

S 104(A)

REPORT OF THE QUEBEC DEPARTMENT OF NATURAL RESOURCES 1966 / 67

Documents complémentaires

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Énergie et Ressources
naturelles

Québec 



*report of
the québec
department
of natural
resources
1966 / 67*



***report of
the québec
department
of natural
resources***

1966 / 67

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, 1967.

Your respectful servant,

PAUL-E. ALLARD

Minister of Natural Resources

Quebec, March 1, 1968

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, 1966, to March 31st, 1967.

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

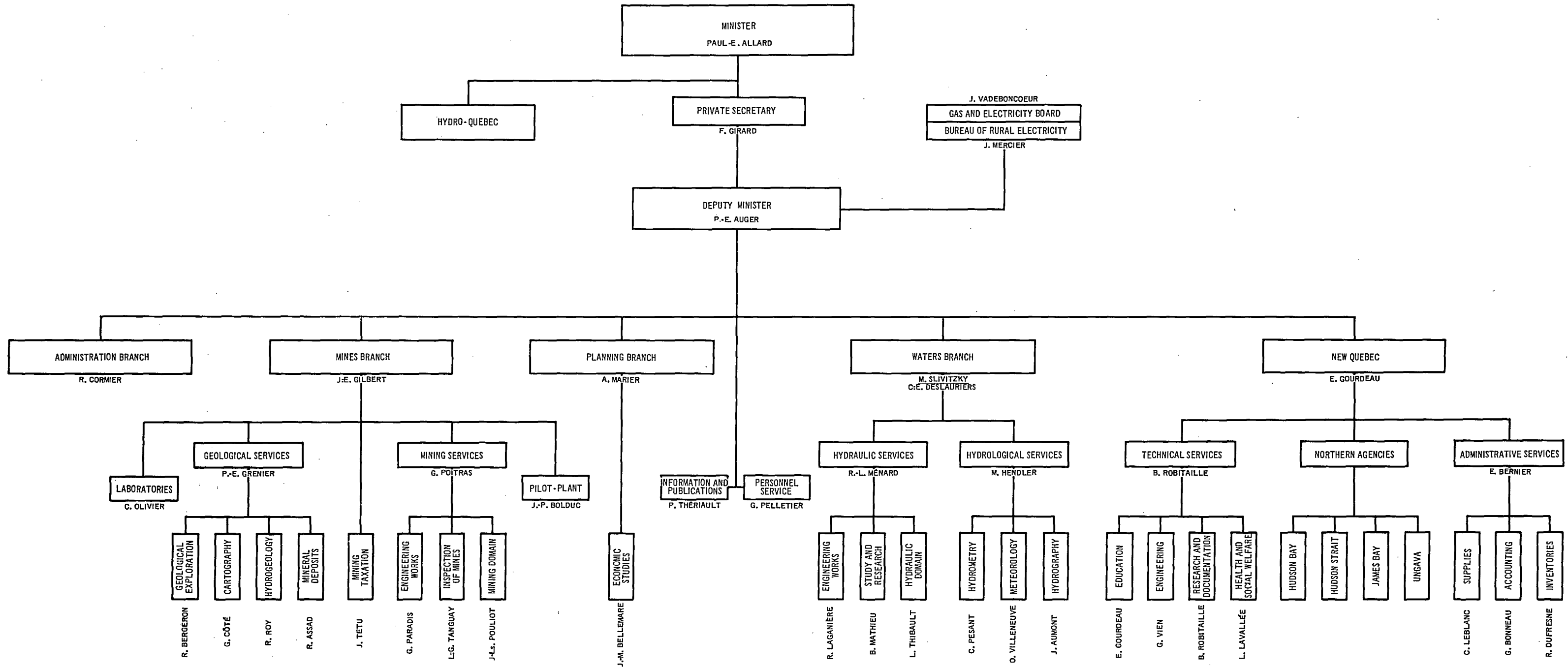
Your obedient servant.

P.-E. AUGER,
Deputy Minister

Quebec, February 28, 1968

QUEBEC DEPARTMENT OF NATURAL RESOURCES

DIAGRAM OF UPPER ADMINISTRATIVE STRUCTURE
(PRESENTLY UNDER REVISION)



LIST OF BRANCHES AND SERVICES WITH NAMES OF CHIEFS

OFFICE OF THE DEPUTY MINISTER

Information and Publications Branch	P. THÉRIAULT
Personnel Service	G. PELLETIER
Legal Service (Department of Justice)	D. POULIOT

ADMINISTRATION BRANCH

Accounting Service (Department of Finance)	J.-C. DELAUNIÈRE
Purchasing Service	G. DURAND
Equipment Service	C. R. STANIFORTH
Secretariate	G. LANDREVILLE

PLANNING BRANCH

Economic Studies Service	J.-M. BELLEMARRE
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MINES BRANCH

Mining Taxation Service	J.-E. GILBERT
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Geological Services	P.-E. GRENIER
Geological Exploration Service	R. BERGERON
Mineral Deposits Service	R. ASSAD

Regional Geological Office:

Rouyn-Noranda, at Rouyn	J. MACINTOSH
Val-d'Or – Matagami, at Bourlamaque	M. LATULIPPE
Chibougamau – Lac Bachelor, at Chibougamau	G. DUQUETTE

Eastern Townships, Gaspé and Lac-Saint-Jean, at Quebec	H. DERÖMER
---	------------

Hydrogeology Service	R. ROY
Cartography Service	G. CÔTÉ

Mining Services	G. POITRAS
Mining Domain Service	J.-Ls POULIOT
<i>District Registrars at:</i>	
Quebec	R. LANGLOIS
Amos	F. ADAMS
Chibougamau	R.-H. LEFEBVRE
Rouyn	T.-H. THÉBERGE
Montreal Agency	R. RICHER
Bourlamaque Agency	M. LAFOREST

Inspection of Mines Service	LS-G. TANGUAY
<i>District Inspectors at:</i>	
Montreal	M.-O. LAFONTAINE
Noranda	G. COURTEMANCHE
Thetford	F. CLOUTIER
Quebec	G. MOSCU
Chibougamau	G. DUCHESNE
	(Noranda)
Engineering Service (Mines)	G. PARADIS
Laboratories Services	C. OLIVIER
Pilot-Plant Services	P. BOLDUÇ
WATERS BRANCH	M. SLIVITZKY
Assistant Director General	C.-E. DESLAURIERS
Hydraulic Services	R.-L. MÉNARD
Engineering Service (Waters)	R. LAGANIÈRE
Hydraulic Domain Service	L. THIBAUT
Hydraulic Development Service	B. MATHIEU
Hydrometeorological Services	M. HENDLER
Hydrography Service	J. AUMONT
Hydrometry Service	R.-C. PESANT
Meteorology Service	G.-O. VILLENEUVE
NEW QUEBEC BRANCH	E. GOURDEAU
Technical Services	R. ROBITAILLE
Administrative Services	E. BERNIER

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Chart

Administrative structure of Department (attached)

Map

Services of the New Quebec Branch

OFFICE OF THE DEPUTY MINISTER

INFORMATION AND PUBLICATIONS BRANCH

The information and orientation program that had been initiated in 1965/66 for recruiting geologists, mining engineers and other specialists to meet the needs of the mining industry was pursued by the Government in high schools within the city and district of Quebec.

The second phase of the general plan, which has been expanding over the past several years, was further extended with the introduction of a new information booth by the Bureau of Information for the purpose of improving the audio-visual aspects of this domain as used up to the present.

In addition to this innovation the local branch of the Canadian Institute of Mining and Metallurgy made available to the Committee a new 30-minute film in color entitled "Carrière d'avenir". This film was shown in all schools where information sessions were held.

Meetings

Following the practice of the preceding year, the Permanent Committee on Education of the Quebec chapter of the Canadian Institute of Mining and Metallurgy, in collaboration with the Department of Natural Resources, organized a series of meetings with groups of students from secondary schools in order to enlighten them concerning the main professional outlets related to the mining industry.

Members of the Committee met students of the regional schools of Sainte-Foy, Charlesbourg and Quebec, as well as those of Quebec and Levis seminaries, Quebec High School and St. Lawrence College.

Each meeting consisted of a brief discussion on the various professions, each profession being represented by a member of the Committee, the presentation of a film, and a forum in which students and committee members exchanged views. These meetings have been featured for the last two years and they are always a source of enthusiasm on the part of school authorities and students, these latter being anxious to discuss, with members of the panel, the possibilities of a career in the mining industry.

Exhibitions

During the year reviewed here, the Department of Natural Resources participated in the regional exhibitions at Thetford Mines, Mont-Joli, Sept-Iles, and

Rouyn-Noranda, as well as taking part in the scientific exhibitions of "La Semaine des Sciences Forestières" that was organized by the student association of forestry engineers of Laval University.

The Department's exhibit at different exhibitions consisted of a series of descriptive placards displaying the more salient advantages of the new Mining Act. Moreover, a double documentary folder was distributed to the visitors, and, although the subject matter was of a rather technical nature, this information was eagerly absorbed by the general public.

At the scientific exhibition, held at the Pavillon Pollack, on the campus of Laval University, the Department described the working methods in the Meteorology Service of the Department and presented a summary of the numerous opportunities for following a career in this interesting field.

On the suggestion of Oscar Villeneuve, director of the Meteorology Service of the Department, a series of the various instruments in use by the Service, accompanied by explanatory notes on their function and application by technicians in meteorology, was put on display. This particular exhibit aroused keen interest on the part of a large number of students, both boys and girls.

Various Achievements

The Branch took an active part in the meetings held during the fiscal year under study through the Subcommittee on Information of CPAR (Comité permanent d'aménagement des ressources). The task of the Subcommittee was to ensure publicity for projects approved by the CPAR; the latter advises the Government concerning works to be carried out under Federal-Provincial agreement relating to ARDA (Agricultural and Rural Development Act).

During the year reviewed here, it was again the duty of the Information and Publications Branch to publicize, usually in the form of press releases, administrative decisions as they are made by officers of the Department and also to prepare publicity articles and communiqués intended for publication by various newspapers and scientific journals.

The demand for information addressed to the Branch is very great, especially on the part of students whose interest in natural resources becomes more and more evident with each passing year. Several requests pertaining to Quebec's resources were received from other provinces of Canada. Moreover, a large proportion of the requests for information received by the Branch in 1966/67 related to natural resources in general; a considerable number of these inquiries dealt specifically with the mining industry, mineral wealth and hydraulic resources.

Editing

The Editing Division is responsible for the preparation, in view of their publication, of manuscripts of a scientific nature coming from the various Services

of the Department, and it also attends to their translation and printing. Moreover, leaflets, circulars and forms for public and internal administrative use were likewise composed and printed by this Division. More than a million copies of these were issued.

Following is a list of the brochures published during the 1966/67 fiscal period:

Preliminary Geological Reports

- P.R. – 555 – Lantagnac – Latouche Area, by J. A. MacIntosh.
- P.R. – 556 – L'Anse Saint-Jean Area, by J. Rondot.
- P.R. – 557 – Dunphy Lake Area, by Erich Dimroth.
- P.R. – 559 – L'Ours Lake Area, by Jean Dépatie.
- P.R. – 560 – Beauvoir – Ascot Corner Area, by R.-Y. Lamarche.
- P.R. – 561 – South Half of Perron Township, by R. Bogoch.
- P.R. – 562 – Lesseps Creek Area, by J.-L. Robert.
- P.R. – 563 – Mount Richardson Area, by P. Girard.
- P.R. – 565 – Description of Mining Properties visited in 1963, 1964 and 1965, by officers of the Quebec Department of Natural Resources.

Final Geological Reports

- G.R. – 120 – Chandler – Port-Daniel Area, by W. G. Ayrton.
- G.R. – 121 – Cuoq-Langis Area, by N. C. Ollerenshaw.
- G.R. – 126 – Duquet-McOuat Area, by A.-N. Deland and G. S. Slater.
- G.R. – 129 – Gras Lake – Félix Lake Area, by P. J. Clarke.
- G.R. – 133 – Saint-Gabriel-de-Brandon Area, by René Béland.

Geological Services Publication

- S.P. – 2 – Annotated Bibliography on Metallic Mineralization.

Meteorological Service Publications

- M. – 21 – Aperçu climatique des îles de la Madeleine, G.-O. Villeneuve.
- M. – 22 – Lexique anglais-français à l'usage du météorologiste-prévisionniste, G.-O. Villeneuve.
- M. – 23 – Probabilités de gel au Québec, Raymond Perrier.

- M. - 24 - Sommaire climatique du Québec, (1^{er} volume), G.-O. Villeneuve.
- M.P. - 8 - Évaluation du siccimètre pour la mesure des dangers d'incendie forestier, J.-G. Fréchette.
- M.P. - 9 - Données météorologiques des stations agronomiques de Laval en 1966, G.-O. Villeneuve.
- M.P. - 10 - Climat du Québec septentrional, R.-M. Gagnon and M. Ferland.
- M.P. - 11 - Bassin versant de l'Eaton, données météorologiques, 1965, M. Ferland.
- M.P. - 12 - Sommaire climatique d'Amos, G.-O. Villeneuve.
- M.P. - 13 - Climat du Québec Méridional, M.-G. Ferland and R.-M. Gagnon.

Publications by the Hydrometry Service

- H.P. - 12 - Répertoire des stations hydrométriques.
- H.P. - 13 - Crue des 3 et 4 novembre 1966.

Hydraulic Services Publication

- R. - 4 - Étude cryologique, B. Mathieu.

Various Publications (Special Series)

- S. - 98 - List of Maps Published by the Geological Services.
- S. - 99 - A Review of the Quebec Mining Industry.
- S. - 100 - Report of the Quebec Department of Natural Resources.
- S. - 102 - Grammaire esquimaude, by R. Schneider.

The Mining Industry in Quebec, 1963 and 1964.

Reprints

During the year reviewed the Editing Division, because of the great demand for certain brochures, had to reprint the following reports:

- 8 Preliminary Geological Reports;
- 11 Final Meteorological Reports.
- 4 Preliminary Meteorological Reports;
- 6 Various Publications.

Library

Reorganizing the Department's library was continued during the fiscal year 1966/67 with the same orientation set forth in 1965. Approximately 3,000 books and brochures, both old and new, were classified and catalogued. Moreover, a complete inventory of the library's periodicals was commenced. Such an inventory will eventually make it possible to issue a list of the publications on hand for distribution to interested parties.

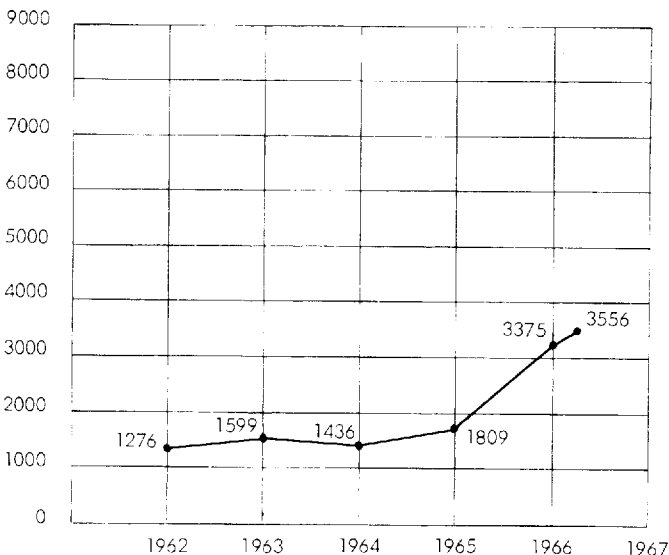
In the period reviewed here, 2,339 new publications of books and brochures were added to the library's collection. Most of these were supplied free to the Department. This number does not include some 200 geological and other maps received for the most part without charge.

The number of volumes lent increased to 3,556, of which 154 publications were lent on an exchange basis with other libraries. Furthermore, 3,132 visitors came to the library.

The library Division subscribes to 264 periodicals, of which 60 are supplied free of charge. Moreover, 47 subscriptions of members of various societies and associations were paid from the library's budget. It is worthy of note that the Department's library has now 32,078 volumes (not counting bound periodicals) in its principal collection.

STATISTICS

PUBLICATIONS LENT



NOTE :

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

Distribution of publications

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

Publications distributed free of charge . . . 63,598 (maps excluded).

Publications sold . . . 7,543 studies and 4,944 maps.

Notices and press releases announcing the publication of 9 preliminary reports, 7 geological reports and 7 miscellaneous releases for a total of 11,643 notices.

Collections of mineral and rock samples . . . 1,839 collections sold, 55 distributed free of charge.

Pamphlets and meteorological bulletins distributed free of charge . . . 38,000.

Personnel Service

The fiscal year under review here was characterized by a marked increase and diversity in the activities of the Personnel Service.

In addition to its customary activities, the Service was given the responsibility of directing and interpreting the Civil Servants Collective Agreement and the Workmen's Collective Agreement, as well as the seven collective agreements affecting the Department's professional staff.

Moreover, in collaboration with officers of other services, the Personnel Service was charged with attending to the classification of professional employees, civil servants and workmen who are employed by the Department. This task was undertaken in accordance with the new regulations which were established by the Civil Servants Commission for each category of government employees.

The Deputy Minister having delegated the Director of Personnel of the Quebec Department of Natural Resources to represent him in all matters concerning employer-employee relations proceeding from the application of various provisions of the collective agreement, the Service was thus called upon to perfect and to execute administrative policies so that it might discharge its responsibilities equitably in this new field of endeavor.

Finally, apart from assuming ever-increasing responsibilities within the Department of Natural Resources, management officers of the Personnel Service were obliged to assist at sessions for different inter-departmental committees that were constituted by groups from central management, such as the Labor Relations Branch (*direction générale des relations de travail*) and the Civil Servants Commission.

Employees

As of April 1, 1967, the Quebec Department of Natural Resources had 709 persons in its employ. During the fiscal year reviewed here, 73 new civil servants entered the Department and 69 left.

During the 1965/66 fiscal period, the Department had 182 professional employees on its payroll. The number of employees classed as professionals within the Department during the 1966/67 fiscal year was 194 and comprised the following:

Agronomist	1
Surveyors	3
Librarians	3
Biologist	1
Accountants	2
Legal advisers	4
Personnel management officers	3
Information officer	1
Economists	12
Geographers	5
Chemical engineers	15
Civil engineers	50
Electrical engineers	5
Forestry engineers	4
Geological engineers	56
Metallurgical engineers	8
Mining engineers	14
Engineering physicist	1
Physician	1
Meteorologists	4
Statistician	1
	<hr/>
TOTAL:	194

Legal Service

The solution of legal problems and the fulfilment of multiple other tasks relating to the application of the Mining Act, the Mining Duties Act and the Water-courses Act and other related acts engaged the attention of the Legal Service during the fiscal year under review here.

As in previous years, the Legal Service provided assistance and counsel on all questions within its jurisdiction, notably on those related to the drawing up of leases and contracts, as well as the drafting of Orders in Council.

The Legal Service made several recommendations for the solution of numerous conflicts and, on certain occasions, pleaded cases before the Mining Tribunal.

The drafting of legal opinions constitutes an important part of the Legal Service's work. These opinions are issued at the request of the various Branch directors and heads of services within the Quebec Department of Natural Resources. Thus, they cover a wide range of subjects related to the application of the Mining Act and require the study of contracts and agreements between the Department and various groups. Legal opinions are also issued by the Service at the request of the public.

ADMINISTRATION BRANCH

The main task of the Administration Branch is to control the expenses of the Services of the Quebec Department of Natural Resources.

The Administration Branch includes the services of Purchasing, Equipment, and the Secretariate. It also embraces a Maintenance Division which, in collaboration with the Department of Public Works, deals with problems relating to installation and maintenance of the various premises of the Department of Natural Resources in the Province.

With the retrocession to the Government of Quebec, in December 1966, of the assets of Metal Mines Limited, at Chicoutimi, the Administration Branch became responsible for the maintenance of this property.

Equipment Service

The Equipment Service now has 156 vehicles belonging to the Department to maintain in good condition, compared with 140 during the preceding fiscal year.

The Service also supplied the technical instruments and the camping material necessary for the 42 parties charged with the carrying out of the work programs of the Department. These field parties were headed by geologists, hydrologists and the engineers responsible for the supervision of construction work on mine roads.

Inspectors from the Meteorological Service also called upon the assistance of the Equipment Service before starting out on their circuits.

It is well to point out that, whereas the geological expeditions were less numerous than those of the preceding year, they were considerably more extensive. Consequently the supply of material was virtually the same.

An inventory of all equipment, the value of which is in excess of one million dollars, was maintained. This equipment is stored in the Department's warehouses, two of which are in Quebec and two in Montreal.

Scholarships

In keeping with a policy adopted several years ago, the awarding of scholarships was continued in 1966/67 with the Quebec Department of Natural Resources granting financial aid to students of mining engineering, geology, metallurgy, hydro-electricity, hydrology, meteorology, hydraulic science or other related studies.

Two distinct committees appointed by the Minister shared the work of examining the files of applicants for these scholarships, according to whether the candidates were interested in pursuing studies in mineral or hydric sciences. These committees were made up of the following members.

MINES

Eugène LAROCHELLE, 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,
 Ecole Polytechnique

V. A. SAULL, Professor,
 Department of Geologic Sciences,
 McGill University

J.-E. GILBERT, Director
 General of Mines,
 Department of Natural Resources

Gisèle LANDREVILLE, Secretary

WATERS

Yvon DEGUISE, Commissioner for
 Hydro-Québec, Chairman

Raymond BOUCHER, Director,
 Department of Civil Engineering,
 École Polytechnique

Bernard MICHEL, Professor,
 Department of Civil Engineering,
 Faculty of Science,
 Laval University

Michel NORMANDIN,
 Dean of the Faculty of Science,
 Sherbrooke University

Svenn ORVIG, Professor,
 Department of Meteorology,
 McGill University

Gisèle LANDREVILLE, Secretary

The main object of these scholarships being to help in the formation of specialists, the committees first of all select the most deserving applicants from among graduates pursuing advanced studies for the degrees of master or doctor. The second choice is made from candidates who are taking regular courses and have met the conditions of renewal. Lastly, a choice is made from new undergraduate applicants.

In making its choice, the committee is guided by considerations of the academic attainments and financial circumstances of the applicants.

Scholarships awarded by the Quebec Department of Natural Resources during the fiscal year 1966/67 amounted to 141 and were shared by students attending the universities listed below.

Grants for Post-graduate Courses

	<i>Mines</i>	<i>Waters</i>	<i>Others</i> *
Laval University	4	7	1
École Polytechnique	3	—	—
Montreal University	4	—	—

* Economic Science.

McGill University	6	1	—
McMaster University, Hamilton	1	-	—
Dalhousie University, Halifax	1	—	—
Massachusetts Institute of Technology	1	—	—
University of Illinois	1	—	—
Purdue University, Lafayette, Indiana	1	—	—
Imperial College, London	1	—	—
École de Soudure Autogène, Paris	1	—	—
	24	8	1
TOTAL:		33	

Undergraduate Students

	<i>Mines</i>	<i>Waters</i>	<i>Others</i>
Laval University	43	11	—
École Polytechnique	47	—	—
Montreal University	3	—	—
McGill University	4	—	—
	97	11	—
TOTAL:		108	
GRAND TOTAL:		141	

PLANNING BRANCH

The Planning Branch, during the course of the year reviewed here, was called upon to assist mainly in the undertakings of the Mines Branch and of the Waters Branch. Thus, in concert with the Mines Branch, it sought to define more accurately certain existing policies, to coordinate and orient the diverse research groups within the Quebec Department of Natural Resources.

The Branch also attempted to evaluate standards for selection of sites for mining villages, and to assess the impact resulting from the construction of mining roads on the general regional development, as well as on the ensuing industrial and commercial expansion. The Branch placed special emphasis on basic studies bearing on a number of elements of the mining industry such as copper, asbestos, lithium, to mention a few. Other studies by the Branch treated the effects, in relation to the general economy, of shipments of certain untreated mineral products, as well as on industries relating to minerals and construction materials such as granite, marble, silica, and cement. Furthermore, the Planning Branch studied certain requests for mining concessions, as well as group projects submitted by SOQUEM to the Legislative Assembly, as prescribed by Charter. It continued to pursue works which it had previously undertaken such as the results of the closing down of some mines and, in collaboration with the Department of Public Works, the problems of manpower in mining, reclassification of this manpower and specific suggestions submitted by mining companies, as well as by union leaders.

The Planning Branch likewise continued, in conjunction with the Waters Branch, to pursue preliminary studies on policies concerning waters. The Planning Branch gave a great deal of attention to, among other things, judicial and administrative problems brought about by legislation in this domain and by certain amendments to the Water-courses Act. Moreover, it participated in a number of specialized studies, and, in particular, one which concerns the feasibility of a hydroelectric installation on Saint-Jean river in Maine and other pertinent projects, as well as some large-scale hydrologic studies, namely those concerning the James Bay basin. It also contributed largely to preparatory works destined to promote a conference dealing with pollution in our environment.

In the realm of electrical power, the Planning Branch continued to implement its policy of collaboration with Hydro-Québec. It was requested to contribute, within the province of its proper scope, to the conception and to the establishment of Hydro-Québec's research institute. The Branch has maintained a keen interest in problems related to the integration of municipal networks into the general network. Studies were undertaken concerning the economical consequences of the Churchill Falls' installation and others in

relation to the networks of other provinces, etc. In general, the Branch gained first-hand knowledge on conditions of domesticating and marketing which would make possible the maximum utilization of diverse forms of gas in the economy of Quebec. The Branch concerned itself with the finding of methods apt to accelerate research for hydro-carbons in Quebec. For this reason, it participated in a study of the agreement by which Hydro-Québec authorized Texaco Exploration Co. through its subsidiary company, la Société acadienne de Recherches pétrolières, to initiate a research program for petroleum in the Gulf of the St. Lawrence, on the Magdalen Islands and in the surrounding areas. The Branch followed with interest the influence of Hydro-Québec on economic developments, as well as that of other sources of energy, such as petroleum and gas. In this way, the Branch studied a number of summary projects concerning the industrial installation where one or the other of these sources of power was a determining factor. These special investigations have been integrated into the general framework of an optimum utilization of the Province's hydraulic energy resources.

In fine, the Planning Branch has set as its objective (and the economic studies that it has pursued have all been directed towards this fixed objective) the deriving of maximum results from the exploitation of this sphere of the Province's natural resources for the benefit of the economy of Quebec.

With this aim in mind, the Branch has studied means to consolidate the economy of mining regions, as well as that of regions where mines and other natural resources play a prime role in the development of the Province.

The Branch has therefore considered these resources in their own light as well as related industries and likewise industries that could be established in these regions as substitute or subsidiary industries. This interest in Quebec's economic expansion, along with the active participation of the Department of Natural Resources represented in the Comité Permanent d'Aménagement des Ressources (CPAR), has led the Planning Branch to take part in a number of *ad hoc* studies under the jurisdiction of the Department.

The Branch has given constant support to the Conseil d'Orientation économique in the analysis of the BAEQ plan on the Gaspesian pilot region and the Lower St. Lawrence. This plan has as a determining factor the development of the Province's resources.

MINES BRANCH

The Department of Natural Resources, by virtue of the provisions conferred on it by statute 9-10, Elizabeth II, Chapter 48, has made the Mines Branch responsible for the application of the Mining Act (13-14, Elizabeth II, Chapter 34) and the Mining Duties Act (13-14, Elizabeth II, Chapter 35).

In summary, the Mines Branch is responsible for:

- (a) Administration of mining lands through the issuance, registration and control of mining titles;
- (b) Supervision and control of mineral exploration and exploitation of mines and quarries with a view to ensuring the safety and comfort of workers, the prevention of water and air pollution and seeing that holders of mining titles carry out the statutory work required for the retention of their titles;
- (c) Assistance to the exploration, exploitation and utilization of the natural resources of the Province of Quebec by means of geological and geochemical studies, analyses and research in laboratories, treatment at the pilot-plant, opening of access roads to resources, establishment of mining villages in isolated regions, etc.;
- (d) Collection of mining dues.

The responsibilities of each of the administrative units which comprise the Mines Branch are described in greater detail in the following chapters of this report along with their main activities during the year 1966/67.

Revenue collected during the fiscal year reviewed here by virtue of the Mining Duties Act and the Mining Act amounted to \$29,862,371.72, of which \$16.3 million was derived from payments by anticipation of duties on mines. Disbursements of the Mines Branch during the same period were \$6.6 million, of which approximately \$3.15 million is chargeable to capital expenditures. Of this amount almost \$2 million is recoverable from mining companies and municipalities or from the Federal Government of Canada.

Mining Taxation Service

The Mining Taxation Service is responsible for the administration and enforcement of the Mining Duties Act. The principal task of this Service is to assess the duties levied on the profit derived from operations by mining companies.

On the administrative level, this task is shared by two divisions. The Assessment Division carries out a program of detailed examination of mining

operations. This program studies the financial requirements and also a variety of technical problems incident to mining operations in general.

On the other hand, the Division of Appeals is charged with regulating disputes resulting from notices of objection or appeal that are made by operators. Its role therefore consists in establishing the facts, interpreting the Act, and submitting appropriate recommendations.

The systematic application of the provisions of the new Mining Duties Act, sanctioned on January 1, 1966, was gradually brought about during the course of the fiscal year terminated on March 31, 1967. A great deal of work was entailed during the fiscal year under review because of the implication of the transitional prescriptions and the final, new provisions. Moreover, several operators were liable to different laws during the same year, since their fiscal periods overlapped in the different calendar years.

The Mining Taxation Service levied \$26,981,864.32 in duties from 62 operators. Of this amount, \$10,653,277.41 is derived at maturity, from payments such as are stipulated in the Qubece Mining Act, whereas \$16,328,586.91 came from payments made in advance such as are decreed in the Mining Duties Act. There are at present five mining companies objecting to the duties levied by the Department and one of these has brought its case before the Provincial Court.

The annual tax that holders of a mining concession are obliged to pay has been raised to \$1.00 an acre. This counts from January 1, 1966. At the present time there are 399 holders of mining concessions, of which 38 are about to have their concessions revoked because of default of payment of the annual tax as stipulated in Section 119 of the Mining Act. Of the 361 concession holders who have met the terms of their titles, 216 paid their annual tax in full to the amount of \$59,493.90. The other 145 are exempt from this tax because they carried out exploratory work or mining operations.

Mining Conflicts Division

The Mining Conflicts Division is concerned mainly with conducting investigations and inspections deemed necessary for the settlement of conflicts involving mining claims that are not yet identified, are recognized, or are under development license. This Division is under the direction of J.-René Dallaire, whose task is to summarize the various reports and make recommendations to the Director-General of Mines.

The personnel of the Mining Conflicts Division consists of six investigators: three stationed at Noranda and three at Quebec. All six are engaged on a full-time basis. Moreover, the Division employs two stenographers: one serving the Noranda office and the other, the Quebec office. The investigators worked on 27 conflicts, 25 of which have been definitively settled.

During the fiscal year reviewed, the Mining Conflicts Division studied various methods with a view to shortening the period that exists between the beginning of a conflict and its settlement, as well as new administrative pre-

scriptions that would make it possible to recognize a controversial staking without having to carry out an inspection. These new methods and prescriptions will be initiated during the coming fiscal year in the hope that they will become standard practice and contribute towards lessening the number of claim-staking conflicts.

GEOLOGICAL SERVICES

Paul-E. Grenier, director, submits the following summary report for the 1966/67 fiscal year:

The function 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 facilitate 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 activities of these four Services are given separately in the reports of their respective directors which follow this summary.

