining and metallurgical methods will be developed which will permit mineral extraction from larger and larger ore bodies of lower and lower grade, until we finally reach the point of extracting ore directly from the rock formations".

In support of these observations, he cited Harrisson Brown (in "The Challenge of Man's Future"):

> "One hundred tons of average igneous rock such as granite contains eight tons of aluminum, five tons of iron, 1,200 pounds of titanium, 180 pounds of manganese, 20 pounds of chromium, 40 pounds of nickel, 30 pounds of vanadium, 20 pounds of copper, 10 pounds of tungsten and four pounds of lead".

Dr. Auger continued:

> "A rapid calculation would reveal that, in Quebec and Ontario alone, we could count on 100 billion tons of granite and related rocks per vertical foot".

In some instances this movement is accompanied by another one in the opposite direction, — namely, the discovery of hidden high-grade deposits, as in the case of iron for example, where, during these past years, it has been possible to promote simultaneously the development of the low-grade taconites of Minnesota and the discovery and exploitation of the high-grade deposits of Mauritania and Liberia.

Under these conditions, the position of the Department of Natural Resources could not merely confine itself to supplying the accustomed cartographic and scientific information. Hence, the Department is widening the scope of its technical services, particularly in the field of geophysics and geochemistry. To-day, it feels that it should also supply the mining exploration fraternity with targets towards which its activities could be directed.

The Province is continuing and accelerating its program, begun in 1962, of aeromagnetic surveys in collaboration with the Government of Canada. To date, several hundred geological maps in this series have been issued and distributed.

The Department of Natural Resources has also entered the field of airborne electromagnetic surveying with a contract covering an irregular area about 25 miles long in a north-south direction and 20 to 25 miles wide. The city of Noranda is within the surveyed area. It is hoped that the information may lead to the discovery of new ore deposits in a settled mining district where the Province will not be faced at this time with the problems of building expensive access roads, mining towns, and other facilities.

The Province has also agreed recently to contribute to the testing, in collaboration with Barringer Research, of a new technique for geophysical exploration. In this program, the area mentioned above, which is covered by an airborne E.M. survey, has been selected for an airborne Radio Phase survey. The new technique makes use of frequencies broadcast by the U.S. Navy and other government agencies in very low frequency bands. The readings are a function of the conductivity of the rock formations located below the aircraft carrying the receiver. It is hoped that the technique may be useful as a mapping tool to trace certain rock formations, major faults, shear zones, and even orebodies in some cases. In selecting the above particular area, it was felt that the testing of this new technique would be over ground very favorable for a reasonable appraisal of its merits, since it is an area where the geology is fairly well known and where there are established ore deposits.

Quebec is also trying to supply the mineral exploration industry with geochemical targets, and also with particular information on the application of the most suitable techniques of geochemical exploration under various conditions.

The staff of the Laboratories Services of the Department is working in close cooperation with the field geologists in our geochemical program. This collaboration has led to the development of a new chromatographic method of analysis which permits the quick detection in soils of maximum values down to 0.5 part per million.

In addition to the geochemical reconnaissance done by the geological mapping parties, special geochemical projects are carried out in order to promote working hypotheses and methods.

One of the latest of these studies was made in the Lake Kipawa district in the Grenville geologic province. To date, rewards for searching for orebodies in the Grenville rocks have been few, possibly because prospecting has been

largely oriented towards the finding of sulphide mineralization readily recognizable as surface showings or inferred by geophysical methods. As a matter of fact an impressive number of uranium orebodies of the world are found in sandstones rich in organic components. The metamorphic equivalent of this rock type in the Grenville Province would be the graphitic paragenesis, which is quite abundant. Highly anomalous concentrations of uranium in the stream sediments of the Lake Kipawa district indicate that the Grenville rocks may well be a bonanza for a new generation of prospectors. The high values of gold obtained from some of the stream-sediment samples are an added incentive for prospecting in this area.

It is well established that standard geochemical soil-sampling methods are rather ineffective in areas of heavy overburden, particularly clay. Some years ago, the Department became anxious to obtain, with reasonable ease, soil samples from close to bedrock under heavy overburden, at depths of 50 feet and more. During 1965, initial tests were carried out by using a portable sampling device designed by the Department. Since this beginning, private industry has developed a satisfactory sampler, which is now being used by various exploration companies. It is now known that certain geochemical anomalies have been outlined over mineralized rock by the use of this method.

