REPORT

OF THE

ROYAL COMMISSION

ON THE

DEVELOPMENT OF

NORTHERN ALBERTA

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EDMONTON, CANADA.

MARCH, 1958.

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EDMONTON, CANADA. MARCH, 1958.

And Moses sent them to spy out the land of Canaan, and said unto them,—

See the land, what it is; and the people that dwelleth therein, whether they be strong or weak, few or many;

And what the land is that they dwell in, whether it be good or bad; and what cities they be that they dwell in, whether in tents, or in strongholds;

And what the land is, whether it be fat or lean, whether there be wood therein, or not.

Honourable E. C. Manning,
President of the Executive Council,
Province of Alberta.

LETTER OF TRANSMISSION

Sir:

The Royal Commission on the Development of Northern Alberta has the honour to submit herewith its findings and recommendations for transmission to His Honour the Lieutenant-Governor in Council.

J. G. MacGREGOR, Chairman

R. C. MARLER, Commissioner

J. O. PATTERSON, Commissioner.

Edmonton,
27th February, 1958.

COMMISSION

JOHN J. BOWLEN

SEAL

(sgd.) .....
LIEUTENANT GOVERNOR

ELIZABETH THE SECOND, by the Grace of God of the United Kingdom, Canada and Her other Realms and Territories QUEEN, Head of the Commonwealth, Defender of the Faith

To All To Whom these presents shall come or whom the same may in anywise concern, GREETING:

CANADA
PROVINCE OF ALBERTA

WHEREAS under the provisions of The Public Inquiries Act, being chapter 258 of the Revised Statutes of Alberta, 1955, the Lieutenant Governor in Council may, whenever he deems it expedient and in the public interest to cause an inquiry to be made into and concerning a matter within the jurisdiction of the Legislative Assembly and that he declares by his commission to be a matter of public concern, appoint one or more commissioners to make the inquiry and to report therein; and

WHEREAS the Speech from the Throne at the opening of the Third Session of the Thirteenth Legislature of the Province of Alberta announced the intention of the Government to establish a Northern Development Commission to make a complete and thorough study of the conditions and particular requirements of the northern areas of the Province in relation to their present and potential development; and

WHEREAS it is evident that Canada's northland holds a vast potential and it is desirable that northern Alberta and related areas be given careful study to obtain information pertinent to the orderly and economic development of northern Alberta; and

WHEREAS it is deemed expedient and in the public interest that the inquiry be now proceeded with under the provisions of The Public Inquiries Act, being chapter 258 of the Revised Statutes of Alberta, 1955.

NOW KNOW YE that by and with the advice of Our Lieutenant Governor in Council, We do by these Presents nominate, constitute and appoint pursuant to the provisions of The Public Inquiries Act, being chapter 258 of the Revised Statutes of Alberta, 1955, J. G. MacGREGOR, Chairman of the Alberta Power Commission, of the City of Edmonton, Alberta, as Chairman of the Commission, J. O. PATTERSON, businessman, of Grande Prairie, Alberta, and R. C. MARLER, farmer, of Bremner, Alberta, as Commissioners to conduct the said inquiry into the present and potential development of that part of Alberta lying generally to the North of the 55th Parallel of North Latitude and in particular into the following matters:

1. the extent and location of the natural resources of Northern Alberta;
2. the population trends and likely areas of concentration of population in Northern Alberta;
3. the agricultural and industrial opportunity in Northern Alberta;
4. the transportation and communication requirements of Northern Alberta;
5. the electrical power resources and requirements of Northern Alberta;
6. the market trend in respect of the resources of Northern Alberta;
7. the measures deemed necessary or advisable to assist the general development of Northern Alberta;

and to report thereon to the Lieutenant Governor in Council and to make such recommendations to the Lieutenant Governor in Council as the said Commissioners may in their discretion consider proper;

AND WE DO DECLARE the matters refered to Our said Commissioners to be matters of public concern;

AND WE DO EMPOWER AND AUTHORIZE Our said Commissioners to secure with the prior approval and consent of the Lieutenant Governor in Council, consultant services where necessary or desirable in any phase or phases of their inquiry in either an advisory capacity or for the purpose of separate analysis to form appendices to the report of the Commission;

AND WE DO CONFER under authority of the Act aforesaid upon Our said Commissioners the power of summoning witnesses before them and requiring such witnesses

(a) to give evidence on oath, orally or in writing, or if they are persons entitled to affirm in civil matters, on solemn affirmation, and

(b) to produce such documents and things as the commissioners deem requisite to the full investigation of the matters into which they are appointed to inquire.

IN TESTIMONY WHEREOF We have caused these Our Letters to be made Patent, and the Great Seal of Our Province of Alberta to be hereunto affixed.

WITNESS: His Honour the Honourable JOHN JAMES BOWLEN, Lieutenant Governor of Our said Province, in Our City of Edmonton, this nineteenth day of July, in the year of Our Lord, one thousand nine hundred and fifty-seven, and in the Fifth year of Our Reign.

BY COMMAND:

R. D. JORGENSON

(Sgd.) .....
ACTING PROVINCIAL SECRETARY

FOREWORD

The first meeting of the Commission was held on July 30, 1957, and shortly after that Mr. Leslie Collins was appointed as Assistant Secretary. Not long thereafter Mr. Donald G. MacArthur was appointed as Secretary-Economist. Advertisements were inserted in the daily papers in Edmonton and Calgary and in all the weekly papers in Northern Alberta, stating that public hearings were to be held, and inviting the submission of briefs.

During the course of its work, the Commission held twelve formal hearings and a number of informal meetings to discuss various phases of its work and to formulate its recommendations. Public Hearings were held in Waterways, Beaverlodge, Grande Prairie, Spirit River, Fort Vermilion, Manning, Grimshaw, Berwyn, Fairview, Peace River, High Prairie and Edmonton.

Twenty-one formal briefs were received from Chambers of Commerce and other allied bodies as well as a number from interested individuals. Lively interest in the work of the Commission was manifest all over Northern Alberta and at Edmonton. A list of the briefs submitted to the Commission is given at the back of the report.

The Commission did not have any occasion to employ counsel. Much of the research work carried out on behalf of the Commission was done by Messrs. Collins and MacArthur. These gentlemen sought specific information from all persons or organizations who in the Commission's opinion were possessed of factual information and statistics regarding the natural resources of Northern Alberta. The organizations consulted in the greatest detail were the following:

Department of Lands and Forests
- Forestry and Wild Life Division
- Lands Division
- Technical Division

Research Council of Alberta
- Soil Survey Division
- Geological Survey Division.

University of Alberta
- Various Departments and Professors

Oil and Gas Conservation Board

Department of Highways

Alberta Government Telephones

Department of Agriculture
- Water Resources
- Statistics Division
- Beaverlodge Experimental Station

Department of Industries and Labour
- Alberta Bureau of Statistics
- Power Commission

Department of Economic Affairs
- Alberta Travel Bureau

Department of Mines and Minerals

Various Federal Government Departments assisted with advice and statistics, including the Soil Survey Department, the Agriculture Experimental Service, the Economics Division and Marketing Services, the Fort Vermilion Experimental Station, the Department of Indian Affairs, and the Department of Northern Affairs and National Resources, Ottawa. The Commission received great assistance from the Edmonton Chamber of Commerce, the Alberta and Northwest Chamber of Mines and Resources and the Associated Chambers of Commerce and Agriculture for Alberta. Many private companies including the following were consulted and were most helpful in providing the Commission with the information which it sought:

Bell Brothers Transport Ltd.
Burns & Co. Ltd.
Calgary Power Ltd.
Canada Packers Ltd.
Canadian Pacific Airlines
Canadian Utilities Ltd.
Canadian Salt Co. Ltd., The
Capital Packers Ltd.
Denny Logging Company
Eldorado Mining & Refining Ltd.
Grimshaw Trucking & Distributing Ltd.
Loiselle Transport Ltd.
McInnes Products Corporation Ltd.
Northern Alberta Railways
Northern Freightways Co. Ltd.
Northern Transportation Co. Ltd.
Northwest Communications Systems
North Star Oil Limited
Peace River Glass Co. Ltd.
Premier Steel Mills Ltd.
Royal Canadian Corps of Signals
Swanson Lumber Co. Ltd.
Swift Canadian Co. Ltd.
Western Plywood Co. Ltd.
Yellowknife Transportation Co. Ltd.
W. R. Zeidler Limited

While the many individuals in these organizations and Government Departments who went to great pains to present accurate information and definite statistics are too numerous to mention, the Commission is under a heavy debt to them for their time and patience and for the whole-hearted co-operation they extended to it.

As rapidly as information was accumulated on the various subjects that came under the scope of the inquiry, this material was made available to the members of the Commission who at the same time were themselves supplementing their own knowledge with facts and opinions gathered from many sources. The Commission's study, therefore, was not confined to the material submitted in briefs or to the subsequent interesting discussions which invariably occurred at its hearings. It sought relevant information wherever it could be found. The members of the Commission, its Secretary and its Economist have sifted all this material and have used it and quoted from it in compiling this report. The sources of all quotations are acknowledged in the text. While a bibliography was considered, the idea was given up because there are relatively few publications dealing specifically with Northern Alberta.

The Commission's Hearings were carried on in a manner as informal as possible yet with a seriousness consistent with the importance of the inquiry. The parties appearing before the Commission almost all submitted formal briefs and were freely questioned at the hearings by the members of the Commission and by other interested persons.

While individual members of the Commission prepared the initial drafts of much of the material appearing in the report all of these were subjected to severe criticism, analysis and amendment at Commission meetings. The recommendations made herewith were formulated by the Commission as a whole, and are the unanimous recommendations of the Commission.

The Commission would like to thank Mr. A. E. Murray for his painstaking work in preparing the maps included in the report and Mrs. E. C. Harrold for her efficient stenographic assistance.

INDEX MAP OF CANADA
SHOWING
Northern Alberta

Scale:
0 100 200 300 400 500 Miles

ALASKA
YUKON
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEWFOUNDLAND
LABRADOR
GREENLAND
Banks Is.
Viscount Melville Sound
Devon Is.
Amundsen Gulf
Victoria Is.
Great Bear Lake
Mackenzie R.
Liard R.
Yellowknife
Great Slave Lake
Thelon R.
Kazan R.
Findlay R.
Peace River
Peace River
Athabasca R.
L. Athabasca
Churchill R.
Churchill
Fort Nelson
Prince George
Edmonton
Jasper
North Saskatchewan River
Pr. Albert
Fe Pas
Lake Winnipeg
Calgary
South Saskatchewan
Regina
Winnipeg
Fort William
Lake Superior
Vancouver Island
Victoria
Vancouver
Foxe Basin
BAFFIN ISLAND
BAFFIN BAY
Davis Strait
Hudson Strait
HUDSON BAY
James Bay
Ungava Bay
Dc Chidley
Clark City
Anticosti Is.
St Lawrence R.
QUEBEC
MONTREAL
OTTAWA
NEW BRUNSWICK
NOVA SCOTIA
Halifax
C. Sable
MAINE
C. Cod
New York
L. Ontario
L. Erie
L. Huron
Lake Michigan
ATLANTIC OCEAN
C. Race
70°N
60°
50°
40°
30°
150°
140°
130°
120°
110°
100°
90°
80°
70°
60°
50°
40°
30°
60° N.
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40°
AM '57

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2. Spirit River Chamber of Commerce
3. Berwyn Men's Club
4. Associated Chambers of Commerce of Peace River District
5. Manning Chamber of Commerce and Agriculture
6. Peace River Bar Association, Peace River Branch
7. Peace River Chamber of Commerce
8. Grande Prairie Chamber of Commerce
9. Executive Council of Alberta Land Surveyors' Association
10. High Prairie Chamber of Commerce
11. Alberta and Northwest Chamber of Mines and Resources
12. Edmonton Chamber of Commerce
13. Alberta Institute of Agrologists
14. District No. 1, Farmers' Union of Alberta
15. Lac La Biche Chamber of Commerce
16. Worsley Ratepayers' Association
17. Fairview Board of Trade
18. Fort Vermilion Board of Trade
19. Grimshaw Board of Trade
20. Canadian Coachways Limited
21. Indian Affairs Branch, Edmonton

LIST OF SUBMISSIONS RECEIVED FROM INDIVIDUALS

1. L. C. Hewson, Blueberry Mountain
2. P. C. Comeau, Grovedale
3. J. L. McIntosh, Wapiti
4. T. Forseth, Peace River
5. D. E. Fevang, High Prairie

SUMMARY OF REPORT

Before their appointment the members of this Commission were all generally familiar with Northern Alberta and realized from the very beginning that it had a great potential. As facts and opinions were presented to the Commission the members became increasingly enthusiastic about its prospects, in spite of its having some physical and economic limitations. The Commission's most important conclusions are that Northern Canada in general is on the threshold of tremendous development and that the Province of Alberta must be prepared to play its full part in that development.

Northern Alberta is neither a vast empty space nor an area crammed with untold riches. It lies between these two, and in this report the Commission has tried to set down its resources factually, ever trying to draw a line somewhere between the extreme position of the starry-eyed optimist on the one hand and the dyspeptic pessimist on the other.

The Commission was fortunate in the calibre of the men who brought information to it or who were sought out by it. As a result, it has had the benefit of the knowledge of experts in fields such as forestry, land, minerals and geology, water resources and many others, all of whom were anxious to ensure that an exact meaningful assessment might be made of Northern Alberta. Much of this report is a compilation and an editing of their knowledge.

The body of the report consists of nine sections, of which Section 1 is filled with introductory material devoted mainly to description. It presents a brief picture of the geography, geology and climate and then goes into a brief history of the settlement of the area, ending up with a reference to its present population.

Section 2 endeavors to set out the "Present Status of Northern Alberta". It tabulates the present population and shows the degree of development of its resources which support the 74,000 people who live north of the 55th Parallel.

Section 3 contains an inventory showing the "extent and location" of the known natural resources of the area and how fortunate Northern Alberta is in having the resources which are summarized very briefly below:

14,500,000 acres of good, presently unimproved, farming land. (Page 83).

27 billion cubic feet of standing saw log timber and 333 million cords of pulpwood. (Page 47).

Tremendous possibilities for base and precious metals in the Precambrian and Paleozoic areas.

In energy resources, it boasts the following: (Page 57).

Oil: 1.4 billion barrels of virgin economically recoverable oil as of 1980. (17% of all Alberta).

Gas: 9 trillion cubic feet of virgin economically recoverable gas as of 1980. (17% of all Alberta).

Athabasca Oil Sands: 300 billion barrels of oil.

Coal: Limited quantity only.

Hydro Power: 2,715,000 H.P. of undeveloped power, which at a load factor of 50% would yield some 9 billion K.W.H. per year.

Thermal Power: Very large amounts which would be derived from items 1, 2 and 3 above.

The above are all on the physical side and are therefore assessable in terms of definite quantities, but Northern Alberta has two other resources. The first is its many and varied tourist attractions which can be converted into an important industry. The other is the effect that the immense but largely unknown resources of the Northwest Territories will have on Alberta acting in its traditional roles of both the Gateway to the North and its servant.

While there are many highlights in the economy of Northern Alberta, there are also areas of shadow. One is the terrible devastation that in the past has converted hundreds of thousands of acres of forests to blackened ruins. Another is the lack of livelihood that faces 3,000 Metis and 5,000 Indians.