Briefly, the group performs the following functions: it carries out geologic mapping at various scales; collects and compiles geological, mineralogical, geophysical and similar data; makes special investigations in various fields, such as unconsolidated surface deposits (gravel, sand, clay, peat, etc.), industrial minerals, building materials, ground water, 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 and figures; keeps up-to-date plans showing all mining claims, concessions and holdings within the Province; helps prospectors, developers, and the mining industry in general, through freely given information and advice, and the offering of 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 are also able to provide useful information and valuable assistance to other Departments and Branches of the Government, and do so when requested.

For example, in 1966 the Department of Industry and Commerce asked the Department of Natural Resources for help in solving the important problem of locating adequate supplies of potable fresh ground water in the Magdalen Islands.

The deterioration, due to pollution, in the quality of existing supplies, and the diminishing quantities available were rapidly having a very detrimental effect on both the health of the inhabitants and the economics of the Islands. The important fish-processing industry especially was being adversely affected.

It should be noted that, although private enterprise, with financial assistance from the Department of Industry and Commerce, had previously attempted to alleviate the situation, results had been very discouraging.

Supported by ARDA (administered in Quebec by the Department of Agriculture and Colonization), the Hydrogeology Service tackled the problem. After a study based on a geologic report and map that had already been published by the Department (following mapping of the Islands some years ago by the Geological Exploration Service), a geologist of the Hydrogeology Service was able to spot several sites for bore-holes to be drilled. The results, to date, have been very encouraging. Certain aquifers have been intercepted, flows of ground water established, and the most pressing needs already met. Additional details on the program are given in the report of the Hydrogeology Service. It is planned that the project will be continued during the next year.

Also, under appropriate circumstances, certain Divisions of the Services unite with services of other Departments in carrying out joint investigations and special research projects. The results being obtained are proving to be of much benefit to the cooperating Departments and to various segments of industry. To illustrate two present examples are mentioned: (a) the work of officers of the Mineral Deposits Service collaborating with colleagues in the Department of Industry and Commerce in collecting, compiling and making available to interested parties (producers, architects, contractors, etc.) data on the building stone industry; (b) the joint work of the Peat Division of the Mineral Deposits Service and officers of the Department of Industry and Commerce, aimed at helping producers of peat to combine their efforts more logically and to mechanize their operations to a greater degree, this for the benefit of all producers.

Summaries of the results obtained from the individual geologic surveys and other projects carried out during the 1966 field season appear in special booklet S-103, which is accompanied by index map N^o 1658.

Dr. H. W. McGerrigle, Technical Adviser in the Geological Services, spent about five weeks during the summer of 1966 reviewing the geology of two localities at the eastern end of Gaspé Peninsula, namely: the vicinity of Percé, including Percé Rock and Bonaventure Island; and the Forillon Peninsula (at the north-east entrance to Gaspé Bay), which includes Cap-Bon-Ami Park. Subsequently he prepared reports and maps on the two areas. It is planned to publish these as booklets in a new series of geologic brochures describing, in an interesting and elementary fashion, the geology, topography, geologic history, minerals, fossils, and other natural phenomena of selected localities in various parts of the Province.

The main purpose of this "Popular Geology" series is twofold. One aim is to provide Quebec's youth—which is generally much more scientifically minded than in previous generations—with stimulating material in the realm of rocks and minerals. It is felt that if an interest in geology and other earth sciences can be aroused in students at an early age that some may later find their careers in such fields. One example of such a method is the summer camp of the "Jeunes Biologistes" at Port-au-Saumon, Charlevoix county. Raymond

Paquet, a geological engineer of the Mineral Deposits Service, contributed to their 1966 program by giving the youngsters a practical, elementary course in geology, which was well received. The geologic booklets are also intended to provide the interested tourist (both parent and child) with a comprehensive and easily readable summary of the geology at various localities he may visit.

Manuscripts for two other brochures in the series have been prepared. The first, by Dr. R.-J.-E. Sabourin of Université Laval, is on Val-Jalbert Park area, near the southwest end of Lake Saint-Jean. It is centered on a ghost village abandoned in 1929 when its paper mill ceased operations. The Quebec Department of Tourism, Fish and Game has taken over the locality and has established therein a picnic area and also an attractive camp-ground. The second booklet—co-authored by Dr. John Riva and René Bureau of Université Laval—is on Montmorency Falls Park, on the north of the St. Lawrence about 6 miles northeast of Quebec City.

In addition to his aforementioned work, Dr. McGerrigle spent considerable time in the technical editing of various geologic reports and maps.

During the autumn of 1966, the Quebec Department of Natural Resources and the Federal Department of Energy, Mines and Resources entered upon a second, joint, three-year program of aeromagnetic surveys of certain parts of the Province. During the first such program, which covered the period 1962-65, about 115,000 square miles of Quebec were surveyed. The results have been published as isomagnetic maps at the scale of 1 inch equals 1 mile. Such maps are very useful in aiding geologic interpretation, especially in regions much covered by unconsolidated deposits or where rock exposures are not abundant. They are also helpful in indicating localities where mineral deposits might be found, following detailed ground investigations.

One especially important change in the organization of the Geological Services was made during the year. Effective January 1, 1967, the Natural Gas and Petroleum Division—which was part of the Gas, Water and Petroleum Service (formerly Branch) for 10 years and for the preceding 8 years was within the Geological Surveys Branch—was transferred to the jurisdiction of the Mineral Deposits Service. The Division is being administered by Dr. W. B. Skidmore, geologist transferred from the Geological Exploration Service, and his colleague is Paul-P. Simard, petroleum engineer, who accompanied the Division in its transfer. It is planned to expand the Division as circumstances warrant. On January 1 also, the remaining part of the former Gas, Water and Petroleum Service was renamed the Hydrogeology Service; Raymond Roy remains its director.

On May 4, 1966, Raymond Roy, director of the Hydrogeology Service, returned from a two-month study tour in France. His trip was made as part of a joint program of the Quebec Department of Education and ASTEF (Association pour les stages techniques en France); these two bodies sponsor and support exchanges of scientific personnel between Quebec and France. Mr. Roy's studies were carried out with the collaboration of the "Bureau de recherches géologiques et minières" (B.R.G.M.) of France. His work enabled him to become familiar with the techniques being applied by French scientists

in the field of hydrogeology. Besides his contacts with hydrogeologists of B.R.G.M., both in Paris and elsewhere, he had numerous exchanges with specialists in hydrogeologic research working for private companies. It is foreseen that the information acquired by M^r. Roy will be very useful to the Hydrogeology Service.

During the period February 10–April 3, 1967, D^r. Robert Bergeron, Director of the Geological Exploration Service, went to France. He had been invited to give a special series of nine two-hour lectures on various aspects of Quebec and Canadian geology at the renowned Sorbonne, Université de Paris. The overture is evidence of the high regard that French institutes have for the geologic work being done by the Quebec Department of Natural Resources. During his visit D^r. Bergeron also gave lectures at the Université de Bordeaux and the Université de Grenoble, under the auspices of ASTEF.

While in France, D^r. Bergeron was able to renew contacts, and make new ones, with officers of a number of branches and services of the French Government and various research bodies and institutes, as well as the professors at several universities. The exchanges of scientific views and the comparison of methods of investigation and related matters that result from such meetings are of much value, not only to the officers concerned but to their respective organizations.

The Director of Geological Services holds various posts in several scientific organizations. In the "National Advisory Committee on Research in the Geological Sciences", he is a member of the Executive Committee, a member of the Subcommittee on Mineral Deposits, and also acts as the Department's representative to that body. He is a member of the Associate Committee on Geodasy and Geophysics of the "National Research Council", as well as the Department's representative for the "Canadian Scientific Committee for the Upper Mantle Project". Within "The Canadian Institute of Mining and Metallurgy", he is on the Executive Committee of the Geology Division, and is the Quebec City Branch representative on the Membership Committee.

Geological Exploration Service

Robert Bergeron, director, reports as follows on the activities of the Geological Exploration Service during the 1966/67 fiscal year.

As of March 31, 1967, the professional staff comprised 15 geologists and geological engineers, the same number as at the close of the preceding year. However, during the year, three geologists resigned—E. H. Chown accepted a college teaching post, and P. J. Clarke and J. Depatie took positions with companies in the mining industry. A fourth geologist, W. B. Skidmore, a valued staff member for 10 years, was, on January 1, 1967, transferred to the Mineral Deposits Service, where he is responsible for the administration of the Natural Gas and Petroleum Division. On the other hand, four geologists—Miss Jolanta Radzimska, Pierre Lasalle, J.-P. Bassaget, and Michael Katz—joined the full-time staff during the autumn of 1966.

Unfortunately, the turnover of members of the professional staff continues at a high rate; the following table shows this clearly.

Turnover of Professional Staff of the Geological Exploration Service during the Last 10 Years

<i>Fiscal Year</i>	<i>No. at End of Year</i>	<i>Left</i>	<i>Joined</i>	<i>Loss or Gain</i>
1966/67	15	4	4	Nil
1965/66	15	7	2	— 5
1964/65	20	2	6	+ 4
1963/64	16	1	4	+ 3
1962/63	13	2	1	— 1
1961/62	14	1	1	Nil
1960/61	14	5	2	— 3
1959/60	17	1	5	+ 4
1958/59	13	Nil	3	+ 3
1957/58	10	4	3	— 1
Yearly Average:	14.7	2.7	3.1	

Over the 10-year period (1958–67) the average annual turnover of professionals was nearly 20%. Of the 11 geologists on staff at March 31, 1957, only three remain with this Service, although three others are still with other Services of the Department.

For the 20 professionals who both joined the Service and left the Department during the ten-year period, the average stay was less than three years; no fewer than nine (i.e., nearly half) remained for only one year or so. It is interesting to note that, of the 20, no fewer than seven resigned to accept university teaching positions (with one exception, in the Province of Quebec). Another six geologists left to join private companies, three are consultants in the Province, two left to continue post-graduate university studies, one transferred to another Department of the Quebec Government, and one went to the Federal Department of Mines and Technical Surveys. It is at least encouraging to note that the experience gained here by those 20 geologists and engineers is, to a very great degree, benefiting the growth of Quebec, either through education of its youth, or economically in the mining industry.

In addition to the professional staff, the Service includes five office assistants and clerks, and seven secretaries and stenographers.

As the principal functions and general operations of the Geological Exploration Service are well summarized in the Annual Report for 1965/66, they are not detailed herein.

The 1966 field program comprised 20 projects, five less than in 1965.

Three parties* (led by A. F. Laurin, E. H. Chown, and J. G. Murtaugh) carried out reconnaissance mapping, compared with two in 1965. In all, they

* One party (E. H. Chown) carried out both regional and reconnaissance mapping.

covered about 15,000 square miles (about 2.5% of Quebec's area), at scales that will permit the publication of maps at either 2 or 4 miles to the inch.

Another ten parties * did regional geologic mapping, compared with 16 in 1965. They covered, in all, approximately 3,700 square miles (about 0.6% of the Province). Most of these maps will be issued at 1 inch equals 1 mile; however, the mapping by two parties (St-Julien and Hubert) was sufficiently detailed to allow the publication of maps at 1 inch equal $\frac{1}{2}$ mile.

Two other parties (headed by G. Tremblay and J.-C. Dubé) mapped the unconsolidated (Quaternary) deposits over areas that total about 1,000 square miles.

Another six field projects were of a miscellaneous nature. They were:

- (a) a continuing program of drill-core logging, by B. Warren;
- (b) diverse projects—mostly connected with bore-holes and the logging of cores—in the St. Lawrence Lowlands, by T. H. Clark;
- (c) paleontologic studies (mainly trilobite fossils), on collections from Gaspesia, by P.-J. Lespérance;
- (d) check surveys south of Lake Saint-Jean, by G. Valiquette;
- (e) special studies in the Shawinigan area, by J. Martignole;
- (f) special studies in the Saint-Paulin area, by M. Hocq.

Only eight of the 20 field parties were headed by geologists of the permanent staff. The other project chiefs had again to be recruited on a short-term basis from outside sources—five were geologists from university faculties; the remaining seven chiefs (five geologists and two geographers) were scientists pursuing advanced research at various universities toward the obtainment of their doctoral degrees. The parties engaged 33 other graduate geologists (including two professors), 38 students, and 53 other men (for varying periods of time) as canoeemen, packers, helpers, and cooks.

Professor F. F. Osborne of Université Laval, enlisted for many years on a part-time basis, spent most of the 1966 field season as a vice-chief on P. St-Julien's project. However, he was also available for advising on various other geologic problems.

Two staff geologists—Richard Grenier and M. M. Ritchie—assisted the Director in administrative, editorial and other duties. W. B. Skidmore ** spent considerable time in compiling the manuscript for a revised edition of the geologic map of Gaspé Peninsula, to be published soon at the scale of 1 inch equals 4 miles. J. H. Remick was occupied mainly in the preparation of reports and maps pertaining to his recent field mapping assignments.

During the field work, the mapping parties of the Service collected systematically, for geochemical analysis, some 2,900 stream-sediment samples from small water courses encountered on their traverses. These, along with considerable data on locations and prevailing conditions, have been submitted to the Mineral

* One party (E. H. Chown) carried out both regional and reconnaissance mapping.

** Transferred to Mineral Deposits Service (Natural Gas and Petroleum Division) — January 1, 1967.

Deposits Service. They are being analysed by suitable methods for indicative values of certain metals, such as copper, nickel, lead zinc, molybdenum, and uranium. It is hoped that this research may eventually help to delineate areas especially favorable for the finding of certain types of ore 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.

An informal geological colloquium, under the chairmanship of P. St-Julien, met from time to time during the winter months. At each meeting, two staff members of the Geological Services gave summaries of published, but not well known, geological papers or volumes. Each presentation was followed by relevant discussion. These sessions are of much interest to the officers of the Department.

Several of the Service's officers hold important posts in various scientific organizations. The Director is a member of the board of directors of the "Centre d'Études nordiques de l'Université Laval". He is also a member of the Education committee of "The Canadian Institute of Mining and Metallurgy", whereas A.-F. Laurin acts in an equivalent role for the Quebec City branch of the society. P. St-Julien is president of "La Société Géologique de Québec", and is a member of the subcommittee on Structural Geology of the "National Advisory Committee on Research in the Geological Sciences". W. B. Skidmore and C. Hubert are members of the Editorial committee for papers submitted for the International Symposium on the Devonian System, to be held under the auspices of the Alberta Society of Petroleum Geologists, at Calgary, in September 1967. Dr. Hubert is chairman of the Department's committee on Stratigraphic Nomenclature. Drs. Bergeron, Laurin and Skidmore were members of the Quebec City Branch organizing committee for the 68th Annual General Meeting of the C.I.M. held in Quebec City, April 25-27, 1966.

During the year, staff members presented lectures and papers 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

Series of nine lectures to the Faculté des Sciences, Université de Paris, France—as an exchange professor—as follows:

1. "Gisements de fer du Canada" — Feb. 20, Feb. 21, 1967;
2. "Géochronologie du Précambrien Canadien" — Feb. 25, 1967;
3. "Structure du Canada (Montagnes Rocheuses, etc.)" — Feb. 27, 1967;
4. "Géologie du Canada" — March 3, March 10, 1967;
5. "Structures circulaires dans le Québec: Caractères météoritiques ou phénomènes cryptovolcaniques?" — March 4, 1967;
6. "Protérozoïque du Québec" — March 13, March 20, 1967.
"Les Services géologiques du Ministère des Richesses naturelles du Québec" — lecture at Laboratoire de Géologie, Faculté des Sciences, l'Université de Bordeaux, at Bordeaux, France, March 16, 1967.

“Le Précambrien du Québec” — lecture at Laboratoire de Géologie, Faculté des Sciences, l’Université de Grenoble, at Grenoble, France, March 22, 1967.

By Erich Dimroth

“Deformation in the Grenville Province between Gatineau and Petite-Nation Rivers, Quebec” — paper published in *N.Jb. Mineral., Abh.*, v. 105, pp. 93–109, Stuttgart, Germany, June 1966.

“Interference and Superposition of Several Fold Systems in the Central Labrador Trough, due to a pre-orogenic block structure” — lecture to Colloquium of the Depts. of Earth Sciences, University of Munich, Germany, November 3, 1966.

By Yvon Globensky

“Le rôle du géologue dans l’exploration” — talk to the graduating class of Collège de Lévis, at Lévis, February 14, 1967.

“Middle and Upper Mississippian Conodonts from the Windsor Group of the Atlantic Provinces of Canada” — paper published in *Jour. Paleontology*, Vol. 41, No. 2, pp. 432–448, March 1967.

By Claude Hubert

“Tectonics of Part of the Sillery in the Chaudière–Matapedia Segment of the Quebec Appalachians” — paper presented to The Royal Society of Canada, at Sherbrooke, June 4, 1966.

By Pierre Lasalle

“La palynologie: définitions et limites” — paper presented to La Société Géologique de Québec, at Quebec, December 20, 1966.

“Late Quaternary Vegetation and Glacial History in the St. Lawrence Lowlands, Canada” — paper published in *Leidse Geologische Mededelingen*, Vol. 38, pp. 91–128, 1966.

By A.-F. Laurin

“Outline of the organization of the Quebec Department of Natural Resources, and summary of the proposed 1967 field program of the Geological Services” — talk to the Department of Geology, University of Western Ontario, at London, December 9, 1966.

By A.-F. Laurin, et al.

Panelist for “Careers in Geology, Mining and Metallurgy” — at forums on career opportunities, held for the benefit of senior secondary school students of: Jean-Talon region, at Charlesbourg, Jan. 30, 1967; de Tilly region, at Sainte-Foy, March 3, 1967; and Quebec High School, at Quebec, March 8, 1967.

By *J. H. Remick*

“L’usage de l’hélicoptère dans la cartographie régionale” — paper presented to the 34th Congress of l’Association canadienne-française pour l’avancement des sciences, at Quebec, November 6, 1966.

By *Pierre St-Julien*

“Tectonics of Part of the Appalachian Region of Southeastern Quebec (Southwest of Chaudière River)” — paper presented to The Royal Society of Canada, at Sherbrooke, June 4, 1966.

“Geology along the Eastern Part of the Eastern Townships Autoroute” — conducting Royal Soc. Can. one-day field trip, June 6, 1966.

List of Geological Field Projects — 1966

Following is a list of the 1966 field projects, including the title of each and the name of the chief. Summaries of these projects are given in special booklet N^o. S-103, which is accompanied by index-map N^o. 1658.

AREAL MAPPING

1. Payne-Kyak Area: New Quebec Richard HARDY
2. Castignon Lake Area: New Quebec Erich DIMBOTH *
3. Sakami Lake North Area: New Quebec J. P. MILLS
- 4a. Lake Gaschet Area: Mistassini Territory, Roberval and Chicoutimi Counties E. H. CHOWN *
- 4b. Croix Lake Area: Chicoutimi County — (1" = 4 mi. mapping) E. H. CHOWN *
5. Baskatong Reservoir Area (West Half): Gatineau County R. S. JACOBY
6. Malbaie River Area: Charlevoix County Jehan RONDOT *
7. Isle Maligne Area: Lac-Saint-Jean, Jonquière — Kénogami, and Chicoutimi Counties — (Quaternary geology) Germain TREMBLAY
8. Péribonca River Area: Roberval, Chicoutimi, and Lac-Saint-Jean Counties — (1" = 4 mi. mapping) A.-F. LAURIN *
9. Mouchalagane — Manicouagan Structure Area: Saguenay County — (1" = 2 mi. mapping) .. J. G. MURTAUGH
10. Drummondville Area (East Half): Arthabaska, Drummond, and Richmond Counties Yvon GLOBENSKY *

* Indicates full-time staff officer.

11. Arthabaska Area: Arthabaska, Mégantic, and Wolfe Counties — (Quaternary geology) J.-C. DUBÉ
12. Quebec Area: Quebec, Montmorency, Lévis, and Other Counties — (1" = ½ mi. mapping) Pierre ST-JULIEN * and F. F. OSBORNE
13. Orléans Area (East Half): Montmagny and Bellechasse Counties — (1" = ½ mi. mapping) Claude HUBERT *
14. Lac-des-Baies Area (West Half): Rimouski and Rivière-du-Loup Counties Jean LAJOIE and Jacques BÉLAND

Miscellaneous Projects

- (a) Drill-core Logging Bertrand WARREN *
- (b) St. Lawrence Lowlands T. H. CLARK
- (c) Paleontologic Studies, Gaspesia P. J. LESPÉRANCE
- (d) Check Surveys South of Lake Saint-Jean Guy VALIQUETTE
- (e) Shawinigan Area Jacques MARTIGNOLE
- (f) Saint-Paulin Area Michel HOCQ

Mineral Deposits Service

J. R. Assad, director of the Mineral Deposits Service, submits the following report on the activities of the Mineral Deposits Service during the fiscal year 1966/67.

The Mineral Deposits Service is responsible for collecting and putting at the disposal, within the least delay possible, information concerning exploration and mining operations of the metallic mineral deposits, industrial minerals, peat-bogs, petroleum and natural gas **.

The responsibilities of this Service are assumed by the main office in Quebec and by the offices of resident geologists. The personnel, at the close of the fiscal year 1966/67, comprised 18 engineers and geologists, one agronomist and 31 technicians, clerks and stenographers. These employees were stationed at the offices of resident geologists in Rouyn (3), Val-d'Or (2), Chibougamau (4) and at the principal office at Quebec (41).

During the year reviewed, four geologists joined the Service's personnel. These were H. S. de Römer, L. Imreh, W. B. Skidmore and Paul-P. Simard.

On the other hand, P.-E. Bourret went into retirement, C. Thibault was transferred to the Mining Domain Service and J.-L. Robert, R.-Y. Lamarche and C. Gélinas resigned from the Service.

* Indicates full-time staff officer.

** At the close of 1966, the Natural Gas and Petroleum Division of the Gas, Water and Petroleum Service was annexed to the Mineral Deposits Service.

The personnel of the main office at Quebec deals with the choice, launching and supervision of the annual campaigns of geological mapping and peat-bog inventory programs, the editing of technical reports, the filing of technical documents, geological and geochemical research, the studying of problems which are submitted to the Service, and the attending to a voluminous correspondence. This office has four specialized divisions: the Technical Archives Division, the Industrial Minerals and Building Materials Division, the Peat-bogs Division, and the Natural Gas and Petroleum Division.

Technical Archives Division

The Technical Archives Division has two sections: one confidential and the other public. In the confidential section are filed reports of development work submitted by mining companies, reports dealing with visits to mining properties by the officers of the Quebec Department of Natural Resources, and other miscellaneous documents. In the section open to the public are kept reports of statutory works on claims reverting to the Crown.

During the fiscal period reviewed here, the confidential section was enlarged by 2,487 reports and 2,775 maps. This increase means 5,262 new documents. During the same year, 877 files were closed. These had contained 2,591 documents that were transferred to the public section. By way of attending to requests for information from mining companies and persons interested in mining operations, a total of 21,695 pages of reports and 1,504 maps were photocopied.

The compilation of index maps showing the areas covered by the documents on file was continued during the fiscal year reviewed. In addition to keeping up to date the plans already on file, the Mineral Deposits Service completed 112 new plans, bringing the total to 459. It should be noted that each plan covers a township and is accompanied by a booklet listing and describing the documents indicated on each of the plans. In all, 2,196 copies of these plans were distributed during the fiscal year under study. Moreover, index plans of airborne geophysical surveys submitted by exploration companies were brought up to date. These plans were made public after they had been kept in the confidential section for a period of six months. Approximately 525 visitors consulted the files at the office of the Technical Archives during the fiscal period.

Industrial Minerals and Building Materials Division

Under the direction of O.-D. Maurice, the Industrial Minerals and Building Materials Division was engaged in promoting the use of the Quebec's resources in industrial minerals and building materials. Its efforts were directed at maintaining contact with producers and consumers, encouraging the publicity of materials and compiling lists of operators who are faced with common problems. The Division also keeps an inventory of resources and studies the possibilities of new uses for these resources. The numerous visits that geologists of this Division make to deposits undergoing exploitation enable them, in many

instances, to give technical advice to operators or to point out to these operators places where further research might result in an increase of their ore reserves. Finally, the Division supplied a great deal of information through correspondence.

Roger Sirois, who is in charge of the building materials section, collaborated with the Division of Economic Studies and with the Division of Raw Materials of the Department of Industry and Commerce in order to initiate a program destined to give new value to the building stone industry of Quebec. A study period of several days was organized at the request of cut-stone producers. Among the measures adopted during these study sessions, two are on the way to becoming a reality: standardizing the product and the issuing of a publication that serves as a purchase guide for architects and builders. A research program is in preparation which has for its object the finding of new applications for building stone, while taking into account the modern methods of construction.

J.-Yves Chagnon, who is responsible for the section dealing with the structure of soils, continued his study of landslides. He has endeavored to compile the data obtained from the study of aerial photographs. He also visited the sites of several landslides and collected samples of clay. His bibliographical research into the nature of unstable earth is almost completed. Furthermore, Dr. Chagnon conducted a preliminary study of land conditions at the location of the five dams that are about to be built on Sainte-Anne river and he was also concerned with the erosion problems at Gayhurst, Saint-Joseph-de-la-Rive, Sainte-Monique-de-Nicolet, and Deschaillons. During the winter months he gathered samples of clay from the bottom of lakes situated on Mount Rougemont and Mount Saint-Bruno in order to investigate the nature of the resistance of the clay under tension and pressure.

During the summer months of the fiscal year 1966/67, O.-D. Maurice visited several silica and feldspar producers. Dr. Maurice also went to the Magdalen Islands in order to sample the sand dunes in that locality. Examination of this material enabled him to redefine a potential for it in industry.

During the summer months of 1966, Marcel Tiphane, professor of geology at the University of Montreal, studied sands from Gaspesian beaches in order to determine their nature. Since the exploitation of sand could be prejudicial to the riparian property holders because of the migration of sand to the places of operations, he hopes to determine to what extent the operation of a sand-pit can affect beaches in a given region.

Peat-bogs Division

The Peat-bogs Division is under the direction of Antoine Simard, agronomist, and comprises two technicians, a clerk and a typist. The principal duties of members of this Division are to make the inventory of the peat-bogs, the surveying of the drainage network of exploitable peat-bogs, scientific research, amelioration of peat production, to find a market for peat, and, finally, the setting up of plans for the peat industry in general.

During the fiscal year reviewed, the inventory of peat-bogs involved :

1. Topographic surveying of the peat-bogs situated at Les Buissons and on the provincial farm at Baie-Saint-Ludger, Manicouagan township, Saguenay county, and a preliminary examination of peat-bogs Nos. 2, 3, and 4 situated on the west parts of ranges III and IV of the same township. This work was the responsibility of Antoine Hotte.

2. Topographic surveying of the peat-bogs situated at Saint-Charles-Borromée, Bourget township, Jonquière-Kénogami county, and at Sainte-Marguerite-Marie, Racine township, Roberval county, and a preliminary examination of the peat-bogs at Dolbeau, Mistassini, Sainte-Jeanne d'Arc, and Péribonea, Roberval county. This work was directed by Denis Tanguay.

3. Topographic surveys of the Mer Bleue and Francœur peat-bogs, in Sainte-Françoise-Romaine parish, Lotbinière county, as well as peat-bogs and swamp lands in the region of Fort Chimo.

These undertakings were accompanied by the gathering of 257 samples, which later became the subject of 1,120 laboratory determinations.

A survey of the drainage pattern of 38 peat-bogs situated along the shores of the St. Lawrence between Yamaska and Matane counties was accomplished by Denis Tanguay. This work made it possible to bring up to date the plans of the network of drainage ditches of all the peat-bogs under exploitation in the Province.

The scientific research programs pursued during the year reviewed are given below :

1. Study of the effects of natural peat and treated peat (humus) as mineral soils additives. This study, which was undertaken in August 1964, is carried out on sandy soils from the Research Center of Les Buissons, Saguenay county.

2. Comparative study of peat litter and straw litter. This study, which was begun in November 1964, is pursued at the Provincial Farm-School in Deschambault, Portneuf county. The study includes two experiments: (a) the systematic utilization of peat and straw as litter under animals subjected to various methods of hibernation and (b) comparison of the yield in planting hay and potatoes in fields fertilized with a mixture of peat and manure with those treated with straw and manure.

3. Comparative study of natural peat and processed peat as mulch in the Royer orchard, at Saint-Pacôme, Kamouraska county.

4. Study of the titration methods of humic acid in peat and of the mechanical separation methods of peat components with a view to producing carbon for industrial ends. This study was conducted in collaboration with Georges Pagé, professor at the Institut de Technologie de Montréal.

5. Ecologic study of four peat-bogs in the region of the lower reaches of the St. Lawrence by R. Gauthier. This study, which was started during the preceding year, was continued into 1966 and was directed toward an examination of the botanical associations, the surface of peat-bogs, the relationship of these associations with the different strata making up the peat-bogs.

On the subject dealing with a greater output and better markets of peat, mention should be made of the effort exerted by M^r. Simard and representatives from the Department of Industry and Commerce with the view to uniting peat-bog producers and of inducing them to mechanize their operations. These same persons, accompanied by producers from Quebec, also met with representatives of the Department of Industry and Commerce from New Brunswick, as well as with operators from this Province so as to attempt to bring an end to the baneful competition obtaining between the producers of the two provinces.

As regards the drawing up of future plans that will favor Quebec and New Brunswick, committees have been formed to study the feasibility of increasing peat production during the course of the next four years in order to meet, in an organized fashion, the normal growth of the American consumption of this product.

As in past years, the Department of Natural Resources made grants for the drainage of peat-bogs. These grants amounted to \$20,000 and were shared by 22 peat operators.

Natural Gas and Petroleum Division

The Natural Gas and Petroleum Division was formerly part of the Gas, Water and Petroleum Service and became part of the Mineral Deposits Service at the close of 1966. Its personnel consists of W. B. Skidmore *, a geologist, and Paul-P. Simard **, an engineer. The Division has the responsibility of the application of the Mining Act and regulations concerning the research, production and underground storage of petroleum and natural gas. It also supplies information and gives technical assistance to companies interested in these resources.

During the year under review, two companies drilled seven wells in the St. Lawrence Lowlands and another drilled a well in Gaspesia.

The personnel of the Natural Gas and Petroleum Division:

1. prepared amendments to be added to the Mining Act that deal with Natural Gas and Petroleum;
2. worked on the preparation of new regulations pertaining to research and exploitation of natural gas and petroleum, as well as underground storage of these substances;
3. followed closely all work directed toward the search of petroleum and natural gas and classified the samples and information resulting from such work;
4. satisfied itself that the work was done according to methods conforming to those used in the petroleum industry;
5. verified the presence of presumed discoveries of natural gas on private lands and saw to the blocking of holes drilled during engineering work that showed natural gas;

* Transferred from the Geological Exploration Service.

** Transferred from the Gas, Water and Petroleum Service.

6. outlined the geological works to be accomplished by the Natural Gas and Petroleum Division during the course of future years, as well as the documentation to be collected and the technical compilations to be undertaken.

In addition to the work accomplished by the Technical Archives Division, the Industrial Minerals and Building Materials Division, the Peat-bogs Division, and the Natural Gas and Petroleum Division, the personnel did or saw to the accomplishment of geological works in the districts mentioned below. The numbers on the following list correspond to those appearing on index map N^o 1658.