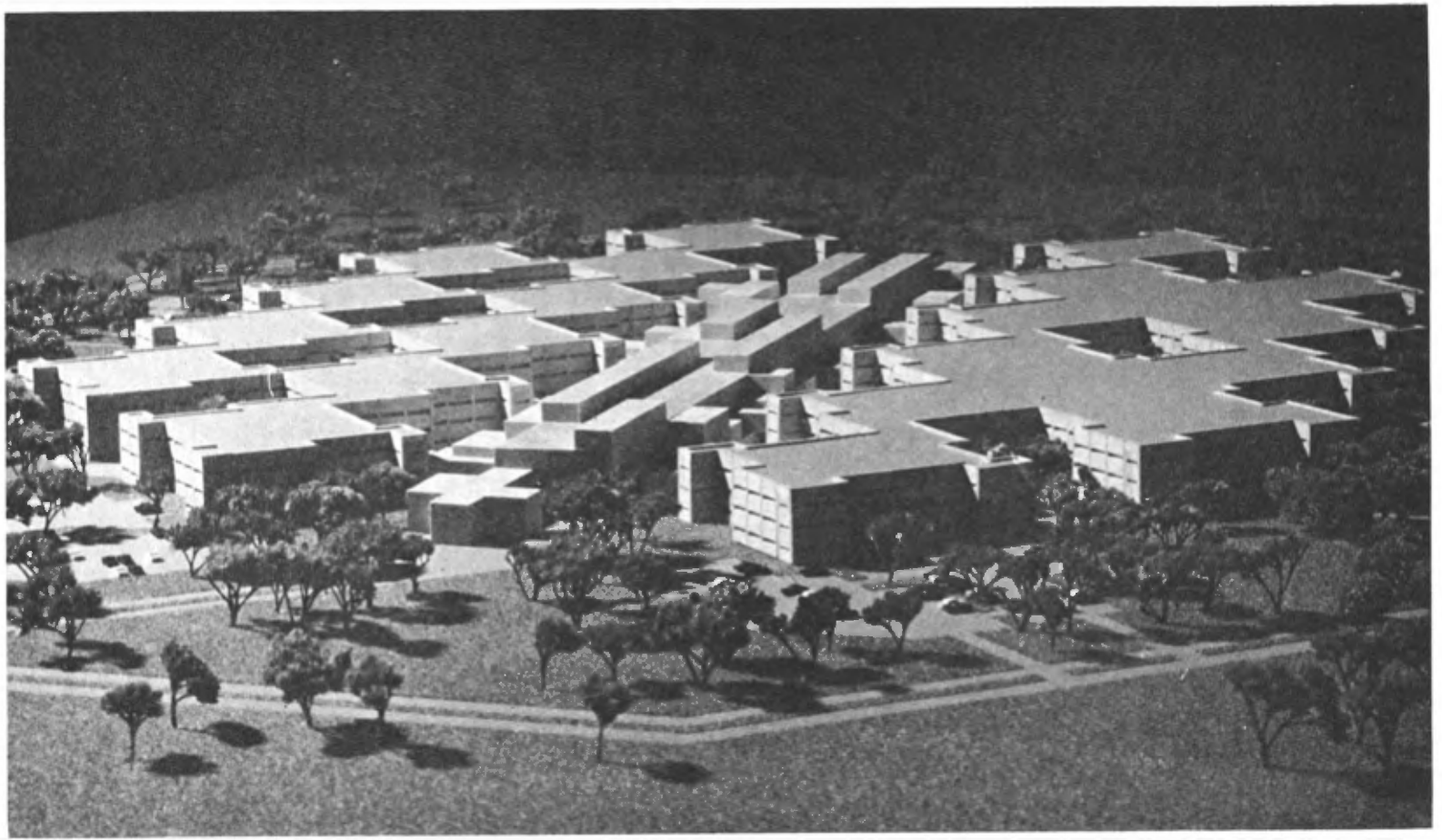
In respect to applied research, the Department of Natural Resources foresees the establishing, within the framework of the scientific governmental complex, of a Mineral Research Center, which would group the present services of the Laboratories and Pilot Plant. These two organizations conduct mineralurgical analyses and research for the Department and private concerns, but their capacity for effectiveness would be greatly increased by being united in a larger and more highly equipped body.

For reasons similar to those advanced in the field of geology, the Department of Natural Resources is being oriented now toward a more scientific and complete participation, even to the extent of supplying private industry with milling and developing processes. In regard to asbestos production, which has always had the support of the Department, work is at present being conducted for the recovery of certain by-products from asbestos wastes. Recently, a process for the production of lithium carbonate from spodumene, which is probably the world's most economic method, was perfected by the services of the future Mineral Research Center. At the moment, these services are working on a project for the future, — the development of titaniferous magnetites.

Also, with a view to coming needs, the Department of Natural Resources is setting up a transport infrastructure having a dual purpose: to open, to prospectors, roads to those regions that so far have been poorly studied owing to their virtual inaccessibility and, on the other hand, to contribute toward the founding of new mining enterprises in these zones, thus leading to the economic integration of these regions with the remainder of Quebec's territory.

Access roads constructed by the Department of Natural Resources should especially advance the development of new resources not only of mining but also of forestry, hydraulic and even touristic operations. One should not over-

PLATE VII



Mock-up of scientific complex to be built in Sainte-Foy.

look the fact that activities of the Department include, at once, mines, waters and also the territories of New Quebec as such. Hence, the Department's Engineering Service (Mines) built a road encircling Monts McGerrigle in Gaspesia, facilitating access to mining resources of this promising area and thus contributing to its economic development.