Having tabulated the resources of Northern Alberta, the Commission was then faced with the problem of trying to foresee what markets would be available for them and what they might mean to Alberta's future economy. It was decided to limit the period under consideration to the next thirty years and to try to discover what the future might hold for Northern Alberta and how much its population might grow in that time. Peering even that far into the future has many drawbacks and makes it necessary to compound estimate upon estimate and leaves the Commission in a position of being somewhat open to accusations of soothsaying. Before this thirty-year period has passed, others armed with the inevitable advance in human knowledge will, undoubtedly, see much greater riches in Northern Alberta than we have dared to assume. While this report gives our findings covering the thirty-year period as accurately as they can be determined, the potential of Northern Alberta beyond that will continue to increase. For instance, the Commission believes that little of the 14,500,000 acres of good land will be settled during the next 30 years. Eventually, however, all of that land will be settled with a consequent great increase in population.

Section 4 deals with the market trend of the resources and, in doing so, lays the foundation upon which to form opinions on the "Agricultural and Industrial Opportunity", "The Population Trend" and "The Electrical Power Requirements". Having estimated future markets for the resources of Northern Alberta, the Commission has come to the conclusion that that area is just on the threshold of development.

Northern Alberta's first exports were furs, which began moving out of that area to European markets before 1700. Its second resource to interest Europeans came to them in the form of a sample of the Athabasca Oil Sands which a Cree Indian by the name of The Swan carried down to the English fort on the shores of Hudson's Bay in 1719—long before white men ever trod in Alberta. For nearly 240 years since that time the Athabasca Oil Sands, along with most of the other resources of Northern Alberta, have not been put to human use.

For nearly two and a half centuries, these resources have been waiting for the time when the world needed them and science and technology could make them available. That time is now here. All Canada is turning its attention to the Northland and Alberta is beginning to realize the value of its heritage North of 55° and even North of 60°.

Being even now on the threshold of development, we expect great strides to be made in Northern Alberta during the next 30 years. Included in these should be a big increase in agricultural production in the Peace River Country. The trend is expected to be towards more mixed farming, with the same sales of cereals as in the past, but greatly increased output of red meats, poultry and dairy products. This, however, will not be brought about by any appreciable increase either in the amount of new land settled or in the number of farmers in the Peace River Country. Farmers and their families will make up only 17 per cent of the total population of Northern Alberta by 1987 as compared to the present 48 per cent. In other words, other industries will become relatively much more important than they are today.

The amount of lumber cut will increase during the next 10 years until it reaches a figure of 333,000,000 F.B.M. per year and then it will remain at that figure. The Commission expects that by 1987 a pulpmill will be in operation in the Lesser Slave Lake area, the Grande Prairie area, the Peace River area, and at or near McMurray.

It is expected that the Hines Creek iron ore will be mined within the next 15 to 20 years and this should give employment to 200 men at the mine and another 300 at the concentrator. If the Precambrian area in the northeast proves to be as rich in mineral deposits as is expected, it will become an important mining area.

Some additional 7,500 oil and gas wells are expected to be drilled by 1980 and it is estimated that the annual production of oil will then be in excess of 60,000,000 barrels, while the amount of gas marketed in 1980 is expected to be over 200 billion cubic feet. (Page 81).

The Athabasca Oil Sands are expected to come into production within the next 10 years and expanding activity there will turn the McMurray area into another industrial region.

Large thermal power stations, fuelled by natural gas, are expected to be in operation by 1987 in the Peace River Country and in the High Level area. The Fort Smith Rapids are expected to be developed on a relatively small scale during the next ten years and before the end of thirty years could be the source of large amounts of power. Several hydro plants will be built on the Athabasca River and much of their power will be transmitted to the Edmonton area.

The Commission expects to see a start made on a railway to Pine Point in the immediate future.

The population of Northern Alberta is expected to reach 270,000 by 1987. Of these, 25 per cent will gain their livelihood from oil and gas exploration and production, 17 per cent from farming, 13 per cent in forestry and 10 per cent in manufacturing, while the remainder will be engaged in many varied occupations. The population of Indians and Metis is expected to increase to about 14,000 but it is hoped that by 1987 we may have gone a long way towards supplying these people with congenial occupations which will go far towards assisting them to raise their standard of living.

Finally, a number of recommendations have been made and these are listed separately. They deal with a wide variety of topics, chief of which perhaps is the recommendation for a railway and for more highways and surveys. The Commission feels that these recommendations are not far-fetched or visionary—perhaps the whole report, even, may be criticized as being too conservative. None of the recommendations have been made without having due regard to the financial ability of the Province.

While the Commission feels that up to the present Northern Alberta has fared well in money spent in highways and other facilities, it is of the opinion that the proportion spent in Northern Alberta and particularly in the presently unsettled areas will have to be greatly increased if Alberta is to cope with the requirements of the development that is both desirable and imminent. This may be difficult to do in view of the fact that Alberta's rapidly growing population demands more expenditure than can be accomplished with the money available. If the unsettled portions of Northern Alberta had been owned by a large mining corporation, for instance, much more money would have been spent in surveys of one kind or another and in development roads. The Commission realizes that governments must be more prudent in developing unknown resources than private companies would be. This, in fact, is the reason for encouraging private enterprise to develop such areas, but the mutual interest of government and private enterprise could be advanced by an increase in the scope of surveys and development work in Northern Alberta.

The North beyond the 60th Parallel, as a part of Canada, is our North too—we who make up one-sixteenth of all the population of Canada. As Albertans and as citizens of Canada we should strive to see that all of Canada awakens to its value so that all of us may share in our vast heritage .We should take the lead in the responsibility for its development and should not let artificial boundaries or a too fine a line between "mine" and "thine" prevent concentrated effort directed toward opening up the North.

Alberta and Canada north of the 55th Parallel hold out almost unlimited promise to Albertans. Let us hope that we have the vision commensurate with our opportunities.

And Joshua the son of Nun, and Caleb the son of Jephunneh, which were of them that searched the land, —spake unto all the company of the children of Israel, saying, The land, which we passed through to search it, is an exceeding good land.

If the Lord delight in us, then he will bring us into this land, and give it us, a land which floweth with milk and honey.

RECOMMENDATIONS

In the last item of its terms of reference, the Commission was instructed to recommend what, in its opinion, were the "measures deemed necessary or advisable to assist the general development of Northern Alberta".

It is realized, of course, that many of the recommendations which the commission is making are already being contemplated by various government departments. As a result of its studies, the Commission makes the following recommendations which are listed here, not in order of importance, but under the headings of:

1. Agriculture
2. Forestry
3. Surveys
4. Transportation
5. Communication
6. Water Resources
7. General

The reasons underlying these recommendations are given in various sections of the report. Where possible, a section number and a page number are given after each recommendation to make it easier to refer to the reasoning behind it.

1. AGRICULTURE

(a) Community Pastures

The Commission recommends that the Department of Agriculture, through its Extension Service, give more attention to the development of community pastures in Northern Alberta, so that more farmers in areas close to Crown Lands may realize the value to them of such pastures and avail themselves of the opportunities they offer. (Page 84 or 85, Section 5).

(b) Seed Cleaning Plants

The establishment of more seed grain cleaning plants would be beneficial to farmers in the Peace River Country. It is, therefore, recommended that the Department of Agriculture should continue to encourage and assist the establishment of these plants. (Page 85, Section 5).

(c) Meat Inspection and Abattoirs

It is recommended:

(1) That the Provincial Government consider establishing standards of construction for abbatoirs and consider providing inspection for abbatoirs and slaughter houses which are too small to obtain Federal Meat Inspection (Page 110, Section 9);

(2) That the Provincial Government approach the Federal authorities in an endeavor to devise some means of meat inspection which will permit meat dressed in the Peace River Country to be sold to wholesale and retail meat outlets beyond the borders of Alberta. (Page 110, Section 9);

(3) That the Provincial Government consider financial assistance for abbatoirs where necessary. (Page 110, Section 9).

(d) District Agriculturalists and Home Economists

Because the farming population of the Peace River Country is so spread out as compared to an equal number of farmers in the remainder of the Province, and because of the relative newness of agriculture in much of that area, this Commission suggests that the Peace River Country is entitled to special consideration from the Extension Branch of the Department of Agriculture. It recommends that sufficient additional District Agriculturalists and Home Economists be stationed in the Peace River Country so that each will have a smaller number of farmers to serve than are served by a District Agriculturalist or a Home Economist in the rest of the Province. (Page 85, Section 5).

(e) Farm Credit

The Commission recommends that the Provincial Government review the Farm Credit Purchase Act. In effect, the Government has recognized by the passing of this Act that the Canadian Farm Loan Board is not meeting the credit needs of farmers. The Commission recommends the establishment of a central Board of Administration, assisted by advisory boards similar to the present Municipal Loan Board set up under the Act, which would make for uniformity, facilitate co-ordination and expedite the processing of applications. Secondly, it is felt that the seller of a farm should not be expected to accept the ten per cent risk. (Page 84, Section 5).

(f) Roads for Newly Settled Areas

The Commission recommends:

(1) That in future, at the commencement of settlement in a township, a gravelled road to the standard of a market road should be built from the nearest existing gravelled highway to some point in or alongside any such township. (Page 99, Section 9);

(2) That all townships in which homesteading has taken place recently and which do not have such gravelled access roads should be provided with these roads as soon as this work can possibly be done, and that the money necessary to do this work should be taken from the general revenue of the Province rather than from any money which otherwise would be allocated to Municipal Districts or Improvement Districts. (Page 99, Section 9).

2. FORESTRY

(a) Fire Protection

It is recommended that the amount of money spent annually on fire fighting and fire protection in Northern Alberta be greatly augmented, so as to make possible the establishment of more watch towers, a larger annual program of construction of access roads and an increase in the number of aircraft owned by the Department of Lands and Forests for use in fire protection and fire fighting. (Page 100, Section 9).

(b) Forestry Research

The Commission recommends that the present program of forestry research be augmented by an increase in staff, whose purpose would be to study better methods of utilization, reforestation, fire fighting and allied forestry problems.

3. SURVEYS

(a) Soil Surveys

It is recommended that soil surveys as conducted now be continued at the present rate. (Page 105, Section 9).

(b) Groundwater Surveys

It is recommended that further groundwater surveys be carried out in the Peace River Country. (Page 104, Section 9).

(c) Geological Surveys

It is recommended that the present program of geological surveys being carried out in the Precambrian and Paleozoic areas of the Province be increased in quantity and speed, and that such surveys should include studies by airborne geophysical means. (Page 105, Section 9).

(d) Basic Legal Surveys

The Commission recommends that a program of surveying be established having as its objective the completion of the surveying of all base lines in Northern Alberta within five years. After all base lines have been established it is recommended that more money be made available for the projection of central meridians from the base lines so that these meridians may be established in any area sufficiently in advance of the requirements of development. (Page 106, Section 9).

4. TRANSPORTATION

(a) Air

It is recommended that provisions for an air strip should be one of the first considerations in laying out new towns in the future.

(b) Railways

A railway to Pine Point is a necessity. It is of great economic importance to Alberta, as well as to the Dominion of Canada. The route chosen should be that from McMurray north, as in that location it will be of greater service and value than if built along any other route. The Commission therefore recommends:

(1) That the Provincial Government approach the Federal Government in an endeavor to have the construction of such a railway started immediately. (Page 93, Section 8);

(2) That the Provincial Government subsidize such a railway to the extent of granting it free right-of-way over all Crown Lands, and in addition, discuss with the Federal Government and the Northern Alberta Railways, the possibility of having the bridge over the Athabasca River near McMurray and the bridge over the Peace River near Peace Point built so as to be used jointly for railway and highway traffic, and that the Provincial Government subsidize the railway to the extent of sharing in the cost of these bridges, which are estimated to have a total costof about $7,000,000. (Page 93, Section 8).

(c) Highways

The Commission is of the opinion that with the exception of two or three relatively minor roads listed below the Government of Alberta is adequately meeting the needs of the Peace River Country for roads, or has even given some special emphasis to road-building in that area. It feels, however, that the remainder of Northern Alberta should receive more attention in future, and recommends that construction of the following main and secondary highways and market roads should be commenced immediately and carried through with all possible expedition.

(i) Extra-Provincial Highways

(1) Rebuild the MacKenzie Highway to a standard sufficient to carry the present heavy loads and the increased traffic of the future during all states of weather. The Federal Government should be expected to share in the cost of doing this work from Mile 70 to the northern border of the Province. (Page 95, Section 8).

(2) Hard-surface the MacKenzie Highway from Grimshaw to Manning. (Page 96, Section 8).

(3) Rebuild the stretch of road from High Level to Fort Vermilion into a secondary gravelled road and continue this east along the north side of the Peace River to join up with the road now being built within the Wood Buffalo Park. (Page 96, Section 8).

(4) Rebuild the present road from Fairview to Clear Prairie to the standard of a secondary highway. The portion of road from Clear Prairie to the British Columbia border should be well gravelled but could be built to a lesser standard. (Page 96, Section 8).

(ii) Intra-Provincial Highways

(1) Build a secondary highway that will be passable in all conditions of weather from Highway No. 46 near Plamondon to McMurray. (Page 96, Section 8).

(2) Build a highway to the standard of a gravelled market road from Fort Vermilion, via Buffalo Head Prairie, and west to the MacKenzie Highway. (Page 96, Section 8).

(3) Build a highway to the standard of a market gravelled road from Sunset House to Valleyview. (Page 96, Section 8).

(4) Build two standard gravelled market roads south from the Hines Creek-Fort St. John Highway, one giving access to Cherry Point, the other to the east of the Clear River. (Page 96, Section 8).

(5) As rapidly as expedient market type gravelled roads should be built to lakes having tourist possibilities. (Page 111, Section 9).

(d) Bus Depots

Bus service has been and will continue to be a vital factor in the development of the North. The Commission recommends that the Government offer financial assistance by way of interest-bearing loans over a reasonable term of years to aid in the development of bus depots throughout Northern Alberta.

5. COMMUNICATION

Because the Alberta Government Telephones is a common carrier and is a member of the Trans-Canada Telephone Association, connected by voice circuits provided over radio and land lines to all points in Canada, the United States and the world, and because it has already constructed a microwave system into Peace River, we feel that this trunk route system should be extended by the Province of Alberta into the Northwest Territories as a part of the overall network.

The Commission recommends:

(1) That the Alberta Government endeavor to work out an arrangement with the Federal Government, so that service to the Northwest Territories, etc., shall be provided through the network of the Alberta Government Telephones. (Page 97, Section 8);

(2) That the Government should urge that as rapidly as possible television service should be provided for the Peace River Country, possibly with stations at or near Grande Prairie and Peace River.

6. WATER RESOURCES

(a) Interprovincial Water Board

It is recommended that the Province of Alberta enter into discussions with the Federal Government and with the governments of British Columbia and the Northwest Territories with a view to the creation of a joint advisory water board along the same lines as the present Prairie Provinces Water Board, which would be charged with the duty of studying and protecting the joint interests of these governments in any inter-provincial waters, such as the Peace and the Slave Rivers. (Page 101, Section 9).

(b) Settlement in Flood Plains

While there are already enough provisions in various provincial acts to prevent settlement or farming operations in the flood plains of rivers or around the margins of lakes and along stretches of rivers which may in future have to be flooded by the construction of dams for hydro power purposes, the Commission recommends that extreme vigilance be exercised by all departments of government having any responsibility for the preservation of these waters for pleasure or industrial purposes. (Page 102, Section 9).

(c) High Prairie Flood Control

The Commission recommends that prompt attention be given to the flood problem as it affects the Town of High Prairie. This problem stems from logs being washed into the East and West Prairie Rivers and eventually clogging these streams at critical points. A continuous program of selected tree removal along the river banks to prevent these logs from getting into the water is recommended. This should be combined with other efforts aimed at preventing logs from reaching the lower portions of these streams, which have a flatter gradient. After the timber problem is solved, then the problem of building a canal to divert both the East and the West Prairie Rivers might be considered. (Page 104, Section 9).