15. Otelnuke Lake, New Quebec	L. KISH *
16. SW. of Obalski township, Chibougamau district ..	G. DUQUETTE * and A. MATHIEU *
17. Part of Lévy and Daubrée townships, Chibougamau district	L. E. WOLHUTER
18. NW. of Rinfret township, Chibougamau	G. ALLARD
19. SE. of Nelligan township, Bachelor Lake area ...	J. A. MACINTOSH *
20. South half of Perron township, Rouyn - Noranda district	R. BOGOCH
21. West half of Blondeau township, Témiscamingue .	L. KISH *
22. East part of Lesseps township, Madeleine Lake area, Gaspesia Park	H. DE RÖMER *
23. Gerido Lake, New Quebec	P. SAUVÉ
24. Study of deposits in Joutel and Poirier townships	R. KELLY *

In addition to these undertakings, examinations of non-ferriferous deposits were carried out by D^r Dugas within the framework of the compilation of a map showing the metallic mineralizations in the Labrador Trough. Among the deposits visited were those of Blue, Dunphy, Romanet, Aulneau, Colombet, and Gerido lakes where the principal metal is copper.

Finally, R. Bureau and J. Riva, of Laval University, studied Montmorency falls in order to prepare a report which will be integrated into the series of publications entitled "Geology for All".

During the course of geological surveys by the Mineral Deposits Service and by the Geological Exploration Service, samples of sediments were collected from the shores of streams flowing in the mapped areas. These samples, which numbered 3,500 for the year 1966, were sent to the Mineral Deposits Service where G. Boiteau was engaged in classifying them and having analyses of them made by the laboratories of the Department of Natural Resources, for copper, zinc, lead, molybdenum, nickel, uranium and other elements. As soon as the analyses of these sediments are completed, the results are recorded on maps

* Member of regular personnel.

showing the locations where the samples were taken so as to study them geochemically and also to publish the findings in preliminary geological reports.

Courses in prospecting offered to the public are the responsibility of the personnel of the Quebec office of the Mineral Deposits Service. During the fiscal year 1966/67, there were no elementary courses given. However, some advanced courses of six weeks' duration were held at Laval University and at École Polytechnique.

Elementary courses concerning geology were presented by R. Paquet at the Jeunes Biologistes summer camp, at Port-au-Saumon, Charlevoix county.

With regard to basic documents, Dr. Dugas is to prepare an annotated bibliography of the metallic mineralizations, other than that of iron, in the Labrador Trough. Research and the compiling of information for the eventual completion of a metallogenic map of Quebec, which is a part of a world mosaic now in preparation, was continued. Also under preparation for publication is a compilation on the copper occurrences in the Province of Quebec.

In the domain of technical revision, the following maps and reports received attention from J. Dugas and R. Gagnon before the manuscripts were sent to the Editing Division.

Geology of the Mount Richardson area

(Preliminary report by P. GIRARD)

Geology of the southeast quarter of Nelligan township

(Preliminary report by J. A. MACINTOSH)

Geology of Lesseps Brook area

(Preliminary report by J.-L. ROBERT)

Geology of Beauvoir -- Ascot Corner area

(Preliminary report by R.-Y. LAMARCHE)

Geology of the northwest quarter of Rinfret

(Preliminary report by G. ALLARD)

Geology of the south half of Perron township

(Preliminary report by R. BOGOCH)

Montmorency Falls

(Booklet prepared by R. BUREAU and J. RIVA)

Val-Jalbert Park

(Booklet prepared by R. SABOURIN)

Resident geologists of the regional offices accomplish an indispensable part of the work of the Mineral Deposits Service. Each has the task of keeping himself informed concerning the mining operations and mining development work taking place within the limits of his special territory. These geologists have to compile geological information, correlate that information and answer all requests for information coming from mining companies and prospectors. They also have the responsibility of visiting mining properties and of preparing reports on the geology, economic value and the stage of development of these properties. Moreover, they supervise the mapping, on a detailed scale, of the geology of their respective districts.

It should also be mentioned that resident geologists collaborate in the launching and in the carrying out of projects by government researchers or by scientific investigators from universities. In order to help them carry out their duties, resident geologists are provided with a collection as complete as possible of reports, maps and other documents pertinent to the geology and mining operations of the regions where they are stationed.

G. Duquette, resident geologist of the Chibougamau district, visited seven mining properties and wrote four visit reports. Moreover, in order to follow up work which had taken place during the summer of 1965 on a property, he carried out a detailed geological survey of the northwest quarter of McKenzie township and produced a preliminary report on this area. At least 250 persons visited his office during the year reviewed here.

In the Val-d'Or district, M. Latulippe made 19 trips to mining properties and prepared two reports. Furthermore, he wrote the drilling logs of four holes put down for water by the Department of Agriculture and Colonization and spent six days studying the geology of Senneterre township. There were 655 visitors to his office during the fiscal year 1966/67.

At Rouyn, John I. Sharpe made 12 visits to mining properties and prepared five reports. He received about 590 visitors.

During the year reviewed, resident geologists started to make files of the principal deposits of their districts. These files, along with complete statistics on the production and reserves of all the mines, shall be useful in the preparation of mineral deposits maps, at the scale of four miles to the inch, on which will appear all important geological information pertaining to each deposit. These mineral deposits maps will follow the production of metallogenic maps at the same scale.

Five geologists of the Mineral Deposits Service took part in scientific and industrial meetings held during the fiscal period under study.

Ovide Maurice was actively engaged in the preparation of a technical program for the Canadian Institute of Mines and Metallurgy Congress which took place at Quebec from April 24 to April 27, 1966. On this occasion Dr. Maurice presented a paper on ornamental stones in Canada entitled "Is the Building Stone Industry Declining in Canada?"

Jean Dugas and Roger Sirois presented, at this same congress, a paper entitled "Metallogenic Maps in Quebec: Their Preparation and Use". This paper was published in the January 1967 issue of the bulletin of the organization.

Dr. Sharpe acted as president of the technical sessions of the geology division of the C.I.M. He was also named president of the committee responsible for organizing a geological excursion for the forthcoming September.

Dr. Assad is a member of the committee created by the Geological Commission of Canada for setting up a system for coordinating geological information.

While president of the subcommittee on geological information gathered in the field, Dr. Assad prepared on this subject a chapter of the final report of the committee.

Hydrogeology Service

Raymond Roy, director of the Hydrogeology Service, submits the following account of the activities of his section during the fiscal year 1966/67.

The personnel of the Hydrogeology Service was, as of March 31, 1967, made up of the following: three engineer-geologists, one geologist, one technician, two technical assistants, one rotary drill operator, one master-solderer apprentice, one secretary-stenographer and two typists. Two employees resigned during the year reviewed, namely: Michel Houde, who accepted a position in the Provincial Department of Education, and Claude René, who took employment with a mining company.

Starting from January 1, 1967, the name of the Gas, Water and Petroleum Service was changed to that of Hydrogeology Service, owing to the transfer of the Natural Gas and Petroleum Division * to the Mineral Deposits Service. It may be noted here that the setting up of this Division goes back nearly ten years. Before that time, because of its limited activities, it was linked to the Hydrology section, which was then a part of the Geological Mapping Service. For more detailed information on the operations of the Natural Gas and Petroleum Division, the reader is referred to the section of this report entitled "Mineral Deposits Service".

As in preceding years, the Hydrogeology Service of the Quebec Department of Natural Resources carried out extensive searchings for underground sources of water at the request of municipalities. Moreover, the Service undertook hydrogeological studies on a regional and limited scale at certain places in the Province.

Presented below is a general description of the principal works, such as are grouped under the four major programs:

1. Aid to 30 municipalities of the Province;
2. Hydrogeological study in the Aylmer - Saint-François Lakes area;
3. The excavating of two test and observation wells in the Magdalen islands and in two municipalities of the Province;
4. Hydrogeological study in the Eaton River basin.

PROGRAM N^o 1: *Aid to 30 municipalities of the Province.*

These studies dealt essentially with the search of water-bearing formations favorable for the development of surface and tubular wells. In order to make the field work easier, when it was necessary, the personnel of the Service conducted seismic surveys, carried out reconnaissance drilling, and subjected all to pumping tests, which made it possible to determine the hydrogeological characteristics of the aquiferous formations studied.

From April 1, 1966, to March 31, 1967, C. Grenier, R. Dessureault, J.-J. Tremblay, G. Simard and C. René undertook and, in some cases, completed 30 of these detailed studies in 22 municipal counties of the Province.

* Paul-P. Simard was transferred to the Mineral Deposits Service.

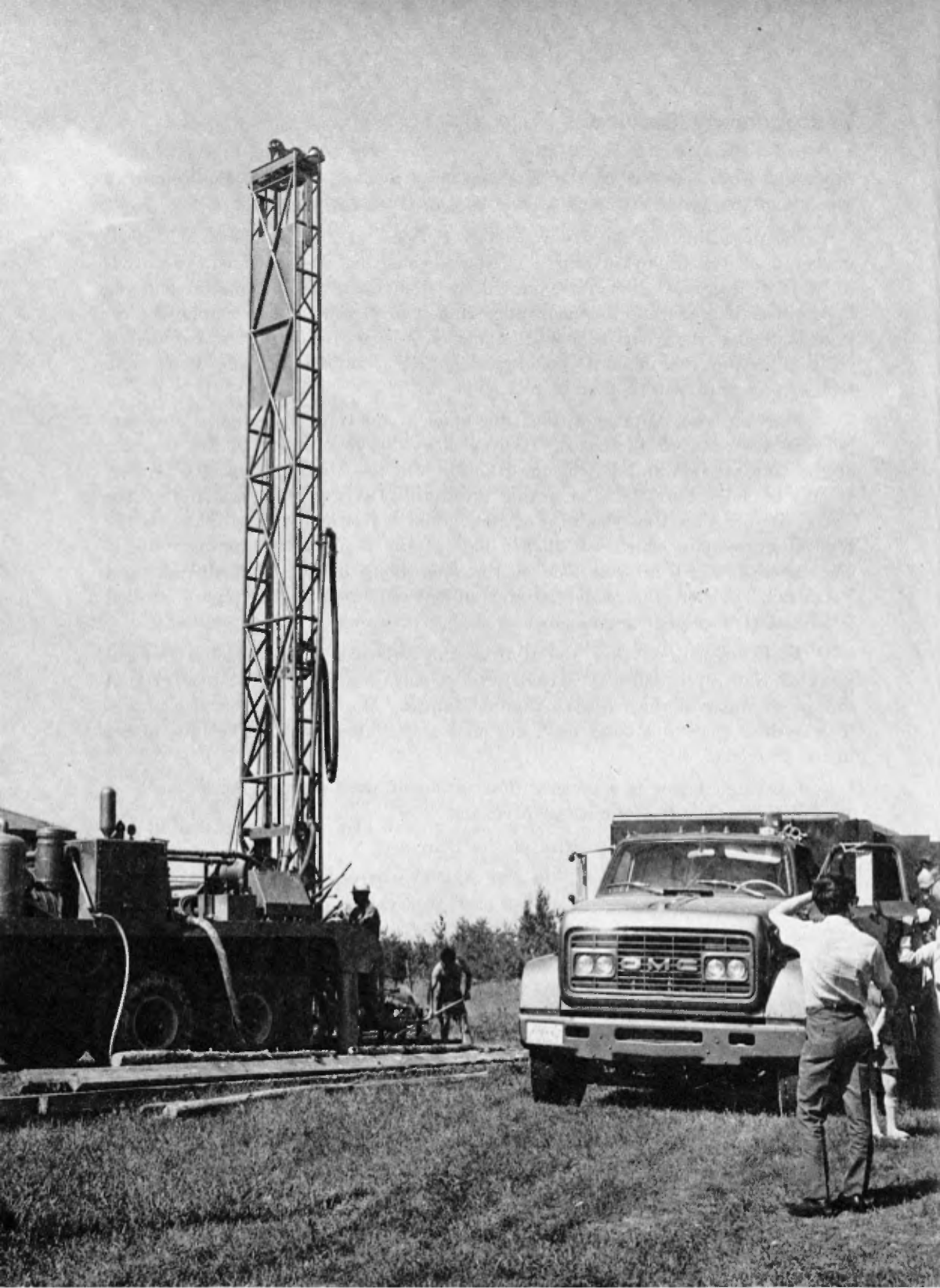


PLATE I

Boring unit : rotary drill and water truck.

PROGRAM N^o. 2: *Hydrogeological study in the Aylmer – Saint-François Lakes area under the direction of C. Grenier and G. Simard.*

The Aylmer – Saint-François area is situated about 70 miles south of Quebec City and covers a part of the counties of Wolfe and Frontenac. It lies approximately between longitudes 71°05' and 71°25' and latitudes 45°45' and 46°00', occupying an area of some 265 square miles. Theoretical calculations of the water supply, based on the total area of the drainage basins of the two lakes, do not correspond to the gauging measurements taken at the Allard and Aylmer dams. It would appear that at certain periods of the year about 100 cubic feet of water a second flows from Saint-François lake into Aylmer lake without interfering with the normal discharge. A preliminary seismic survey, followed by two reconnaissance drill-holes near the Allard dam, at the discharge of Saint-François lake, revealed overburden to a depth of at least 200 feet overlying the bedrock. The mapping of the surficial deposits, as well as a more detailed seismic study, in the valley uniting the two lakes, followed probably by electric and mechanical soundings, and the excavation of a few observation pits will make it possible, during the next fiscal year, to obtain a large number of facts and thus account for the anomaly existing between the theoretical and the observed water discharge.

PROGRAM N^o. 3: *Excavation of test and observation wells in the Magdalen islands and in two municipalities of the Province, under the direction of R. Dessureault and C. Grenier.*

These works were financed through the Act for the promotion of rural and agricultural development, known under the name of ARDA.

The first study consisted of the taking of an inventory of wells in the principal inhabited centers of the Magdalen islands, excavating eight test wells and 15 observation wells. From a geological point of view, the islands are composed mainly of sandstone, siltstone, shale, gypsum and volcanic rocks. The sandstone, which forms the bedrock for the greater part of the islands, is one of the best aquiferous formations known. As the result of pumping tests over an extended period carried out on four test wells, it was calculated that there existed a capacity of transmissibility ranging from 4,000 to 18,000 g.p.d./ft. (gallons per day per foot). The maximum specific capacity obtained is of the order of 14 g.p.m./ft. (gallons to the minute per foot).

Since the archipelago of the Magdalen Islands is completely surrounded by salt water, there are certain particular factors that must be considered, such as the influence of the tides on the piezometric levels and the possible invasion of seawater infiltrating the formations containing fresh water. In order to be able to follow the fluctuations of the water-table, engineers of the Hydrogeology Service installed two limnographs: one in the island of Havre-Aubert and the other on the island of Cap-aux-Meules. During the next fiscal year, other pumping tests will be carried out and additional limnographs will be installed.

The second study concerned the excavation of test wells in two rural municipalities of the Province that had already been the object of a hydro-



PLATE II

Technicians drilling a stratigraphic bore-hole.

geological survey. This work is only partially completed and it is intended to cover 11 municipalities in all. In Notre-Dame-du-Nord, Témiscamingue county, a pumping test of an experimental well, bottomed in a gravel formation, indicated a capacity for transmissibility of the order of 300,000 g.p.d./ft. and a specific capacity of 6 g.p.m./ft. At Bryson, Pontiac county, the test well was terminated in a rock of the crystalline limestone type. The known transmissibility capacity is 1,000 g.p.d./ft. and the specific capacity is 1 g.p.m./ft. In these two municipalities the possibility of supplying the population with fresh water is thus favorably confirmed.

PROGRAM N^o. 4: *Hydrogeological study in the Eaton River basin within the framework of the International Hydrological Decade, under the direction of J.-J. Tremblay and F. Gilbert.*

The study of the Eaton River basin which began in 1965 was carried out by the Hydrogeology Service and the Waters Branch of the Quebec Department of Natural Resources. The basin is in the Appalachians and comprises the tract between longitudes 71°10' and 71°45', and latitudes 45°10' and 45°30'. The area of Eaton River basin is 250 square miles. Between the outlet and the highest point of this basin there is a difference in elevation of 1,300 feet.

Up to the present time, nearly half of the Eaton River basin has been studied by the seismic method. This method made it possible to determine the thickness of the overburden and also certain geological parameters. Moreover, samples of water gathered from various tributaries and from a few wells in the basin were submitted for analysis in order to determine whether there exists a direct relationship between surficial waters and those of subterranean origin. It appears, in fact, that the water accumulated in the alluvions is directly related to the drainage at depth. Before this hypothesis can be proved, however, it will be necessary to compile a great deal of information. For this reason, during the next fiscal year, an extensive program of reconnaissance drilling will be undertaken, which will be connected with the installation of piezometric networks. These piezometers will make it possible to observe the fluctuations of the water-table in different lithological units and perhaps also enable the personnel of the Hydrogeology Service to determine the store of underground water in each aquifer.

Furthermore, an engineer of the Hydrogeology Service took an inventory of the wells in the Montreal area. Most of his work was in the counties of Chambly and Verchères where he plotted the largest possible number of wells by the quadrillé method and, for each well, prepared a brief description concerning the following subjects: depth, diameter, supply, quality of water, and lithology.

It may be pointed out also that the professional personnel of the Hydrogeology Service assisted at conferences, symposiums, and study sessions dealing with hydrogeology. Georges Simard, an engineer, followed a popular course on the principles of hydrology that was held at the University of Saskatchewan from September 6 to September 23. This course was essentially concerned with the hydrological cycle of water. J.-J. Tremblay, geologist, presented a paper

before a joint meeting of the Geological and Mineralogical Associations of Canada, during meetings that took place in Halifax on September 12 and 13, 1966. The title of the paper was "The Geochemistry of Underground Water in the Belœil Area".

During the fiscal year under review here the Hydrogeology Service likewise did the preparatory work on regulations dealing with the exploitation of subterranean waters.

Cartography Service

The Cartography Service was organized in 1936. It was directed by Marc Boyer from 1936 to 1944 and by Léon Valois from 1944 to 1961. Since 1961, this Service has been under the direction of A. Blanchette and his assistant, Gérard Côté.

As of April 1, 1966, the Service was staffed by 21 persons. The staff comprised one technician in graphic arts, one secretary, 16 technicians specialized in topography and one messenger-clerk.

The Cartography Service is made up of three divisions. The chief technicians of these three divisions are André Lehoux, Raymond Tanguay and Yvon Lebel. The co-ordinator, André Lehoux, attends to the publication of maps and directs the Topography Division. Raymond Tanguay is assigned to the preparation of maps for field parties and is also in charge of the Mining Claims Maps Division. Yvon Lebel, who is responsible for the Geological Maps Division, sees to the tracing of geological maps.

This Service is occupied mainly with the drawing up of the various maps, diagrams and plans needed by the several services of the Quebec Department of Natural Resources. Its principal work consists in: (1) the preparation of base maps required by geological field parties; (2) keeping maps of mining claims up to date; and (3) tracing maps which accompany publications, particularly those of a geological nature.

It is one of the tasks of the Cartography Service to prepare on tracing linen, from the topographic data gathered from aerial photographs and other sources, the base maps that field parties use on their geological expeditions.

Moreover, the Service keeps up to date two series of maps on tracing linen, drawn to the scale of one inch to the half mile. One of these tracings shows the location of mining claims and mining concessions and the other, the boundaries of mining properties. The number of maps comprising the series indicating properties is 501, whereas 30,504 new mining claims have been plotted on the 1,499 maps of the first series.

In answer to numerous requests received during the course of the fiscal year under review here, the Service distributed 17,169 copies of these traced maps.

Nevertheless, the most important duties of the Cartography Service still remain the preparation of the maps which accompany all geological reports.

and the supervising of the printing of those maps that are produced by a lithographer. These maps illustrate the geology studied in the field and show the topography, township boundaries and location of mining properties. There are two types of maps and they accompany the preliminary and final reports respectively. The preliminary maps are printed in black, green, red and blue, whereas the final maps, completed after more advanced geological research in order to illustrate a more definite geological interpretation of an area, are drawn in such a manner that they may be printed in several colors.

The 14 preliminary geological maps published during the year under review in this volume cover the following areas :

- N^o. 1607. Lake Memphremagog area
- N^o. 1607*a*. Fossiliferous Deposits (Memphremagog)
- N^o. 1698. Assinica Lake area
- N^o. 1609. Northeast quarter of McKenzie township
- N^o. 1611. Saint-Michel-des-Saints area
- N^o. 1614. Northeast quarter of Roy township
- N^o. 1615. East half of Gaboury township
- N^o. 1616. L'Anse Saint-Jean area
- N^o. 1617. Lantagnac – Latouche area
- N^o. 1618. Dunphy Lake area
- N^o. 1621. Baskatong Reservoir area
- N^o. 1627. Percé area
- N^o. 1628. Forillon Peninsula area (Cap Bon-Ami Park)
- N^o. 1629. Mining developments north of the 50th parallel.

The other 11 (colored) maps are detailed geological maps, published during the year under study here :

- N^o. 1568. Chandler – Port-Daniel area
- N^o. 1569. Châteauguay area
- N^o. 1570. Cuoq – Langis area
- N^o. 1571. Takwa River area
- N^o. 1572. Frotet and Troilus Lakes area
- N^o. 1573. Duquet – McOuat area
- N^o. 1577. Belleau – Desaulniers area
- N^o. 1600. Metallic mineralization of Northwest Quebec (6 sheets)
- N^o. 1610. Saint-Gabriel-de-Brandon area
- N^o. 1619. Orford – Sherbrooke area
- N^o. 1630. Index of geological maps.

Moreover, the Cartography Service prepared 23 plans for the Hydrogeology Service and the Natural Gas and Petroleum Division, as well as 78 diagrams and plans for publication. Finally, the layout section prepared 430 forms, graphs, vignettes and covers for reports. This work was done at the request of the Information and Publications Branch of the Department of Natural Resources.

MINING SERVICES

The Mining Services consists of three administrative services, namely:

- (a) the Mining Domain Service;
- (b) the Inspection of Mines Service, and
- (c) the Engineering Service (Mines).

They are responsible for the application of the Mining Act in what concerns:

1. The granting of mining titles on Crown lands through issuance, as the case may be, of registration of mining claims, development licenses or special permits; the sale or rent of lands for mining operation purposes, and the ascertaining whether the holders of mining rights fulfill the obligations set down by the titles they hold.
2. Inspections to ensure that working conditions in mines, quarries, and plants conform to the Mining Act and regulations regarding the safety and health of workers in mines.
3. The preparation and execution of engineering works necessary to the opening of new mining districts or new mining installations, including the construction of mining access roads, the establishment of mining villages, etc.

Mining Domain Service

The Mining Domain Service is responsible for granting mining titles on Crown lands. It sees that holders of these titles fulfill the obligations that go with these rights and it studies requests addressed to the Department relating to the sale or rental of lands for the purpose of mining operations. The Service investigates exploration and development work reports, receives and compiles the statistical reports that all operators must supply each year, and supervises the application of the "Unwrought Metal Sales Act".

The administrative tasks of the Mining Domain Service are carried out by three divisions: the Claims Division, the Licenses, Leases and Concessions Division and the Mining Operations and Obligations Control Division.

Claims Division

All operations relating to the issuance of prospectors' licenses, the registration of mining claims and the transfer of mining rights are handled by the Claims Division, in accordance with Sections 12, 38, 45, and 195 of the Mining Act (13-14 Elizabeth II, Chapter 34). These operations represent a multitude of tasks and involve several varied and different procedures.

The regional offices of Quebec, Amos, Rouyn, Chibougamau, Bourlamaque and Montreal issue prospectors' licenses and collect the fees for the issuance of various mining titles and for the registration of transfers of mining rights. Moreover, the personnel of these offices have to answer the various demands for information that are made to it.

All these regional offices, except those in Bourlamaque and Montreal, register mining claims in their respective districts. In the centers of Hull, Ville-Marie and Campbell's Bay, prospectors' licenses are issued by agents who are stationed in these places. However, it is well to note that the Quebec office is the only one responsible for the registration of transfers of mining rights.

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

Issuance of 10,095 prospectors' licenses;

Acknowledgement and registration of 30,504 mining claims;

Registration of 2,168 transfers of mining rights pursuant to the prescriptions of Section 195 of the Mining Act.

Moreover, it is worth while mentioning that, during the fiscal year reviewed here, four requests for the withdrawal of staking on lands were approved by the Lieutenant-Governor in Council, pursuant to the provisions of paragraph 1 of Section 268 of the Mining Act. These requests pertained to:

1. A parcel of land located in the electoral district of Matane and comprising a part of the seigniorship of Matane and Matane township;
2. A parcel of land located in the electoral district of Nicolet and comprising a part of the parish of Saint-Edouard-de-Gentilly and St. Lawrence river;
3. The lands located at a distance of 20 chains or less from the reservoir water-storage works of the Mercier dams.
4. The riparian lands contiguous to the water-storage works of Mitchinamekus reservoir and located at a distance of 20 chains or less from these works.

Licenses, Leases and Concessions Division

This Division, the personnel of which are stationed in the Quebec office, is responsible for such duties as concern the issuance or renewal of development licenses, exploration licenses, special licenses, exploration permits, mining

leases, mining concessions, and operating leases. This Division is also responsible for preparing and recommending the issuance of letters patent. These functions are carried out by virtue of Sections 62, 68, 136, 189, 210, 270, 89, 113, 117, and 160 of the Mining Act (13-14 Elizabeth II, Chapter 34).

The Licenses, Leases and Concessions Division has also the task of seeing that holders of mining titles abide by the prescriptions of the Mining Act and fulfill all the obligations laid down by their titles.

In respect to the activities briefly described above, the operations of the Licenses, Leases, and Concessions Division for the fiscal year being reviewed may be divided as follows:

1. Issuance or renewal of 7,341 development licenses;
2. Sale of four mining concessions and granting of two mining leases upon the recommendation of the director of the Mining Services, by virtue of Sections 113 and 89 of the Mining Act.

From solemn declarations submitted by claim-holders in conformity with the provisions of Sections 62 and 68 of the Mining Act, it is worthy of note that development work carried out on the lands concerned for the fiscal period reviewed was equivalent to a total of 8,222,390 hours.

It is this Division that mainly assumes the task of issuing the exploration licenses authorized by the Minister of Natural Resources, by virtue of Division XVI of the Mining Act.

During the fiscal year 1966/67, the Minister authorized the issuance of 16 exploration licenses for petroleum and natural gas in the St. Lawrence valley and in the Gaspé peninsula, as follows:

- (a) The first comprising an area of 5,350 acres in the electoral district of l'Assomption;
- (b) The second comprising an area of 59,000 acres, in the electoral district of Berthier;
- (c) The third comprising an area of 39,700 acres in the electoral district of Joliette;
- (d) The fourth comprising an area of 34,000 acres in the electoral district of Huntingdon;
- (e) The fifth comprising an area of 56,400 acres in the electoral district of Gaspé-South;
- (f) The sixth comprising an area of 54,000 acres in the electoral district of Gaspé-South;
- (g) The seventh comprising an area of 60,000 acres in the electoral district of Gaspé-South;
- (h) The eighth comprising an area of 60,000 acres in the electoral district of Gaspé-South;
- (i) The ninth comprising an area of 57,000 acres in the electoral district of Gaspé-South;

- (j) The tenth comprising an area of 24,000 acres in the electoral districts of Huntingdon and Soulanges;
- (k) The eleventh comprising an area of 57,600 acres in the electoral district of Gaspé-South;
- (l) The twelfth comprising an area of 57,600 acres in the electoral districts of Gaspé-North and Gaspé-South;
- (m) The thirteenth comprising an area of 54,725 acres in the electoral districts of Gaspé-North and Gaspé-South;
- (n) The fourteenth comprising an area of 44,350 acres in the electoral districts of Gaspé-North and Gaspé-South;
- (o) The fifteenth comprising an area of 51,850 acres in the electoral districts of Gaspé-North and Gaspé-South;
- (p) The sixteenth comprising an area of 26,500 acres in the electoral district of Gaspé-North.

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

- (a) The first license is valid for all minerals and covers an area in Beauchastel township, electoral district of Rouyn-Noranda;
- (b) The second license is valid for minerals other than gold and silver and covers an area in Brompton township, electoral district of Richmond;
- (c) The third license is valid for minerals other than gold and silver and covers an area in Stukely township, electoral district of Shefford;
- (d) The fourth license is valid for minerals other than gold and silver and covers an area in Brome township, electoral district of Brome.

The Minister may also authorize, by virtue of Section 270 of the Mining Act, the issuance of exploration permits for the search of mineral substances, except petroleum and natural gas, in the territory of New Quebec. During the year reviewed, the Minister authorized one such license covering an area of 28.5 square miles in the region of Kaniapiskou river, east of Cambrien lake in the territory of New Quebec.

Moreover, this Division attended to the preparation and issuance of an operating lease for petroleum and natural gas covering an area of 5,500 acres in the electoral district of Saint-Maurice. This was in conformity with Section 160 of the Mining Act.

Mining Operations and Obligations Control Division

Pursuant to the prescriptions of Sections 99, 133, 223 and 243 of the Mining Act (13-14 Elizabeth II, Chapter 34), this Division was engaged in the study of requests presented to the Department of Natural Resources for the approval

of the Lieutenant-Governor in Council and dealing with the locating of the installations necessary to the operation of mines and to sites for rejected material.

At the present time, eleven companies hold leases which were consented to under the former Quebec Mining Act at prices and rates and upon conditions established by Order in Council on Crown lands entitling them to deposit their rejected material or waste-rock on these lands; one company works a sand and gravel deposit; another company has under rent a strip of land for the right of way for a pipe-line. Moreover, the Department continues to rent to an operator a strip of land that was obtained under the former Quebec Mining Act for the installation and operation of a telfer railway.

During the course of his nine inspection trips, an engineer of the Service visited 15 producing or abandoned mines and gathered from these samples for the purpose of studying the effects of effluents flowing from waste dumps into nearby hydrographic basins.

Since January 1, 1966, the date of the coming into force of the Mining Act (13-14 Elizabeth II, Chapter 34), the Department of Natural Resources is responsible for the disposal, under conditions determined by regulation, of the right of working sand and gravel deposits. All demands made to the Department are studied by the Mining Operations and Obligations Control Division. Should there be no objection relating to public interest, the requested permit is then granted. The Department, in collaboration with that of Roads, issued, during the course of the year reviewed, 52 operating licenses for the exploitation of sand and gravel deposits on public lands, in accordance with Section 129 of the Mining Act.

In order to conform with Divisions VIII and IX of the Mining Act, a claim-holder must, within the prescribed delay, carry out, declare and submit exploration and development works on the lands on which he wishes to keep the mining rights he has already obtained. It is again the responsibility of the Mining Operations and Obligations Control Division to examine the justifying documents supplied by claim-holders.

During the fiscal year 1966/67, a geologist approved about 190 geological or geochemical studies, 320 land geophysical studies, 61 airborne geophysical studies, 319 reports on diamond drilling work, and 15 statements submitted on laboratory research work, metallurgical assays and treatment of ore.

Moreover, this Division had the responsibility of studying three reports which had been submitted in support of requests for mining leases and two reports in support of mining concessions, in compliance with prescriptions of Divisions X and XI of the Mining Act.

The Department of Natural Resources continued to study, as in the past, requests for information relating to the reports that every mining company has the obligation of supplying under the provisions of "regulation made under the Quebec Securities Act" (3-4 Elizabeth II, Chapter 11, and its amendments) for the issuance or renewal of its registration as a broker. During the year reviewed, the Department received from the Quebec Securities Commission 67

requests for information bearing on mining companies that had submitted reports.

Since 1963, the Quebec Bureau of Statistics has charge of gathering and compiling statistics pertinent to the mining industry. However, this Bureau is obliged to transmit to the Department of Natural Resources a copy of all the reports that it receives and to supply the Department with all the compilations needed.

As in previous years, the Division of Statistics has the task of keeping up to date, in conformity with the provisions of Section 250 of the Mining Act, a list of the operators of mines and quarries of the Province. This list, which is sent to the Quebec Bureau of Statistics, is very useful to the Bureau for dispatching to the operators questionnaires related to the preparation of its annual report.