This orientation of the Department of Natural Resources toward a systematic and orderly development of the natural resources of Quebec proceeds quite normally from its mandate in the domain of planning for the exploitation of resources. Indeed, the Department's mandate is not only one of a technical nature (inventory of resources) but is also that of economy. This latter aspect of its role leads the Department to promote the implantation of industries and to be concerned with the employment situation in mining regions. Hence, like all other economic departments of the Government, it is interested in attracting investments, more especially in mining, not merely by introducing plans for developing resources in which private enterprise and the State each has its part to play (the latter by setting up the necessary substructures, development projects, and mining villages), but likewise by having recourse to associated promotions when one or the other of the sections of the mining industry wanes. The relative ineffectiveness of the exploration effort of Quebec since several years had led to the founding, in 1965, of the Quebec Mining Exploration Company, which was designed to give renewed impetus to research programs. Nevertheless, it will take from 10 to 15 years of effort to restore Quebec's mining capital, and, in the meanwhile, measures must be taken to revive mining activity. A "Program for Revitalizing Mining Activity" has, therefore, been initiated by the Department and is to be submitted for consideration by both the Government and industry. This program covers the following:

expansion of geophysical and geochemical programs, with or without the cooperation of outside organizations;

initiating new development projects in more remote regions (for example, the Sept-Iles – Labrador City line, on the North Shore).

Finally, certain measures involving financial inducements are now under study by which deserving cases will receive suitable mitigation of the requirements of the State with regard to companies in the field of mining. While assisting their financial efforts, these steps should encourage greater investments in the mines of Quebec.

MINERAL PRODUCTION OF QUEBEC IN 1967 AND 1968

SUBSTANCES		ESTIMATE 1967		ESTIMATE 1968	
		Quantity	*Value*	*Quantity*	*Value*
METALLICS					
Bismuth	pounds	517,460	$ 1,933,343	429,240	$ 1,532,561
Cadmium	pounds	377,280	1,069,270	337,027	891,952
Cobalt	pounds	30,000	64,800	12,000	25,920
Columbium	pounds	2,207,000	2,627,000	2,118,000	2,393,340
Copper	pounds	318,175,024	151,355,859	312,226,020	150,180,715
Gold	ounces	837,772	31,625,893 **	772,853	29,144,287
Iron (metal)	tons	373,400	18,332,344	538,731	22,022,849
Iron (ore)	tons	14,518,000 *	135,474,839	15,607,238	145,133,551
Lead	pounds	4,190,678	586,695	5,983,100	808,915
Molybdenum	pounds	3,728,298	6,575,733	2,738,136	4,869,135
Nickel	pounds	3,358,400	3,170,330	1,773,513	1,800,116
Selenium	pounds	517,425	2,328,400	455,000	2,047,500
Silver	ounces	4,921,250	8,533,447	4,015,827	9,308,687
Tellurium	pounds	61,755	401,400	47,000	305,500
Titaniferous iron	tons	48,000	287,000	69,522	346,826
Zinc	pounds	485,881,925	70,404,291	424,742,618	59,888,709
TOTAL METALS :			$434,770,644		$430,700,563
NON-METALLICS					
I – Industrial minerals					
Asbestos	tons	1,260,468	$138,828,849	1,368,811	$151,770,454
Feldspar	tons	10,555	264,527	10,708	258,723
Industrial lime	tons	271,568	3,148,900	296,615	3,447,536
Industrial limestone and marble	tons	1,000,000	2,800,000	900,000	2,700,000
Lithium	pounds	564,977	266,226	——	——
Magnesitic dolomite and brucite	tons	——	3,441,405	——	2,719,377
Marl	tons	60,000	105,000	63,000	110,250
Mica	pounds	——	——	——	——
Natural gas	M. cu. ft.	61,000	8,000	136,500	20,475
Ochre and iron oxide	tons	700	28,000	600	33,000
Peat (moss and humus)	tons	108,000	2,235,000	101,650	2,414,450
Quartz and industrial sand	tons	550,000	3,350,000	847,217	4,176,126
Soapstone and talc	tons	15,800	229,000	——	225,000
Sulfur	tons	——	2,174,750	——	2,892,030
Titanium (oxide and other titanium products)	tons	418,670	23,704,420	504,272	28,016,184
			$180,584,077		$198,783,605
TOTAL INDUSTRIAL MINERALS :					
II – Building materials					
Building lime	tons	$ 38,000	$ 400,000	29,000	$ 330,000
Building stone	tons	47,741,204	49,984,475	34,652,472	39,060,886
Cement	tons	2,207,966	41,804,530	2,400,961	41,073,140
Clay products	tons	——	7,139,284	——	5,835,851
Sand and gravel	tons	45,650,000	21,350,000	35,317,769	18,531,010
TOTAL BUILDING MATERIALS :			$120,678,289		$104,830,887
GRAND TOTAL :			$736,033,010		$734,315,055

* In view of the uncertainty as to the location of the boundary between Quebec and Newfoundland, the amount shown may not represent all the iron production of Quebec.

** Value in Canadian funds. According to the international rate which is $20.671834 an ounce troy, the Quebec production is equivalent to $17,318,284 for 1967 and to $15,976,289 for 1968.

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