(d) Lac La Biche Dam

The Commission understands that the construction of a dam on the La Biche River would soon pay for itself in improved commercial fishing and would, as well, bring other benefits to the residents of the Lac La Biche area. It is recommended, therefore, that such a dam be built. (Page 104, Section 9).

7. GENERAL

(a) Indians and Metis

It is recommended:

(1) That a careful combined study of both Indians and Metis in Northern Alberta should be made, and that some body should be appointed and charged with the responsibility of such a study which would include consideration of the points mentioned in Section No. 9 dealing with Indians and Metis. (Page 107, Section 9);

(2) That a review of the principle of isolation embodied in both the Indian Act and the Metis Betterment Act be made inasmuch as through both of these acts—one Federal and the other Provincial—isolation and segregation are inevitably practised. (Page 107, Section 9);

(3) That employment be recognized as a fundamental necessity in providing the environment and atmosphere which will lead to the ultimate adjustment of the Indians and Metis, and that work programs of a nature which will invite and induce the Indians and the Metis to work with other citizens of Canada should be offered. (Page 107, Section 9);

(4) That, so that the growing labour potential of Indians and Metis be more fully utilized, a liaison committee be formed, composed of representatives of industry, government departments and the Indian Affairs Branch, and that it be charged with the duty of co-ordinating all efforts towards employing these people in industries involving forestry, fire prevention and fire fighting, highway clearing and construction, pipeline and railway construction and maintenance, surveying, sawmilling, the building trade and agriculture, and utilizing all possible means of doing so. (Page 107, Section 9);

(5) That officials of Improvement Districts, Municipal Districts, Counties and School Divisions be encouraged to accept their responsibility to the Metis in their areas in respect to health, social problems and employment services. (Page 107, Section 9).

(b) Wood Buffalo Park

The Commission recommends that the Provincial Government approach the Federal Government or the Department of Northern Affairs and Natural Resources with a view to having the restrictions in the Wood Buffalo Park relaxed so as:

(1) To permit the exploitation of the gypsum deposist there in the same way as the restrictions have been relaxed so as to permit logging operations within the Park (Page 110, Section 9);

(2) To allow geological surveys to be carried out within the Park, and if these surveys indicate interesting mineral or oil probabilities, to endeavor to work out some means of permitting prospecting and the development of mines in certain limited areas of the Park. (Page 110, Section 9);

(c) Tourist Promotion

It is recommended:

(1) That the Province embark upon a program of promoting and advertising Northern Alberta and indeed the North as a whole, with a view to attracting a lucrative tourist trade for Northern Alberta. Such a program should extend over a period of several years and, while it should be handled by the existing tourist promotion department, it should have a separate and distinct budget, so that it does not become submerged in general tourist promotion (Page 111, Section 9);

(2) That since these are a number of good fishing lakes east and northeast of Lac La Biche which present wonderful tourist opportunities, highways should be built to them so that as opportunities offer they can be exploited to help build up our tourist potential (Page 111, Section 9);

(3) That steps be taken to reserve beaches, etc., for public use before any settlement is permitted around lakes with good tourist potential such as Lesser Slave Lake (in the vicinity of Shaw's Point and along the east shore), Margaret Lake and many others. (Page 111, Section 9);

(4) That the Province accelerate its activity in Northern Alberta in the way of providing wayside tables, kitchens and camp sites and the setting aside of Provincial Parks (Page 111, Section 9);

(5) That efforts be made to assist the financing of tourist facilities and accommodation in Northern Alberta (Page 111, Section 9).

(d) Advisory Boards

It is recommended:

(1) That the Province set up a Northern Development Advisory Board to be composed of representatives of business, industry and government departments. Its duties should be to conduct a continuous study of the requirements of Northern Alberta in relation to the rest of the Province, and also in relation to the Northwest Territories and adjoining areas, so as to be in a position to act as spokesman for Northern Alberta and to advise the Provincial Government and the public on the needs of Northern Alberta, its development and its publicity. (Page 113, Section 9);

(2) That the Province of Alberta urge upon the Federal Government the creation of a statutory body which might be named the Northern Development Advisory Committee, and which would be made up of representatives of industry, both within and without the Territories, and of the governments of the Territories and of the provinces adjoining them, and which would meet at least twice a year to report to the Federal Cabinet its findings and recommendations on matters affecting Northern Development. (Page 114, Section 9);

(3) That the Province of Alberta take the lead in urging the creation of and bringing into being an "Institute for Northwestern Canadian Research," (Page 114, Section 9), which would be a permanent co-ordinating agency for the purpose of:

(i) Gathering together all available data on Northwestern Canada in the field listed below, tabulating it and co-ordinating the many separate studies being made along these lines:

(ii) Initiating research in such fields of knowledge as:

1. Muskeg studies.
2. Permanently frozen ground studies.
3. Reconnaissance studies for economic industrial minerals.
4. Water supply and pollution studies.
5. Highway and railway construction methods under Northern conditions.
6. Building methods.
7. Fly control.

SECTION 1

INTRODUCTION

That part of the Province which the Commission was instructed to study—that is the area north of the 55th Parallel of North Latitude—will be referred to in this report as NORTHERN ALBERTA. The 55th Parallel runs east and west across the Province approximately one hundred miles north of Edmonton, the capital city. Northern Alberta is bounded on the north by the 60th Parallel, which is the southern boundary of the Northwest Territories. On the east it is bounded by Saskatchewan along the 110th meridian and, on the west, by the Province of British Columbia along the 120th meridian. The average width of the area is approximately 370 miles, while from north to south it stretches approximately 350 miles, so that it contains an area of about 129,000 square miles. This is slightly more than one-half of the 255,285 square miles in the Province as a whole.

While Northern Alberta thus embraces a vast area, its population in 1956 was only 73,683, so that at present its resources have been developed to a limited degree only. Up to the present its resources have either been too remote from markets or else have been of such a quality that in many cases the requirements of the National Economy for these products have been met by developing the resources of other more accessible parts of Canada. This development naturally has taken place in those areas where the necessary products could be obtained and delivered most economically to their markets.

Fortunately Northern Alberta, this area of 129,000 square miles with its population of only 74,000, holds a wealth of resources which Canada, the United States and the world need. Not only is the population of this continent growing at a very rapid rate but the per capita demand for raw materials is also increasing. This will bring about an increasing demand for the raw materials of Northern Alberta. At the moment the known resources consist largely of timber, gas and oil and the McMurray tar sands. While the market for all of these items is depressed at the moment this condition will not continue and we may expect a growing demand for all of these products. While iron ore forms the only presently known deposits of metallic minerals, it seems certain that other base and precious metals will be discovered in the Precambrian and in the Paleozoic areas of Alberta. If they are discovered we may expect considerable mining activity in that area.

Even if they are not discovered there it is anticipated that many more discoveries of minerals will take place in the Northwest Territories. The Paley Report, which was made to the United States Government, pointed out the impending mineral shortage on this continent. The Report of the Gordon Commission estimated that by 1980 the demand for the following minerals from Canadian sources would increase by the following percentages over the 1955 production:

Copper	—	200%
Nickel	—	225%
Lead	—	200 - 400%
Zinc	—	200 - 400%

Since the Canadian demand for these minerals is going to increase markedly, we may be certain that the Northwest Territories, which contains so many of these minerals, is in for a period of greatly increased activity so that even if it turns out that there are no minerals in Northeastern Alberta, the Province will benefit by the developments in the Northwest Territories. Northern Alberta is the gateway to the Northwest Territories and any developments that take place beyond our Northern border will have a marked effect upon the Province as a whole. The Commission has tried to evaluate this in terms of what service the Province provides to the North and looks upon the North as a very valuable resource for the Province.

There is no place in a report like this for meaningless phrases such as "boundless wealth" or "untold resources". The resources of Northern Alberta are great enough and near enough to development to be expressed as acres, barrels, board feet and tons. In spite of the fact that surveys in the field of soil, geology, etc., have been little more than started and that much is left to be done, we do possess sufficient knowledge to speak in fairly definite terms.

GEOGRAPHY

Northern Alberta is part of the Great Central Plains, which include all the area between the Pre-Cambrian Shield on the east and the Rocky Mountains on the west. It is a north-easterly-sloping plateau descending by a series of low escarpments to a lowland that extends northward to the Arctic. It is intersected by the valley of the Hay River, which flows into Great Slave Lake, and by the valleys of the Peace, Athabasca and Slave Rivers, all of whose waters finally empty into Great Slave Lake. In general, then, Northern Alberta slopes towards the northeast into the low-lying area which contains Lake Claire and Lake Athabasca. These central plains extend beyond the north boundary of the Province and have a north-facing escarpment that extends from Fort Smith on the Slave River to the Liard River. The slope of the country is gradual and the drainage immature with numerous muskegs and lakes. There are many areas of prairie-like land, especially in the Peace River basin.

There are several isolated ranges of hills sometimes called mountains, and these range in elevation from 3,666 feet in the Clear Hills, near the B.C. border and north of the Peace River, to the Caribou Mountains, which have an elevation of 3,300 feet and lie a few miles north of Fort Vermilion. Another important range is the Birch Hills which lie about 80 miles north-west of McMurray and have an elevation of about 2,700 feet.

Northern Alberta contains the five largest lakes in Alberta. These are the following:

Name	Area (sq. miles)
Utikuma	130
Bistcho	150
Lesser Slave Lake	462
Claire	640
Alberta portion of Lake Athabasca	900
(Total area of Lake Athabasca 2,800)	

The dominating geographical features of the area are the two great rivers: The Peace which has an average yearly flow at Fort Vermilion of 50,500,000 acre feet, and the Athabasca which has an average yearly flow at Athabasca of 12,250,000 acre feet. The waters from these two rivers unite north of Lake Athabasca to form the Slave River which flows for some 75 miles practically straight north and leaves the Province near Fort Smith to continue a further 215 miles before flowing into Great Slave Lake. The Slave River at Fort Smith drops 110 feet in a series of rapids some 17 miles long and at this point has a maximum recorded flow of 296,080 c.f.s. Except for a very small area (1,300 square miles) in the extreme south-east corner of Northern Alberta, the drainage of the whole area is carried to the Arctic.

As a matter of interest, 64% of the total area of Alberta drains north, while the Slave River alone leaves the Province with the water that falls on a drainage area of 234,000 square miles, of which 38,300 square miles is in British Columbia. When the Peace River enters Alberta below Fort St. John it has a maximum flow of about 400,000 c.f.s.

GEOLOGY

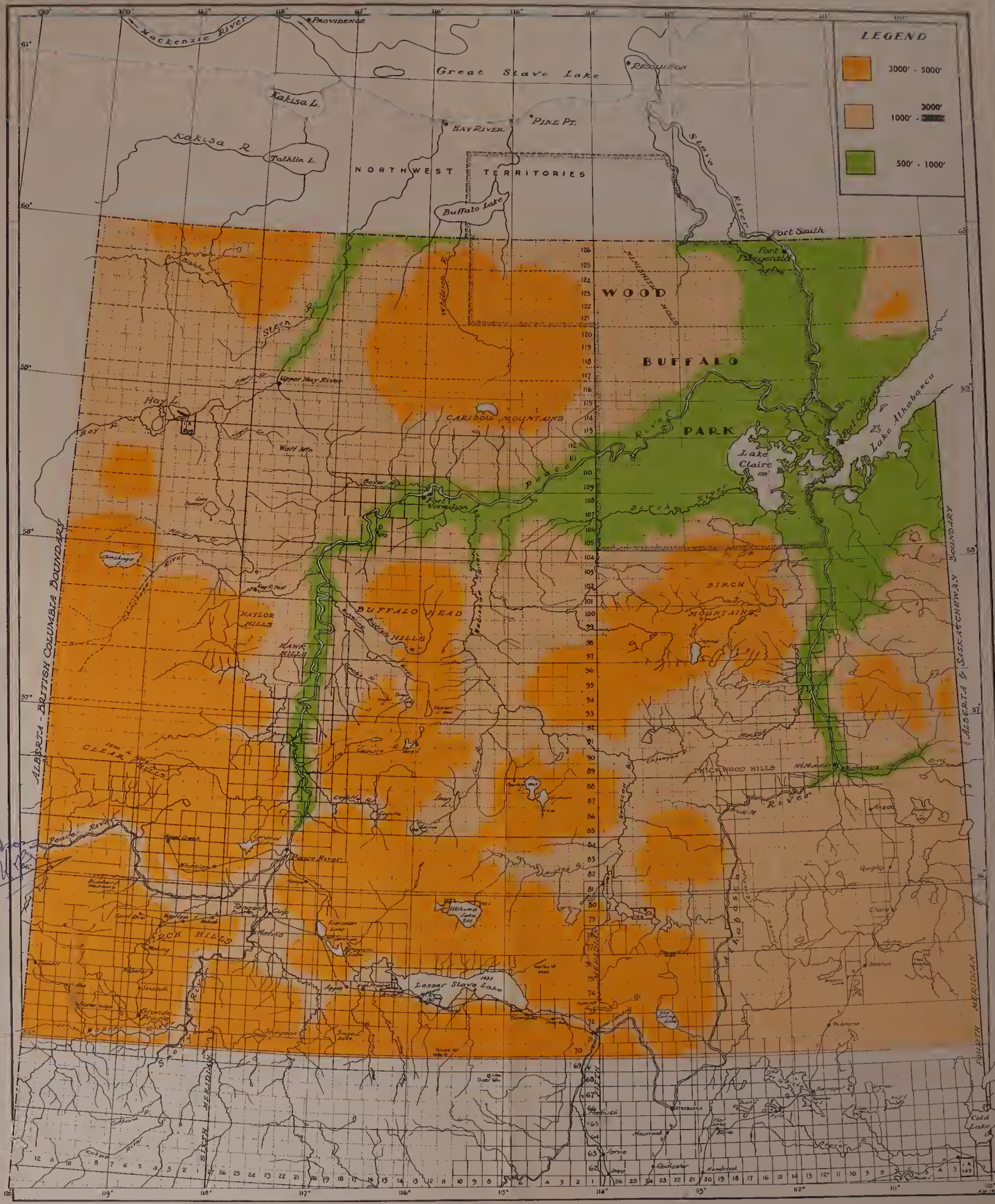
The following brief notes on the general geology of Northern Alberta have been prepared for the Commission by Dr. C. P. Gravenor, Chief Geologist, Research Council of Alberta:

"The oldest rocks found in the Province exist in the north eastern portion of Alberta, north and south of Lake Athabasca. These rocks form a portion of the Canadian Shield—a vast area of Precambrian granites, lavas and metamorphic rocks ringing Hudson Bay. Early in the earth's history, the Canadian Shield was made up of sedimentary rocks—sandstones, limestones and shales. Earth movements of an enormous scale thrust these sediments up into mountain ranges. The high temperatures and pressures accompanying this upthrusting fused the sediments into igneous rocks—primarily granite. The Precambrian mountains were then subject to erosion by water and wind for millions of years, which resulted in a complete planation of the Shield. The Precambrian Shield as we see it today represents the fused roots of the old mountain systems which existed some two billion years ago in central Canada.

"In Paleozoic time, long after the planation of the Precambrian mountains, the land surface of Alberta subsided and was invaded by marine waters. Limestones, shales, dolomites, salt and gypsum were deposited from these marine waters. In some places in this sea, marine life developed reefs—much the same as the coral reefs now found in the south seas. These reefs are well known in Alberta for their oil potential but in some areas, such as at Pine Point, the reefs have been impregnated with metallic ores. Paleozoic limestones, dolomites and salt deposits outcrop in a narrow band west of the Slave River and southwest of Lake Athabasca.