To help in the organized and continually up-to-date filing, all reports received from the Quebec Bureau of Statistics are the object of a meticulous examination that, in many cases, results in necessary corrections, which are in turn made known to the Bureau so that it can rectify the original reports that it holds. This control system makes it possible to obtain reasonably accurate results and gives a true picture of shipments, values, manual labor, etc. in the mines of the Province, and also to answer adequately all requests for information from departmental or other services. It may be pointed out furthermore that, during the year reviewed, this Division collaborated more actively than in past years in the preparation of the report entitled "Mining Industry in Quebec", by presenting more extensive tables, setting up graphs and writing explanations which are included in the statistical section of that publication.

Inspection of Mines Service

The Inspection of Mines Service is responsible for the application of regulations concerning the health and safety of workers in mines, in accordance with Sections 256 to 267 of the Mining Act. This involves regular inspection of mines, open-pit operations, and quarries, including the inspection of electrical and mechanical installations and smelters; testing the cleanliness of air in mining operations; investigating accidents or other occurrences which may affect the lives of workers in the mining industry; and directing the annual mines rescue program.

In the course of their regular inspections of mines and quarries, engineers of the Service obtain information on current and future operations of operators that is useful in governmental administration.

Engineers of the Service proceeded, in 1966/67, to carry out 412 inspections of mines and quarries. These inspections, conducted during working hours, allowed the engineers to examine working conditions and work in progress and to verify whether the safety regulations were being well observed as to the disposition of working premises, the condition of machines, and the protection of workers.

Moreover, the engineers conducted inquiries into 21 fatal accidents involving 22 victims and investigated other unusual events, following which reports were published.

For their part, electrical engineers of the Service conducted 116 inspections of electrical installations, verifying whether these conformed to regulations of the Mining Act. They examined detailed plans of new electrical installations or modifications to existing ones that had been submitted to the Department for approval.

The Department is also responsible for the approval and inspection of mechanical installations, such as mine hoists, compressors, etc. The Mechanical Installations Division of the Inspection of Mines Service supervises the installation of all new hoists and other types of heavy equipment in mines and quarries and conducts periodic verifications to ensure that the equipment conforms to safety regulations and that its maintenance is satisfactory.

During the year under review, 25 special inspections of hoisting equipment were carried out. Also, a number of mines and quarries were visited in order to investigate mechanical accidents or to discuss various specific problems. The Division received 227 hoist-cable registration reports, 343 rope-breaking test reports, 121 steam-boiler inspection reports, and 276 medical certificates on hoist operators. The study of these documents permits the engineers to exercise a strict control on all hoist-cables and boilers used in mines and quarries.

For several years now, some mines have voluntarily adopted the electromagnetic method of cable testing. During the 1966/67 fiscal year, 173 tests of this type were carried out.

During the period reviewed here, electronic instruments (oscillograph and remote-control decelerometer) were used for detailed analysis of the working of hoist brakes in mines. This work has revealed a number of interesting braking-device characteristics, and it is hoped that continual use of this equipment will enable the making of modifications to these devices so as to increase the safety of their operation.

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 mining operations. They conducted 56 control inspections and made 786 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 No. 887, dated August 30, 1956, requires that workers exposed to dust in all mining operations in the Province, including groups one, two, and three of class five of the tariff table on the Workmen's Compensation, hold a medical certificate renewable each year. The Inspection of Mines Service thus received 20,873 radiographic examination certificates submitted by miners in the course of the year under review.

Finally, it is the common practice that miners, chosen by aptitude, be trained in rescue and first-aid work in all important mines. The mining companies pay the cost of the courses or exercises which are organized and directed by the Inspection of Mines Service. During the year reviewed, 36 mines

benefited from these exercises, which have trained, since 1948, 1,487 first-aid attendants, of whom 364 are, at the present time, available in case of emergency. Interest in rescue training is stimulated by competitions and tests between teams from various mines. The annual competition took place in Val-d'Or, in May 1966, between the eight finalists of the original 24 teams that had taken part in the preliminary competitions. Quemont Mining Corporation Limited was the mine whose team won the trophy.

Engineering Service (Mines)

The Engineering Service of the Mines Branch is responsible for the preparation, execution, and supervision of the various engineering works destined to permit and facilitate the discovery, development, and mining of the mineral deposits of the Province of Quebec.

Among the principal activities of the Service that are worthy of special mention are, on the one hand, the construction of highways for the purpose of aiding prospecting in districts that hold promise from a point of view of mining operations, and access roads to mining properties the value of which has been recognized and, on the other hand, the founding of mining villages and towns in regions where mining operations have just started. This Service also has charge of the administration of the municipal funds of several mining towns and villages by orienting these moneys in the best possible manner toward the various expansion projects of these communities.

For administrative purposes, the Engineering Service of the Mines Branch comprises the Mining Roads Division and the Mining Villages Division.

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 expense of the Province, works that he considers necessary for promoting the development of the Mining Industry in this Province.

A - CONSTRUCTION OF MINING ROADS

The budget allocated in 1966/67 to the Engineering Service (Mines) for the construction of mining roads was raised to \$3,035,500. However, as early as July 1966, it was foreseen that certain works could not be carried out because of unforeseen circumstances. This situation thus freed a sum of \$600,000, which was directed to other services of the Quebec Department of Natural Resources. The available budgetary funds were therefore reduced to \$2,435,500 and out of this amount a total of \$1,855,424 was eventually spent.

Following the practice of preceding years, the Government of Canada and a few mining companies have contributed financially to certain enterprises, whereas other works were paid for entirely out of the funds of the Province.

I - WORKS CARRIED OUT WITH THE FINANCIAL COOPERATION OF THE FEDERAL GOVERNMENT FOLLOWING THE FEDERAL-PROVINCIAL AGREEMENT OF OCTOBER 18, 1960.

Since, as of March 31, 1966, Quebec had not received the maximum amount of \$7,500,000 from the Federal Government, the agreement was extended to March 31, 1967, in order that the Province could recover the balance of this contribution, which was \$219,180.04.

Waconichi Lake - Albanel Lake Road

For the various projects of this road, the Engineering Service of the Mines Branch devoted the sum of \$1,342,096 which was spent on:

1. Completely finishing the second, third, and fourth sections of this road, which represents a total length of 70 miles extending between Mile-post 22 and Mile-post 92;
2. Completing the construction of seven permanent bridges of which five span Bordeleau, Bignell, La Perche, Révélation-Sud and Révélation-Nord rivers;
3. Pursuing, after erecting a temporary bridge of the "Bailey" type across Témiscamie river at Mile-post 92, the construction of the fifth, and last, section of the road which makes it possible to reach the east shore of Albanel lake at Mile-post 97. As of March 31, 1967, about 90 per cent of the work was completed.
4. Undertaking the construction of a permanent bridge so as to span Métawishish river, which crosses the road at Mile-post 86. This bridge will be 110 feet long and 30 feet wide. Its reinforced concrete platform rests on steel girders that are supported by two concrete abutments. At the close of the fiscal year being reviewed, nearly all the material had been brought to the site and this represented about 40 per cent of the total value of the bridge.

II - WORKS CARRIED OUT WITH THE COOPERATION OF MINING COMPANIES

A - Road leading to Mines de Poirier Inc., Joutel township, Abitibi-East county

1. Widening of the first section for a distance of eight miles:
This work, which had been commenced during the preceding year, was achieved through the spending of \$128,710. The work involved the widening of the roadway from 20 feet to 36 feet and also the completing of two culverts made up of semi-circular steel plates that repose on reinforced concrete foundations.
2. Bridge over Harricana river: In order to complete this 426-foot-long bridge the Quebec Department of Natural Resources spent \$192,971.05 during the course of the fiscal year under study.

B – Road leading to the property of Chimo Gold Mines Limited, Vauquelin township, Abitibi-East county

This road is seven miles long and had to be built in stages. During the year reviewed, the Quebec Department of Natural Resources contributed \$2,630.34 toward its construction. This sum equalled 40 per cent of the cost of the work carried out by the mining company itself.

C – Road giving access to the property of Mines de Silice Supérieure Ltée, Brassard township, Berthier county

This company spent more than \$50,000 in the construction of an access road of 4.5 miles in order to reach the site of its operations and to promote the development of its mine. For these ends, the Quebec Department of Natural Resources made a contribution to the company of \$20,000.

III – WORKS PAID ENTIRELY BY THE PROVINCE OF QUEBEC

A – Chapais – Senneterre road

Since the last two years, the Department of Natural Resources has been carrying out improvements to the section of this road lying between Waswanipi river and Rapide-des-Cèdres. In 1966/67 the Department was engaged in this work, commencing from Miquelon, over a distance of 20 miles in the direction of Senneterre. To this end, it disbursed the sum of \$149,919.25.

B – Access Road to the Property of McAdams Mines Ltd. in McCorkill Township, Abitibi-East County

Construction of a part of this 13-mile-long road had been provided for in the preparation of the budget of 1966/67. However, the work was not completed because those interested in this enterprise were not ready to assume their share of the cost of the building of the road. Nevertheless, engineers of the Engineering Service (Mines) finished preparing for the project by drawing up the plans, profiles and dimensions and by marking out the position of the road on the ground. This work involved the disbursement of \$8,500.

C – Various Roads

The settlement of certain outstanding accounts resulting from professional fees for plans, specifications and supervision of construction of a bridge spanning Waswanipi river, as well as the expenses of surveying the Amos – Matagami road, necessitated a disbursement totalling \$10,000.

B – MAINTENANCE OF MINING ROADS

During the fiscal year 1966/67, the Engineering Service (Mines) had to assume the responsibility of maintaining about 230 miles of roads. Since the Quebec

Department of Natural Resources does not possess the equipment to carry out this work, it is obliged to rent the necessary machinery. In the case of the Chapais-Senneterre road and of roads in the vicinity of Chibougamau, maintenance was carried out with the complete cooperation of the Department of Roads, which was reimbursed by the Quebec Department of Natural Resources for all expenses, that is for a total of \$278,718.34. If to this figure the sums spent by individuals and private enterprises for the upkeep of other roads be added, the cumulative total expenses come to \$375,000 for maintenance, for the fiscal year under review.

It may be pointed out here that on November 2, 1966, the Lieutenant-Governor in Council approved the transfer, to the Department of Roads, of the jurisdiction of certain mining roads that had become with the passing years completely integrated with the road network of Quebec. Such a transfer of jurisdiction was fully justified by reason of the economy and efficacy in maintenance that can result from this action.

By virtue of the same Order in Council, this principle shall apply likewise to those roads that the Department of Natural Resources will construct each year, as well as to those that are now being maintained at the expense of mining companies but which, for reasons of public interest or other causes, should become the burden of the Crown.

Division of Mining Villages

Purpose

The Division of Mining Villages was organized in 1936 for the purpose of promoting the rational development of the different types of urban buildings on mining concessions in Northwestern Quebec and to ensure that persons who settle in mining towns and villages have the same advantages offered to them as are available to those dwelling in small towns 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 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 mining towns and villages on Crown lands in order to ensure that persons who choose to live in these new settlements will have from the very beginning adequate municipal, cultural and educational services.

Accomplishments

The first two mining villages to be entirely established under the direction of the Quebec Department of Natural Resources were that of Chibougamau in McKenzie township, by Order in Council N^o 436, dated April 19, 1950, and that of Matagami in Isle-Dieu township by virtue of Order in Council N^o 1493, dated June 30, 1961. The respective populations of these two towns were, as of January 1, 1967, 9,000 and 2,800.



Order in Council N^o. 565 of March 23, 1965, authorized the Minister of Natural Resources to undertake the work of establishment, opening streets, and setting up municipal services in the village of Joutel in the township of the same name. More than 125 families have already been installed there.

Method followed for 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 pure and simple deeds of sale.

These conditions, as permanently 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 to the consolidated fund of the Province a sum representing \$0.01 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 seventy per cent (70%) 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 and legal fees and administration costs involved in the transfer of the sites.

B - On Crown Lands

In mining towns and villages constructed on Crown lands, the sale of lots is carried out by the Department of Natural Resources, and the moneys from the sale of lots are deposited in the fund of the municipality concerned, except an amount representing \$0.01 per square foot of the surface, which amount is transferred to the consolidated fund of the Province.

The method of ceding lots is as follows:

(a) Option Contract

Upon payment of the sum of \$100 for each domestic 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 assignment. When all the condi-

tions of an option have been fulfilled, the sale is concluded and this sale is effected through letters patent.

This possibility of obtaining a new title (letters patent) in substitution for the emphyteutic lease has been considered very popular with those who already hold lots under conditions of the former lease. Thus, Iron Ore Land Company of Schefferville has availed itself of this privilege by requesting the issuance of letters patent for the 311 lots that it already holds under emphyteutic lease, and a number of firms have done the same.

Municipal Funds

The municipal fund is designed as capital created by means of revenue provided from the sale of lands situated in mining concessions or from sale of lands under the jurisdiction of the Quebec 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 the permanent municipal services, such as the construction of water-works 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 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 \$2,833,569.71 was paid to mining towns and villages. During the fiscal period ended March 31, 1967, payments to municipalities totalled \$120,000.

Works during the fiscal year 1966/67

Activities of the Mining Villages Division were, for the year under review, again directed toward the founding of the village of Joutel, in Joutel township, Abitibi-East county.

The municipal works of the first stage of the village, started during the fiscal period of 1965/66, were concluded at the beginning of the autumn of 1966. Completion of this contract comprised mainly the laying of the gravel foundations and the layers of crushed gravel on 8,000 linear feet of streets, the construction of 6,000 feet of sidewalks and of 6,500 feet of street landscaping. The networks of the water mains and sewage and rain-water pipes, which were 80 per cent constructed during the fiscal year 1965/66, were completed with the laying of water mains and the making of man-holes, drainage inlets, and services to lots. This work consisted of a municipal network of 8,000 feet and the servicing by this network of a total of 90 lots. This first section of Joutel can accommodate 150 families.

Hydro-Québec also completed, in this section of Joutel, the network of electrical distribution and the street-lighting system.

Through the payments contributed by the Department of Natural Resources, Hydro-Québec has erected round reinforced concrete posts for the distribution circuit of street-lighting.

This part of Joutel, with its 145 dwellings, church, school, hotel, curling rink, and temporary store, now needs only paved streets to resemble the small modern towns that spring up close to urban centers.

During the course of the fiscal year studied here, the Department of Natural Resources granted a contract for the construction of municipal services in the second section of the village of Joutel in order to permit the building of 150 other buildings and a permanent commercial center. It is readily seen that, with the opening of this network of more than 8,000 feet, the village will be able to cope with the demand for building lots for some years to come. This work will relieve the municipal council that will soon be set up from making capital expenditures during the first years of its existence. The second contract has been more than 80 per cent completed.

Joutel will be totally endowed, at the beginning of the next fiscal year, with a filtration plant having a daily capacity of 300,000 U.S. gallons. Works relating to this potable water supply are 95 per cent completed, and the plant should be in operation before the end of May 1967. The water, which will be drawn from Harricana river, will be treated first with alum, carbonate of soda, and calcium chloride in order then to be chlorinated and finally to be subjected to fluorination treatment. This filtration plant, which has been built in very modern style, is located just at the entrance to the village.

The cost of the municipal works at Joutel and the expenses incident to their execution amounted to \$1,301,929.05 during the fiscal year 1966/67. Up to the present time, the Quebec Department of Natural Resources has spent the sum of \$2,004,992 for works relating to the establishing of the village.

Cadastration of new subdivisions on Crown lands in the mining towns of Chibougamau, Matagami, Rouyn and Val-d'Or carried out during the fiscal period 1966/67 came to \$3,110.72.

A sum of \$995.49 was spent in the town of Matagami in connection with the installation of sanitary vans put at the disposition of the Indians. This amount will be reimbursed eventually by the Indian Affairs Branch of the Federal Government. These installations, for which the Department of Natural Resources has disbursed an amount of \$19,262.47 up to the present, represent the start of a pilot project of settling the Indians at Matagami. Different departments of the Government of Quebec and of the Federal Government in Ottawa are interested in this project, and, once the roles of the Federal and Provincial authorities are established, the Department of Natural Resources will be able to recover all or part of the expenses mentioned above.

Disbursements by the Department during the fiscal year 1966/67 attained \$1,306,035.26 for both mining towns and mining villages.

APPENDIX I
MINING TOWNS AND VILLAGES
POPULATION, LOTS SOLD, MUNICIPAL FUND

April 1, 1966 — March 31, 1967

<i>MUNICIPALITY</i>	<i>Approximate Population as of January 1967</i>	<i>Lots Sold</i>	<i>Amounts Deposited in the Municipal Fund¹</i>	<i>Balance of Municipal Fund as of March 1967</i>	<i>Amounts Withdrawn from Municipal Fund and Given to Municipalities for Municipal Works</i>
CADILLAC	1,400	Nil	\$ 253.66	\$ 785.92	
CHIBOUGAMAU	9,000	23	28,598.65	73,834.39	
JOUTEL	500	90 ²			
MATAGAMI	2,800	72	69,709.91	26,304.76	\$100,000 ³
BELLETERRE	850	Nil	676.28	686.28	
BOURLAMAQUE	4,200	Nil	2,529.72	2,898.01	5,000
CHAPAIS	2,500	5	6,021.78	4,987.79	15,000
MALARTIC	6,700	Nil	2,169.30	3,345.90	
MURDOCHVILLE	3,000	Nil		187.56	
ROUYN	20,000	9	20,448.37	23,622.48	
SCHEFFERVILLE	3,300	5	735.34	35,962.05	
VAL-D'OR	12,000	6	8,233.35	27,178.26	
TOTAL:		210	\$139,376.36	\$199,793.40	\$120,000

¹ This total includes payments due on lots sold during preceding years.

² Lots occupied as of March 31, 1967; the deeds of sale will be completed during the next fiscal year.

³ Transfer of municipal funds from the town of Matagami to the Provincial Treasurer to the amount of \$100,000 in payment for municipal works and services by the Department of Natural Resources in the town of Matagami.

LABORATORIES SERVICES

The function of the Laboratories Services is to promote all laboratory research tending to favor the discovery and utilization of the ore deposits of the Province.

Maurice Archambault and Charles-A. Olivier are the joint directors of these laboratories. They are assisted by Henri Boileau, chief chemist, and Fernand Claisse, chief physicist, on a part-time basis.

As of March 31, of the year under review, the personnel consisted of 56 persons, 20 of whom were university graduates in science.

The Services comprise a group of laboratories of four different types, as follows: chemistry, physics, metallurgy, and mineralogy-petrography.

Their activities consist of:

1. analyses and studies of minerals, ores, rocks and products derived from these substances; and
2. basic and applied research, with special emphasis on methods to discover and exploit to the fullest the mineral resources of the Province.

Given below is a summary table of the analyses and studies carried out in the various laboratories during the fiscal year reviewed here.

TABLE I

Samples received	12,085
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Routine analyses	33,741
Semi-quantitative analyses	6,112
Highly accurate or highly complex analyses	1,504
Research analyses	2,678
Mineralogical and petrographic determinations	5,939
Determinations by X-ray diffraction	1,396
Radioactive analyses	36
<hr/>	
TOTAL ANALYSES AND DETERMINATIONS	51,406

Chemistry Service

During the year reviewed, the Chemistry Service carried out 34,421 chemical analyses, of which about one third were made in duplicate. The analyses are divided as follows:

TABLE II

Routine analyses	28,785
Highly accurate or highly complex analyses	1,504
Research analyses	2,066

Among the special analyses, the following should be given particular mention:

- 52 water analyses;
- 13 alumino-silicate analyses;
- 2 gas analyses;
- 2 crude petroleum analyses.

Also worthy of note are a number of other research works undertaken with a view to perfecting new methods of analysis. One of these projects resulted in the discovery of a method having great interest to those prospecting for uranium. This method has been the object of extensive research in the Service's geochemical laboratory (see further details under research project N^o. 156).

Physics Service

The main tasks of the Physics Service is to conduct laboratory studies and analyses through methods based on the principles of physics, such as those of emission spectrography, X-ray spectrography, X-ray diffraction, and radioactivity.

The X-ray diffraction method has the advantage of making possible the identification of component substances of a sample without general chemical analysis. By this very fact it is evident that this Service complements the work of the metallurgist.

The personnel of the physics laboratories carried out analyses and studies, which may be classified as follows:

TABLE III

Emission spectrography	8,939
X-ray spectrography	675
X-ray diffraction	1,396
Radioactivity	36
	<hr/>
TOTAL:	11,046

Out of the above total, 3,266 were general quantitative analyses, 612 were research analyses and 234 were carried out for the Department of Health.

One of the staff of the Physics Service, Frédéric Abesque, conducted (a) a normative study of surgical instruments upon request of the Department of Health, and (b) a study of certain substances from the Saint-Romuald smelter, for the purpose of improving their production.

The constant goal of research projects of the Physics Service, especially in the X-ray fluorescence section, is that of perfecting standard methods of analyses (see review in research project N^o. 155).

Mineralogy and Petrography Service

The Mineralogy and Petrography Service laboratories, like the other laboratories, is at the disposal of all—governmental services, companies, and private concerns—for the identification and study of mineral substances. This Service is open for consultations and it supplies technical information to interested parties upon request.

This is the Service that is responsible for the preparation of rock and mineral collections destined for educational purposes. The following table presents in summary the main activities of the Service :

TABLE IV

Mineral determinations	5,939
Letters and reports edited	398
Thin and polished sections prepared	31
Mineral collections :	
— regular	—
— small chips	1,100
Rock collections :	
— regular	—
— small chips	1,100

As a substantial quantity of regular collections remains in stock owing to the decrease in demand, preparation of collections of this type has been temporarily discontinued.

Metallurgy Service

The Metallurgy Service has as its principal task the laboratory study of the beneficiation of ores, such as:

- (a) through mechanical processing;
- (b) through hydrometallurgy; and
- (c) through pyrometallurgy.

Charles-A. Olivier, François Simonyi and Arpad E. Torma studied Osisko lake and its vicinity for the purpose of finding a method of recovering the lake water, which is polluted to such a degree as to make it unfit for use by the neighboring cities of Noranda and Rouyn.

During the year reviewed, Silien Dessureaux went to Schefferville for the purpose of holding discussions with the personnel of the Iron Ore Company's research department in the hope of finding means by which certain types of iron deposits that have up to the present time been non-productive could be made commercially exploitable.

Charles-A. Olivier, François Simonyi and Arpad E. Torma visited Baraute in order to conduct a study of the recent installations of Quebec Lithium Corporation. On that occasion they made recommendations as to how production costs might be reduced.

The principal activities of the Metallurgy Service are to be found in the following resumé table in which the main research projects are summarized.

TABLE V

<i>Project No.</i>	<i>Subject and Work Accomplished</i>
8 (PHYSICS)	Claude Frémont conducted theoretical and practical research into the construction of a magnetometer small enough to be lowered into diamond drill-holes.
116a (PHYSICS)	Research work was done by Fernand Claisse and Claude Samson for the purpose of determining the influence of surface unevenness on the intensity of X-ray fluorescence.
116h (PHYSICS)	Fernand Claisse investigated the influence of heterogeneities on the matrix effects in X-ray fluorescence.
116m (PHYSICS)	Fernand Claisse and Michel Quintin did the basic research on the correction of the effects of matrix in X-ray fluorescence by the use of theoretical constants.
148e (METALLURGY)	Maurice Archambault and Arpad E. Torma investigated the possibilities and the advantages that might result from the use of electrolytic methods for the manufacture of lithium hydroxide starting with bicarbonated solutions.

<i>Project N^o.</i>	<i>Subject and Work Accomplished (cont'd)</i>
148z (METALLURGY)	Arpad E. Torma studied the possibilities of utilizing, as molecular sieves, the zeolites obtained from the production of lithium carbonate, by processing alkaline treatment of spodumene in accordance with the method invented by the Laboratories Services.
152 (METALLURGY)	Maurice Archambault and Silien Dessureaux pursued their research into methods of concentration by flotation of certain iron oxide hydrates from Ungava.
154 (METALLURGY)	Charles-E. Beaulieu and Jean-Jules Panneton pursued theoretical studies of the partial reduction of iron oxides at low temperature.
155 (METALLURGY)	Charles-A. Olivier, Frédéric Abesque and Jean-Louis Caouette carried out research with a view to finding a self-reducing compound having a pyrochloric base which would advantageously replace ferrocolumbium in the preparation of some special steels.
156 (CHEMISTRY)	Jean Plamondon perfected a method of analysis which makes it possible to detect, with a high degree of accuracy, tenors in sediments to the order of one-half part per million. This method is of great practical use to those engaged in geochemical prospecting for uranium.
157 (MINERALOGY)	Stephen Lakatos studied under infra-red conditions the nature of oxhydrile grouping in sepiolite and palygorskite.

Patents

The Metallurgical Service now has to its credit 57 patents, of which five were received during the fiscal year under review. These are as follows:

Canada

753,164 – Hydrothermal processing of fluoride and other lithium salts:
Maurice Archambault, Charles-A. Olivier,
Jean-Jules Panneton and Paul Fortier
February 21, 1967

United States

3,310,368 – Extraction of lithium salts and by-products:
Maurice Archambault
March 21, 1967

France

1,459,408 – Pyrometallurgical treatment of iron ores:

Charles-E. Beaulieu

October 10, 1966

Germany

1,229,054 – Direct hydrothermal production of lithium carbonate:

Maurice Archambault

March 21, 1967

Great Britain

1,024,361 – Extraction of lithium salts and by-products:

Maurice Archambault

January 27, 1967

Maurice Archambault, Charles-A. Olivier, and Charles-E. Beaulieu had to devote much of their time in maintaining the patent rights (originality and superiority) on the processes they had invented. They had, in certain cases, to prove by laboratory experiments that processes objected to by the patent office were of a different nature and of higher efficiency.

Publications

Fernand Claisse gave a lecture concerning the influence of the heterogeneities on the matrix effects of X-ray fluorescence before the congress of "Groupement pour l'Avancement des Méthodes Spectrographiques" at Paris, in June 1966.

Fernand Claisse and Michel Quintin, the latter from Université de Paris, prepared a lecture dealing with the correction of matrix effects of X-ray fluorescence through the use of theoretical constants. This work should be ready for presentation at the "Colloque International de Spectrographie" to be held in June 1967.

In April 1966, Charles-E. Beaulieu and Jean-Jules Panneton gave a lecture before the Canadian Institute of Mines and Metallurgy entitled "Bolitzing Roast Improves Magnetic Roasting".

Charles-E. Beaulieu and Jean-Jules Panneton presented a paper before the ACFAS congress at Quebec, in November 1966, entitled "Réduction des Minerais de Fer de la Région de Schefferville".

Other Activities

The personnel of the Physics Service contributed extensively to the organization of the "XIII Colloquium Spectroscopicum Internationalae", either by actually taking part in the organization committee or by making the translation of about 200 abstracts. It may be mentioned, moreover, that some members from the other laboratories collaborated in this translating work.

PILOT-PLANT SERVICES

The Pilot-Plant Services, persistently pursuing policies entrusted to it and conscious of the scientific and technological significance of the contribution it has brought and will continue to bring to the development of the mining domain, is justifiably proud of the vital part which it has played in the economic expansion of Quebec.

It is due to the constant efforts of a small but highly qualified personnel, fully aware of its responsibilities, that this participation has taken on added significance. The Pilot-Plant Services acknowledges the much valued collaboration of the Laboratories Services, without whose assistance it would have difficulty in operating efficiently.

Since 1960, close to 350 diverse projects in applied research, covering a wide variety of methods and touching in a particular and direct manner Quebec's mineral resources, were entrusted to the Pilot-Plant Services for their solution.

Every single one of these projects was the subject of special studies, carried out either in the laboratory or in the pilot-plant for the purpose of assessing the economic value of ores submitted for assay and of determining for each of these the type of treatment most appropriate, from both a technological and economical standpoint. Each of these studies, which incidently is confidential in nature, led to the presentation of reports by engineers, a good number of which contributed directly to the mining of newly discovered deposits. Other studies paved the way for introducing changes in certain concentration processes already in use. In other instances generally for reasons of the economic order directly related to market fluctuations, the data obtained were placed aside for the moment but will eventually serve new industrial undertakings.

Certain studies carried out by the Pilot-Plant Services brought to light, from the first stages of development onward, the incompatibility of some minerals to respond to the conventional method of concentration, thus ensuring that major capital investments would not be put uselessly into these projects.

There exists, however, a gap which the means in human resources and materials now at the disposal of the Pilot-Plant Services have not been able to fill. This gap is evident in the almost complete lack of oriented basic research. Even at this point, the Pilot-Plant Services has had to limit its efforts in applied research bearing on ores submitted for assay and envisaging immediate objectives. The assignment of well equipped research crews having as prime aim to seek out and find solutions to certain problems characteristic of extractive metallurgy becomes increasingly necessary, not to say essential.

To cite one example, it is by intensifying studies on certain ores still resisting economic concentration by standard methods of treatment and by further emphasis on the conception of new and better processes and apparatus that another type of the Province's natural resources, now considered useless, will become more amenable to beneficiation. Success in this field will undoubtedly result in revitalized industry.

The Pilot-Plant Services is ardent in its hopes that, in the near future, it can enter into this vast domain of oriented research, in which case the economical impact will have far-reaching effects in the mining industry, as well as in other facets of Quebec's economic life.

With a view to long-term research programs and in pace with works required by industry and other services within the Department of Natural Resources, the following four projects were initiated during the course of the year reviewed here :

- (a) A research project into the concentration of molybdenum sulfur in the presence of talc. This study is aimed at finding solutions to some of the more serious problems common to mining development in Quebec.
- (b) A research project into the purification of asbestos fibers by magnetism.
- (c) A research project into the classification of ultra-short fibers (floats).
- (d) A research project intended to perfect a new method of measuring the degree of breaking of asbestos fibers.

In each case, results obtained have proved highly favorable and preliminary works will be intensified during the forthcoming year.

If one takes into account the number of days in operation and other special conditions, the fiscal year under review may well be considered as a period of great achievement for the Pilot-Plant Services. The fact remains that in 10 months of activity, the Pilot-Plant Services received 81 lots of ores weighing a total 390,425 pounds. These it classified into 36 projects under special headings and Table I indicates, in alphabetical order, the names of shippers and, for each lot received, weight of the samples, as well as the nature of the ore submitted for metallurgical studies.