"After the deposition of the Devonian (Paleozoic) limes, there followed a long period of erosion and it was not until Cretaceous time that seas again invaded northeastern Alberta. The Cretaceous seas covered almost the whole of Alberta and with the exception of the Lake Athabasca region, all the surface rocks in Northern Alberta are Cretaceous and Tertiary in age. These Cretaceous sediments are mainly composed of sandstones, shales, bentonite beds and coal seams. The bentonite beds are formed of altered volcanic ash and mark eras of intense volcanic activity in central British Columbia. The coal seams mark periods when Alberta was raised above sea level and was covered by vast swamps and slow-moving, meandering rivers which flowed from west to east.

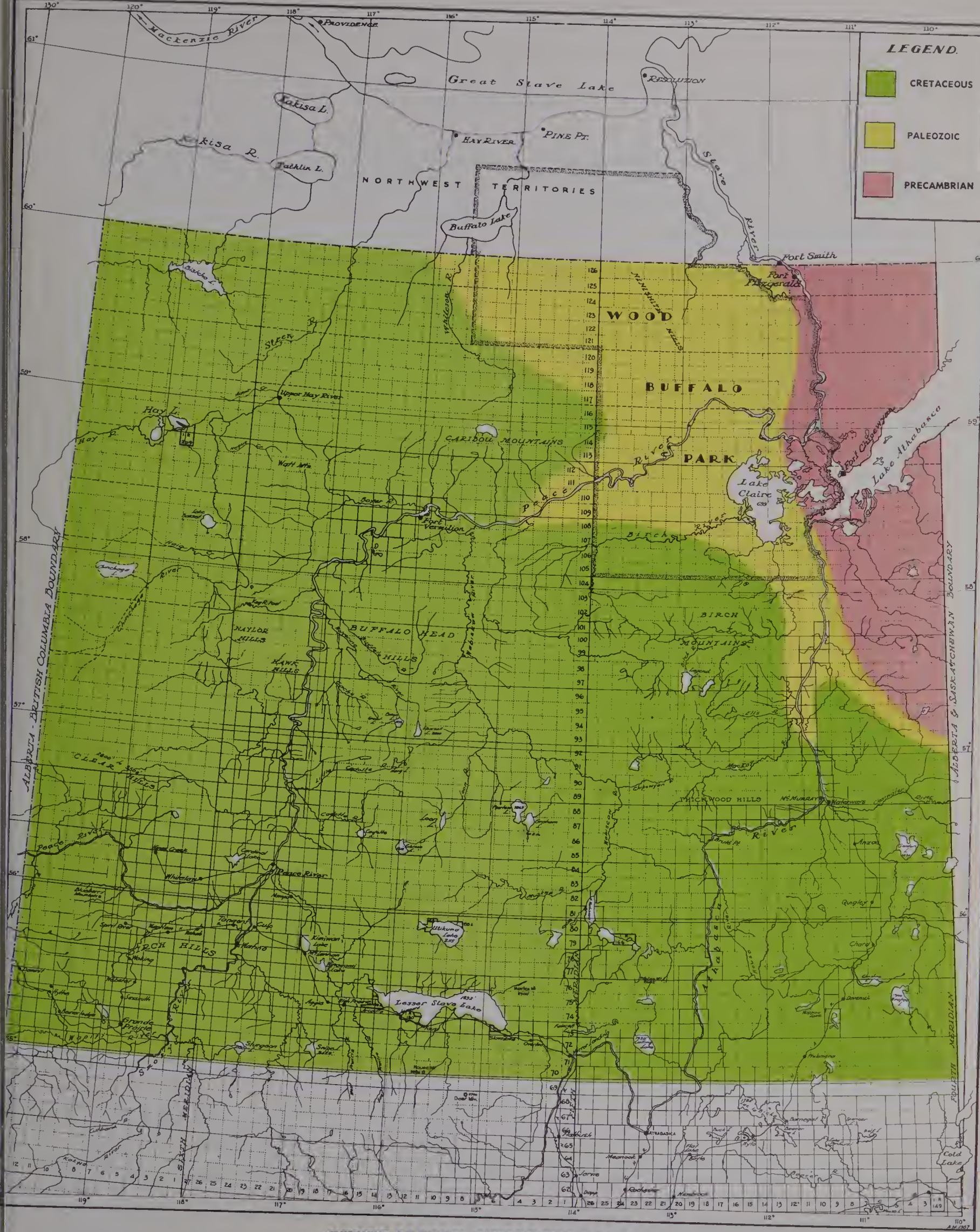
"Following Tertiary time—at which point the Rocky Mountains were uplifted—Alberta was subjected to glaciation. Continental glaciers formed up in the Hudson Bay area and flowed in a westerly and southerly direction across Alberta. Well developed drainage systems were disrupted and replaced by post-glacial streams. A mantle of glacial debris was deposited, masking the underlying Cretaceous sandstones. Gravels and sands were deposited by glacial melt-waters and finally Alberta was coated with a layer of clay and stones which form our fertile lands of today."



PHYSIOGRAPHY

Scale in Miles

10 0 10 20 30 40



GENERALIZED GEOLOGIC MAP

Scale in Miles

10 0 10 20 30 40

CLIMATE

There is a popular misconception fostered by writers of fiction that Northern Alberta is part of the Frozen North. In reality it is not. To the ordinary resident of that area there is no perceptible difference betwcen his climate and that of Edmonton. He experiences the same intense cold as the Edmontonian and the same heat waves, and, in general, the same characteristically clear sunny weather. As a rule the rainfall in Northern Alberta is considerably less than at Edmonton and so is the amount of snow. As the north boundary of the area is approached the frost-free days become less. But in spite of that all ordinary grains are grown at Fort Vermilion, which is the most northerly agricultural settlement in the Province and is 650 miles north of the International Boundary.

The following data on climate was prepared by Mr. D. H. Smith and Mr. Van Valkenburg of the Edmonton Meteorological Office of the Department of Transport. Much of it was compiled from:

(1) Climate of Central Canada by W. G. Kendrew & B. W. Currie

(2) Various publications of Meteorological Division, Department of Transport—Canada.

"Northern Alberta, forming as it does the Western and Northwestern portion of the Forest and Parkland region of Alberta and Saskatchewan, has a climate typical of this region.

"**Temperature**: The mean range of temperature from winter to summer increases rapidly in the middle of the region and is about 67 degrees at latitude 54, Edmonton, and exceeds 80 degrees in the northeast, the increase being due to the rapid decrease of winter temperature to the northeast which approaches the tract with the coldest temperatures in the continent. Summer temperatures are remarkably similar over the whole region in contrast to the winter with its steep increase in severity from the Southwest to the Northeast.

"**Winter**: During the 5 month period, November to March, the mean monthly temperature is below 32°. Cold increases rapidly from the Southwest to the Northeast. Winter temperatures in the Western and Northwestern portions of Northern Alberta are frequently moderate by the fohn effect of the Southwesterly winds. The effect of these winds decreases rapidly to the Northeast. The January mean decreases to —20° in the Northeast.

"The number of Sub-Arctic days (days with maximum temperature equal to or less than 0°) increases from an average of 30 in the vicinity of Edmonton to an average of 60 in the vicinity of Yellowknife. There are, on the average, 10 Arctic days in the South and 20 in the Northeast. The mean percentage frequency of thaw days (days with maximum temperature above 32° during the period when the normal mean temperature is less than 32° F.) decreases from 35% in the vicinity of Edmonton to 15 to 10% in the northeast corner of the Province.

"**Summer**: Monthly means above 50° are typical of the southern sector of Northern Alberta during the five month period, May to September, but only during the three month period, June to August, in the Northern sector. July is warmest in both sectors; 64° in the Southern sector and 60° in the Northern sector on the average.

"The mean daily maximum exceeds 70° in the Southern part during July and August, but only during July in the Northern part, while the mean daily minimum is above 40° during the period, June to August, throughout Northern Alberta.

"Lowest readings below 32° have been registered in all summer months at most stations and 28° at some. However, the latter readings are rare.

"Warm summer days (days with maximum temperature equal to or greater than 77°) range from 35 in the Southern sector to 20 in the Northern sector. Tropical days (maximum temperature equal to or greater than 86°) average 10 in the vicinity of Edmonton. The large lakes reduce the number of warm summer and tropical days. Fort Chipewyan has 21, while Fond Du Lac at the east end of Lake Athabasca has only 12.

"**Transition Seasons**: Temperatures rise very rapidly from Winter to Summer and fall with equal rapidity from Summer to Winter. Spring, with a mean temperature between 30° and 50°, embraces only the one month —April, and Autumn only October.

"**Precipitation**: The total of all forms of precipitation ranges from 18 inches in the Southern sector to 13 inches in the Northern sector. About 30% of it is snow. Summer (June to August) has a strong maximum. Periods of drought are generally more numerous in the Northern sector than in the Southern sector of Northern Alberta.

"These climatic conditions are illustrated by the figures in the following tables:

Mean Temperature

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
a) Edmonton	6	11	23	40	51	57	62	59	50	41	24	13	37
b) McMurray	—6	1	13	34	49	56	62	58	48	37	15	—2	30
c) Fort Vermilion	—9	—4	11	32	49	57	62	58	48	34	11	—5	29
d) Fort Smith	—13	—9	5	26	45	55	61	57	44	32	10	—7	26
e) Hay River	—12	—9	3	23	41	51	60	57	46	33	10	—7	25
f) Yellowknife	—18	—15	0	18	40	53	60	57	46	31	7	—13	22

Years of Observation: a) --76 b) —— c) —30 d) —30 e) —29 f) —10

Mean Precipitation

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
a) Edmonton	0.93	0.73	0.81	0.99	1.88	3.28	3.39	2.52	1.33	0.77	0.83	0.89	18.35
b) McMurray	0.83	0.62	0.85	0.77	1.39	2.11	3.06	2.25	1.67	0.97	0.95	0.74	16.21
c) Fort Vermilion	0.71	0.66	0.74	0.61	1.36	1.67	1.87	1.66	1.27	0.61	0.74	0.86	12.76
d) Fort Smith	0.53	0.66	0.67	0.52	0.97	1.41	1.99	1.65	1.54	0.96	0.86	0.87	12.63
e) Hay River	0.67	0.56	0.50	0.66	0.99	1.17	1.32	1.60	1.51	1.15	1.09	0.80	12.02
f) Yellowknife	0.54	0.46	0.39	0.36	0.59	0.73	1.15	1.02	0.92	0.99	0.69	0.61	8.45

Years of Observation: a) —63 b) —— c) —30 d) —29 e) —29 f) —10

Mean Monthly Length (Days) of Droughts

Longest Drought Given in Brackets After Mean for Each Month
10 Year Period—1934 - 1944

	Apr.	May	June	July	Aug.	Sept.
Edmonton	10 (18)	12 (25)	10 (17)	7 (14)	8 (14)	9 (22)
Fort Vermilion	16 (38)	8 (18)	10 (19)	9 (23)	12 (25)	10 (29)

Drought—a period of at least 5 successive days without total precipitation of at least .10 inches.

Mean Sunshine Hours

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Edmonton	81	117	168	219	253	251	302	268	188	154	97	75	2173
Beaverlodge	78	109	157	215	265	263	299	255	180	137	80	66	2104
Fort Vermilion	70	109	166	213	257	273	299	256	173	121	64	50	2051

FROST DATA	Average Frost Free Period	Last Frost (Spring)			First Frost (Fall)			Frost Free Season—Extremes on Record					
								Longest			Shortest		
		Average	Earliest	Latest	Average	Earliest	Latest	Last Spring	First Fall	No. of Days	Last Spring	First Fall	No. of Days
Edmonton	115	May 24	April 28	June 21	Sept. 16	Sept. 6	Oct. 12	May 16	Oct. 12	149	June 21	Sept. 18	89
McMurray	67	June 16	June 1	July 12	Aug. 22	July 18	Sept. 10	June 1	Sept. 10	101	June 19	July 18	29
Fort Vermilion	65	June 13	May 18	July 14	Aug. 17	July 17	Sept. 11	May 30	Sept. 11	104	July 14	July 19	5
Fort Smith	59	June 18	May 23	July 12	Aug. 16	July 17	Sept. 23	May 23	Aug. 25	94	July 2	July 17	15
Hay River	88	June 11	May 17	July 1	Sept. 7	July 31	Oct. 1	May 17	Sept. 12	118	June 30	Aug. 10	41
Yellowknife	113	May 31	May 15	June 12	Sept. 21	Sept. 2	Oct. 3	May 15	Sept. 28	136	June 5	Sept. 2	89

STATION	Opening of Navigation	Closing of Navigation	Average Duration Shipping Season
Waterways	April 25	October 20	178 Days
Ft. Fitzgerald	May 15	October 20	158 Days
Goldfields	June 6	October 20	136 Days
Yellowknife	June 16	October 15	121 Days
Norman Wells	June 22	October 15	115 Days
Aklavik	June 30	October 15	107 Days
Port Radium	July 17	October 15	90 Days

	FORT SMITH		HAY RIVER		FORT NORMAN	
	Sub Arctic Days	Arctic Days	Sub Arctic Days	Arctic Days	Sub Arctic Days	Arctic Days
Nov.	0-2	0	0-11	0-1	4-21	0-2
Dec.	2-31	0-12	1-31	0-9	8-31	0-20
Jan.	15-28	1-16	8-29	0-18	13-31	0-14
Feb.	0-24	0-20	1-26	0-14	3-25	0-11
Mar.	0-18	0-5	1-17	0-6	0-22	0-6
Apr.	0	0	0-2	0	0-3	0

Sub Arctic Maximum Temperature—less than or equal to 0°.

Arctic Minimum Temperature—less than or equal to —40°.

Average winter has 10-20 arctic days in Mackenzie Basin.

Most valley bottoms, much higher numbers, many winters far from average.

BACKGROUND OF NORTHERN TRANSPORTATION

Transportation has always been and still is the major problem of the North. Until 1905 Northern Alberta remained the domain of the fur trader. Incidental to the transportation and communication requirements of this industry, various small settlements grew up along the three great waterways, the Athabasca, Peace and Slave Rivers.

Edmonton was the supply depot and goods entered Northern Alberta by a freight road to Athabasca Landing. From this point stern wheelers operated down to the Arctic on one route and to Hudson Hope by another.

Athabasca Landing to the Arctic: This waterway was interrupted by two sets of Rapids. The first was on the Athabasca and commenced at Grand Rapids, Township 85, Range 17, West 4th. The turbulent waters from there to the mouth of the Clearwater River at McMurray prevented the use of steam boats on this section of the river. The second interruption to navigation was at Fort Smith Rapids on the Slave River. After these had been overcome by a portage at Fort Smith, goods could be shipped to the Arctic by steamboats.

As a result of these interruptions to navigation the town of McMurray grew up in Alberta and the towns of Fitzgerald and Fort Smith came into being on either side of the north boundary of the Province. Steamboats operated from McMurray to Fitzgerald. From Fort Smith the waterway was clear down the remainder of Slave River, across Great Slave Lake and thence to the Arctic Ocean by way of the MacKenzie River. Steamers on the McMurray to Fort Smith run carried goods destined for all parts of the Northwest Territories as well as for points on Lake Athabasca and up the Peace River. That river could be navigated from where it enters the Slave River to Vermilion Chutes, 185 miles upstream. After portaging the Chutes, goods could be shipped to Hudson Hope, 525 miles upstream.

The Peace River: Before the advent of railways, goods destined for the Peace River Country—either in Alberta or in British Columbia—could be shipped by the route mentioned above or by an alternative route. They could be taken by steamer from Athabasca Landing, up the Athabasca and Lesser Slave Rivers, west over Lesser Slave Lake and thence by a ninety-mile portage to Peace River Crossing. From there steamers ran all the way up to Hudson Hope where the Canyon interrupted further navigation. Peace River town, Dunvegan and Fort St. John were served by steamboats, although navigation up to Hudson Hope was sometimes difficult in low water. From Peace River town steamers carried goods destined for the Northwest Territories down the Peace River to Vermilion Chutes. Using these various water routes, the towns of Athabasca, Fort Vermilion, McMurray, Chipewyan and Peace River in Alberta, and Fort Smith just over the Border in the Northwest Territories, came into existence solely for the purpose of water transport.

In an effort to make transportation into the North easier, three railways were built:

(1) Canadian National Railways from Edmonton to Athabasca in 1912.

(2) Edmonton, Dunvegan and British Columbia Railway from Edmonton to Peace River Crossing—built in 1916—to reach navigable water on the Peace River and to open up promising areas of good soil in the Peace River area. The Grande Prairie branch was eventually continued to Dawson Creek, British Columbia, and the Peace River branch was constructed as far as Hines Creek.

(3) The Alberta Great Waterways from Edmonton to McMurray (1917). This was built to overcome the difficult navigation on Athabasca River upstream from McMurray.

In time the last two railways became the Northern Alberta Railways, which are operated jointly by the Canadian National Railways and the Canadian Pacific Railways. Until the advent of the Alaska Highway and the MacKenzie Highway, the railway line to McMurray carried the major supplies to the far North.

The exigencies of the Second World War brought the Alaska Highway to being. This is served by the Northern Alberta Railway via Grande Prairie and Dawson Creek. The necessity for a highway to Great Slave Lake to serve the mining areas of the North brought the MacKenzie Highway into being. This was constructed in 1948.

The point of departure for the North by way of these means of transportation or routes was Edmonton. Thus, from the beginning, Edmonton has served the Northwest Territories and the Peace River Country. This intimate connection has created a mutual loyalty between Edmonton and the North.

SETTLEMENT

Settlement of Alberta followed the construction of the main line of the Canadian Pacific Railway through Calgary in 1883, and its extension in 1891 to Edmonton. The building of the main lines of the Grand Trunk Pacific in 1909 and the Canadian Northern through Edmonton about 1905 augmented this process. These three railways with their subsequent branch lines provided access for the settlement of 40,000,000 acres of arable land of Southern Alberta (South of 55°). Access for the 17,000,000 acres of arable land in Northern Alberta was slower in coming about and is not yet completed.

Before the main line of the Canadian Pacific Railway was built consideration was given to routing it through the Yellowhead Pass and studies were also made of a possible route through Edmonton, the Grande Prairie Country and thence via the Wapiti, Pine or Peace River Passes to the Coast. Similarly, the Canadian National Railway and the Grand Trunk Pacific studied the possibility of a route via Grande Prairie. It is interesting to speculate about what changes might have taken place in the Peace River Country and in Northern Alberta had any one of these main lines been built through the Grande Prairie region at the beginning of the century. At various times studies were made for a route for a railway from Churchill, Manitoba, to Stewart, British Columbia, by way of the Peace River Country. The facts of economics decided against such a railroad at the time and it appears that even today they provide no great incentive. In the future, access to the North will be obtained by building railroads north from established main lines.

Settlement of the Peace River Country: Agricultural settlement of the Peace River Country began sporadically about 1905 but had to wait until 1911 for any marked movement of people into the area. Although the region was far from railway transportation, the fertility of the soil lured the venturesome. With the building of the Edmonton, Dunvegan and British Columbia Railway (now the Northern Alberta Railway) to Peace River and Grande Prairie in 1916, and subsequent extensions to Hines Creek and Dawson Creek, the major flow of settlement took place. This was not confined to Alberta alone as the Peace River Country extends across the British Columbia border and takes in a large area there which has a population today of about 37,000. Until the opening of the Hart Highway some ten years ago all communication to the Peace River Block in British Columbia was from Alberta. Now with the pending extension of the P. G. E. Railway to Fort St. John and to Dawson Creek where it will connect with the Northern Alberta Railway, the flow of traffic in and out of the whole Peace River Country is bound to be re-oriented to some degree.

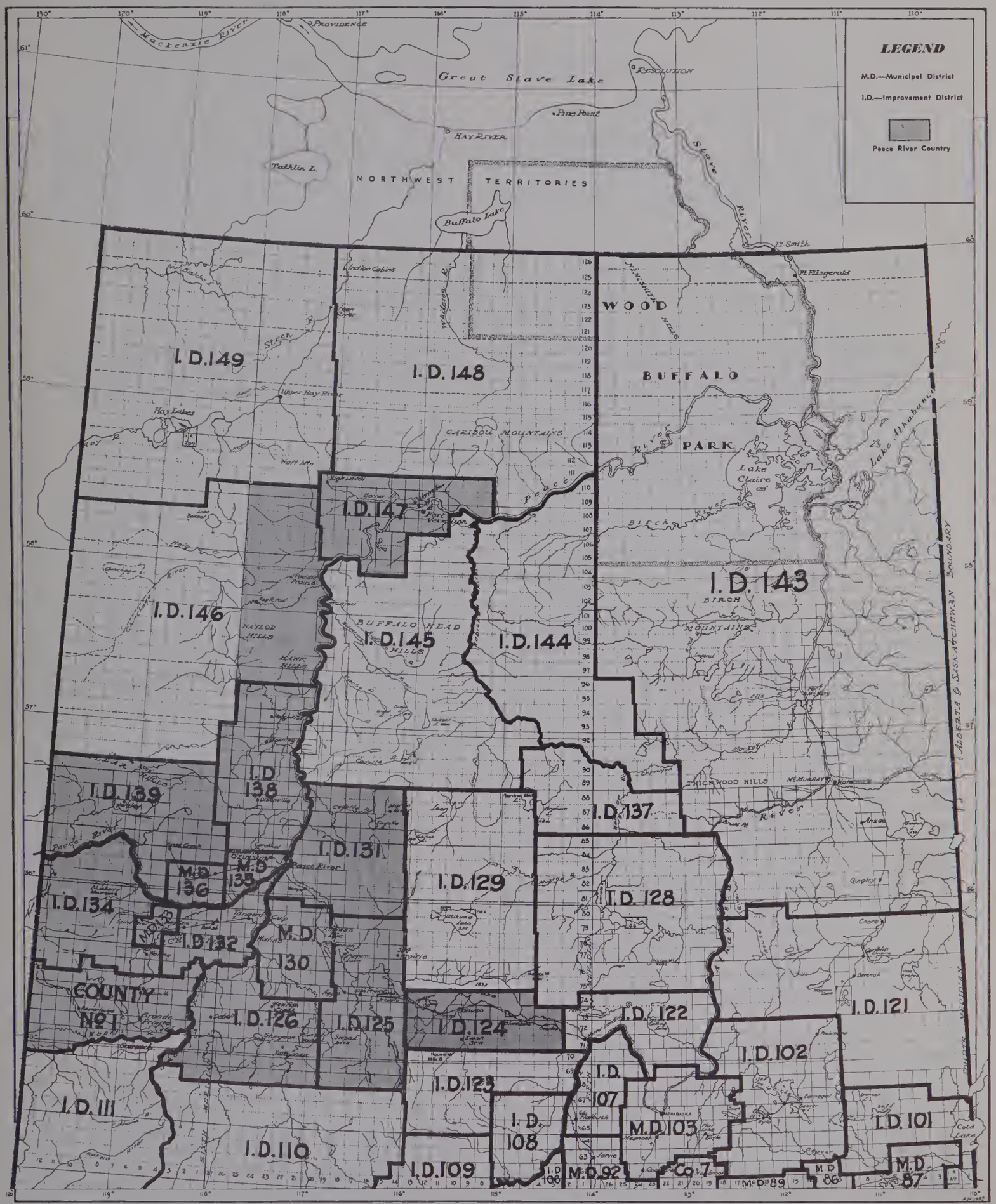
POPULATION

Northern Alberta for all its vastness and for all the rich resources it contains has a population of only 73,683 (1956). The remainder of the Province which lies south of the 55th Parallel has a population of 1,049,433. The white population of Northern Alberta is 70,121, while the remaining 3,562 are Native Indian. Out of the total population of Northern Alberta the PEACE RIVER COUNTRY, which for our purposes may be defined as an area of 41,000 square miles and includes Local Improvement District numbers 124, 125, 126, 131, 132, 134, 138, 139, 147 and the east portion of 146, County No. 1, and Municipal District numbers 130, 133, 135 and 136, has a population of 64,561, which is largely dependent upon agriculture, lumbering and supplying the transport to the North. The remaining area of Northern Alberta, consisting of 88,000 square miles, has a population of only 9,122.

The growth of population in the Peace River Country during the years 1941, 1951 and 1956 is shown below:

Year	Population
1941	57,500
1951	61,800
1956	64,500

In general, settlement went to those areas which contained the best soil, although exceptions to this are the Manning area which did not settle up until about 1929, and the Keg River and Fort Vermilion areas in which much good soil is not yet taken up. Compared to the Peace River Country as a whole, however, these areas are relatively small.



MUNICIPAL UNITS

Scale in Miles

10 0 10 20 30 40

SECTION 2

THE PRESENT STATUS OF NORTHERN ALBERTA

The Commission is charged with the responsibility of making a complete and thorough study of the particular requirements of Northern Alberta in relation to its present and potential development. This section of the report will deal with the present status of Alberta from the standpoint of population and will present statistics on the basic industries of agriculture, forestry, mining, etc., and on the transportation and manufacturing industries, the number of people presently engaged in the transportation and manufacturing industries, the number of people presently engaged in the service industries and, finally, will try to assess the effect on Alberta of the Northwest Territories.

POPULATION

Northern Alberta's vast area of 129,000 square miles is at present occupied by less than 74,000 people. The distribution of this population by municipal areas is shown in Table No. 2.

Native Population: According to the census of 1956, there are 3,562 Indians in Northern Alberta. There is reason to believe that there may actually be about 5,000. This is the approximate number of Indians in the area drawing Treaty. It is estimated also that there are about 3,000 Metis in the same area. These are included by the census taker in the white population but there is often some difficulty in distinguishing between Metis and Indians. Except for those Metis who live in the parts of the country adjacent to white settlement and make their living from agriculture or lumbering, the remainder obtain their living back in the bush by hunting, trapping and fishing. The great majority of Metis and Indians eke out a very slender existence and constitute a problem to which further reference will be given in this report.

While exact figures are not available it is estimated that the following numbers of people are supported by the Industries shown in Table No. 1:

TABLE No. 1

Agriculture	35,200	
Fur Farming	500	
Forestry	6,000	
Trapping (Wild)	4,000	
Commercial Fishing	1,000	
Mining (Oil and Gas)	4,500	
Manufacturing	5,500	
Construction	2,000	
Transportation	2,000	
Other Services	13,000	73,700

In an area as large as the Peace River Country and having agricultural and timber resources of such magnitude, it may be wondered why these resources have not produced larger communities and more industry. The answer appears to be that the Peace River Country and Northern Alberta in general bear somewhat the same relation to the rest of Alberta that the Prairie Provinces bear to the Provinces of Ontario and Quebec. Industrial concentration in Canada began in Ontario and Quebec and such concentration is cumulative. Moreover, an area presently in a highly developed state of industrialization tends to specialize in the more advanced types of manufacturing; for instance, steel fabrication, machinery, factories and chemical industries. These industries are market-oriented and consequently gravitate to centres of large population which offer them convenient and speedy access to markets, as well as a labor supply and access to related industries and services. Such large centres tend to acquire an increasing proportion of tertiary industries such as business offices, professional people and personal services, and this brings about a further concentration of population in these areas. This process is still going on in Ontario and Quebec and much as we in Alberta might wish it were otherwise, it is still one of the facts of life.

At the present time, however, an area of industrial concentration is growing up around Vancouver and to a lesser extent in the two large Alberta cities—Calgary and Edmonton. These bear somewhat the same relation to the Peace River Country and Northern Alberta in general that Ontario and Quebec bear to the Prairie Provinces.

The present economy of the Peace River Country is governed by the production, processing and marketing of its natural resources. Its raw materials are extracted and exported. Consequently the industries arising from the resources of Northern Alberta generate a growth of population in centres like Calgary and Edmonton, and in Vancouver, instead of on the site where the materials originate. The population growth occurs in existing industrial and commercial centres such as Edmonton and Calgary, which can produce on a large scale—and thus more cheaply—the goods and services needed in a frontier settlement. Most of the growth in industrial population generated by the resources of Northern Alberta therefore occurs in Edmonton and Calgary, and in Vancouver.

This pattern of industrial growth has been true in the past and will continue for at least the next two decades. It is to be expected that the bulk of the growth in population in Northern Alberta will be from the labor forces necessary to extract its raw materials, although the economy of the Peace River Country in particular will tend to fall in line with the rest of Canada in that an increasing percentage of its population will be employed in manufacturing and services. As Alberta develops and as we draw more heavily on the resources of the Northern half of the Province we can expect cities like Edmonton and Calgary to grow rapidly. In these places markets already exist; large quantities of electrical power are available; transportation and other services are already

TABLE No. 2

Population of Northern Alberta Above The 55th Parallel—1956 Census

M.D. or I.D.	Location or Centering Around	Incorporated City Town or Village		Town Population	Rural Population	Total
County No. 1	Grande Prairie	Grande Prairie	6,302			
		Sexsmith	345			
		Wembley	272			
		Beaverlodge	768			
		Hythe	481	8,168	8,899	17,067
M. D. 130	McLennan	Girouxville	300			
		McLennan	1,092			
		Donnelly	265			
		Falher	802	2,459	3,955	6,414
M. D. 133	Spirit River	Spirit River	743			
		Rycroft	424	1,167	1,413	2,580
M. D. 135	Grimshaw	Grimshaw	904			
		Berwyn	342	1,246	1,732	2,978
M. D. 136	Fairview			1,260	1,885	3,145
I. D. 102 (Part Only—Est.)	Lac La Biche				350	350
I. D. 107 (Part Only—Est.)					230	230
I. D. 121	Christina Lake				197	197
I. D. 122	Calling Lake				557	557
I. D. 123	Swan Hills				2	2
I. D. 124	Kinuso	Kinuso		306	3,216	3,522
I. D. 128	Wabasca Lake				947	947
I. D. 129	Utikuma Lake				877	877
I. D. 126	Valleyview	Valleyview		973	2,427	3,400
I. D. 125	High Prairie	High Prairie		1,743	3,155	4,898
I. D. 131	Peace River	Peace River		2,034	2,413	4,447
I. D. 132	Wanham				3,133	3,133
I. D. 134	Blueberry Mountain				2,633	2,633
I. D. 137	Trout Mountain				127	127
I. D. 138	Manning	Manning		726	3,489	4,215
I. D. 139	Hines Creek	Hines Creek		360	2,635	2,995
I. D. 143	McMurray	McMurray		1,110	879	1,989
I. D. 144	Mikkua River				26	26
I. D. 145	Buffalo Head Hills				136	136
I. D. 146	Keg River				634	634
I. D. 147	Fort Vermilion				2,500	2,500
I. D. 148	Caribou Mountains				—	—
I. D. 149	Hay Lakes				122	122
		Total White Population		21,552	48,569	70,121
Rural Indian	* Part of Census Division No. 15				3,032	
	Part of Census Division No. 12				530	
						3,562
	GRAND TOTAL			21,552	52,131	73,683

*North of 55th Parallel—Estimate by Alberta Bureau of Statistics.

developed; and these cities provide the labor force and the general amenities of organized communities. This does not mean that the large towns in the Peace River Country will not grow. While Edmonton was named a city in 1904, some 50 years prior to Grande Prairie being so named, present trends do not indicate that Grande Prairie is 50 years behind. They do indicate that speedier development will take place in Northern Alberta's only city.