Table I

<i>Shipper</i>	<i>Number of Lots</i>	<i>Weight in lbs.</i>	<i>Nature of Ore</i>
Abitibi Asbestos Mining Co.	4	6,553	Asbestos
American Chibougamau Mines Ltd.	1	416	Magnetite
Anglo American Molybdenite	2	1,375	Molybdenite
Asbestos Corporation Ltd.	1	25	Asbestos
Assad, Robert (D.N.R.)	1	80	Peat
Assad, Robert (D.N.R.)	1	980	Fe, Ti, V
Bourré, Adélarde	1	335	Copper
Campbell Chibougamau Mines Ltd.	8	74,907	Magnetite
Carey Canadian Mines	1	200	Asbestos
Compagnie Minière Péribonka	2	230,596	Sands (Fe - Ti)

Table I (continued)

<i>Shipper</i>	<i>Number of Lots</i>	<i>Weight in lbs.</i>	<i>Nature of Ore</i>
Cormier, Antoine	1	75	Magnetite Ilmenite
Equity Exploration Ltd.	1	50	Gold
Farago, Jack	1	684	Granite
Gauthier, M.-R. (D.N.R.)	2	56	Peat
Gibbs, G.	1	200	Asbestos
Great West Mining & Smelting	1	600	Magnetite Ilmenite
Laboratoires d'Inspection et d'Essais Inc. ...	7	791	Aggregates
Laboratoire de la Voirie	3	1,010	Aggregates
Lacombe, Pierre	3	34,763	Graphite
Lambert, Louis	1	100	Asbestos
Landsdonne Exploration	1	13	Asbestos
Lynn MacLoad Eng. Co.	1	2,000	Asbestos
Maurice, O. (D.N.R.)	1	50	Granite
Muscocho Exploration Ltd.	1	155	Magnetite
National Asbestos	1	22	Asbestos
North American Mining & Explo. Co.	1	6	Magnetite
Portneuf Mineral Corp.	1	20,000	Molybdenite Mica
Quebec Asbestos Mining Association Research Testing Laboratory	3	75	Asbestos
Quebec Iron & Titanium Co.	2	8,600	Ilmenite
Red Mill Industries	1	75	Iron oxide
Roy, Marius (Laval University)	1	1,609	Limestone Quartz
Simard, Antoine (D.N.R.)	3	434	Peat
St. Lawrence Columbian & Metal Corp.	3	1,016	Columbium
Terra Nova Exploration Ltd.	3	2,235	Magnetite Ilmenite
Terra Nova Exploration Ltd.	1	220	Copper
The Ruberoid Co.	14	119	Asbestos
	—	—	
	TOTAL:	81	390,425

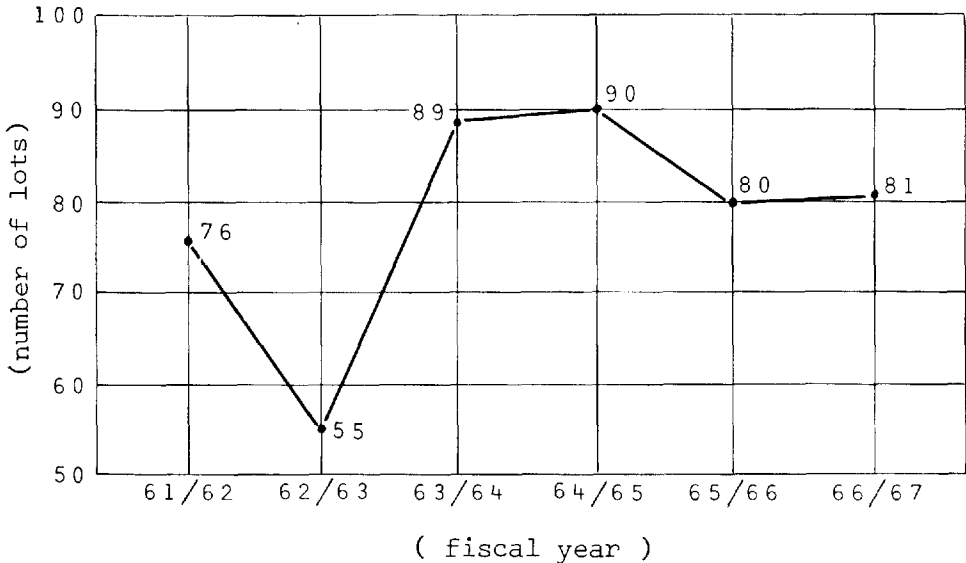
Table II reclassifies these same projects according to the nature of samples received.

Table II

<i>Nature of Ore</i>	<i>Number of Projects</i>
Iron, titanium	11
Asbestos	10
Metallic Sulfides (including gold and silver)	5
Others	10
	—
TOTAL:	36

The following graph gives the annual variations in arrivals of lots of ores submitted for metallurgical studies over the last five years.

Table III



As in other years, leading ores were those of iron, titanium, and asbestos, which figured somewhat more prominently than sulfide minerals.

The year under review here, although not exceptional in the strict sense of the word, proved highly satisfactory for the Pilot-Plant Services. During this period, ambitious work programs carried out by a number of engineers led to the presentation of 28 reports of which some will definitely have a direct bearing on the Quebec Mining Industry.

The Pilot-Plant has at its disposal first-class material which it intends to maintain in a state of constant progression so that it may keep pace with the rapid evolution in modern technology, particularly in the field of instrumentation and automation.

WATERS BRANCH

HYDRAULIC SERVICES

The Hydraulic Services, through the three Services making up this body, is responsible for administrating the rights of the Crown on surface waters of the public domain, for the application of the Act Respecting the Use of Water-courses, and for the carrying out of works and operations conducive to the conservation, development and exploitation of hydraulic resources.

The Water-courses Act, which was sanctioned in 1918, is no longer an adequate instrument for the administration of the water resources of the Province of Quebec. There is urgent need for this Act to be amended and, indeed, eventually to be completely revamped. During the fiscal year 1966/67, the Hydraulic Services reformulated the amendments that had been proposed since 1962. There is now good reason to believe that these amendments will be presented before the Legislature in the near future. The basic studies necessary for the working out of an entirely new legislation were pursued under the direction of the Hydraulic Services during the fiscal period studied here.

In the field of administration of the rights of the Crown in what pertains to the waters of the public domain, the Hydraulic Services has been placing more and more emphasis on the conservation aspect of this resource, while allowing the riparian property holders the exercise of a reasonable control of it.

In what relates to the realization of office and field work undertaken by the Hydraulic Services for the purpose of ensuring the development of the resource or for the protection and fight against floods, all in response to current requests or needs, energies of the Service are being directed more and more toward the perfecting of a general plan for the systematic control of hydrographic basins and sub-basins.

Activities special to the three Services making up the Hydraulic Services are presented below.

Engineering Service (Waters)

During the 1966/67 fiscal year, the Engineering Service (Waters), as in the preceding year, consisted of a group of four divisions, the activities and accomplishments of which for this period were shared as described below.

REMEDIAL WORKS DIVISION

Personnel

The Remedial Works Division was staffed during the fiscal year reviewed by an engineer in charge of the Division, four other engineers, two technical officers, three technicians, and a construction clerk.

Activities

As in past years, the standards and directives that had previously been given by the authorities of the Department of Natural Resources to the Engineering Service (Waters) in matters dealing with water works were rigorously followed.

During the fiscal year 1966/67, the major part of the field program, as well as an important part of the budget, was devoted to the pursuit of remedial works connected to the general Chaudière project.

It should likewise be mentioned that, during this fiscal year reviewed here, most of the projects prepared and accomplished by this Division and which could be in the context of the Federal-Provincial agreement on the economic recovery of rural areas, for the years 1965 to 1970, were previously submitted to the A.R.D.A. organization. The expenses entailed in these undertakings conforming to established standards were or will be eventually reimbursed in favor of the Department.

Achievements

The program carried out by the Remedial Works Division during the fiscal year 1966/67 includes the completion of 29 projects costing \$501,158.27. Eight of these projects were carried out within the framework of the general Chaudière plan at the cost of \$243,793.47. To this amount must be added the sum of \$3,339, which went to defray part of the cost, that is a balance due for professional fees of a legal adviser in the land expropriation in the parish of Saint-François-de-Beauce, during the fiscal period reviewed.

A summary description of each of the 29 projects which were accomplished during the fiscal year 1966/67, as well as a recapitulative table (N^o 1) showing costs of the works carried out, is given further on in this report.

Moreover, the Remedial Works Division received 116 requests for intervention, 110 of which came from various municipalities of the Province and six were sent in by the different departments or governmental organizations. The recommendations given after a study of each request may be classified as follows:

Sixty-five requests were rejected after inspection and study, since they did not meet the standards laid down by the Department of Natural Resources for warranting intervention.

Twenty-five requests are still pending until additional information required to make a final decision as to the intervention of the Department is obtained. Out of this number about 20 inspections could not be undertaken because of the winter season, and these were transferred to the program for the next fiscal year.

Eleven requests are still to be studied and will be eventually the object of a recommendation for works or of a refusal, according to whether or not certain criteria safeguarding the Public Domain will have been established.

Ten requests have been recommended for the carrying out of work and they will be included in the program for the next fiscal year.

Five requests have been attended to by the carrying out of remedial works during the course of the fiscal year reviewed, because of their urgent character and because they concerned public welfare.

List of remedial works carried out in 1966/67

BEAUCE COUNTY

1. *Chaudière River*: lot 158, Range I, SW. Saint-Joseph-des-Érables parish:
Raising and correcting the river bank along 350 feet; protection of this bank by a stone facing over the same distance.
2. *Des Plaines River*: lot 695, Range I, NE. Saint-Joseph's parish:
Redefinition of the bed of Des Plaines river along 1,000 feet; construction of two ridges with stone only; protection of the stone facing over an approximate distance of 675 feet.
3. *Chaudière River*: lot 894 and lots 594 to 600, Range I NE., Saint-Georges:
Complete removal of Gilbert Island, cadastral N^o. 894; construction of an embankment about 2,000 feet long; protection of this embankment with a concrete retaining wall over a length of 200 feet and with stone facing for a distance of 1,800 feet. These works will be completed during the fiscal year 1967/68.
4. *Morency River*: lots 767 to 769, Range I NE., L'Enfant-Jésus parish:
Excavation of a gravel bank situated in Chaudière river along the above-mentioned section; straightening of the mouth of Morency river so as to direct the course of this tributary in the same direction as that of the Chaudière in order to reduce the formation of deposits at the mouth of this affluent; protection of the banks with a stone facing at the mouth of Morency river and along the right bank of Chaudière river immediately upstream from Morency river. These works were started during the fiscal period 1965/66 and will be completed in 1967/68.
5. *Chaudière River*: lot P-96, Range I NE. and P-1524, Range I SW., Beauceville:
Removal, from the bed of Chaudière river, rock ridges that retard the flow of ice-floes during periods of break-up.
6. *Chaudière River*: lots 1509 to 1513, Range I SW., Saint-François parish:

Levelling the ground that was left in an uneven state after work carried out at that place during the winter of 1965/66.

7. *Chaudière River*: lots 20 and 21, L'Enfant-Jésus parish:

Correction of the right river bank of the Chaudière along a distance of 500 feet; protection of this bank with a stone facing over the same length.

BONAVENTURE COUNTY

8. *Nouvelle River*: lots 20 and 21, Range NW. of Nouvelle river, Nouvelle parish:

Protection of the left river bank with stone facing along a distance of 150 feet.

CHARLEVOIX COUNTY

9. *Du Gouffre River*: lots 922 to 936, Baie-Saint-Paul:

Construction of an embankment for a distance of 130 feet on the right bank of Du Gouffre river.

10. *Du Gouffre River*: lot 915, Baie-Saint-Paul:

Construction of a masonry wall supported on pile foundations on the right bank of Du Gouffre river. This wall is 55 feet long.

11. *Du Bras River*: lot 813, Baie-Saint-Paul:

Construction of a 400-foot-long embankment on the right bank of Du Bras river.

12. *Des Mares River*: lots 571 to 584, Range Mare à la Truite, Baie-Saint-Paul:

Cleaning and redefinition of Des Mares river bed along 3,900 feet; construction of a gabion retaining wall along the right bank for a distance of 270 feet. This gabion wall is situated at the approaches of bridge-road N^o 15.

CHÂTEAUGUAY COUNTY

13. *Chaudière River*: lots 339 to 348-B, Ormstown municipality:

Construction of a retaining wall resting on piles along a distance of 460 feet.

CHICOUTIMI COUNTY

14. *Des Boudreault*: lots 4 to 7, Range I, Anse-Saint-Jean:

Redefinition of the bed of the stream and raising of the banks along a length of 2,000 feet.

DUPLESSIS COUNTY

15. *Rat Musqué River*: Letellier township:

Demolition of a dam and of a wooden obstruction situated upstream from the dam.

FRONTENAC COUNTY

16. *Chaudière River*: lot 12, Range I, Gayhurst township:

Rebuilding of the left river bank of Chaudière river along a distance of 300 feet and protection of this shore with a stone facing.

GASPÉ-SOUTH COUNTY

17. *Saint-Jean River*: lots 21-B-C and 22-A-B, Range I NW., Douglas township:

Cleaning of the bed of the main branch of Saint-Jean river by removing the accumulations of branches, stumps, trees, debris, etc., which obstruct the flow for a distance of 1,900 feet.

18. *York River*: lots 24 and 25, Range I S., York township:

Construction of an embankment along a distance of 1,000 feet in front of lot 24; re-routing the river bed fronting lot 25 and blasting the new left bank for a length of 350 feet.

ILES-DE-LA-MADELEINE COUNTY

19. *St. Lawrence Gulf*: lot 21, L'Étang-du-Nord municipality:

Construction of a retaining gabion wall along a distance of 320 feet. This work was carried out in cooperation with the municipality of Étang-du-Nord. The Quebec Department of Natural Resources financed the cost of the material and the municipality covered the cost of labor and machinery.

L'ASSOMPTION COUNTY

20. *St. Lawrence River*: lot 41-1, Repentigny:

Filling in of a canal controlled by the riparian proprietors on the Public Domain.

MASKINONGÉ COUNTY

21. *Petite rivière du Loup*: lot P-675, Louiseville municipality:

Construction of a retaining wall on piles on the left bank of Petite-Rivière-du-Loup along a distance of 100 feet.

MATANE COUNTY

22. *Matane River*: lots 1 and 2, Range I, Tessier township:
Redefining of the right river bank of Matane river along a distance of 510 feet; protection of this bank with a stone facing over the same length.
23. *St. Lawrence River*: section comprised between Caouette and Bernier streets:
Raising of the jetties built by the Quebec Department of Natural Resources in 1964 for an average height of about 2 feet.

MÉGANTIC COUNTY

24. *Bécancour River*: sector of Bécancour comprised within the limits of Thetford Mines:
Construction of an 600-foot-long masonry wall. This particular work was part of the general program which ought to be completed within a period of three years. This program was started in 1964 so as to be completed during the fiscal year under review.
25. *Blanche River*: lot 251, Ireland township, Black Lake parish:
Redefining of the bed of Blanche river along a distance of 1,300 feet; protection of the right river bank for a length of 425 feet with a stone facing.
26. *Blanche River*: lot 964, Range VI, Halifax township, Sainte-Sophie parish:
Construction of a gabion retaining wall along a length of 115 feet; redefining of the river bed for a distance of 200 feet.

MONTMORENCY COUNTY

27. *Sainte-Anne River*: lot 415, Beaupré:
Construction of a masonry retaining wall for a distance of 430 feet.

SAGUENAY COUNTY

28. *St. Lawrence River*: lots 15-A-8 to 15-G-16, Range I, Les Escoumins municipality:
Construction of an embankment over a length of 255 feet; raising of the embankment built in 1965 by the Quebec Department of Natural Resources over a distance of 980 feet.

WOLFE COUNTY

29. *Nicolet and Morasse Rivers*: lots 21-A, Ham township, Notre-Dame-de-Lourdes:

Cleaning of the bed of Nicolet river near the mouth of Morasse river over a length of 400 feet; cleaning of the Morasse river bed near the mouth of Morasse river along a distance of 400 feet.

Dams Division

Personnel

The personnel of the Dams Division was slightly increased during the fiscal year under review. It now consists of an engineer in charge of the Division, three other engineers, one technician and two draftsmen.

Activities

As mentioned in the preceding report of 1965/66, the transfer on July 1, 1965, of several reservoir-dams built on Saint-Maurice and Gatineau rivers to Hydro-Québec appreciably reduced the number of works relating to repair and restoration of dams still under the direct jurisdiction of the Department. However, the number of dam projects, the study of which was undertaken for the Department and for various municipalities, has increased to the point where dealing with these undertakings has become the principal preoccupation of the personnel of this Division.

The study of most of the projects that were undertaken during 1966/67 or that will be carried out during the next fiscal period was begun or more or less completed as follows:

- (a) rebuilding of the dam at Lac-des-Neiges in Laurentides Park, to be undertaken in 1967/68;
- (b) construction of a dam on Chaudière river at the outlet of Lac-Mégantic, to be started in 1967/68;
- (c) rebuilding of the downstream face of Allard dam at the outlet of Saint-François lake in Mégantic county, scheduled for 1967/68;
- (d) modification of the dam of Krueger Pulp on the Saint-François river, at Bromptonville, to be undertaken in 1967/68;
- (e) planning and construction, during 1966/67, of three gauging dams for the Hydrometry Service, two of which will be in the Montmorency forest and one on Delorme brook in Sainte-Hyacinthe county.

Achievements

The work program carried out by the Dams Division during the fiscal year 1966/67 consisted in the completion of eight projects, distributed as follows:

A - MAINTENANCE AND REPAIR OF DAMS OWNED BY THE DEPARTMENT OF NATURAL RESOURCES

1. *Ouiatchouane River*

Repair work to the dam at Commissaires lake. This dam, formerly the property of the insolvent Quebec Pulp and Paper Company, was not in very good condition and it was necessary to make some fairly important repairs, such as replacing numerous pieces of rotten wood in the central part, completely rebuilding of the caissons of the downstream right abutment and the panelling of the exterior walls of the flood-gates building. Moreover, with a view to making greater use of the flood-gates, the hoisting apparatus was motorized.

2. *Nord River*

During the fiscal year reviewed, the Dams Division, at the request of the Operations Service, pursued the construction of a permanent concrete pillar upstream from the Théodore dam in order to accommodate the hydrometric scale, and also the installation of a locking apparatus of the stop-logs for the purpose of preventing unauthorized persons from changing the sluice openings of the dam.

3. *Au Sable River*

Restoration in concrete of the log-slide of the Pibrac-Ouest dam. This project called for the removal of the disintegrated concrete and its replacement.

Other major repairs to the upstream face of this dam were intended to be completed during the fiscal period under study, but, because certain difficulties were encountered that were beyond the Division's control, it became necessary to carry the project over to the fiscal period of 1967/68.

Table 2, accompanying this section, gives summarized data concerning costs of the maintenance work and repairing jobs carried out at each of the dams.

B - CAPITAL EXPENDITURES

Saint-François River

Completion of the restoration work and water-proofing of the upstream face of the Allard dam.

Because of certain delays, these undertakings could not be concluded during the winter of 1965/66. They were pursued and completed during the months of the following winter season. The work of renovating and water-proofing of the cart road during 1966 and of placing guard rails on the outside of this path was conducted. This work was found nec-

essary in order to prevent rain-water or water derived from the melting of snow from seeping through this road between the old and new concrete.

In the same way reference to maintenance and repair works are to be found in Table 3, which shows the cost of this capital expenditure for the fiscal year under review.

C - CONTRIBUTIONS OF THE DEPARTMENT OF NATURAL RESOURCES

1. *Eaton River*

Rebuilding of the dam at Sawyerville. This work was given over to a contractor after public tenders were submitted. This project is a 200-foot-long reinforced concrete dam which, at the same time, serves to reduce erosion along the shores in the upstream basin and to impound waters. The municipality of Sawyerville contributed 10 per cent of the cost of this enterprise.

2. *De la Gare Brook*

After the collapse, in November 1966, of the municipal reservoir built in the municipality of Les Éboulements, the municipality of Saint-Joseph-de-la-Rive, situated downstream on de la Gare brook, was subjected to heavy damage. The Provincial Government decided, through the intervention of the Quebec Department of Natural Resources, to contribute under the form of a grant to the cost of repairs carried out by this municipality up to the extent of \$14,000. To date, \$5,293.86 was disbursed by the Department.

3. *Sainte-Anne-de-la-Pérade River*

Enlargement of the sluice-gate in the Chute-Panet dam. After Saint-Raymond Paper Company had decided to start work on the enlarging of this gate in order to reduce the level of the water upstream from the dam in periods of flood, the Quebec Department of Natural Resources consented to defray 25 per cent of the cost of these works, which amounted to \$2,200.

4. *Massawippi River*

Construction of an additional flood-gate in the Massawippi dam and extension of the retaining wall on the left side downstream.

In order to provide better protection to the railroad situated immediately downstream from the dam, the Quebec Department of Natural Resources decided to extend the retaining wall on the left bank. Furthermore, upon request from the municipality of North Hatley, the Dams Division commenced the installation of a supplementary metallic gate in order to increase the discharge capacity in periods of floods. These works

were carried out under government control from the beginning of 1967. Table 4 gives the amount spent by the Department of Natural Resources under the form of a contribution or a grant for each of these cases.

Topometry Division

Personnel

The staff of the Topometry Division comprised, during the fiscal year reviewed, one land-surveyor as head of the Division, one technical officer, and six technicians. During the summer of 1966, it also had at its disposition nine students who, under the direct supervision of the technicians, helped with the surveying.

Activities

The Topometry Division carries out the topographic surveys required by the Engineering Service (Waters) and it also works in close cooperation with the Study and Research Service and with the Hydraulic Domain Service.

Accomplishments

During the fiscal year 1966/67, the Topometry Division completed 38 topographic surveys, 14 of which served or will be used to develop undertakings related to the general Chaudière project. Other surveys were performed in various parts of the Province during the same period.

Further mention of these surveys is given in Table 5, which shows the various locations and costs of work accomplished.

Costs Division

The Costs Division still employs an engineer and a clerk. The activity of this Division for the fiscal term under study did not change much from that during the preceding years. Most of the inspections that were made as the result of requests for intervention submitted by municipalities were carried out by this Division.

It has always been the function of this Division to gather, compile and examine all available information in order to build up a documentary file on unit costs pertaining to the work performed by the Engineering Service of the Waters Branch.

The Engineering Service (Waters) likewise contributed to the costs of studies that went into the preparation of two reduced-scale models to the amount of \$28,317.62. These studies, which were undertaken during the preceding fiscal year, were pursued in collaboration with the Studies and Research Division of the Quebec Department of Natural Resources with Laval University and Lasalle Hydraulic Laboratory, and were concluded during the course of the year 1966/67.

The implementation of these models had for its object the study, before the real dams were set up, of a breakwater on Chaudière river at Rapide-du-Diable and of a section of Saint-François river at Bromptonville for the purpose of forestalling flooding.

In the carrying out of the projects described above, the Costs Division employed local manpower each time that it was possible to do so. The engineer or the technician in charge of organizing these works applied at the regional Provincial Unemployment Office in order to obtain a list of persons available in the regions concerned.

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

TABLE No. 1 — REMEDIAL WORKS CARRIED OUT DURING THE FISCAL YEAR 1966/67

<i>County</i>	<i>River</i>	<i>Municipality</i>	<i>Description of Works</i>	<i>Cost</i>
Beauce	Chaudière	Saint-Joseph-des-Érables	Protection of bank	\$ 15,182.74
Beauce	Des Plaines	Saint-Joseph	Correction of bed and protection of bank	19,207.95
Beauce	Chaudière	Ville de Saint-Georges	Correction of bed and protection of bank	171,029.19
Beauce	Morency	L'Enfant-Jésus parish	Correction of bed and protection of bank	11,483.78
Beauce	Chaudière	Beauceville	Correction of bed	2,351.41
Beauce	Chaudière	Saint-François parish (Charlemagne Bernard island)	Contouring the ground	870.00
Beauce	Chaudière	L'Enfant-Jésus parish	Protection of bank	16,281.48
Bonaventure	Nouvelle	Nouvelle parish	Protection of bank	934.24
Charlevoix	Du Gouffre	Ville de Baie-Saint-Paul	Protection of bank	4,921.36
Charlevoix	Du Gouffre	Ville de Baie-Saint-Paul	Protection of bank	8,140.42
Charlevoix	Du Bras	Ville de Baie-Saint-Paul	Protection of bank	14,027.14
Charlevoix	Des Mares	Baie-Saint-Paul parish	Correction of bed and protection of bank	15,537.64
Châteauguay	Châteauguay	Town of Ormstown	Retaining wall	43,602.68
Chicoutimi	Boudreault brook	Anse Saint-Jean	Correction of bed	381.87
Duplessis	Rat Musqué	Letellier township	Demolition of a dam	8,413.03

TABLE N^o. 1 (Concluded)

<i>County</i>	<i>River</i>	<i>Municipality</i>	<i>Description of Works</i>	<i>Cost</i>
Frontenac	Chaudière	Gayhurst township	Protection of bank	\$ 7,386.92
Gaspé-South	Saint-Jean	Douglastown	Cleaning of bed	9,891.72
Gaspé-South	York	York	Correction of bed and protection of bank	17,885.67
Iles-de-la-Madeleine	Gulf of St. Lawrence	Étang-du-Nord	Retaining wall	20,907.41
L'Assomption	St. Lawrence	Repentigny	Filling in of a canal	910.00
Maskinongé	Petite Rivière-du-Loup	Louiseville	Retaining wall	4,190.90
Matane	Matane	Tessier township	Protection of bank	6,112.00
Matane	St. Lawrence	City of Matane	Heightening of the jetties built in 1964	3,347.85
Mégantic	Bécancour	City of Thetford Mines	Masonry retaining wall	35,985.14
Mégantic	Blanche	Black Lake	Correction of bed and protection of bank	6,114.79
Mégantic	Blanche	Sainte-Sophie	Gabion retaining wall	3,009.66
Montmorency	Sainte-Anne	Town of Beaupré	Masonry retaining wall	37,328.43
Saguenay	St. Lawrence	Les Escoumins	Protection of bank	14,951.10
Wolfe	Nicolet and Morasse	Ham township Notre-Dame-de-Lourdes	Cleaning of bed	771.75
TOTAL :				\$501,158.27

TABLE N^o. 2 — DAMS DIVISION

Maintenance and Repair Work on Dams Owned by the Department in 1966/67

<i>County</i>	<i>River</i>	<i>Dam</i>	<i>Description of Works</i>	<i>Cost</i>
Roberval	Ouiatchouane	Lac des Commissaires	Repair of the building housing the flood-gates, the right abutment and motorizing the hoisting apparatus	\$ 9,100.63
Terrebonne	Au Sable	Théodore	Construction of a support for the hydrometric scale and installation of a system for locking stop-log gates	133.60
Jonquière	Au Sable	Pibrac Ouest	Repair of log flumes and erection of a metallic fence	10,152.54
			TOTAL :	\$19,386.77

TABLE N^o. 3 — DAMS DIVISION

Capital Expenditures 1966/67

<i>County</i>	<i>River</i>	<i>Dam</i>	<i>Description of Works</i>	<i>Cost</i>
Mégantic	Saint-François	Allard	Repair and water-proofing of the upstream face and the service path of the dam	\$156,968.42
			TOTAL :	\$156,968.42

TABLE N^o. 4 — DAMS DIVISION
Contributions from the Department, 1966/67

<i>County</i>	<i>River</i>	<i>Dam</i>	<i>Description of Works</i>	<i>Cost</i>
Compton	Eaton	Sawyerville	Construction of a control dam and protection against erosion	\$47,256.05
Charlevoix	De la Gare brook	Les Éboulements	Grant to the municipality of Saint-Joseph-de-la-Rive for damage incurred	5,293.86
Portneuf	Ste-Anne-de-la-Pérade	Chute-Panet	Contribution, by the Department, to the construction of a flood-gate in the dam	2,200.00
Stanstead	Massawippi	Massawippi	Addition of a retaining wall and a flood-gate to the present dam	16,851.86
			TOTAL :	<u>\$71,601.77</u>

TABLE N^o. 5 — SURVEY WORK
CARRIED OUT DURING THE FISCAL YEAR 1966/67

<i>County</i>	<i>River</i>	<i>Locality</i>	<i>Cost</i>
Argenteuil	Lac-des-16-Îles		\$ 137.65
Beauce	Chaudière	Saint-Joseph-des-Érables	186.50
Beauce	Chaudière	Beauceville, Rapide du Diable	89.52
Beauce	Chaudière	Beauceville, survey of islands	559.19
Beauce	Chaudière	Saint-Georges, sites 1 and 2	206.10
Beauce	Chaudière	Mégantic, site of dam	213.80
Beauce	Chaudière	Saint-Georges, stone wall	126.58
Beauce	Nadeau-Lessard	Vallée-Jonction	1,901.96
Beauce	Le Bras	Saint-Victor	8,360.53
Beauce	Des Plantes	Beauceville	66.90
Beauce	Famine	Saint-Georges	333.85
Beauce	Maheux brook	Sainte-Marie	46.05
Bonaventure	Nouvelle	Nouvelle-Ouest	2,723.95
Charlevoix	Du Gouffre	Baie-Saint-Paul	1,830.60
Châteauguay	Châteauguay	Ormstown	627.45
Drummond	Saint-François	Voltigeurs Park	9,067.69
Frontenac	Chaudière	Breakwater at Drolet	1,138.22
Frontenac	Chaudière	Gayhurst	3,411.95
Gaspé-South	Darmouth	Darmouth	36.91
Kamouraska	Du Loup	Saint-Alexandre	201.60
Labelle	Lac Labelle	Joly	77.46
Labelle	Rouge	L'Annonciation	100.99
Lac-Saint-Jean	Lac Kénogami	Hébertville	9.75
Laval	Montmorency	Sainte-Thérèse-de-Laval	1,859.10
Matane	Matane	Saint-René-Goupil	274.33
Montcalm	Lac Beaulac	Beaulac	73.46
Montcalm	Lac des Îles	Saint-Émile	180.80
Montmorency	Sainte-Anne	Saint-Féréol	309.95
Montmorency	Sainte-Anne	Sainte-Anne-de-Beaupré	86.00
Montmorency	Lac des Neiges	Laurentides Park	580.40
Papineau	Lac Simon	Chénéville	92.19
Portneuf	Sainte-Anne	Saint-Raymond	94.81
Richelieu	Richelieu	Saint-Blaise	311.14
Rimouski	Mitis	Sainte-Angèle	1,672.35
Saint-Maurice	Yamachiche	Yamachiche	110.90
Saint-Maurice	Du Loup	Louiseville	43.05
Wolfe	Saint-François	Barrage Allard	239.13
TOTAL :			\$38,170.16

Hydraulic Domain Service

The Hydraulic Domain Service of the Quebec Department of Natural Resources is responsible mainly for supervising the application of the Water-courses Act (R.S.Q. 1964, Chapter 84) and of the Timber-driving Companies Act (R.S.Q. 1964, Chapter 96).

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

Finally, the Hydraulic Domain Service issues, in the absence of judicial decisions, administrative opinions concerning whether or not certain lakes and rivers in Quebec are to be considered navigable and floatable. These opinions guide the administration of the Department of Natural Resources, as well as other departments, in the establishment of rights of the Province on its streams.

Appendix III of this report gives comparative statements of revenue for the fiscal year 1966/67 and of the preceding fiscal period 1965/66.

A – Main activities of the Hydraulic Domain Service pertaining to the administration of the Water-courses Act

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

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

The Department's conservation policy, which is to keep in the public domain as much as possible the ownership of the beds and shores of streams and lakes of this Province, was continued. Leases granted for beach and deep-water lots are valid for short or long periods, depending on the importance of the works which are to be conducted on the lots.

The Hydraulic Domain Service administers nearly 1,000 leases in virtue of Division I, 118 of which were granted during the fiscal year reviewed here and 18 of which were renewed.

Revenue from the administration of all leases of this nature issued by the Hydraulic Domain Service amounted to \$69,830.71 during the fiscal year under review, compared with \$100,542.66 during the preceding fiscal year.

At first sight, this drop in income may appear strange, since mention was made of an increase in the number of leases.

This difference is explained, however, by the fact that, during the fiscal year 1965/66, large sums of rent in arrears, in addition to the usual

annual rentals, for use by third parties of government rights on beach and deep-water lots were recovered.

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

During the year under review, eight (8) Orders in Council authorizing the ceding of lands, cancelling of leases, transfer of hydraulic power and dams for the purpose of generating hydraulic energy were sanctioned by the Quebec Legislature.

As most of the leases issued under Division III provide for the payment of an annual rental based on the production of each plant, in addition to the fixed rental, the Hydraulic Domain Service must set up controls and make the verifications needed to evaluate this rent.

During the course of the fiscal year 1966/67, the Hydraulic Power Division verified, on the site, or at the head office of companies and of Hydro-Québec, the production of all the power plants listed in Appendix II.

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 holders 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, revenue from the leasing of hydraulic power sites owned by the Crown reached \$2,628,501.17 and revenue arising from the Act to ensure the Progress of Education amounted to \$2,438,481.40.

During the preceding fiscal period, revenue from these sources was \$2,203,137.06 and \$2,500,936.32 respectively. Since January 1, 1964, all rental fees and royalties payable by Hydro-Québec were replaced by a single royalty amounting to \$0.50 per thousand K.W.H. produced. Under this arrangement Hydro-Québec paid, during the fiscal year 1966/67, a total amount of \$21,851,124.56, compared with \$19,547,903.06 for the preceding fiscal year.

- (c) Under Division IV of the Water-courses Act, hydraulic power producers may, in consideration of certain conditions, expropriate land necessary for their power plant and related construction needs, such as roads, power transmission lines, sub-stations, etc., subject to prior approval by the Lieutenant-Governor in Council.

During the fiscal year reviewed here 16 requests for premission to expropriate were submitted to the Hydraulic Domain Service and resulted in recommendations that were confirmed by two Orders in Council bearing numbers 2071 and 2217 and dated respectively November 9, 1966, and November 24, 1966.

- (d) Division VI 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 Crown Lands necessary for the maintenance of these dams. For this purpose, a new Order in Council was adopted. It has a tariff attached to it, bears number 646 and is dated April 5, 1966.

At the close of the preceding fiscal year and at the beginning of the 1966/67 fiscal period, new administrative procedures, along with a census of all such works, have enabled the Quebec Department of Natural Resources to make a list of all the dams maintained on streams of the Province by log-driving companies without proper authorization.

At the end of the fiscal period being studied here, the legalizing of log-driving dams had been virtually completed and a program destined to legalize log-boom works was established. One Order in Council has already been sanctioned (N^o. 611, March 15, 1967).

In the course of the fiscal period reviewed, seven Orders in Council authorized the approval of plans and specifications, as well as the rental of lands needed for the maintenance of 28 log-driving dams. Moreover, 131 new leases were issued, ten of which were renewed.

Revenue from leases issued under this Division of the Water-courses Act amounted to \$175,258.70, compared with \$533,980.81 during the fiscal year 1965/66. This decline is explained by the fact that the sums from rent in arrears owed to the Department for the use of these works in the past were collected and banked during the fiscal year 1965/66, such as was the case for the arrears for beach lots and deep-water lots mentioned in a previous paragraph.

- (e) Division VII of the Water-courses Act provides for the approval of plans and specifications, as well as for the rental of lands needed for the establishment of reservoirs for municipal or industrial waterworks. As most of the leases issued under Division VII provide for, in addition to the fixed rental, the payment of a royalty based on production, the Department's engineers make the necessary verifications and controls to determine the amount of this royalty.

Moreover, technicians from 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 profits, whether maintained by the Department or by private concerns, amounted to \$353,572.91, compared with \$729,431.59 for the preceding fiscal period. This difference may be accounted for by the transfer of several reservoir-dams to Hydro-Québec.

- (f) As in the previous year, the Department intensified, as much as possible, its supervision relative to the conservation and protection of Crown property.

Inspectors assigned to the Protection Division made 1,011 investigations principally for the following reasons: complaints, encroachments, unauthorized use of public property, location of protective walls, verification of works, and establishment of yacht clubs and marinas. Of these inspections, 663 were in order to make technical surveys in the regions of Hull, north of Montreal, Joliette and Shawinigan. Moreover, the inspectors prepared a plan of all these technical surveys.

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, waterworks, log-flumes and all other related purposes.

Fifteen (15) new requests were made to the Hydraulic Domain Service during the fiscal year 1966/67.

At the present time, 36 cases concerning the aforementioned purposes have not been settled. Fifteen (15) of these are to be studied, 15 are waiting for technical documents, and six (6) are about to be settled.

Moreover, the Hydraulic Domain Service issued 12 new leases for rights of way.

Technicians of this Service were also engaged in studying the different jurisdictions affecting the territory of Lafleche township.

Revenue from these rentals amounted to \$26,141.76, compared with \$42,075.08 received during the preceding year. The decrease was due to the replacement of the rental fees and royalties to be paid by Hydro-Québec by the fixed royalty mentioned above and by the forthcoming completion of the legalization of all rights of way.

- (b) As mentioned earlier in this report, the Hydraulic Domain Service issues, in the absence of a court decision, certain opinions as administrative guidance to the Department of Natural Resources and other departments concerning the character of navigability of lakes and rivers of this Province. During the fiscal year reviewed in this report, 13 lakes were the object of studies and special surveys at their sites by technicians of the Service responsible for this work in order to prepare these opinions.

Actually, the work is not done on a sufficiently large scale and it is intended that efforts should be intensified until a complete inventory of all streams and sheets of water belonging to the Crown is made. The addition to the staff of a new technician will, however, make it possible to start toward that goal. Appendix I contains a list of the lakes on which surveys were conducted during the fiscal year 1966/67.

In addition to the surveys mentioned above, these technicians patrolled more than 100 lakes in order to determine whether the lakes are in their natural state and also to see to what degree the riparian property holders have encroached upon them.

The Hydraulic Domain Service has completed the compilation of all opinions issued to date concerning the navigability of the various watercourses of Quebec and, before long, it will publish a record to this effect. This compilation will, without doubt, prove helpful to many government services.

- (c) In addition to the requests for the establishment of dams, the construction of which is provided for under various Divisions of the Water-courses Act, the Hydraulic Domain Service also receives numerous requests for the erection of dams for other purposes. Under present legislation, the Hydraulic Domain Service may intervene only if the construction of these dams affects parts of the streams or lands belonging to the Crown. In other cases, the Hydraulic Domain Service can only warn the owner that he is responsible under the Civil Code in the event that damages are caused to third parties.

It is hoped that in the very near future amendments to the existing legislature will be passed in order to permit the Hydraulic Domain Service to exercise a closer surveillance of such works as could, in certain cases, constitute a real danger.

During the fiscal year 1966/67, requests were sent to the Service for the construction and the maintenance of dams of a nature other than those foreseen by the Water-courses Act.

Furthermore, a general census of hunting and fishing clubs was carried out in the previous fiscal years, revealing the presence of 1,119 dams that were used and maintained by sporting organizations. These dams had been built either by officials of private clubs or were repaired by them after being abandoned by companies that had maintained the dams for forestry operations.

A total of 79 inspections were carried out during the year reviewed.

Order in Council N^o 568 of March 23, 1965, authorized the Hydraulic Domain Service to issue leases for such purposes. At the present time, 82 leases have been authorized and about 817 will be issued for the maintenance of these dams. The other dams will eventually be demolished.

APPENDIX I

List of lakes that required a local survey prior to the issuance of an opinion
—fiscal year 1966/67.

- Gauthier lake, situated in Grandison, township, Terrebonne county.
- Prêle lake, situated in Trécesson township, Abitibi-East county.
- Sans Nom lake, situated in Litehfield township, Pontiac county.
- Pluie lake, situated in Joliette township, Berthier county.
- Truite lake, situated in Low township, Gatineau county.

- Spectacles lake, situated in Harrington township, Argenteuil county.
- Massan lake, situated in Marchand township, Labelle county.
- East Branch lake, situated in Orford township, Sherbrooke county.
- MacKenzie lake, situated in Marston township, Frontenac county.
- Rond lake, situated in Denholm township, Frontenac county.
- Catherine lake, situated in Church township, Pontiac county.
- Blanc lake, situated in Gauthier township, Berthier county.
- Edouard lake, situated in Loranger township, Labelle county.

APPENDIX II

List of the companies and power stations that are the subject of annual inspections for the purpose of determining the duties to be paid to the Department of Natural Resources on the production of hydro-electric power.

<i>Companies</i>	<i>Stations</i>
Aluminum Co.	Shipsaw Chute-à-Caron Chute-du-Diable Chute-à-la-Savanne Chute-des-Passes Passe-Dangereuse
Anglo Can. Pulp	Riv. Sault-au-Cochon
Cité de Sherbrooke	Weedon Westbury Drummond
Domtar	East Angus
E. B. Eddy	Hull
Électrique de Mont-Laurier	Mont-Laurier Val-Barrette
Electric Reduction	Buckingham
Gulf Power	Riv. Sainte-Marguerite
Hart Jaune Power	Riv. Hart-Jaune

<i>Companies</i>	<i>Stations</i>
Hydro-Ontario	Joachims Otto Holden Chenaux
Hydro-Québec	Anse Saint-Jean Belle-Rivière Bersimis I Bersimis II Chaudière Chute-Garneau Magpie Manie I McCormick (6 and 7) Métis I Métis II Petites-Bergeronnes Pont Arnault Sept-Chutes Saint-Alban Saint-Elzéar Saint-Raphaël Beauharnois Carillon Chute-Wilson Des Cèdres Rawdon Rivière-des-Prairies Sainte-Adèle Sainte-Agathe Bell Falls
	Bryson Chelsea Corbeau Farmers Rapids High Falls Hull II Kipawa Les Quinze Rapid II Rapid VII Rapide-des-Iles Thurso Parent Beaumont Burrough Falls Drummondville Grand'Mère Hemming Falls La Gabelle La Trenche La Tuque Rapide-Blanc Shawinigan II Shawinigan III Sherbrooke Saint-Narcisse
James Maclaren	Chutes Dufferin
Jonquière Pulp	Jonquière
Kruger	Bromptonville
Lorraine Mining	Riv. Winneway
Maclaren Quebec Power	High Falls Masson
Manicouagan Power	McCormick
Ottawa Valley Power	Chat Falls

<i>Companies</i>	<i>Stations</i>
Pembroke Electric Light	Waltham
Price Ltée	Chicoutimi Murdock-Willson Chute aux Galets Kénogami Jim Gray Adam Cunningham
Quebec North Shore	Riv. aux Outardes
Saguenay Power	Isle Maligne
Saint-Raymond Paper	Chute Lamartine
Saint-Régis Paper	Grand Ruisseau Blanc
Smelter Power	Chutes Blanchette

APPENDIX III

Statement of Income

Comparative Table

	<i>1965/66</i>	<i>1966/67</i>
(a) Interest	\$ 72,398.12	\$ 65,207.23
(b) Sundry fees (Hydraulic Service)	19,894.75	5,300.00
(c) Storage dams	729,431.59	353,572.91
(d) Hydraulic power	2,203,137.06	2,628,501.17
(e) Beach lots	100,542.66	69,830.71
(f) Log-driving dams	533,980.81	175,258.70
(g) Land sales	7,315.58	24,414.03
(h) Income on number of kilowatt-hours of electricity produced — P.E.	2,500,936.32	2,438,481.40
(i) Quebec Hydroelectric Power Commission contribution	19,547,903.16	21,851,124.56
(j) Transmission lines	42,075.08	26,141.76
	<hr/>	<hr/>
TOTAL INCOME:	\$25,757,615.13	\$27,637,842.47

Statement of Income

From April 1, 1966 to March 31, 1967

(a) Interest	\$ 65,207.23
(b) Sundry fees (Hydraulic Service)	5,300.00
(c) Storage dams	353,572.91
(d) Hydraulic power	2,628,501.17
(e) Beach lots	69,830.71
(f) Log-driving dams	175,258.70
(g) Land sales	24,414.03
(h) Income on number of kilowatt-hours electricity produced — P.E.	2,438,481.40
(i) Quebec Hydroelectric Power Commission contribution	21,851,124.56
(j) Transmission lines	26,141.76
	<hr/>
	TOTAL INCOME: \$27,637,842.47

Study and Research Service

The purpose of this report is to present a summary of the activities of the Study and Research Service during the fiscal year 1966/67, which, incidently, is the fourth year of the Service's existence. Despite the strike that resulted in work stoppage among the engineers, between May 9 and July 29, 1966, the accomplishments of the fiscal period under review were such as generally to complete the projects determined by the administrative needs of the other units of the Hydraulic Services, which call upon the Study and Research Service in order to expedite their business transactions.

The work accomplished is more diversified than that of previous years and it stresses the fact that the Study and Research Service is playing an ever-increasing role in the preparation of development projects dealing with rivers in what concerns their respective drainage basins, instead of confining its energies to the analysis of local situations created by the movement of waters. This trend is influenced in great measure by the nature of the requests submitted to the Quebec Department of Natural Resources, by the municipalities and by various regional committees which desire full-scale intervention so as to develop the resources of streams crossing their territories and also to make the best use of these resources.

Personnel

The recruiting by the Study and Research Service of two newly graduated engineers and of one technician brought the technical staff of this Service to

12 employees. The personnel is now made up of six engineers, one administrative officer and five technicians. In September 1966, one of the engineers of the Service commenced a two-year course of studies at the University of Denver, in Colorado, for the obtention of his doctorate in science.

Achievements

During the fiscal year 1966/67, a certain number of achievements previously undertaken and mentioned in the report of the Service for the preceding year were pursued. Other accomplishments commenced during the period reviewed were likewise carried out at the request of the Hydraulic Services.

Long-term Projects

GENERAL CHAUDIÈRE PROJECT (Beauce and Frontenac Counties)

Mill dam N^o. 1 (near Mégantic)

Changes to Mill dam N^o. 1, which is situated five miles downstream from Lake Mégantic, had been previously programmed so that the dam would be in a position to retain the ice-floes originating in the Chaudière's upper reaches. Observations made at the height of the spring flood in 1967 confirmed certain theories that had been formerly advanced to the effect that ice accumulations are taxing to the limit the control works in question. Because of the numerous meanders a short distance upstream from the dam, these accumulations do not create sufficient thrust to fissure the solid ice cover and open a channel to the crest of the dam. Under present conditions, the stationary ice field melts in place for the most part. It is believed that the changes already conducted are not great enough for present needs.

Gayhurst dam

A geologist from the Mineral Deposits Service of the Mines Branch undertook the study of the progress of a clay movement which is increasing the size of a breach that was started in the spring of 1962 in the Gayhurst dam situated some 12 miles downstream from Mégantic. Ever since the beginning of this project, an economically feasible method for stabilizing the constantly changing escarpments has been the object of attention by the Study and Research Service. The removal of these steep slopes carries off an imposing volume of material, which is deposited on the bed of the river at places where the flow is already impeded by islands and sills. First of all, the Service plans the drainage of surface waters beyond the zone affected by debris. It is estimated that there has been 90,000 cubic yards of material drawn to the wall from the breach since 1962, when the annual rate of movement was in the order of six feet.

Saint-Georges dam

The perimeter of the future reservoir that will be formed by the construction of the Saint-Georges dam has been the object of a survey for the purpose of detecting the areas where the limits of the water line may change because of erosion, debris, or landslides because of waves, fluctuations of the level of restrained waters, and the runoff of surface waters. In consideration of the nature of the lands along the banks, the geological structure of the shores and their slant, as well as of the density of the vegetation, the most vulnerable spots that could be affected by the occurrence of any one of the phenomena mentioned were marked out. Investigators of the Study and Research Service point out that certain sectors of the left bank should be stabilized in order to check encroachments by water.

Experience acquired by the engineers of the Study and Research Service in the field of sedimentology has likewise enabled them to make certain recommendations concerning measures to be adopted to reduce the depositing of sediments that have a tendency to accumulate near the upstream limit of the higher level created by the reservoir. In order to forestall this situation, the Engineering Service (Waters) proposed to excavate a sediment ditch and to construct a sill at the foot of the Lessard falls.

Retaining Wall at Saint-Georges

The Quebec Department of Natural Resources approved a 1,000-foot extension to the walls erected by the town of Saint-Georges along Chaudière boulevard. This project would run 800 feet upstream from the bridge road and 200 feet downstream.

After the program was accepted, the Study and Research Service proposed that work destined to preserve a sufficiently free channel in a section of the river be undertaken so as to avoid the possibility of the current's shifting to the opposite bank.

Works for Retaining Ice at Beauceville

Most of the essential characteristics of this key undertaking of the general project has been shown experimentally on a reduced-scale model planned by an engineer from the Study and Research Service and operated by technicians of the Service in the hydraulic laboratory of Laval University. Several tests were conducted on this model while simulating the flow and ice volumes under conditions that would be favorable for floods. This was done for the purpose of finding the most suitable location for a dam site, for determining the height of the sill, for measuring the intensity of the thrusts occasioned by the ice floes and for verifying the increase in height of the impounded waters. An analysis of these factors will enable the Service's engineers to calculate the permanence of the work and to adopt an economic set-up that could be at the same time efficient and appropriate for coping with conditions of spring break-up. These experimental tests were concluded at the end of March 1967 with the result that the Engineering Service of the Waters Branch will be in a position to prepare the plans and estimates during the fiscal year 1967/68.

Reservoir Dams on the Tributaries

In connection with the struggle against flooding by free water in the section comprised between Saint-Maxime-de-Scott and Beauceville, personnel from the Study and Research Service carried out investigations on the Famine and Du Loup rivers, two tributaries having their confluences in the proximity of Saint-Georges. The purpose of these examinations is to study the storage possibilities for controlling floods and at the same time to regulate the runoff. Among the sites considered favorable for the construction of reservoir dams on these tributaries, two places on Famine river were proposed: one near Morisset station and the other in the vicinity of Plamondon falls. On Du Loup river the site chosen is near the river's mouth, in the neighborhood of the remains of an old dam. Each of these sites was surveyed. Moreover, a preliminary geological study revealed no aspects unfavorable to the pursuit of the project. Unitary hydrograms were prepared in connection with the characteristics of floods as recorded at station 023422 on Famine river and station 023423 on the Du Loup. These graphs were adjusted and then applied to each of the sites mentioned earlier. There remains now the perfecting of the multi-copying system which will be used to distribute, in an adequate way, the storage between the reservoirs before determining the basic elements necessary for more detailed plans and estimates of the dams.

The advantages of the projects relating to the fight against flooding along free water will be based on the findings of a feasibility study after evaluation of the previous damage caused by the periodic overflow of the Chaudière, except during the winter season, in the urban and rural zones lying between Saint-Maxime-de-Scott and Beauceville. This study will involve, among other items, marginal benefits (the introduction of recreative and tourist facilities, etc.) anticipated with the completion of these reservoirs.

Plantes river

Because of difficulties occasioned by the acquiring of rights of way and of lands necessary for the execution of works at the mouth of this tributary in Saint-François parish, the laying out of the proposed drainage channel was changed over a distance of 2,000 feet, commencing at the railway bridge. This project is one which will be carried out jointly by the Agricultural Hydraulic Service of the Department of Agriculture and Colonization and by the Engineering Service (Waters) of the Department of Natural Resources, such as was mentioned in the annual report of the Department of Natural Resources for 1965/66.

NOUVELLE RIVER (Bonaventure County)

Confronted with numerous requests from the municipal corporation of Nouvelle for works on the lower section of Nouvelle river, the Study and Research Service commenced a complete inventory of the sections affected and of damage by flooding instead of attending exclusively to the places which had already

been the object of inspections with consequent recommendations. One immediate intervention was recommended in a special case in order to protect a section of road threatened by erosion. This was on the left bank facing lots 20 and 21 of range NW. of Nouvelle river.

The Service awaits the completion of the surveying carried out in the autumn of 1966 and the results of the reconnaissance visits before making its decision as to whether or not a project dealing with the many objectives is deemed necessary. Estimates recorded by the Waters Branch for the projects (1967-72) drawn up in connection with the putting into execution of the "Development and operation plan in the pilot territory prepared by the B.A.E.Q.", which of necessity embraces the drainage basin of Nouvelle river, will be taken into account.

GOUFFRE RIVER (Charlevoix County)

Several phases of a program of studies beginning with the scale of the drainage basin of Gouffre river are nearly completed. Conclusions arising from this research will enable the Service to set forth the basic factors for initiating projects designed to preserve and protect the agricultural lands and, at the same time, the urban zones affected by the behavior of Gouffre river and its affluents, especially in the lower section of this stream as it flows between Baie-Saint-Paul and Saint-Urbain. The interpretation of the meteorological surveys and the definition of maximum swellings are the responsibility of the Hydrological Services. The damage from erosion affects most of the curves of the section concerned, and the Study and Research Service is aware that the situation cannot be corrected by local intervention alone, that is without drawing up a general plan that will embrace all aspects of the problem.

DU LOUP RIVER (Kamouraska County)

A report published in 1965 by the firm of consulting engineers of Cartier et Leclerc was made the object of revision intended mainly to verify the hypothesis and consequences of the proposed dredging and correcting of the Du Loup river bed in the parishes of Saint-Alexandre and Saint-Antoine. In order to accomplish this work, the Study and Research Service plotted control sections for a distance of five miles downstream from the Saint-Alexandre bridge and then determined the line of critical energy. Whirlpool graphs for discharges of 1,000, 2,500 and 5,000 cu./ft./sec. in the section concerned in relation to the normal state and with the modifications that were carried out were established as the start of a program to be perfected for this particular case. The study also included an examination of the feasibility of installing a mobile sluiceway at the discharge of the dredged section for the purpose of maintaining a suitable level during low-water periods. This study, moreover, involves research into favorable sites for the creation of reservoirs for the storage of additional quantities of water upstream from the point of confluence of Fourchue river.

SAINTE-ANNE RIVER (Portneuf County)

At the beginning of 1966, Saint-Raymond Paper Company had completed the installation of a 12-foot-wide draw-gate in the Chute-Panet dam. This apparatus, the cost of which was defrayed partly by the Department of Natural Resources, increases the discharge capacity of the works and is intended to lessen to some degree the swellings that each year affect the property of the town of Saint-Raymond, more especially when the impounded waters are filled with accumulations of drift ice and frazil.

During the winter of 1966/67, the Study and Research Service plotted the concentrations of frazil in the neighborhood of the breakwater piles spread along a distance of one mile, about 5,000 feet downstream from the railroad bridge which crosses Sainte-Anne river approximately at the mouth of its main affluent, the north branch. After an agreement was made with Saint-Raymond Paper Company, the gate was opened for a period of 21 hours without appreciably reducing the water reserve serving the mill. It was hoped that this manœuvre would dislodge the accumulations of anchor ice but these accumulations continue to be stable because the pumping effect on the impounded water is now considered insufficient. In the absence of ice accumulations, at the time of the last break-up, it was impossible to test this same operation for getting the stationary ice moving.

YAMASKA RIVER (Eastern Townships)

The drainage basin of Yamaska river includes parts of nine counties and the total area of Bagot and Shefford counties. During a conference on "Pollution and Our Environment", held in Montreal at the end of October 1966 under the auspices of the Canadian Council of the Ministers of Resources, the high degree of pollution observed in this stream was pointed out, and the problem of supplying potable water to certain municipalities situated in the lower section of this basin was discussed. Because of this situation, the Study and Research Service concluded an agreement with the director of the Hydraulic Services whereby an experimental study would be undertaken on the scale of the Yamaska basin while taking an inventory of the consumption of water. A great deal of information gathered within the Department of Natural Resources and various other government organizations, such as the Administration of Waters, the Department of Agriculture and Colonization, the Department of Lands and Forests, the Department of Commerce and Industry and the Department of Health, has been shown on charts drawn to an appropriate scale. In addition to characteristics relating to the configuration and occupation of lands of the basin as a whole and secondary basins, the Study and Research Service mapped the longitudinal profile of the main branch and of the principal tributaries, the location of the dams, and stations of the hydrometeorological network. It also demonstrated on maps the branch sections affected by drainage works and the legal aspect of a part of the main stream.

Demographic data on each of the municipalities of the Yamaska river basin are compiled and, at the same time, hydrometric information and data relating to the water supply requirements for domestic and industrial use will be assessed in part in the report published at the beginning of 1967 by Shawinigan Engineering, the officers of which have studied the upper section of the Yamaska's basin as far as Farnham.

Commencing with a proposal of a project prepared by the consulting engineering firm of Lalande, Tétreault and Associates of Saint-Lambert, the Study and Research Service estimated to 966,900 (which figure is 35 per cent of the total cost of the project valued at \$2,800,000) the preparations and works connected with the dredging operations in Yamaska river at Granby. The purpose of this program is to provide an increase in the supply of drinking water for the city of Saint-Lambert by rearranging Boivin lake and by controlling the storage capacity of this reservoir. Having made this estimation, an inspection of the stableness of the embankments from the dredging, and the discharge capacity of the control works, the Government made a grant of \$500,000, which was divided into amounts of \$100,000 over a period of five years, starting from the initiation of work in 1967.

Studies and Projects of Local Interest

DARMOUTH (Gaspé-South County)

In 1964 and 1965, ice-jams that formed in the neighborhood of the Cortéreal bridge were the cause of damage to two sections of the road bordering the banks of the Darmouth river and also to a few farms situated in this section. Technical information gathered on the site between 1962 and 1965 showed that this situation could result from two factors: the narrowing under the bridge and a levelling off downstream. Before orientating the Service's studies in what concerns these initial observations, it was decided to complete the topographic survey and to scrutinize the successive phases of the anchoring of ice-floes during the autumn of 1966 and their evolution at the time of the spring break-up in 1967. These two events and the sampling of the ice sheet during the winter demonstrated that the tide flow in the vicinity of the bridge stabilized the ice floes at the exact spot where the tide was felt. The bridge pillars and the break in the slope have only a secondary effect on the degree of evacuation of the ice. The method for lessening the overflowing occasioned by these break-ups would be to reduce the solid volumes which are wont to accumulate at this place and to do this it would be necessary to install a device designed to retain the ice-sheets farther upstream. This solution would involve a great deal of work in view of the relatively weak intensity of the damage registered during the past few years. This suggestion has been submitted to the Engineering Service of the Waters Branch, since it sought the opinion of the Study and Research Service concerning this problem.

MALBAIE RIVER
(Gaspé-South County)

In connection with the request drawn up by the municipal corporation of Barachois the Study and Research Service suggested to the Engineering Service (Waters) a project of dredging in front of lots 39 to 41 of range I Nord, Malbaie township, as well as the removal of the ledges which hinder the flow upstream from this sector. This project was designed to improve the regime of ice-floes and likewise to correct a situation which affects several riparian properties involved in the periodical flooding caused by the priming of spring break-up.

MÉTIS RIVER
(Matane County)

Observations of the ice conditions at Sainte-Angèle-de-Mérici revealed three critical points especially favorable to the accumulation of ice sheets and frazil. These places are conspicuous by narrow transversal sections in the center of very sharp curves. The overflows of the river already referred to as having occurred at Sainte-Angèle at the end of autumn and the beginning of winter are attributable to the formation of frazil originating in the rapid zone upstream from the village and coming down to obstruct the sinuous section and also to the slight slope crossing the residential center. In order to improve the situation, the Study and Research Service planned a correction of the bed and the removal of the principal obstacles to the circulation of frazil.

SAINT-FRANÇOIS RIVER
(Richmond County)

In the second portion of its report setting forth the various situations analysed, on a reduced-scale model, for the purpose of controlling the regime of ice-floes at Bromptonville, La Salle Hydraulic Laboratory recommends the installation of a hole in the dam and a sluice-gate sector, the operation of which at the opportune time would permit the evacuation of a sufficiently extensive runoff so as to prevent flooding. The Department of Natural Resources approved this solution in principle but the application of the program depends on the results of the talks that have been started between the Waters Branch and the authorities of Kruger Pulp and Paper Limited, the company owning the dam.

ST. LAWRENCE RIVER AT GODBOUT
(Saguenay County)

Acting within the framework of an urgent work program of repairing and consolidating protective constructions which are being attacked and entrenched by the action of waves from the St. Lawrence and which are the cause of considerable damage to the main highway from the village of Godbout, the Study and Research Service supplied the specifications for the transversal profile of the stone packing and for the minimum weight of the rocks to be used

in the stone facing. In the absence of accurate information permitting the estimation of the height of the aforementioned waves at Godbout, the Service considered a wave of 15 feet, which is equal to the proposed wave-height adopted at Baie-Comeau for the commencement of similar maritime works.

DES PRAIRIES RIVER (City of Laval)

During the flood of February 1967, the overflow of Des Prairies river caused damage to about one hundred homes situated in two residential zones of the city of Laval, on Île Jésus, that is between Duvernay and Saint-Vincent-de-Paul. The swollen waters also entered into the basements of a dozen riparian properties in the city of Montréal-Nord. Faced with the urgency caused by the flood situation, the executive council of the city of Laval made an appeal to Civil Protection and to an engineer of the Service, who, with a group of specialists in dynamiting from the C.I.L., prepared to dispose of an ice-jam formed in the vicinity of Notre-Dame-des-Prairies church. The operation had the result of freeing a relatively small part of the ice-jam, if one considers the imposing volume of ice that was piled up at the foot of the Des Prairies rapids. A fall of 18 inches was recorded in the level of the river during this operation.

Contributions of the Administration of the Hydraulic Domain

SEIZE-ÎLES LAKE (Argenteuil County)

The dam situated on lot 24, range IX, Wentworth township, controls the level of Seize-Îles lake. It is supplied with two openings with small beams, and is also provided with an overflow-shoot. The study conducted for the purpose of establishing the elevation of the normal high-water mark shows that the average heightening produced by the dam is of the order of 1.5 feet. The Study and Research Service recommended the installation of a limnograph in the lake for the purpose of establishing the high-water level as it changes. This device would make it possible for the Service to determine a location that would correspond to the boundary line between private property and lands of the public domain.

ARCHAMBAULT LAKE (Montcalm County)

According to observations made in 1932 and to findings of studies conducted in 1964 and 1966, the high-water level is influenced by the presence of a sill situated on lot 35, range III of Lussier township, coinciding with the 1,277-foot elevation. The average raising produced by the sill being of the order of six feet, the Study and Research Service suggested the adoption of a 1,271-foot level as the limit of domanial property.

KELKENNY LAKE OR BEAULAC (Papineau County)

Different sources of information concerning the registration of the high-waters of Kelkenny lake, the level of which is influenced by a control section obstructed by the remains of an old dam and situated in front of lot 9, range III, Hartwell township, made it possible for the Study and Research Service to propose the level of 644.6 feet as the dividing line between public property and the limits of the lake.

DES PRAIRIES RIVER (Montréal-Nord)

The deeds and circumstances which surround the ceding of beach lots on Des Prairies river within the city of Montréal-Nord were set forth in the report of the Study and Research Service for the fiscal year 1965/66. The first phase of the project, which involves a section comprised between the eastern limit of the city and Hénault avenue, was virtually at a standstill during the fiscal period under review because of the delay of the riparian property owners to construct the retaining walls required by the Department of Natural Resources. It is for this reason that only 11 letters patent were issued up to the present, out of a possible 91. The second phase of the project concerns the riparian properties situated between Hénault avenue and the western limit of the city. The municipality entrusted to the surveyors' office the topographic survey of the two places concerned by the second phase. The surveying is being pursued and the plans ought to be ready at the beginning of the summer of 1967.

Other Information

Grant to Laval University

The first interim report on the state of progress of the experimental study carried out in the hydraulic laboratory of Laval University and subsidized by the Quebec Department of Natural Resources presents a method of approach for the purpose of testing a process for stabilizing the bed and the shores by means of a carpet of wooden laths, of the snow-fence type. Results of the first tests revealed that the speed was doubled from the beginning of the dragging of the material (Ottawa sand) used on a model without undermining the bed. A second interim report makes it possible to establish that the carpet in question may be used in an effective manner for deterring the undermining caused by currents. The carpet's efficiency varies according to the spacing and direction of the laths. The speed of flow from the beginning of the dragging of the material and the water depth remain the principal factors to be considered in the course of experiments which will follow for testing a similar system in the erosion of shores.