The status of the various industries as at 1956 is probably shown best by the estimated net value of production for Northern Alberta, which is given in Table No. 3.

TABLE No. 3

Net Value of Production

Agriculture (includes Fur Farming)	$44,103,000
Forestry	4,300,000
Trapping (Wild)	600,000
Commercial Fishing	268,000
Mining (Oil & Gas)	5,250,000
Manufacturing	7,000,000
Construction	7,650,000
	$69,171,000

AGRICULTURE

Existing agriculture in Northern Alberta is confined almost entirely to the Peace River Country, as will be seen from Table No. 4. This table, which is based upon census figures, is in error to the extent that the 1951 census did not include the farms in the Fort Vermilion area. Except in the matter of number of farms, this omission is not too serious and comparisons based upon it are close enough for all practical purposes. The correct number of farms in 1951 appears to have been approximately 9,400 instead of 9,199 as shown in the table. Throughout the remainder of the report we shall use this figure of 9,400.

TABLE No. 4

Statistics Relating To The Peace River District (Census Division 15 North of The 55th Parallel of Latitude)

		Number of Farms & Acreages			Field Crops (Acres)								Livestock (Nos.)				
		Occupied Farms	Acres Occupied	Acres Improved	Total	Wheat	Barley	Oats	Rye	Flax	Mixed & Other Grains	Cultivated Hay	Other Fodder Crops	Horses	Cattle	Sheep	Pigs	Poultry
124 I.D.	1941[a]	267	43,121	8,753	6,124	1,354	774	2,478	11	4	242	698	426	767	2,157	221	2,125	12,157
	1951[a]	279	50,192	14,991	12,082	1,983	3,406	5,443	203	--	--	570	420	535	1,639	363	1,181	11,887
	1956	259	55,638	19,244	13,105	1,587	4,758	4,580	139	167	73	1,267	210	321	2,671	440	1,639	14,548
125 I.D.	1941[a]	536	134,720	41,076	30,682	10,621	5,166	11,831	62	--	458	2,134	206	2,683	4,486	1,084	10,272	34,339
	1951[a]	573	180,199	72,982	59,095	10,693	28,279	14,221	215	166	281	4,655	524	1,979	4,670	547	5,260	27,708
	1956	590	203,022	88,234	67,006	4,465	44,229	9,170	115	1,199	272	6,082	1,417	1,259	6,665	850	6,664	32,175
126 I.D.	1941[a]	456	111,533	25,661	19,167	7,015	2,236	7,668	23	88	84	1,791	205	1,813	2,707	102	6,099	19,723
	1951[a]	484	146,838	55,519	45,839	11,553	5,989	15,294	93	1,248	282	11,227	141	1,255	2,902	226	2,392	20,264
	1956	403	156,249	58,556	45,962	5,912	13,553	11,403	26	4,936	144	8,907	1,054	664	4,845	404	3,918	30,126
128 I.D.	1941	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	1951	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	1956	2	1,216	397	98	--	15	35	--	--	--	41	--	16	102	--	33	210
130 M.D.	1941[a]	804	229,538	122,661	73,060	31,795	5,428	25,811	63	1,667	1,056	6,020	1,068	3,342	3,469	381	10,774	42,716
	1951[a]	854	316,963	195,456	146,593	51,305	10,206	48,552	230	2,134	152	33,492	470	1,298	2,173	271	3,810	34,470
	1956	920	377,676	248,894	177,026	33,828	47,656	44,029	--	19,744	640	27,160	1,376	595	4,949	557	10,425	42,556
131 I.D.	1941[a]	397	124,787	36,282	21,558	11,398	1,610	6,855	24	34	68	872	621	1,439	1,845	137	2,843	20,632
	1951[a]	498	182,038	73,787	54,052	22,985	5,481	12,342	39	714	27	12,284	137	975	1,678	497	1,734	17,251
	1956	457	201,849	98,206	62,599	19,532	15,485	11,656	80	5,653	110	9,018	828	459	2,703	158	3,348	23,743
132 I.D.	1941[a]	539	157,177	51,530	38,712	21,559	2,434	11,282	53	585	63	2,072	554	2,552	2,761	420	5,105	31,177
	1951[a]	690	255,700	134,919	104,589	39,434	11,324	20,290	1,250	8,619	48	22,511	869	1,514	2,937	271	2,888	29,594
	1956	731	332,685	197,511	137,386	40,159	37,011	16,617	486	19,864	176	21,188	1,484	732	5,000	728	5,387	33,594
133 M.D.	1941	356	123,117	62,799	39,801	26,501	2,778	8,653	124	463	--	847	353	2,175	2,209	189	3,308	28,991
	1951	383	146,970	87,266	64,298	28,409	9,146	15,814	395	727	--	9,089	656	913	2,214	168	1,571	24,670
	1956	375	156,905	99,345	68,147	15,314	29,575	10,002	30	3,220	38	8,914	751	387	3,468	168	1,960	23,889
134 I.D.	1941[a]	861	255,730	87,511	58,085	30,026	1,976	21,320	40	299	14	2,576	1,652	4,102	3,815	850	6,779	44,998
	1951[a]	882	296,597	154,097	110,386	49,915	10,675	29,612	2,151	1,877	5	15,195	834	2,197	3,886	734	3,350	39,632
	1956	750	285,674	151,487	100,701	34,376	28,590	14,965	489	5,060	106	14,936	1,842	987	4,853	1,202	4,642	42,631
135 M.D.	1941	461	170,365	100,143	61,671	36,551	4,284	15,699	186	1,256	8	1,953	1,653	3,199	3,277	856	5,950	32,758
	1951	411	178,919	114,677	83,388	34,471	11,454	27,379	571	1,871	10	6,227	1,376	1,145	2,576	57	3,418	21,027
	1956	369	182,449	119,594	81,953	24,576	25,118	19,588	170	4,443	95	5,535	1,984	448	4,728	316	3,926	23,936
136 M.D.	1941	520	208,862	123,054	74,792	45,839	3,656	16,547	539	1,381	1	5,550	1,178	3,934	3,035	640	6,042	36,331
	1951	447	218,380	141,421	100,081	38,287	9,634	29,162	6,137	1,690	12	14,594	553	1,075	2,795	84	2,398	28,160
	1956	434	227,285	153,212	109,216	36,788	25,411	25,048	241	7,158	389	12,965	1,154	429	4,362	9	3,181	28,259
138 I.D.	1941[a]	908	252,820	90,970	61,615	36,518	3,374	19,595	156	1,985	335	907	674	4,019	4,358	915	9,503	46,604
	1951[a]	920	339,897	167,447	118,341	48,129	10,580	36,223	612	4,231	125	16,636	1,745	2,039	5,162	689	3,821	41,138
	1956	872	377,687	210,650	141,840	49,246	25,939	24,515	351	24,202	885	13,878	2,417	945	7,289	601	6,890	54,220
139 I.D.	1941[a]	612	181,271	43,421	30,931	13,315	1,742	12,872	4	628	33	1,552	633	2,591	3,083	452	6,544	32,900
	1951[a]	682	256,602	97,707	73,284	26,488	9,019	31,069	435	1,262	258	4,254	430	2,378	3,941	620	3,417	27,909
	1956	770	344,788	147,242	107,264	19,731	35,550	35,032	398	4,834	161	9,531	1,987	1,353	6,965	1,284	5,324	33,989
145 I.D.	1941	5	2,350	1,751	375	210	14	118	--	--	4	28	--	25	96	87	154	235
	1951[b]	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
	1956	4	1,484	974	752	77	20	114	--	325	--	216	--	13	111	1	16	145
146 I.D.	1941[c]	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)
	1951[b]	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
	1956	52	16,425	6,631	5,250	1,260	1,627	919	155	956	--	268	40	89	277	87	866	1,018
147 I.D.	1941[c]	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)
	1951[b]	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
	1956	274	99,957	43,252	29,068	4,176	1,257	4,765	98	11,609	6	5,137	1,858	746	2,589	276	3,558	13,653
County No. 1	1941[a]	2,562	818,430	438,450	274,907	121,478	14,338	116,921	1,118	2,649	708	14,799	2,417	17,679	16,627	3,030	33,050	159,180
	1951[a]	2,093	839,179	497,206	366,724	91,900	35,515	143,116	10,726	7,536	599	75,156	1,885	6,830	16,473	1,966	12,214	121,876
	1956	2,192	939,145	573,390	396,552	41,880	95,314	127,893	791	20,997	1,264	100,294	7,456	4,574	29,953	3,919	24,542	143,906
Other Parts	1941	139	40,409	11,727	7,186	2,273	544	2,679	11	337	3	742	546	1,071	2,543	261	1,810	9,846
	1951[b]	3	2,704	937	869	--	--	115	3	400	--	350	--	18	108	229	--	11
	1956	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTALS																		
	1941	9,423	2,854,230	1,245,789	798,666	396,453	50,354	280,329	2,414	11,376	3,077	42,541	12,186	51,391	56,468	9,625	110,358	552,587
	1951[b]	9,199	3,411,178	1,790,412	1,339,621	455,552	160,708	428,632	23,060	32,475	1,799	226,240	10,040	24,151	53,154	6,722	47,454	445,597
	1956	9,454	3,960,134	2,216,819	1,543,925	332,907	431,108	360,331	3,569	134,367	4,359	245,337	25,858	14,008	91,530	11,000	86,319	542,598

(a) Approximate, due to the change in I. D. and M. D. boundaries in 1956.
(b) 1951 Census did not include an estimated 200 farms in Northern Alberta.
(c) Included in "Other Parts".

In 1956 there were 9,454 occupied farms embracing 3,960,134 acres of land, of which 2,216,819 were improved. Improved acreage has increased from 1,790,412 in 1951 to 2,216,819 in 1956. During the same period, the number of farms increased from 9,400 to 9,454. The area occupied has increased from 3,411,178 in 1951 to 3,960,134 in 1956. Table No. 4 also shows the details of crop and livestock for the three census years.

Table No. 5 shows the value of agricultural production in 1956:

TABLE No. 5

Value of Agricultural Production in Peace River Country

Wheat	$8,586,338
Barley	8,873,065
Oats	7,526,594
Rye	71,315
Flax	3,397,336
Miscellaneous Crops	2,400,000
Cattle and Calves	3,515,300
Hogs	4,663,000
Sheep	59,300
Poultry	1,905,100
Dairy	2,042,700
Wool	17,600
Fur	750,000
Honey	295,000
	$44,102,648

The following table shows that for the period 1951-56, the number of occupied farms in the Peace River Country remained almost constant, whereas there was a decrease of 7% in the rest of the Province.

TABLE No. 6

	Total Farms	Peace River Country	Remainder of Alberta
1951	84,315	9,400	75,116
1956	79,424	9,454	69,970
	(Inc.)	54	(Dec.) 5,146

During this period changes were taking place in the farm population in Alberta and in the Peace River Country as shown by the following table:

TABLE No. 7

Farm Population

	Total, Alberta	Peace River Country	Remainder of Alberta
1951	345,222	35,717	309,505
1956	332,191	35,147	297,044
Decrease	13,031	570	12,461
Percent Decrease	3.8%	1.6%	4.0%

At the same time changes were taking place in the size of farms. These changes are shown in the following table:

TABLE No. 8

Area of Farms—Peace River Country

Year	No. Farms	Acres Occupied		Acres Improved		% Improved of Occupied
		Total	Per Farm	Total	Per Farm	
1951	9,199	3,411,178	371	1,790,412	195	52.5%
1956	9,454	3,960,134	419	2,216,819	234	55.9%

The figures in this table are taken direct from Table No. 4, in which it will be remembered the farms in the Fort Vermilion area were omitted for 1951. Omitting these leaves the figures for number of farms for that year at 9,199 instead of 9,400, and accounts for the acreages in these 9,199 farms only. If Table No. 8 could be corrected for this omission, the increase during the period 1951 to 1956 in acres occupied per farm and in acres improved per farm would be larger. The figures in Table No. 8, however, serve to show the trend in size of farms. It will be seen that the size of the average farm is increasing and that the acres improved per farm is also increasing.

Two processes are at work in the Peace River Country:

1. (a) People are leaving their farms either by renting or selling them to neighbors. In this case the land which they have brought under cultivation is continuing to be farmed with the result that the farms which remain in the Peace River Country are getting bigger. (b) In some cases in the more remote corners of the country farmers are merely abandoning their farms even though they may still retain title to them.

2. Additional land is being homesteaded in the Peace River Country. Out of the total homestead entries in Alberta for the last five years, 75% are in the Peace River Country.

The following table shows the estimated number of homestead entries in the Peace River Country for the years 1951 and 1956. These entries are not confined to any particular area but are most numerous in the area south and west of High Prairie, in I. D. No. 132, in the Worsley country, in the area north of Hotchkiss and in the Fort Vermilion area.

TABLE No. 9

Homestead Entries in Peace River Country

Year	Issued				Patented				Cancelled
	Veterans		Civilians		Veterans		Civilians		
	No.	Acres	No.	Acres	No.	Acres	No.	Acres	No.
1951	250	70,300	867	215,000			72	13,900	469
1952	145	41,200	778	196,000			67	12,600	432
1953	98	28,100	652	167,100	45	11,100	79	15,400	362
1954	84	24,900	560	144,800	74	14,500	86	16,600	424
1955	83	22,600	593	153,500	55	13,500	106	21,300	532
1956	68	18,700	587	147,800	103	27,200	164	35,200	554

It is interesting to note the total increase or decrease in occupied farms by I. D.'s and M. D.'s as shown by Table No. 10.

TABLE No. 10

1951-1956

Municipal or Improvement District	Increase or Decrease in Number of Farms in the Peace River Country	
I. D. 124	— 20	(Kinuso)
I. D. 125	17	(High Prairie)
I. D. 126	— 81	(Valleyview)
M. D. 130	66	(McLennan)
I. D. 131	— 41	(Peace River)
I. D. 132	41	(Wanham)
M. D. 133	— 8	(Spirit River)
I. D. 134	—132	(Blueberry Mountain)
M. D. 135	— 42	(Grimshaw)
M. D. 136	— 13	(Fairview)
I. D. 138	— 48	(Manning)
I. D. 139	88	(Hines Creek)
I. D. 145	4	(Buffalo Head Hills)
I. D. 146	52	(Keg River)
I. D. 147	74	(Fort Vermilion)
County No. 1	99	(Grande Prairie)

The changes in production that have taken place in the Peace River Country as shown by Table No. 4 for the years 1941, 1951 and 1956, may indicate some trends in farm production. There is a large increase in the acres sown to barley; 431,108 in 1956 as compared to 50,354 in 1941. Similarly, oats have increased to 360,331 in 1956 as compared to 280,329 fifteen years earlier. There has been a tremendous increase in the acreage sown to flax. This has increased to 134,367 in 1956 from 11,376 in 1941. Cultivated hay has also increased considerably. Cattle and sheep have registered an increase, whereas pigs seem to fluctuate but are well below the level that obtained during the war years.

Farm Electrification is well dispersed over the main body of the Peace River Country. At the end of December, 1957, there were 2,300 farms obtaining Central Station service. There are many new areas such as Blueberry Mountain, Worsley, Whitemud Creek, New Fish Creek, the Hawk Hills and the Fort Vermilion area, into which farm electrification has not yet penetrated due principally to the fact that these areas are relatively new, or indeed are so new that in many cases the farmers have not yet really settled down on the land. Some of these areas are slated for construction during 1958, but others will be two or three years before getting service.

Fur Farming

Fur farming north of the 55th Parallel is carried out mainly in the Calling Lake and Slave Lake areas which produce more pelts than any other single area in Alberta. Between 1947 and 1956, the value of pelts produced has remained fairly constant at between one-half to three-quarter of a million dollars, although the number of fur farmers is decreasing through some of them moving to British Columbia and others going out of the business.

Fur farming is almost entirely dependent on the amount of rough fish produced from local lakes. The Lesser Slave Lake provides an annual production of about 4,000,000 pounds of rough fish unsuitable for human consumption and the value of this often exceeds the value of the commercial fish produced, which means that the two industries are equally dependent on each other.

The following table shows the status of fur farming north of the 55th Parallel as at August 31, 1956:

TABLE No. 11

District	Number of Licenses Issued	Number of Mink Declared	
		Standards	Mutations
Calling Lake	10	164	1,436
Canyon Creek	17	7,904	2,815
Faust	41	7,571	9,014
Kinuso	6	881	882
Joussard	20	2,594	2,209
Slave Lake	8	1,332	3,282
Widewater	35	20,359	9,594
	137	40,805	29,232

FORESTRY

The forest industry is a very important segment of the economy of Northern Alberta. In 1956 its net value of production was $4,300,000, which is an estimate of the value of the lumber at the sawmills. Much value is added to this lumber during the finishing stages when it is planed, etc., and this additional work usually takes place in such centres as Grande Prairie, Spirit River, Peace River, etc. During this stage in the manufacture of lum-

ber, an additional five million dollars is added to the value of it, but this is considered under the heading of "Manufacturing" in this Section.

During the winter of 1956-57 there were between 100 and 125 operators in the area and these employed approximately 1,350 men. In summer, this figure drops to around 400 men.

For administrative purposes, the Forestry Branch of the Department of Lands and Forests has divided the Province into large areas called Divisions, in each of which a number of smaller areas called Management Units are being set up. Northern Alberta contains the following four Divisions:

Grande Prairie,
Lac La Biche,
Peace River, and
Slave Lake.

Only the Grande Prairie Division has as yet been completely subdivided into Management Units, so that in order to obtain a better picture of the distribution of forestry resources, the other three Divisions have, for the purposes of this report, been subdivided into a number of areas. Map No. 5 shows the boundaries of the various Divisions, Management Units and Areas.

Included in these are two small units which are shown on the map as M-3 and M-4 (Area 3 of the Slave Lake Division). These are Metis Reserves, and in 1956 about 3,000 M.F.B.M. of spruce lumber were cut on M-3 while 2,500 M.F.B.M. of poplar were cut on M-4.

The Grande Prairie, Lac La Biche and Slave Lake Divisions extend slightly south of the 55th Parallel, but the area south of that line is so small that for our purposes we have considered all of these Divisions as being in Northern Alberta. Something over 42% of Alberta's spruce lumber comes from Northern Alberta.

Table No. 12 shows the 1956 production of timber by Divisions and Management Units.

As will be seen from the table, the bulk of the timber cut in Northern Alberta is spruce, which, in lumber alone, accounts for 171,055 M.F.B.M. (thousands of board-feet) out of a total production of timber for all purposes of 190,295 M.F.B.M. The next most important species is pine, which yields 8,100 M.F.B.M. in lumber alone, but is also used extensively for poles, piling and railway ties. Poplar yields 6,518 M.F.B.M. of which 5,536 M.F.B.M. was converted into plywood.

Forestry operations are largely confined to the area south of the 57th Parallel. In 1956 only 6,863 M.F.B.M. of lumber and 25 M.F.B.M. of spruce piling were taken out north of that parallel.

The main regions in which lumbering operations are carried on are in the areas tributary to Grande Prairie, Faust, Peace River and Lac La Biche. In the past, operations have tended to be carried out in close proximity to the railroad. With the depletion of existing stands close to the railways, however, and also with the development of better highways and better trucking facilities, there has been a tendency for lumbering operations to be carried out further back. Several large blocks about 70 to 80 miles south of the railroad at Grande Prairie were recently sold. Timber has been sold bordering the MacKenzie Highway some 120 miles north of the railroad at Grimshaw.

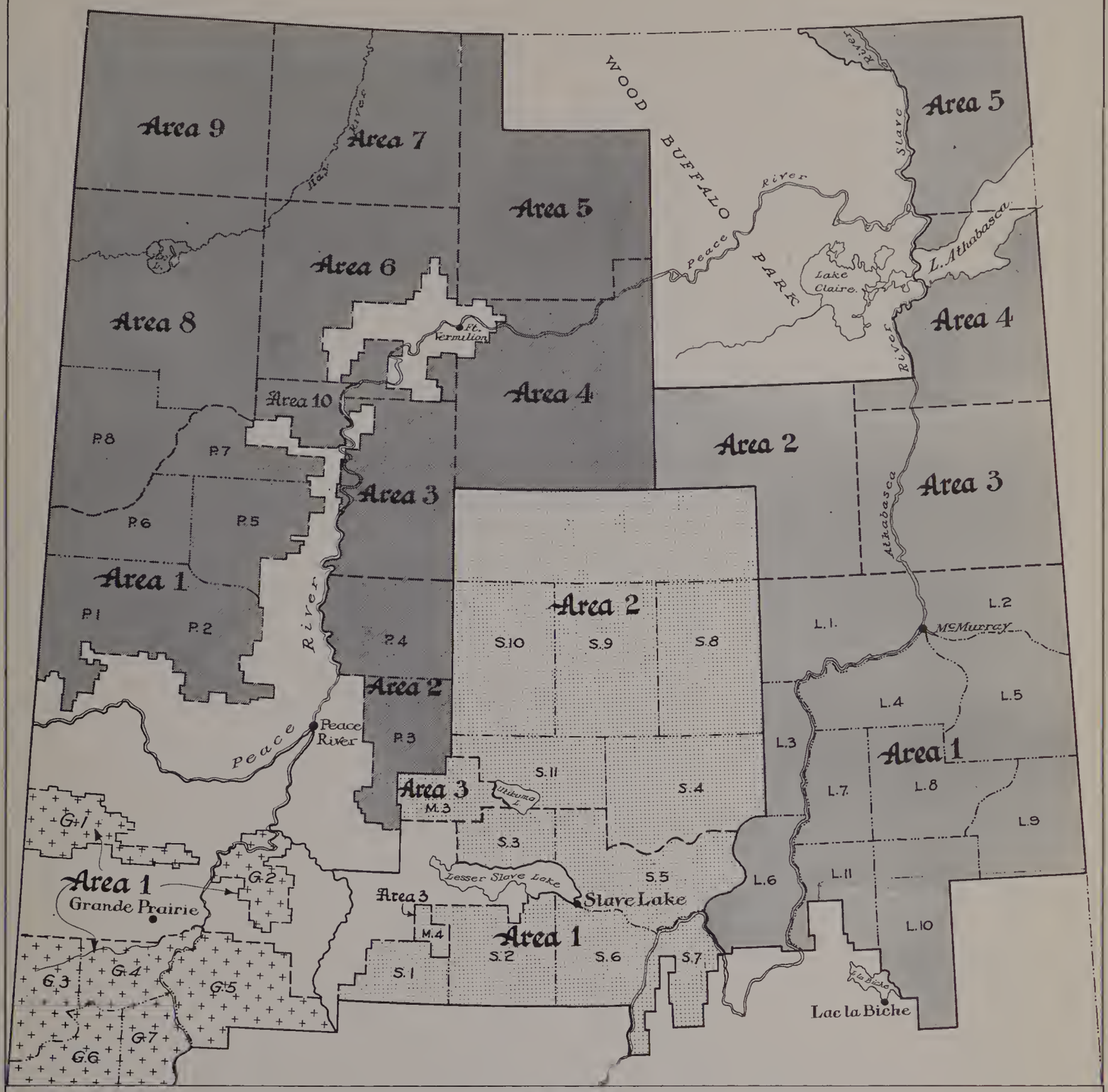
The total area of Northern Alberta is some 129,000 square miles, of which the Wood Buffalo Park occupies some 15,000 square miles where the timber, and in fact all other resources, are the property of the Dominion Government. In general, the timber in the Wood Buffalo Park is somewhat sparse, but some excellent stands occur along the Peace River and the Slave River. During 1955-56 the Dominion Government sold four large berths of timber located along the lowest fifty miles of the Peace River to the Denny Logging Company of California. That Company is required to develop these stands within the next few years. A sawmill and planing mill was scheduled to commence operations during November, 1957. This mill, which is located at Fitzgerald, will have a capacity of 85,000 F.B.M. per day. A plywood plant, estimated to cost two million dollars, is scheduled for completion by January 1960. It is anticipated that the sawmill, plywood plant and logging operations will employ 250 men and will have an annual payroll of $1,500,000. The total capital investment will be $4,000,000 and the total production per year will be in the neighborhood of from 20,000,000 to 30,000,000 feet. It is hoped that operations will be on a year round basis, but there is a possibility that there will be a two to four-month shutdown during the winter months because of transportation problems. In order to operate on a year round basis, it is necessary to carry extremely high inventories of logs and finished lumber.

While the Denny Logging Company's mill is located at Fitzgerald just a few miles south of the Alberta border, most of the staff of the mill will reside in Fort Smith, N.W.T., which is one mile north of the Alberta boundary. Even though these employees live in Fort Smith, they form part of Alberta's economy because Fort Smith is serviced from Edmonton in the same way as is any town in the Peace River Country.

There are three other large sawmills operating near the Peace River in the Wood Buffalo Park. These are Swanson Lumber Company Ltd., Clark Brothers Ltd., and Eldorado Mining and Refining Company's mill.

From a commercial point of view, spruce has been Alberta's most important wood. It is used extensively in construction, particularly in house building in the form of shiplap and boards. For this type of construction, the wood is almost ideal, being light, strong, easy to handle and to nail. Spruce timber takes from 120 to 150 years to mature and grows best where there is an abundance of moisture. In Northern Alberta about eighteen logs of spruce are required to make 1,000 feet of lumber, and a stand yielding about two million feet to the square mile is considered quite good. In British Columbia, on the other hand, the standard is 10 logs to the 1,000 feet and 6 million feet to the square mile. Regeneration of spruce is still a problem and there is no general agreement as to the best methods. Reforestation of cut-over areas is left to nature and there is considerable doubt as to the economic feasibility of reforestation by planting. It is notable that after a fire new growth is usually pine and poplar rather than spruce.

Pine is the second most important timber species in the area. It is a soft wood which as a finished product



NORTHERN FOREST ALBERTA DISTRICT

PEACE RIVER DIVISION

LAC LA BICHE DIVISION.

GRANDE PRAIRIE DIVISION

SLAVE LAKE DIVISION.

Division boundaries shown thus . . .

Area boundaries " " . . .

Unit boundaries " " . . . L.5 etc.

AM '58

TABLE No. 12

Forest Products Production in Thousands of F.B.M. (M.F.B.M.), 1956

DIVISION	Management Unit	LUMBER					SPRUCE PULPWOOD		PINE POLES	POLES & PILING		PLYWOOD	RAILWAY TIES
		Spruce	Pine	Poplar	Balsam Fir	Birch	Green	Fire-Killed		White Spruce	Pine	Poplar	Pine
Grande Prairie	G-1	5,711	543							2	7		
	G-2	12,073	849										
	G-3	3,840											
	G-4	13,200										428	
	G-5	3,780											
	G-6	5,767											
	G-7											32	
	Total:	44,371	1,392							2	7	460	
Lac La Biche	L-2	629											
	L-4	203					6	398			2		
	L-6	11,239	321		148	5			49		28		
	L-7	2,306											
	L-10	5,181	67										274
	L-11	3,376	80										73
	Total:	22,934	468		148	5	6	398	49		30		347
Peace River	P-1	9,629	1,008								3		
	P-2	8,719	192										
	P-3	9,382	599					18	45		4		
	P-5	8,671								4			
	Total:	36,401	1,799					18	45	4	7		
Slave Lake	S-1	2,613	1,148										1,286
	S-2	16,874	890	362			11	61				155	1,188
	S-3	2,495	164				325						
	S-5	9,004	1,433		429			207	11	2	5		
	S-6	26,496	806	620		6						2,421	
	S-10	4											
	Total:	57,486	4,441	982	429	6	336	268	11	2	5	2,576	2,474
Above 57th Parallel	Total:	6,863								25			
Metis Reserves	M-3	3,000											
	M-4											2,500	
	Total:	3,000										2,500	
	TOTALS:	171,055	8,100	982	577	11	342	684	105	33	49	5,536	2,821

Grand Total of All Forest Production in Northern Alberta in Thousands of F.B.M. 190,295

is similar in appearance to spruce and, in fact, spruce and pine are often sold indiscriminately as spruce. Pine tends to grow in the higher altitudes and its regeneration is not a problem. After a fire, it is extremely common to see a growth of pine trees. At the present time pine is used to a great extent in the production of lumber, of which a considerable amount has come as a by-product of the production of ties. There is a very large footage of pine available in Northern Alberta, particularly in pulpwood sizes.

Poplar is a very common timber in Northern Alberta, but until very recently it has not been considered as having any great commercial value. A limited amount of lumber has been produced to be used in the manufacture of coal doors for the railroad and in the manufacture of furniture, for it is a very tough wood, easy to nail and takes a good coat of paint. Its main defect is its moisture absorbent quality. When exposed to the weather, it tends to absorb moisture and to twist and otherwise not hold its shape. Recently poplar has been used fairly extensively in the manufacture of plywood. Fir is usually used in the core, with high grade poplar used for the surface areas. The two main species of poplar are commonly referred to as White Poplar and Black Poplar. Black Poplar is used more frequently for plywood because it grows larger in size.

There are three poplar plywood plants in Alberta at the present time, of which two are situated in Edmonton and the third, Northern Plywoods, is at Grande Prairie. At full capacity, Northern Plywoods employs 130 men in the plant and 90 - 100 in the forests. Its plant payroll during the past year was around $33,000 a month. It can handle 44,000 feet of timber and the investment in the plant is one million dollars. The production of plywood is around 100,000 F.B.M. ¼" base per day or 440,000 F.B.M. 1/16" base. The plant used all Black Poplar during the past year, but next year plans call for two-thirds lodgepole pine and one-third poplar. The markets for Northern Plywoods are in the Dawson Creek - Fort St. John area, the Peace River area of Alberta and in Eastern Canada.

There are two plywood plants in Edmonton, namely: W. R. Zeidler Ltd., and Western Plywoods. The former obtains all its logs from the Kinuso and Enilda area (Slave Lake Division) and uses between four and five million feet a year. The latter, which uses about nine million feet, obtains about 60% of its logs from the vicinity of Slave Lake (Slave Lake Division), while the remainder comes from points along the Athabasca River in the vicinity of Whitecourt and Mayerthorpe. These plants have only recently gone into production so their timber is not reflected in Table No. 12.

The process of manufacturing lumber as conducted in Alberta generally involves the building of a small sawmill right out in the timber. Since the ground on which spruce grows usually has a high moisture content, and is more or less inaccessible during the summer, the logging and sawmill operations take place during the winter season, roughly from November 15th to the end of March. The sawn lumber is hauled during the wintertime to a planing mill usually located on the railroad, and then put in "dry pile" until about the latter part of May or early June when it is dry. The heavy shipping season is from June 1st to the end of September. There are some variations of this procedure, such as taking the planing mill right out to the timber and planing the green lumber immediately after sawing and then trucking this planed, green lumber either to the railroad or direct to large consuming areas, such as Edmonton. The trend is towards the operation of larger sawmills. Smaller operators are finding the competition stiff because of the economies inherent in large scale operations.