Critical Path Method Course

A group of engineers from the Hydraulic Services followed a series of courses given on the operational method of the critical path method by José Llamas, an engineer who had previously attended lectures on the same subject in company with Robert-L. Ménard, director of the Hydraulic Services.

Publication

“Aménagement de la rivière Chaudière” is the title of an article that was published in the issue of February 1967 of the French review “Le Génie Civil des Techniques”. This publication, which was prepared by Robert-L. Ménard, engineer, director of the Hydraulic Services, and Bernard Mathieu, engineer, set forth the features identified with the drainage basin of the Chaudière and the peculiarities of its behavior during periods of spring break-up, as well as the construction and works integrated in the general plan for preventing flooding in the presence of ice-floes.

Publicity Folder

The Study and Research Service presented to the Engineering Service of the Waters Branch a text published in the form of a folder which gives a historical outline of the Chaudière, the role assigned to the Saint-Georges dam, and the main characteristics of this work.

“North East Fish and Wildlife Conference”

In February 1967, Claude Triquet, engineer, presented a paper entitled “Ice Retaining Construction on the Chaudière River” during the annual sessions held by this organization at Quebec.

Conference on Water for Peace

In the framework of this international conference which was held in Washington at the end of May 1967, the Study and Research Service submitted a paper entitled “Snow and Ice in Quebec”. The authors were Claude Pesant, engineer, director of the Hydrometry Service, and Bernard Mathieu, engineer attached to the Study and Research Service, both of whom compiled the opinions of several officers of the Waters Branch on the subject.

I.A.H.R. Congress

On the occasion of the last congress of the International Association of Hydraulic Research (I.A.H.R.), which was held in Colorado in September 1967, Bernard Mathieu, engineer, and Claude Triquet, engineer, prepared papers which were presented before the ice section of this association. The papers were entitled “Dry Ice-jams” and “Ice-retaining Works on Chaudière River”.

HYDROLOGICAL SERVICES

The Hydrological Services, through its Meteorology, Hydrometry, and Hydrography services, is responsible for collecting, studying, and supplying basic data on waters within Quebec's territory.

This work involves the observation, compilation, and analysis of a wide range of information concerning precipitation and other meteorological phenomena, variations in the level of lakes and rivers, the variability of the flow of rivers and the topography and hydrography of the Province's streams.

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Mortimer Hendler, director of the Hydrological Services, continued, throughout the year under review here, to represent the Quebec Department of Natural Resources on the Hydrology Subcommittee, an associate committee on geodesy and geophysics of the National Research Council. This subcommittee aims at encouraging, promoting and coordinating hydrology and hydrological research across Canada.

M. Hendler and R. Ménard took an active part in two meetings of the Great Lakes Commission. This commission is made up of representatives from the eight American States bordering the Great Lakes and from the provinces of Quebec and Ontario. These representatives attended the meetings as observers.

Hydrography Service

The Hydrography Service studies the topographic characteristics of drainage basins of streams in the Province and the variations in level of rivers and lakes.

I – Topographic Characteristics

The study of topographic characteristics consists in collecting basic data relating to the shape and relief of a drainage basin, and then analysing these data in order to know the distinguishing features proper to the basin. This work, which is the first stage in the study of all watercourses, is divided into two parts—field work and office work.

(a) Field work

The field work consists essentially in topographic surveys along rivers and around lakes as the profile along watercourses, the vertical control necessary for mapping, and the sounding of lakes. Since several years, the main work has involved the taking of river profiles for the purpose of making the inventory of the hydraulic resources of the Province.

Hence, the survey program for the summer of 1961 dealt with a study of Magpie, Romaine, Natashquan, and Petit Mécatina rivers, all situated on the North Shore, in the region of Havre-Saint-Pierre. About 45 persons, 25 of them students, were needed to carry out the 400 miles of surveying involved in this program. However, owing to the strike among the professional staff that was started in the month of May, the program was changed. The Service delayed the departure of the field parties, and the students that had been engaged were kept working on the surveys in the Service's offices.

At the beginning of August, four students were sent to the North Shore to complete the contouring of Romaine and Natashquan rivers. The auxiliary personnel were hired on location at Havre-Saint-Pierre. During this month of work, approximately 70 miles of surveying was carried out in order to finish the profiles of these two rivers.

The Hydrography Service also did survey work for other services. In this connection, upon request from the Hydrometry Service, students from the Hydrography Service prepared the final staking of the dams situated on Nord river and integrated these datum lines into the geodesic network of Canada. Other surveys requiring three weeks of work were conducted in Montmorency forest to meet the needs of the Meteorological Service.

At the beginning of November, heavy precipitation resulted in the overflow of several rivers on the north shore of the St. Lawrence, thus causing considerable floods in the area between Beaupré and Sept-Îles. A visit to the locations most affected by the flooding was organized for the purpose of gathering information through the testimony of eye-witnesses and measurements of the highest levels attained by the flood waters.

(b) Office work

With the help of the information obtained in the field and gathered from existing charts, the Hydrography Service determined the topographic features of drainage basins, these principal traits being the surface area of the basins and sub-basins, the sheets of water, the wooded areas, the cultivated or fallow areas, the hypsometric and isochronic curves, the density and slope indexes, the characteristic lengths and altitudes.

Since the values of drainage basin areas are being utilized by various services for their studies relating to rivers, it is logical that there should be only one and the same value for the surface of each basin. Having this idea in mind, the Hydrographic Service has assumed the task of determining, as accurately as possible, the basin area of all the rivers of the Province. This work was commenced last year and it was pursued during the summer of the year reviewed here by students specially engaged for that purpose and by those who had been hired to work in the field but who were detained in the offices of the Service. In this way the surveying of all the rivers on the south shore of the St. Lawrence was completed, and work was started on rivers on the north shore of the St. Lawrence between the Ottawa and Saint-Maurice rivers. This study was done with the aid of maps at the scale of 1 inch equals

50,000 feet. In areas for which such maps are not yet available, the work will be accomplished with maps at the scale of 1:250,000. A publication giving the areas of the drainage basins will be prepared with the values obtained.

Other characteristics have been determined for the drainage basins of Outardes, Eastmain, Eaton and Sainte-Anne rivers, notably in what concerns the hypsometric and isochronic curves.

The Hydrography Service undertook the publication of a series of pamphlets containing the results of surveys carried out along rivers within the program of studies commenced a number of years ago by the Government for the purpose of making an inventory of the Province's hydraulic resources. The pamphlets give descriptions, locations and altitudes of all permanent markings made by the surveying crews. Those covering the drainage basins of James bay and Hudson bay are completed and are ready for publication, whereas the booklets dealing with other regions will be available as soon as results will have been compiled and verified.

II – Water-level Variation

Another activity of the Hydrography Service is that of seeing to the operation and expansion of the network of stations where the variations of the level of rivers and lakes are observed. The information thus acquired is necessary for a study of the normal flow of waters and also for determining riparian rights. Up to recent times, the installation of stations depended on requests received from the different services of the Quebec Department of Natural Resources and from the general public, but the Service is endeavoring, for the future, to keep ahead of these requests and to install stations in all places that are likely to supply useful information. With these objectives in view, the Service is increasing the number of its stations by 15 each year.

At the close of the fiscal year 1966/67, the Service had in operation 89 limnometric stations, 11 of which were the maxima type, that is they record only the maximum height of the water level during a flood. There were 23 stations equipped with recording apparatus and 52 stations having a scale to be read by observers. Of these 89 stations, 14 were installed during the fiscal year under review.

Technicians from the Hydrography Service supervised the installation and the proper functioning of the stations. Hence, they made regular visits to each station from three to six times a year, according to needs, in order to verify the work of the observers and to keep the recording apparatus in good working condition.

In the offices of the Service the staff verified the collected data, analysed the information, recorded it graphically, and, finally, published it in the hydrological annual that was prepared in collaboration with the Hydrometry Service.

Students working in the Service's offices brought up to date data on a number of stations that were in operation for many years.

During the fiscal year reviewed here, the engineer in charge of the Hydrography Service assumed the duties of secretary of the "Sous-comité des Eaux du Comité permanent d'Aménagement des ressources" (C.P.A.R.) and in this capacity assisted at all meetings and prepared minutes of the sessions.

Hydrometry Service

A growing demand for information on the characteristics of the province's watercourses regime illustrates the need to operate an adequate network of hydrometric stations. This network will make it possible to obtain the necessary data for studies on the regional variability of the stream-flow and the level and flow of watercourses in times of swelling and low water. These studies on the regime of watercourses are motivated in part by the use of water for the following purposes: domestic, industrial and agricultural consumption, log-driving, navigation, leisure, etc.; and, furthermore, by the necessity of carrying out various engineering works, in order to enable the production of electrical or mechanical energy, the control of flood waters, the stabilization of water levels, the protection of banks, the construction of bridges, etc.

It is thus obvious that the Hydrometry Service's assignment is vital to the rational use of this renewable resource. Therefore, in order to gear its activities to the present and future use of this resource, the Service is now active in four main fields. Its first responsibility is to collect first-rate hydrometric data enabling it to render the required services. Secondly, the Service is responsible for the publication of these data for the benefit of interested parties. In addition to these functions, the Service endeavors to continue short- and long-term hydrological studies so as to acquire a better knowledge of Quebec's regime of watercourses and to be able to operate the hydrous resources of the Province to their fullest. Finally, its fourth function consists in the operation of reservoir dams built to regularize the flow of certain watercourses and to set up a program of studies on the quality of Quebec's surface waters. The activities of the Service during the year under review here will be explained in detail in this report.

Hydrometric Data

The Hydrometry Service continued its efforts to establish a program which will ensure a more precise evaluation of the stream-flow characteristics in the Province. Furthermore, the number of gauging stations has increased progressively. The use of more perfected instruments to record the fluctuations of water level and the building of immersed sills to ensure the stability and the sensibility of height-flow relations will make it possible to improve the data collected at gauging stations.

In its record of achievements for the year under review, the personnel of the Hydrometry Service carried out 1,048 flow measurements and 1,818 inspections of instruments servicing hydrometric stations. A certain number of

measurements were carried out to determine the discharge of small streams; these hydrometric surveys provided information requested by municipalities and general contractors in connection with diversion works or the utilization of streams as a source of supply for drinking water. At each gauging station, measurements of flow were taken during the year and these measurements served to define the height-flow relation which is at the base of daily calculations. Moreover, some 48 visits were made to dam stations, taking in the inspection of dams and water level stations necessary for the operation of reservoirs.

During the 1966/67 fiscal year, 28 new gauging stations were put into operation and 32 other stations were renovated, works which represent 98 per cent of the Service's objective. In keeping with a program of expansion and improvement of the hydrometric network, launched two years ago, most of the new stations have been added to the network, whereas a few of them will be used to replace existing stations.

During the year being reviewed here, eight stations were closed and, on March 31, 1967, the hydrometric network counted 193 gauging stations and 71 dam stations. This network is comprised of four gauging stations under the jurisdiction of the Inland Waters Branch of the Federal Department of Energy, Mines and Resources and 52 dam stations operated by private concerns. These were added to the network in order to complete information on the variety of the regime of rivers in Quebec. This information is published in the Service's hydrological annual.

Concerning the gauging stations, it should be mentioned that up until March 31, 1967, only 17 per cent of the Service's stations were equipped with a non-recording gauge, whereas 48 per cent were equipped with a limnograph and 35 per cent with a perforated tape recorder. Also during the year, the Service doubled the number of gauging stations equipped with a perforated tape recorder. The number of gauging stations equipped with a non-recording gauge went from 46 to 33. The following table indicates the equipment used at stations operated by the Hydrometry Service.

<i>Equipment</i>	<i>Gauging</i>	<i>Dam</i>
Non-recording gauges	33	13
Limnographs	88	4
Perforated Tape Recorders	68	2
	—	—
	189	19

As for the density of the Hydrometric network, the territorial distribution of gauging stations in the 10 hydrographic regions of the Province is indicated below. The publication "Répertoire des stations hydrométriques"¹, gives particulars on the information available at these stations.

¹ List of hydrometric stations in use as of March 31, 1967 — Quebec Department of Natural Resources.

DENSITY OF NETWORK

<i>Hydrographic Region</i>	<i>Surface Area (sq. mi.)</i>	<i>Number of Stations</i>	<i>Stations (1,000 sq. mi.)</i>
00 St. Lawrence River	—	1	—
01 Des Chaleurs Bay — Gulf of St. Lawrence south of Rocher Percé	5,940	6	1.0
02 Gulf of St. Lawrence north of Rocher Percé and southern drainage basin of the St. Lawrence	13,400	28	2.1
03 Southern drainage basin of St. Lawrence to west of Bécancour river	12,900	24	1.9
04 Drainage basin of the Ottawa river	41,100	27	0.7
05 Northern drainage basin of the St. Lawrence between the Ottawa river and the Saguenay river	27,600	28	1.0
06 Drainage basin of the Saguenay river	35,000	10	0.3
07 Northern drainage basin of the St. Lawrence to east of the Saguenay river	106,000	13	0.1
08 Hannah and Rupert bays	67,000	13	0.2
09 James and Hudson bays	143,000	31	0.2
10 Hudson strait and Ungava bay	142,000	12	0.1

For the purpose of ensuring the proper functioning of instruments that the Service uses to record the variation of the water level at its gauging stations, recent developments achieved in the sphere of electronics have been put to the best advantage. Thus, a rectifier of alternating current (110 volts—7.5 volts) is being used to feed, with a direct current, instruments placed at sites that are power serviced by electrical lines. In many other instances the Service is using, as a source of electrical power, nickel-cadmium rechargeable batteries. These have proved to be highly effective even when used at very low temperatures.

On Delormes creek, which is an affluent of Yamaska river, the Service built a broad-crested weir in order to put a gauging station into operation and to study the regime of this watercourse, which has a drainage basin of 37 square miles. This station was put into operation on September 29, 1966, and will serve for the study of the water budget of a type-basin of the lowlands of the valley of the St. Lawrence. These works were undertaken under the direction of the Engineering Service (Waters).

Following outstanding swelling on November 3 and 4, 1966, of the rivers on the north bank of the St. Lawrence, a program of hydrometric surveys was carried out at stations in this sector to gain information, indispensable to the study of floods observed on these watercourses.

In February, a thermograph was installed at one of the gauging stations at Montmorency forest to record variations in temperature of surface waters. This is the second gauging station to be equipped with an instrument which records water temperature.

For mainly practical reasons, the Hydrometry Service carried out inspections at eight limnometric stations situated in New Quebec and in Témiscamingue, but the analyses compilation of these data remain the responsibility of the Hydrography Service.

Studies

The personnel of the Studies Division numbers six professional employees. During the year, two engineers pursued specialized studies. This group is directly allied to studies initiated within the International Hydrological Decade and also carries out hydrological research work and other specialized studies. Among these were:

1. Collaboration in the adjustment of a mathematical model to study the swelling caused by melting on the drainage basin of the Kénogami reservoir and of Outardes river.
2. A preliminary study on the relationship between the variability of flow of Eaton river and the specific conductance of water at the East Angus station. This relation will prove to be useful in studies of precipitation swellings and will make it possible to differentiate surface runoff, alluvial deposits and aquiferous inflow, and then, if this correlation is satisfactory, it could be used advantageously in calculating the daily flow during the winter months when the presence of ice-jams renders it difficult to determine the flow.

Operation

The personnel of this Division is assigned to the task of regulating outflow in 17 reservoirs that are under the direct jurisdiction of the Department of Natural Resources. It should be mentioned that some studies were undertaken in order better to define means of putting into operation reservoirs for the best use of existing dams. Limnographs were installed at a number of these dam stations; improvements were made on the equipment and on the machinery necessary for the operation of dams. The personnel of this Division also contributed to the Service's hydrological annual by attending to the analysis, the control and the preparation of data received from operators of reservoirs and of hydroelectrical power plants.

Quality of Surface Waters

This topic covers efforts brought mainly to the establishment and to the elaboration of a program of studies into the quality of Quebec's surface waters. A network of stations looking into the quality of water will enable the Service

to answer numerous questions which it receives on the subject of surface waters and also on the increasing use of the Province's hydric resources, particularly in heavily populated areas or in highly industrialized centers.

In December 1966, a chemical engineer was hired to set up this program. His main task was to gain first-hand knowledge of the systems used in this field by Canadian and American associations. During the forthcoming fiscal year, the Service will proceed to recruit and to train personnel to deal with surveys, establish some stations and carry out a program of sampling which will be used in studies currently underway on certain rivers.

International Hydrological Decade

The increase in population, the general improvement of living standards, the irrigation of new lands, and the increased implantation of new industries will all contribute to an increase in water needs. Whether it be to transport water over a long distance, to store it in reservoirs or to maintain its quality, installations and works necessary to obtain the available quantities will cost fabulous sums of money.

In some parts of the Province where water reserves no longer meet the demand, the problem is becoming more acute because the large reserves available are located at a great distance.

It is only through a continued and coordinated program of observation and scientific research in hydrology that it will be possible to evaluate and operate the water resources of the Province.

Within the scope of the International Hydrological Decade, the Hydrometry, Meteorology and Hydrogeology services have joined forces to complete successfully special studies scheduled in the program of observation and scientific research in hydrology. Projects undertaken by the Hydrometry Service this year are described below.

1 — *Eaton River*

Revision of hydrometric data of the Eaton River gauging station for the 1932-1964 period. This work will be used for a statistical study of flow, for the determining of the low-flow recession curves and other studies necessary to the knowledge of the water budget of this drainage basin; preparation of a publication entitled "Débits journaliers de la rivière Eaton" for the period extending from 1932 to 1964; setting up of two gauging stations on the main stem of Eaton river, which work completes the network of gauging stations scheduled for the study of the water budget of this representative basin.

2 — *Statistical study of the low-flow relation between this characteristic flow and the form of the recession curve*

Regime of the Saumon, Maskinongé, and Madeleine rivers, including a study of the summer season dryness index, low-flow recession curve and

determination of the relation of low-flow versus the coefficient of the index. This study made necessary the analysis and, in case of need, the revision of rating curves and flow calculations at gauging stations of these rivers. This same study is being carried out on Trois-Pistoles, Tonnerre, and Petite-Nation rivers.

3 — *Study of a technique to measure river flow under an ice cover and the effect of this on the flow-level relation of a gauging station*

For this reason, 53 flow measurements were made, from November to March, at three stations of the basin of Sainte-Anne-de-la-Pérade river for the purpose of improving the method of flow calculation during winter months.

4 — *Presence of Tritium in Water*

The purpose of this project is to obtain basic information on the distribution of tritium in continental waters. World-wide observations on tritium fall-out have revealed that this substance could be found in very large proportions in the hydrosphere. The Service's contribution to this international project consists in taking water samples of the St. Lawrence river at Champlain and Portneuf each month and sending these for analysis to the Atomic Energy of Canada Laboratory at Chalk River.

5 — *Montmorency Experimental Forest*

The Service's participation in the Montmorency Forest research program consists in supplying the necessary equipment and technical assistance for the hydrological study of this forestry basin.

During the year reviewed here, the Service added four gauging stations to study the regime of surface waters, including Montmorency river downstream from Eaux-Volées creek, Noire river, an affluent of the Montmorency river, and sub-basins 5 and 7-A. In the last case, the preparation of plans and the construction of two gaugers were entrusted to the Department's Engineering Service (Waters). These works were carried out under state supervision and were completed at the end of autumn.

At the present time five gauging stations are in operation at the Montmorency Experimental Forest and the Hydrometry Service foresees that within the next two years it will have completed the network by adding one gauger at sub-basin 7 and by putting into operation one gauging station on Montmorency river upstream from the territory considered as experimental forest.

Publications and Reports

The Hydrometry Service publishes at regular intervals a hydrological annual containing data on water level and flow of a number of watercourses in the Province. Moreover, various reports are prepared during the course of each

year for the benefit of interested groups. These reports include information of a varied nature and are published on a weekly, monthly, or annual basis.

During the course of the year under review here, the hydrological annual of 1964 was published, as well as the index of hydrometric stations in service as of March 31, 1966. The first publication treats on all the basins of the Province of Quebec and presents hydrometric information collected at gauging, limnometric and dam stations. In its second publication, the Service describes the entire network of 310 hydrometric stations and in so doing may, on request, supply additional information.

Each month, eight different reports dealing with the level and flow of certain streams of the Province are prepared and sent to the Federal Government, to Hydro-Québec or to companies which benefit from the storage facilities at different reservoirs. In addition to this, two weekly reports are prepared for the benefit of Hydro-Québec and the International St. Lawrence River Board of Control.

Worthy of mention is the fact that, for the purpose of collaborating with the publication of the monthly Water Resources Review published by the American Government, a report on the hydrological data of four typical Quebec rivers is sent each month to Washington, D.C. This bulletin contains information on the conditions of flow and on the state of underground reserves throughout North America. In addition to this, the Service contributes actively to the Federal monthly bulletin dealing with conditions of flow in the basin of Ottawa river.

This year also, Claude Pesant in a joint effort with Bernard Mathieu of the Hydraulic Development Service of the Department prepared a text for the conference "Water for Peace" which took place in Washington, in May 1967. The title of the text was "Snow and Ice in Quebec".

Personnel

As of March 31, 1967, the staff of the Hydrometry Service comprised 58 employees, including 14 professionals, 27 technicians and technical assistants in hydric resources, 11 dam operators, 2 workmen and 4 staff members assigned to administration. During the year under review here, there were four appointments. One engineer was transferred to another service and four technicians resigned.

From May 9 to July 29 of the year reviewed here, ten engineers employed in the Hydrometry Service were absent because of the strike by government-employed engineers.

Last September, Henri Saint-Martin, engineer, obtained his master's degree in hydrology from the University of Guelph, Ontario. He followed post-graduate courses for a period of 12 months.

As a result of an agreement with ASTEF (Association des Stages Techniques en France) for a professional exchange, Guy Morin, engineer, has followed specialized studies since April 1966, and, in return, Marcel Roche,

director of the Department of Basic Research's (Recherche Fondamentale) Hydrology Service of ORSTOM spent some time in Quebec, in order to acquaint himself with the hydrology of Canadian territory and thus to find solutions to problems pertaining to this field.

Claude Pesant, director of the Hydrometry Service of the Waters Branch of the Quebec Department of Natural Resources, and Pierre Desforges participated at a seminar which was held April 14 and 15 at the University of Toronto. Sessions dealt with studies of experimental basins that Canadian groups intend to create within the framework of the International Hydrological Decade.

In October 1966, Robert Théorêt, engineer attached to the Service, took part, as an observer, in a series of gaugings carried out on the St. Lawrence river, upstream from the Honoré Mercier bridge. These surveys were carried out under the direction of the Inland Waters Branch of the Federal Department of Energy, Mines and Resources.

In November of the year under review, two study sessions were held for the technical personnel of the Service in charge of the operating of gauging stations. The first session was given by the Canadian representative of Neyrpic Company, and featured a descriptive report on the characteristics, the functioning, and the maintenance of a current-meter. The second session dealt with the functioning of a servo-manometer and was given by a representative of the Canadian Aviation Electronics Company (CAE).

Professionals attached to the Hydrometry Service attended a number of conferences on November 9 and 10, 1966, during a seminar dealing with the formation and the evolution of ice in lakes and in rivers. This seminar was held at Laval University under the auspices of the Canadian National Committee of the International Hydrological Decade.

The Service also collaborates in works by the "Sous-comité des Eaux du Comité permanent d'aménagement des ressources".

Meteorology Service

General Statement

By an Order in Council 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, Industry and Commerce, Agriculture, and Natural Resources.

From its inception, the new Meteorological 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.

Inspection Division

The six 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 year under review in this report, the Meteorology Service was more than ever occupied with completing the meteorological network of the Eaton basin. This work was carried out within the context of the International Hydrological Decade, and consisted in preparing for the installation of a special meteorological network in Gaspesia with a view to conducting a climatological study of the Shickshocks, as an objective within the program of ARDA, and, moreover, to planning a hydrometeorological study of the Sainte-Anne River basin.

The inspectors keep continually up to date a map of the meteorological stations of the Province 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.

At the present time the Quebec meteorological network consists of 522 permanent stations, that is to say stations under observation throughout the year; 137 seasonal stations, or stations subject to observation during only a part of the year, which means during the summer season; 53 temporary stations, meaning certain stations that will be visited only a limited number of times a year and which serve a particular need; 107 nivometric survey stations; and nearly 50 snow-gauging stations serving winter tourism. The Meteorology Service is also responsible for 24 climatological stations in Montmorency forest, where a hydrometeorological study was commenced last year within the framework of the International Hydrological Decade.

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 technical 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 the nivometric surveys and the forest inflammability index as determined at the forestry meteorological stations, and to return to the observers correction notes and directives relating to their work. A forest inflammability index report

is likewise sent each week to the forest fire rangers in the respective territories of the stations concerned.

This Division received special data from about 40 observers who collaborated in a study of the method now in use for evaluating forest fire danger. It has, moreover, prepared an index of the meteorological stations in the Province in 1966.

Studies and Information Division

The Studies and Information Division consists of three engineers, three meteorologists, four technicians and one technical assistant. Its duties are to analyse and study climatic data in relation to the requirements of the various Provincial Government departments and of the public and also to prepare for publication monthly and annual summaries of observed meteorological characteristics. These research workers conducted several different undertakings in hydrometeorology, climatology, and agrometeorology during the fiscal year under review here.

Nivometric Surveys

Perforated cards were prepared for the registration of data on snow samples collected from all over the Province. These cards are useful in the making of tables showing the information gathered, in the study of the relationship between surveys of the snow accumulations and climatical data, and in the preparation of the average values of the depth of the snow and the water equivalent of the snow at each station.

Precipitation in the Eastern Townships

Meteorologists from the Service have undertaken a study of maxima precipitations of different durations in the region of the Eastern Townships. This study, which was suspended in autumn because of the departure of the student personnel, will be pursued again in May 1967.

International Hydrological Decade

Works completed in Montmorency forest were the installing of instruments for measuring radiation, wind, evaporation, and precipitation at the principal station, the revision of the secondary network of hydrometeorological measurements (precipitation, temperature, snow blanket), the preliminary study of the melting of snow in the spring of 1966, the compiling of all information gathered in 1966, and the setting up of a network for keeping track of the humidity of soil.

In the Eaton basin various works were carried out, such as preparation of a program for the installation of a radiometer at Sawyerville, publication of a compilation of the daily and monthly meteorological data for the year 1965 and another collection of information for 1966, and the extraction of all meteorological data prior to 1965 for eight stations of the Eaton basin.

Maximum flood of the Saint-François and the Chaudière

This study, which was carried out in collaboration with the Meteorological Service of Canada, has just been concluded, but results will not be published until the autumn of 1967.

Climatical Atlases

The descriptive texts and climatical charts of two atlases of Quebec (the northern part and the southern part) were completed during the fiscal year reviewed in this report. These atlases are just about ready for publication.

Frost Probabilities in Quebec

Tables showing the frost probabilities for 83 stations in Quebec, as well as descriptive charts and explanatory notes, have been completed. These probability tables were published in May 1967.

Flood of November 3 and 4, 1966

An analysis of the meteorological factors involved in the origin of the intensive storms of November 3 and 4, 1966, was made by the Meteorological Service. The Service conducted a hydrometeorological analysis of the storms and made a high-frequency duration curve chart in relation to these storms. A report was prepared and will be interpolated in a text covering also the analysis of hydrometric and hydrographic factors and the assessment of damages caused by floods.

Bécancour River

The Studies and Information Division of the Meteorological Service made an evaluation of the efficacy of the pluviometric network that was put into operation three years previous in the upper basin of Bécancour river. This study has enabled the staff to establish correlations between the various stations in such a manner as to determine the specific use of each of the stations.

Index of Stations

The Studies and Information Division continued to insert on perforated cards all the geographical, historical and other information conducive to the identification of meteorological stations. These cards will eventually enable the Service to publish an index of the stations by methods of computing data.

Moreover, the Studies and Research Division supplied, during the fiscal year reviewed here, the following reports on climate conditions: 791 meteorological certificates, 712 photocopies of monthly climatological résumés, 164 photocopies of climatic summaries and 683 copies of Bulletin Météorologique, in addition to those sent out by the Distribution and Publishing Division of the Quebec Department of Natural Resources. In 1966, 2,777 persons were regular recipients of Bulletin Météorologique and Feuillet Météorologique.

The Meteorological Service publishes two periodicals: Bulletin Météorologique, which each month gives the monthly averages and total values of the meteorological aspects observed at stations throughout the Province and also annually, in a 13th number, certain yearly values and the index of stations, and Feuillet Météorologique, which informs its readers, and especially the observers, concerning the directives, advice and news on meteorology and climatology. Feuillet Météorologique is in its 18th year of publication and, in 1966, it consisted of 312 pages of text and an index of subjects.

Furthermore, the Meteorological Service made available to the Meteorological Service of Canada nearly 5,000 monthly climatological reports. Collaboration between the Federal and Provincial organizations continues to be very close and most beneficial.

Miscellany

During the year 1966, G.-Oscar Villeneuve became a member of the subcommittee on Meteorology and Atmospheric Sciences, an affiliate of the Geodesy and Geophysics committee of the National Research Council. This subcommittee aims at encouraging, aiding and coordinating the development of meteorology and atmospheric sciences across Canada.

An article by Dr. Villeneuve, entitled "Beau temps... Mauvais temps... la météorologie au service de la population" appeared in the publication "Le Jeune Scientifique" during the course of the year under review here. Parts of this article were distributed by the Department.

NEW QUEBEC BRANCH

It will be four years on April 8th since the New Quebec Branch was called upon to exercise, in the name of the Government of Quebec, all administrative functions, with the exception of the sphere of jurisdiction proper to the Department of Justice and the Department of Lands and Forests, in the administratively unorganized territory of New Quebec. The field of operations which has thus been confided to it is doubly vast, since it covers an area of approximately 400,000 square miles and involves such diverse responsibilities as the administration and management of the country and the installation of public services adapted to the needs of the aborigines as regards instruction, health and social security, as well as the organization incident to the physical well-being of native villages.

It is to this end that the efforts of the New Quebec Branch have been directed during the first four years. These efforts will result in establishing principles and instruments of an extended governmental action—an action that will be diversified according to the most urgent needs of the natives and that, above all, will respect their cultural traits.

At the close of the fiscal year 1966/67, the New Quebec Branch had representatives at 10 posts in northern Quebec and consisted of 112 regular or full-time employees, of whom 29 were attached to the main administrative office at Quebec City and 83 were engaged in the northern regions. These were grouped into two main sections or divisions: the Technical Services and the Administrative Services.

Technical Services

The Technical Services are, in practice, those services designed to further human knowledge, scientific or technical, for the unfolding of administrative action as it obtains in northern Quebec. The Technical Services comprise the Research and Documentation Service, the Engineering Service (New Quebec), the Education Service and the Health and Social Security Service.

Research and Documentation Service

One of the tasks indispensable to the administration of New Quebec consists in preparing the way for decisions and administrative duties by compiling the information and by pursuing the studies that are necessary as much for

the administration of the country as for the development of its physical and human resources. This is the purpose for the existence of the Research and Documentation Service. Its work consists as much in making an inventory of the available fauna and analysing the economic potential of the region as in compiling files preparatory to the localization of a building or of a village to be constructed.

The making of an inventory of the resources of New Quebec was, for the most part, greatly reduced in 1966, owing to a strike which deprived the public function of the services of the professional employees during 12 weeks, that is from the beginning of May to the end of July, which duration is the best period for carrying out research in the territory of New Quebec. An expedition was, however, made to Akpatoc island during the summer of 1966 by the personnel of the Technical Services for the purpose of learning the geography and the fauna of an island in the Ungava Bay, which through its physical and human ties is attached to the territory of New Quebec.

It was after the results of a geographic study that the site of the new village of Baie-des-Feuilles was chosen in view of its access to local resources. This is the village that the New Quebec Branch undertook to construct in the autumn of 1966 near Ungava Bay upon the request of the Eskimos of Fort-Chimo who were desirous to exercise their traditional occupations of hunting and fishing. However, it became necessary to postpone the work and the negotiations preparatory to the establishment of the village of Baie-Deception which the New Quebec Branch had to build in order to bring together the Eskimos employed in mining operations of Asbestos Corporation from the time that the company made known its decision, at the end of March 1967, to interrupt for the present the construction of its installations.

Other more limited researches have also been conducted in 1966/67 for the guidance of administration. One of these, undertaken by an adviser in anthropology, was intended to localize the most favorable site for the installation of a refrigeration plant in the region of Wakeham for the needs of the natives. Another dealt with the possibility of exempting the Eskimos from the tax imposed on motor fuel at Quebec and a third was the comparative study of the administration of justice in northern Quebec with the judicial system as it is applied in the Northwest Territories. Moreover, the Research and Documentation Service followed negotiations and took the steps necessary for the next transplantation of muskox in the Ungava district because of the value of the fleece and flesh. The Service likewise continued to prepare a file with a view to the transfer of the services of the Federal Government to the Government of Quebec in northern Quebec.

While engaged in various works the Research and Documentation Service never failed to inform the Department of Lands and Forests concerning occupation of the lands of New Quebec. To this end, the Department of Lands and Forests surveyed, upon request from the Service, the villages of Inoued-jouac, Ivujivik, Saglouc and Wakeham as a means of accurately delimiting the properties and of establishing a cadastre which can guide, in the future, the

granting of lands, the choice of sites for houses, the construction of roads, or of a runway in the posts.

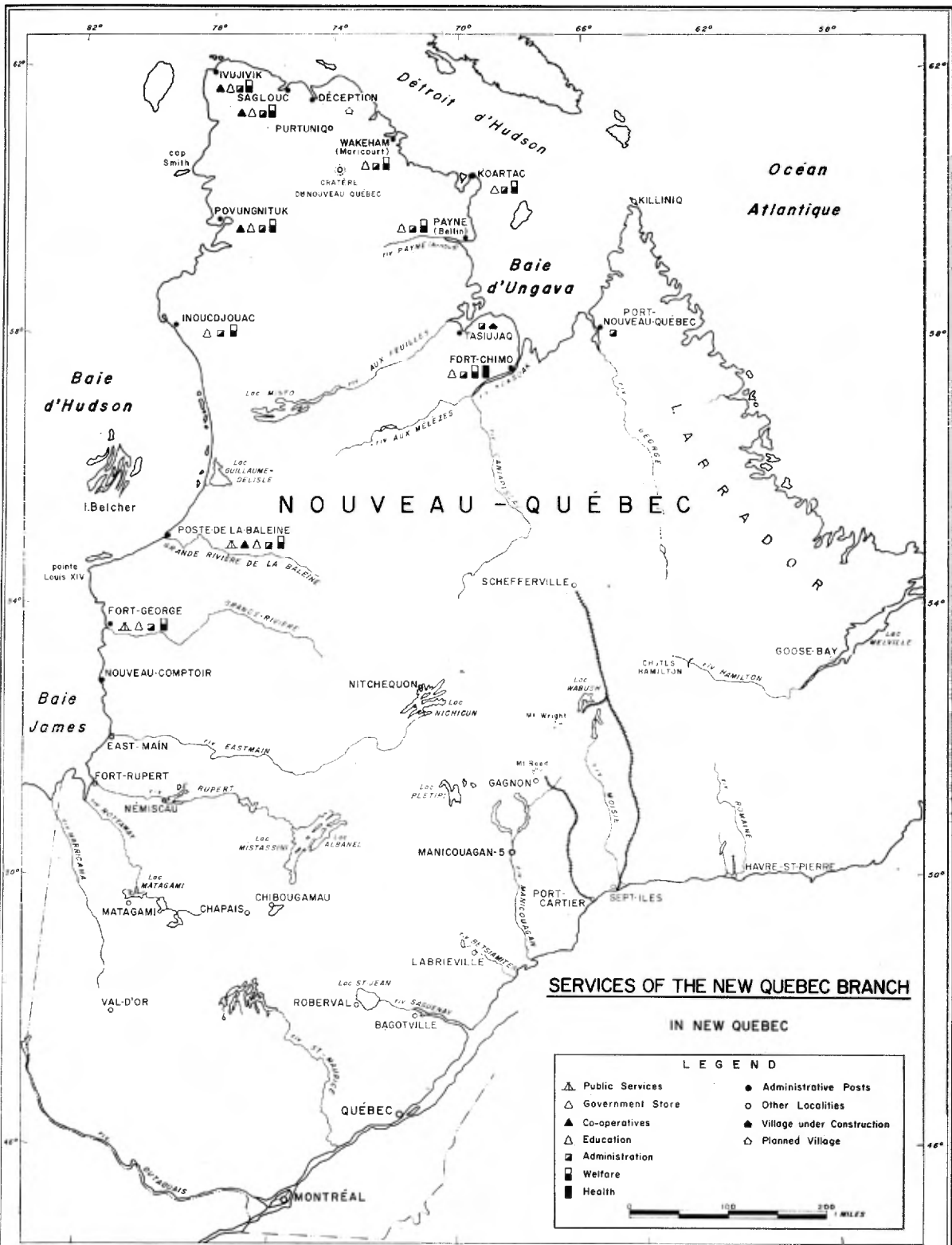
It is also the responsibility of the Research and Documentation Service to train the personnel destined for posts in northern regions while devising the plans necessary for that goal with the needs of the natives in view. One such program was concluded during the fiscal year under study. This work pertains to a rapid method for the study of the Eskimo language. Inspired in the beginning by the Berlitz method, the process consists of 22 recorded lessons and it is presented through audio-visual means, such as drawings, and through the magnetophone to introduce the student to the vocabulary and to the sounds while reducing the role of the teacher through practical exercises. The White and the Eskimo personnel who have contributed to the development of this Eskimo language course are now ready to publish, at the close of 1967, a French-Eskimo dictionary, the vocabulary of which is divided into subjects such as those of anatomy, health, mechanics, family, etc., to meet the needs of daily life in the northern posts. Meanwhile, the Research and Documentation Service compiled in one publication entitled "Aperçu sur le Nouveau-Québec", the articles that had been issued on northern Quebec in 1964/65 with the collaboration of the New Quebec Branch. Together, these undertakings make three invaluable implements: the first two answering especially to the internal needs and the third series intended to instruct those of the public who seek information on the northern districts of Quebec's territory.

Finally the documentation section of the Research and Documentation Service was increased, during the course of the fiscal year reviewed here, by 367 volumes and 15 new periodicals and Danish manuals as used by the Eskimos of Greenland, which the Service had translated for internal use, especially for the Quebec personnel charged with teaching in New Quebec.

Engineering Service

The New Quebec Branch devoted a large part of its efforts during the fiscal year reviewed here to the construction of buildings. In these constructions the help of the Branch is required to set up services to meet the needs of the native populations dwelling beyond North latitude 52°. The Engineering Service is at one time called upon to build a house for the Quebec agent, at another, to erect a school or, again, to install an electricity generating plant or even a general store, according to the demands of the various posts.

One of these buildings, a school at Chimo, the construction of which took place during the fiscal year here under review, was opened in September 1966 and later officially inaugurated on January 23, 1967, by the Associate Minister attached to the Department of Education. The Engineering Service built, in the village of Chimo in 1966/67, a government pavilion which houses the offices of administration, a clinic and a wing reserved for the hospitalization of the sick, living quarters for future employees and rooms for transient visitors, a kitchen, a dining room and a meeting hall.



NOUVEAU-QUÉBEC

SERVICES OF THE NEW QUEBEC BRANCH

IN NEW QUEBEC

LEGEND

▲ Public Services	● Administrative Posts
△ Government Store	○ Other Localities
▲ Co-operatives	◆ Village under Construction
△ Education	◊ Planned Village
■ Administration	
■ Welfare	
■ Health	

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A list of the works carried out at various northern posts in 1966/67 follows:

- at Koartac on Hudson strait, construction of a dwelling for the Quebec agent, including also a classroom, a general store, a warehouse-workshop and the installation of an electricity generating plant;
- at Fort-Georges on James bay, construction of a school capable of housing three classes and a workshop; transformation of a house, property of the Department of Tourism, Fish and Game;
- at Port Nouveau-Québec on the east side of Ungava bay, construction of a house for the Quebec agent and a warehouse-workshop;
- at Ivujivik at the extremity of Hudson bay and Hudson strait, construction of a house for the Quebec agent;
- at Baie-des-Feuilles on the west side of Ungava bay, construction of a store-warehouse and a house for the Quebec agent; installation of an electricity generating plant;
- at Wakeham on Hudson strait, construction of a landing for travellers and a bridge over a stream tributary of the river that crosses the village;
- at Saglouc on Hudson strait, repair of a building for use as a warehouse for the local co-operative.

The duties of the Engineering Service commence with the preparation of plans and only terminate with the completed construction of the building. Its responsibility is, in fine, to draw up the plans and estimates, to determine the material, to supervise the delivery and then to transport the material by boat and, finally, to erect the building with the help of tradesmen and porters, both White and Eskimo. Moreover, the Engineering Service has charge of administrating the essential municipal services linked to the airport of Poste-de-la-Baleine, such as the services of water, sewers, fire protection and refuse disposal (production and distribution of electricity, which are controlled by Hydro-Québec, are not included) since the expiration of the contract by Canadian Marconi on February 1, 1967.

Fifty-nine persons were engaged in the maintenance of these services and other auxiliary services of the air-base of Poste-de-la-Baleine, at the close of the fiscal year under review.

Education Service

Education is as indispensable an instrument for the evolution and development of aboriginals as it is for any other ethnic group. For this reason, the New Quebec Branch has undertaken to set up, among the Eskimos of Quebec, a system of instruction in keeping with their culture and environment. Confronted with the system of teaching applied by the Federal Department of Northern Affairs, the Education Service had no other choice at first than to limit its field of educational activity to a type of relative instruction, while opening, for example, kindergarten classes in certain posts in 1963/64 and in 1964/65 in order to hasten the development of the young. The Service had six such classes

in operation during the fiscal year 1965/66 in New Quebec and these were situated at Chimo, Payne, Wakeham Ivujivik, Povungnituk and Inouedjouac. At a later date, Quebec government authorities undertook to lead these students of the kindergarten classes to the first grade in 1965 and then to the second grade in 1966 in the posts of Fort-Chimo and Wakeham. The originality of these New Quebec schools lies in the fact that the Eskimo language is the teaching medium during the years of the first cycle of studies, which consists of the kindergarten, the first grade and the second grade of the elementary course in such manner as to permit the child to form the bases of his thinking and to express himself freely in his idiom before entering into the mental field of a second language, whether it be French or English. After this preliminary training the young natives will be able to learn a second language much more readily, such as the three Eskimo students who have been in Quebec schools during the past year have demonstrated.

In order to facilitate the task of its teachers in this field, the New Quebec Branch published, in the 1966/67 fiscal year, its first manual in Eskimo. This volume consists of two series of illustrated books for reading and exercise work: one is presented in syllabic characters and the other in Roman characters, according to the spelling as normally used. The first series comprises a reader and an exercise copybook, to be used in the first grade, whereas the second is made up of a primer for first-grade students and a reader and exercise copybook for second-year students. This is the first time in Canada that civil servants have provided natives of the far North with texts to teach them the rudiments of knowledge in schools through manuals prepared for them and presented in their own language, and with their cooperation. Moreover, the New Quebec Branch did this without losing sight, in practice, of the respect it owes to the cultural traits of the aborigines and with due regard to the basic principles designed for the advancement of educational institutions.

Since February 1967, the Education Service has been conducting, at Wakeham, similar preoccupations during the period of probation for the practical training of natives who are to become teachers. The Eskimos, two young men and four young women, who participated in the course, have familiarized themselves with the preparation of class-work and the practice of teaching under the guidance of instructors. They taught, for example, each in turn, by way of preparing for the tasks which they will assume on a full-time basis in September, in classes of the first cycle of elementary studies in New Quebec.

However, the most noteworthy example of action by the Education Service in education in northern Quebec in 1966 was the establishing of a trades school, situated at Poste-de-la-Baleine and intended to help the natives learn such trades or occupations as woodwork, carpentry, electricity and mechanics. Opened on May 15, 1966, with 30 student recruits from other posts, the school of Poste-de-la-Baleine comprised 55 students at the close of the fiscal term being reviewed. Most of these scholars are boarders, that is to say they are lodged and nourished in buildings at the radar base. The program of studies, which is divided into three trimesters comprises two courses, namely: a course of recuperation, of two years' duration, intended for persons between the ages of 19 and 35 years, on the one hand, and, on the other, for the younger

people of ages between 15 and 18 years, an optional three-year course, which combines the study of school subjects of the second degree of a tradesman's apprenticeship. Inspired by rapid methods and the audio-visual systems, directors of the trade school tend, like those of the first-cycle classes, to place the native as much as possible among the teaching personnel. To this end, the New Quebec Branch provided for the period of probation for four Eskimos in institutions in the South, namely: the Technical Center of Vaudreuil, L'auto-neige Bombardier Ltée of Valcourt, and at the maintenance and repair shops of Hydro-Québec, Jarry Street, Montreal.

It is likewise necessary to class among educational activities other types of teaching or of initiatives in public instruction which have been followed intermittently since some years. A large part of the personnel of the New Quebec Branch assigned to northern villages also exercise, to a certain degree and in accordance with diverse methods, an instructive role among the natives, whether it relates to teaching of French in the schools of the Department of Northern Affairs or by organizing work-rooms for the teaching of housekeeping or handicrafts for the benefit of the Eskimo population. One of these sessions for the teaching of housekeeping was held at Sagloue during the preceding fiscal period and dealt with the arts of cooking and sewing, whereas the workshop for handicrafts gave courses at Ivujivik on the preservation of fur items intended for export to the South.

A committee of recreation and sports, among other activities, helped to fill in the free time of the population of Chimo by the organizing of games and especially of movies during which documentary films played a great part. Finally, 18 students, men and women from Quebec, were engaged in the field as organizers during the summer of 1966 in various posts of New Quebec while introducing the teaching of French in the organization of recreation among the younger native population. Adapted to variable circumstances these activities took on, according to the places involved, a more or less uniform aspect starting from the kindergarten to the French class or to participation in the games and work of the aborigines.

Today, when the aborigines of New Quebec are abandoning more and more their traditional occupations of fishing and hunting, it is imperative that measures be taken to prevent them from sinking into the passive existence of state-supported individuals. Aware of its responsibilities in this regard, the Quebec Government has established a number of institutions whose main objective is to train and equip the Eskimo to participate fully in northern enterprises and development of this environment. Among these institutions is the well-known trade school at Poste-de-la-Baleine.

Health and Social Security Service

The Health and Social Security Service has made giant strides during the fiscal year under review here, a highlight of which was the laying of the foundations of the first health center in New Quebec early in September 1966, and the appointment of a physician and a nurse at Fort-Chimo.



PLATE IV

Quebec government pavilion, built at Chimo
in 1966/67 partly of cement
and partly of wood and comprising
a floor-area of 12,000 square feet.

PLATE V

D^r. Serge Bourdua, physician in charge
of the Chimo health center, examining
an Eskimo child at the clinic, aided by nurse
Lucille Boucher.



March 7, 1967, saw the establishment of a clinic providing laboratory and X-ray facilities at Chimo by the Quebec Government. This clinic is located at the government pavilion at Chimo. Among the many services the clinic offers the native population is a wing for patients requiring hospitalization.

The Eskimos have been quick to realize the benefits offered them at the Fort-Chimo clinic. The number of persons who have availed themselves of these services has steadily increased to more than 200 a month, whereas residents of other stations along Ungava bay receive only periodic visits from a Quebec physician.

The Chimo health center is operated according to the Quebec Government medical and administrative program under the direction of a physician. Plans for the center include its eventual expansion into neighboring villages along Ungava bay to complete the health program designed for the diverse regions of New Quebec.

The opening of the Chimo health center has made it possible for residents of New Quebec to receive treatment at hospitals and clinics in the southern regions of the Province. During the first evacuation exercise from Chimo, 17 patients were flown to Quebec City where they received treatment at St-Sacrement Hospital. It was the cooperation of this institution which made this operation possible.

The Health and Social Security Service has attended to the needs of hospitalized Eskimo patients. While receiving the ultimate in therapeutic care in Quebec hospitals, Eskimo patients were also provided with an interpreter so as to avoid any inconvenience that might arise because of language difficulties. Also, the Eskimos may have the advantage of the visits of medical specialists at the Chimo health center. The Health and Social Security Service arranged for consultations by specialists at the Center. One example which may be cited is an ear, nose and throat specialist who, in March 1967, examined and treated natives suffering from infections of the ear and of the respiratory tract.

The Health and Social Security Service does not underestimate the importance of acquiring as much knowledge as possible concerning the history and causes of illness among the natives so as to prevent disease from spreading. The cooperation of services of the Department of Health has been acquired in this effort. For instance, the director of health clinics agreed to supply, voluntarily, vaccines, and to make available consultations in hygiene in answer to needs of northern posts. Access to the registry on case histories of tuberculosis will also make it possible to examine those files which describe cases of this disease in New Quebec. In the same way, copies of birth marriage and death certificates which the director of the Demography Service has placed at the disposition of the Branch have helped to shed new light on problems of health and social security.

Needless to say, the application of social security measures for the natives requires a thorough knowledge of their situation so as to adopt to their conditions the norms and forms of social assistance which have been established in Quebec for the southern population. To this end, the Branch's Health and Social Security Service gave special attention, during the year under review

here, to a systematic grouping, by posts, of information on Eskimo families so as to draw up a complete file which will serve as a guideline in interpreting their problems to the services of the Department of Family and Social Welfare. One government staff member has continued to take on this task of acting as an intermediary between the villages of the North and welfare services in order to ensure that the Eskimos receive all the financial assistance accorded to the population of the South.

The fact remains, however, that the particular conditions of life of the Eskimo people and their culture as exemplified by their family structure make it clear that a social security program would not be practical or effective unless it be adapted perfectly to the particular characteristics of those people who should benefit from it.

Conclusion

To sum up, the New Quebec Branch continued, during the fiscal year under review here, to give its support to the native co-operative movement. In this respect the Branch allocated a grant of \$40,000 to the Quebec Co-Operative Council, which assumes the responsibility of lending money and supplying staff officers needed for the creation and the expansion of co-operatives in northern Quebec. It also made a grant of \$70,000 to the Centre d'Études Nordiques of Laval University—a group which came into being following a contribution by the Government in 1961,—thus making it possible for a French Canadian body to conduct research specifically orientated to New Quebec.

Participation in Works of Independent Organizations

Some staff members of the New Quebec Branch took part, in 1966/67, in works carried out by independent groups. They participated actively, each in his own sphere, by giving courses, conferences or exposés.

The director general of the New Quebec Branch attended a meeting of specialists in resources which was organized by the Canadian Council of Resources Ministers and held at the Queen Elizabeth Hotel, in Montreal, from October 29 to November 4, 1966. Eric Gourdeau directed one work group which was set up to examine the problems of urbanism and regional planification.

Among the authors of special reports presented at a conference of ACFAS, which took place in Quebec on November 4, 5, and 6, 1966, were three staff members of the New Quebec Branch, namely: Benoît Robitaille, director of the Branch's Technical Services; Camille Roy, geographer; and Roger LeJeune, biologist. M^r. LeJeune presented a descriptive article on the "Mouvements de l'ombre chevalier à Tasiujaq", whereas M^r. Roy examined the geographical aspects of hunting and fishing in the Ivujivik region. M^r. Robitaille treated two subjects, one entitled: "Tasiujaq, nouveau village esquimau de l'Ungava" and the other entitled "Problèmes Géomorphologiques de l'île Akpatoc, baie d'Ungava".

The director of Technical Services, M^r. Robitaille, was asked to give a course on the first of February, 1967, at the Department of Geography of McGill University. This course was part of a series of public courses on the geomorphology of Canada. His conference was entitled "L'île Akpatok, étude et géomorphologie périglaciaire".

Benoît Robitaille, geographer, and Roger LeJeune, biologist, presented a joint report on the "Tourism Potential of New Quebec" at a meeting of the Association of Geographers of French America which was held at l'Estérel in the Laurentians, from March 17 to March 19, 1967.

PROGRESS OF THE QUEBEC MINING INDUSTRY

For the second consecutive year the mineral production of the Province of Quebec has surpassed the \$700 million mark: \$721 million in 1965 and \$770 million in 1966 (figures are not final). All indications seem to suggest that this production value will attain \$800 million in 1967.

Metallie substances alone were responsible for 60 per cent of Quebec's mineral production, accounting for \$457 million out of the \$770 million for the year 1966. During the preceding year \$432 million out of the cumulative total of \$721 was attributable to mineral substances. Much of the Province's total metallie production came from four sources, namely iron ore, copper, zinc and gold.

In all, there are some 40 substances both metallie and non-metallie mined within the Province of Quebec. These mines give employment to about 30,000 persons and contribute annually more than \$140 million in salaries through the mining industry.

New Developments

Copper, zinc and gold, which occur in northwestern Quebec, the Eastern Townships and Gaspesia, constitute, along with iron ore from the North Shore and New Quebec, the principal metallie minerals of Quebec. Much of the copper is associated with other substances, especially zinc and nickel.

Similarly, the mining of new copper-nickel deposits is likewise stressed to the degree where the Quebec output was in excess of 6.6 million pounds valued at \$5.5 million in 1965 and 8.5 million pounds having a value of 7.3 millions in 1966.

Moreover, several new copper- and zinc-producing mines have commenced operations in the northwest and in the Eastern Townships, and new developments are foreseen for the near future.

Gaspé Copper is at present in full expansion. Apart from advancing the daily capacity of its concentrator from 7,500 to 11,000 tons, this company plans to exploit new deposits before long.

During the past few years, there has been a marked increase in the production of molybdenum, a metal invaluable to the space age, and also of its by-product, bismuth. Molybdenum production in Quebec for 1964 was worth \$1.9 million, and for 1966 the output of molybdenum rose to \$7.5 million. On the other hand, the value of the Province's bismuth production advanced from \$320,826 in 1964 to \$803,901 in 1965 and to \$2.6 million in 1966.

Gaspesia

The Quebec Department of Natural Resources is now pursuing the systematic development of a network of access roads to the natural resources of Gaspé Park where encouraging discoveries have been made since the opening of the

park in November 1963. This work program is to be spread over a period of three years.

Northwest

The Waconichi Lake – Albnel Lake road was completed during the fiscal year reviewed in this report. Its construction was in progress during six years.

After establishing Matagami, the Department of Natural Resources founded another mining village in this northwest region. This new village is known as Joutel and it was built to house the miners of Poirier mine at the cost of \$2,000,000.

Another mine, Joutel Copper Mines, commenced mining operations in 1966. Copper ore reserves in this region surpass 2,000,000 tons.

Research

Insofar as research is concerned, the Quebec Government is to prepare a plan before undertaking the construction of a research center of mineral sciences for the purpose of promoting a more intense development of the mining industry in Quebec.

Aeromagnetic Surveys

During the fiscal period under study here the Department of Natural Resources undertook a series of aeromagnetic surveys in Gaspesia and along the North Shore. These surveys which Quebec has initiated will be conducted over a period of three years. The project will cost \$898,240 and will necessitate more than 200,000 miles of flying. The costs will be shared equally by the Government of Quebec and the Federal Government. The Department will also carry out aeromagnetic surveys in the Matagami district. In this case the expense will be covered entirely by Quebec.

SOQUEM

“La Société Québécoise d’exploration minière” pursued its operational research. It was authorized by the Government of Quebec to enter into contracts with several private concerns with a view to studying the possibility of opening new mines in the Province.

SAREP

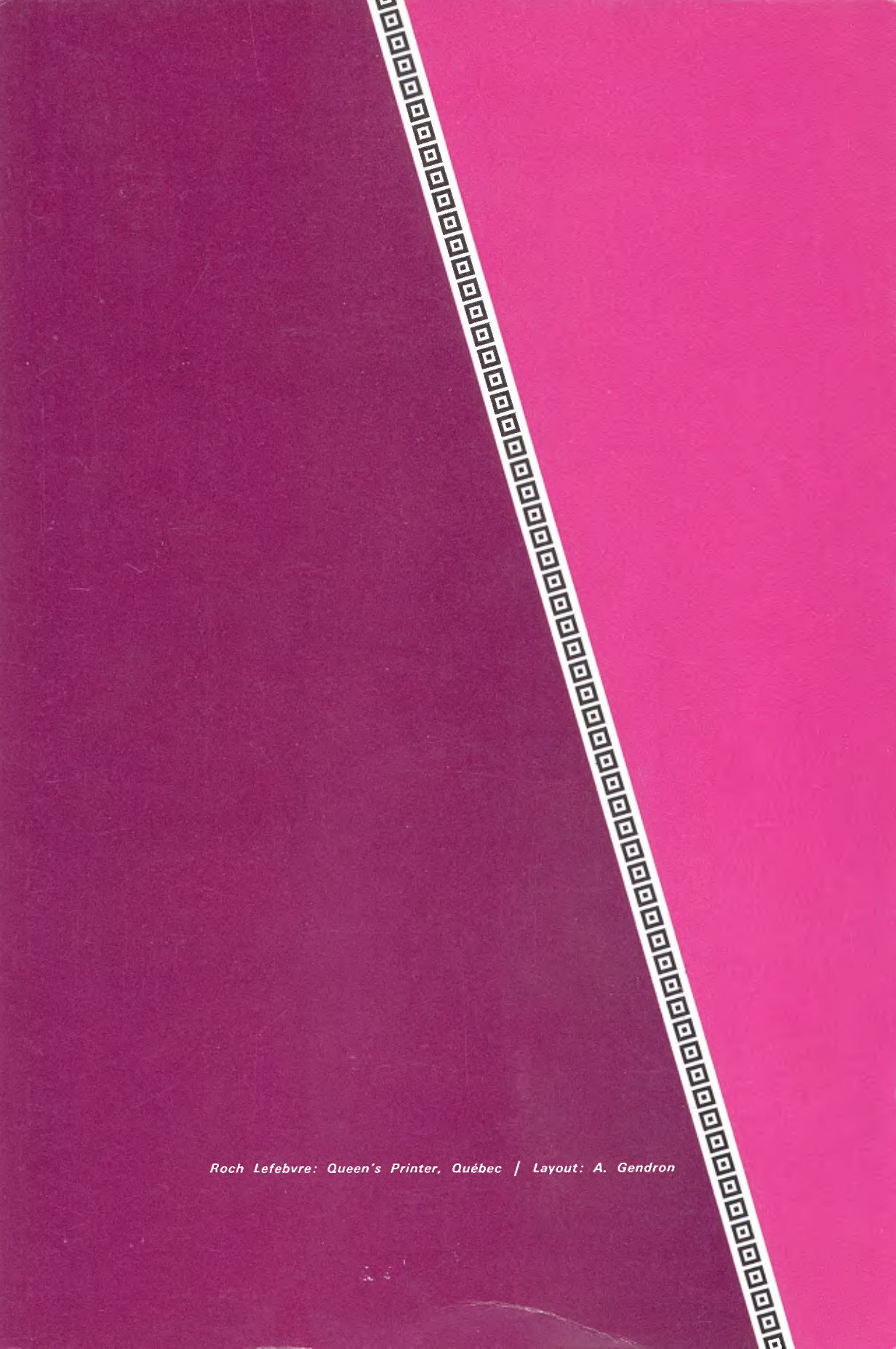
Upon the recommendation of the Government of Quebec, Hydro-Québec, which holds all the exploration licenses in the Gulf of the St. Lawrence, signed a contract with a petroleum company (Texaco) for the purpose of exploration and development of the sedimentary basin of the St. Lawrence, more especially in the part lying in the gulf. The joint company formed in virtue of this agreement is known as “Société acadienne de recherche pétrolière”.

MINERAL PRODUCTION OF QUEBEC IN 1965 AND 1966

SUBSTANCES	SUBJECT TO REVISION				
	1965		ESTIMATED FIGURES 1966		
	<i>Quantity</i>	<i>Value</i>	<i>Quantity</i>	<i>Value</i>	
<i>METALLICS</i>					
Bismuth	pounds	280,246	\$ 738,966	650,753	\$ 2,603,012
Cadmium	pounds	346,591	963,523	304,421	730,610
Cobalt	pounds	95,000	295,200	101,000	218,116
Columbium	pounds	2,333,967	2,528,051	2,600,000	3,150,000
Copper	pounds	347,435,444	130,635,727	345,434,345	155,100,021
Gold	ounces	894,616	33,753,862 * *	944,934	35,725,802 * *
Iron (metal)	tons	384,520	18,171,713	13,817,367	128,707,024
Iron (ore)	tons	14,817,820 *	146,713,624	355,311 *	16,895,216
Lead	pounds	8,426,230	1,306,066	7,508,276	1,121,736
Molybdenum	pounds	2,351,246	4,334,158	4,896,309	7,589,279
Nickel	pounds	6,082,613	5,109,395	8,593,400	7,364,544
Selenium	pounds	314,780	1,526,683	297,800	1,828,500
Silver	ounces	5,140,107	7,191,010	5,780,130	8,086,402
Tellurium	pounds	54,364	353,366	56,900	372,100
Titaniferous iron	tons	58,124	385,255	18,760	142,290
Zinc	pounds	545,766,224	82,410,700	580,504,425	87,656,168
TOTAL METALS :			\$436,327,299		\$457,290,820
<i>NON-METALLICS</i>					
<i>I - Industrial minerals</i>					
Asbestos	tons	1,234,977	\$122,802,838	1,336,566	\$141,559,725
Feldspar	tons	10,904	252,868	15,900	397,500
Industrial lime	tons	334,980	3,786,049	318,342	3,411,306
Industrial limestone and marble	tons	1,030,025	2,811,964	1,100,000	3,000,000
Lithium	pounds	1,013,565	1,141,426	244,063	258,794
Magnesitic dolomite and brucite	tons	77,774	4,010,927	—	3,928,158
Marl	tons	68,792	120,386	93,778	164,112
Mica	pounds	547,611	25,414	339,800	14,082
Ochre and iron oxide	tons	309	13,879	300	14,000
Peat (moss and humus)	tons	107,669	2,306,007	110,000	2,500,000
Quartz and industrial sand	tons	522,474	3,246,032	540,000	3,400,000
Soapstone and talc	tons	14,675	172,834	15,100	191,100
Sulfur	tons	236,348	1,560,788	—	1,441,027
Titanium (oxide and other titanium products)	tons	410,255	22,425,094	395,523	21,615,610
TOTAL INDUSTRIAL MINERALS :			\$164,676,506		\$181,895,414
<i>II - Building materials</i>					
Building lime	tons	36,271	\$ 404,064	34,000	\$ 357,000
Building stone	tons	43,002,301	46,816,052	47,362,626	51,841,068
Cement	tons	2,834,718	45,774,187	2,976,610	49,361,015
Clay products	tons	—	6,663,438	—	6,600,000
Sand and gravel	tons	45,101,021	21,010,210	49,611,123	23,111,231
TOTAL BUILDING MATERIALS :			\$120,667,951		\$131,270,314
GRAND TOTAL :			\$721,671,756		\$770,456,548

* 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 \$18,737,301 for 1965 and to \$19,533,519 for 1966.



Roch Lefebvre: Queen's Printer, Québec / Layout: A. Gendron