Forest Tenure

With the exception of the pulpwood lease, the usual method of selling Crown timber is by sale of timber berths for saw milling to loggers and the sawmill companies. The usual sale covers a small area—commonly one to three square miles. The applicant makes a deposit to cover the costs of handling the application — for instance, $50.00 for an area of not more than two square miles, up to $500.00 for an area of more than ten square miles but not more than 25 square miles. The successful bidder assumes the cost of cruising, surveying and advertising the berth. Most sales are made by sealed tender, but some are by open auction, and in both cases the highest bidder wins the berth. An unsuccessful bidder who owns or operates a mill reasonably close to the berth in question or who has a reasonable expectation of being able to operate the berth more economically or advantageously than the person making the highest bid or tender may appeal to an arbitration board to have this berth assigned to him. If, in the opinion of the board, he can cut the timber in question to better advantage, the berth is awarded to him, providing he pays the same amount as that offered by the highest bidder. As a condition of the contract, the Department of Lands and Forests may impose terms which it considers desirable for good forestry practices. The main ones are the limitation of the cut to trees larger than a specified minimum diameter, such as eight or fourteen inches, and requirements relating to the quality of trees cut or to other logging operations such as the burning of debris. While the cutting rights are held, the licensee pays a ground rent of $30.00 per square mile and a fire-guarding charge at rates prescribed.

The other component of the purchase price is set by the terms of the tender. The Provincial "Dues" form the reserve bid or upset price of nearly every sale. These dues are determined by a uniform formula of 10% of the average selling price of dressed lumber during the previous year. The upset price for 1956-57 was $6.00 per 1,000 F.B.M. of sawn lumber, except in the case of poplar and balsam. At many sales an over-bid is offered, that is, the bidder offers to pay more than the upset price. Once set at an auction, the over-bid holds for the duration of the contract. In 1954, about 60% of the sales of sawmill berths went for the upset prices alone; the remaining 40% carried overbids.

No berth may be sold unless notice of the sale has been given by advertisement. Such notice gives the distinguishing number of the berth, the description of the land and area, the money required as a deposit, the place, day and hour at which the sale is to be held, the number of years for which the license is to be renewable and the product of the forest that is to be the basis of competition for the berth.

The following table presents some data on timber leases in Northern Alberta at the present time:

TABLE No. 13

TIMBER LEASES

Number of Berths Active at November 1, 1957

Division	Area in Square Miles					Total No.	Total Area
	0-1.9	2-4.9	5-9.9	10-19.9	20 or over		
Grande Prairie	41	8	5	4	2	60	204
Lac La Biche	38	7	4	2	—	51	113
Peace River	37	8	8	1	1	55	138
Slave Lake	43	36	7	12	1	99	377
Totals	159	59	24	19	4	265	832

It will be seen from the Table that while there are a number of larger berths ranging from two square miles up to over twenty square miles in area, more than one-half of the total berths are under two square miles. These smaller berths generally fall into the following categories:

Small Commercial Berths: Section 39 of the Forests Act provides for permits to be granted without competition to commercial operators for the purpose of cutting for sale timber occurring in areas adjoining land on which they now cut. The area must be isolated from other areas of merchantable timber, must not exceed 160 acres, must not contain more than 125,000 F.B.M. of spruce, pine, tamarack and species other than poplar.

Settlers' Berths: Permits are also granted to actual settlers without competition and on the payment of dues so that they may cut timber on Crown land. This timber must be for their own use on their own farms, with a maximum of 10,000 F.B.M. in any permit year, and not more than 30,000 F.B.M. in total. Settlers have other rights as set forth in "Regulations Governing the Granting of Miscellaneous Timber Permits to Cut Timber on Public Lands".

Alberta is in the fortunate position of having as nearly accurate information of its forest resources as it is presently possible to obtain. It has carried out a complete aerial photographic survey of all of the timber areas in Alberta at a cost of approximately $1,000,000 of which the Province and the Dominion bore about $683,000 and $317,000 respectively.

Fire Fighting

In the past, much timber in Northern Alberta has been lost by fire. The rate of burn for the whole Province for the past several years was given in the submission made by the Department of Lands and Forests to the Gordon Commission as about 0.86% per year, i.e. each year about 8.6 acres out of every thousand acres of forest has been burned. This is a tremendous economic loss. It is felt that with proper fire fighting, this could be reduced to about 0.25%. Due to dry conditions, etc., some years of course will have much heavier fire losses than others, but on the whole, if the rate could be reduced to 0.25%, this is about as far as it is reasonable to expect. There has been a marked improvement during the last few years in the efficiency of fire fighting. The map in the pocket at the back of the report shows, amongst other things, the extent of damage by fire since 1941.

In the 17-year period, 1941 to 1957, it is estimated that the equivalent of more than 15 billion board feet of timber have been destroyed in Northern Alberta. This was made up of 2 billion board feet of timber of sawlog size and 27 million cords of non-mature timber of over 4 inch D.B.H. On the basis of 1957 values of approximately $35.00 per thousand F.B.M. delivered at the planing mill, the loss to the economy of the Province for the 2 billion board feet of sawlog timber alone was $70,000,000. Had this sawlog timber been cut, the Province would have reaped $20,000,000 in fees at the average rate of $10.00 per M.F.B.M. This means, actually, that while this timber was standing, it was worth only $20,000,000. The difference between that and the $70,000,000 quoted above, that is, $50,000,000, is the labor that would have been expended to cut the timber, haul it to the mill, saw it and truck it to the planing mill. This fire loss, then, cost the Province $20,000,000 in fees and deprived the Province of $50,000,000 in the payroll which otherwise would have been expended to process the timber which was burned up. And this is the loss of sawlog timber only. Over and above that, the loss of the 27 million cords of pulpwood was many times greater.

In seventeen of the thirty-one existing management units in Northern Alberta, the average rate of burn in the past has been so high as not to permit any allowable annual cut, i.e. the rate of burn has equalled or exceeded the rate of regeneration or regrowth. It is recognized that it will be impossible to stop forest fires altogether, so that the first fire prevention target is to reduce forest fires to an "acceptable rate of burn". There is some variation in this acceptable rate of burn for different localities and between different species of timber based on the rate of regeneration and growth, but, for Alberta, they are the following: 0.1% for white spruce, 0.15% for black spruce, 0.25% for pine and 0.4% for deciduous species in general. In practice, an average of 0.25% is used.

In the management units set up in 1956, allowable annual cuts have been worked out on a provisional basis for both present and acceptable burn in the case of twenty of these thirty-one units. In the case of white spruce lumber, the total allowable cut for these twenty units is 51 million board feet per annum at present average rate of burn, and 131 million board feet at the acceptable rate of burn. Comparable figures for pine timber are 46 million board feet at present average rate of burn and 91 million board feet at the acceptable rate of burn. The difference is 80 million board feet of white spruce and 45 million board feet of pine per annum, making a total of 125 million board feet of saw lumber. At $35.00 per 1,000 F.B.M. delivered at the mill, this would be worth $4,375,000, of which at $10.00 per 1,000 F.B.M. the government would receive $1,250,000 in revenue.

To take a single example, in management unit L-10 the 1956 inventory showed 271,037,000 board feet of mature white spruce timber. The average rate of burn since 1941 was 1,062,000 board feet per annum, or nearly 0.4%. Reducing the rate of burn to the acceptable figure of 0.1% would mean a saving of approximately 800,000

board feet a year, worth, at 1957 values, about $28,000 delivered at the mill, of which $8,000 would have been paid to the Province in fees.

The figures given above are somewhat theoretical, because much of the lumber would probably not have been cut anyway, but are based on the assumption that it would have been cut and that there would have been a market for it. The examples, however, do show the seriousness of the past rate of burn in our forests.

Successful control of forest fires depends almost entirely on reaching them while they are still small enough to be fought by a handful of men and equipment. In the past, the inaccessible areas of Northern Alberta have suffered much damage because fires there could not be reached in time. In fact, until three or four years ago, fires were fought only if they were within ten miles of a main transportation route (highway or navigable river). Men on foot, carrying their equipment, can only travel at about one mile an hour in the bush, which means that at peak hazard periods a fire can travel faster than the men.

TABLE No. 14

Comparison of Rates of Burn of Productive Area

Management Divisions and Units	Average Annual Percentage Burn 1941-57	1941-50	1951-7
Grande Prairie			
G1	1.27	2.17	Nil
G2	2.25	3.80	0.02
Slave Lake			
S1	1.24	1.96	0.16
S2	0.54	0.73	0.26
S3	0.95	1.20	0.52
S4	0.65	0.91	0.26
S5	0.77	1.29	0.03
S6	0.09	0.14	0.02
S8	0.99	1.64	0.05
S9	3.04	4.91	0.24
S10	1.94	3.20	0.10
S11	1.51	2.16	0.48
Peace River			
P1	0.23	0.39	Nil
P2	0.80	1.35	Nil
P3	3.90	6.63	Nil
P4	1.19	2.03	Nil
P5	0.09	No figures available	
P6	0.10	No figures available	
P7	0.18	No figures available	
P8	0.20	No figures available	
Lac La Biche			
L1	0.54	0.50	0.56
L2	0.39	0.30	0.49
L3	0.11	0.10	0.13
L4	0.43	0.28	0.62
L5	0.06	0.04	0.09
L6	1.31	2.23	Nil
L7	0.15	0.25	Nil
L8	0.20	0.34	Nil
L9	0.11	0.18	0.01
L10	0.46	0.78	Nil
L11	1.94	3.30	Nil

During 1957, fire-fighting effectiveness was increased by the purchase of a small aircraft and the rental of a helicopter during May and June, which are usually the peak hazard months. This enabled fires to be fought throughout the province and, fortunately, there was no concentration of outbreaks of small fires at one time. Because of this, and because weather conditions in 1957 were not too unfavorable, the air equipment was not overtaxed.

However, White Spruce, for example, takes something of the order of a century to reach maturity and even an occasional year of large fires can nullify the success of years of adequate protection.

That this need for adequate protection is being realized is reflected in the increase in expenditure by the Province. The estimated cost of protection and administration for 1957 is almost $3,000,000, compared with $440,000 in 1947 and $165,000 in 1940.

Table No. 14 shows that this increased expenditure is achieving results. Of the 27 management units for which figures are available, in only five has the average annual rate of burn increased in the period 1951-57 compared to the period 1941-50.

Each one of the Forestry Divisions has a Forest Superintendent in charge with a Forest Officer (Ranger) in each of the smaller units. In addition to these men, there is a network of twenty-six lookouts, each equipped with fire-fighting equipment and two-way radio. The following table shows that there are at present 57 Forest Officers and 34 Divisional Staff in Northern Alberta:

TABLE No. 15

Fire Protection Staff

	Divisional Staff	Rangers
Lac La Biche	8	14
Slave Lake	8	16
Grande Prairie	8	11
Peace River	10	16
	34	57

The forestry map in Section 3 shows the locations of lookout towers, standing crews, divisional headquarters and where rangers are stationed. The map also shows the volume of timber per acre by areas.

The forests and forest industries in Northern Alberta play a vital role in the economy of the Province. The forests provide a livelihood for some 6,000 people in lumbering and many more in manufacturing operations in the larger towns of Northern Alberta. They also afford recreation for the public; provide homes for wild life; and what is perhaps more important, they protect our watersheds. The protective influences of the forests include the stabilization of the soil, the promotion of clean and well distributed stream flow, the recharge of ground waters and the reduction of damaging winds and floods to crops, lands, homes and settlement.

Forests are a renewable resource, and if properly exploited and conserved under the best forestry policies, will continue to contribute to Northern Alberta's economy for all time.

June 22, 1971

The Honourable Jack Davis
Minister of the Environment
House of Commons
OTTAWA, Ontario

Dear Sir:

During his recent visit to Edmonton your Parliamentary Secretary, Eymard Corbin suggested that I forward to you the enclosed excerpts from the Report of the Royal Commission on the Development of Northern Alberta (MacGregor Report) which was submitted to the Provincial Government in 1958.

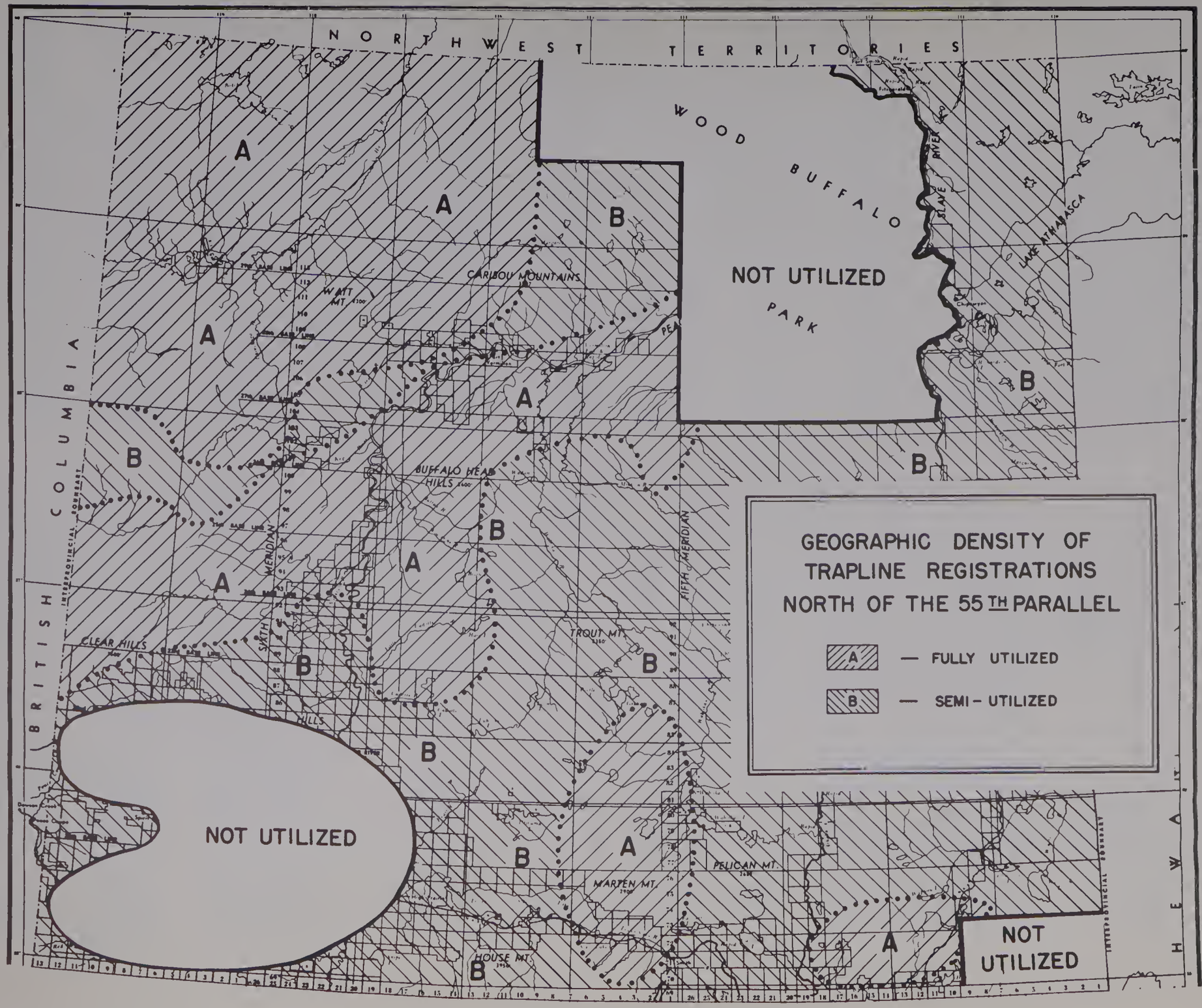
You will note this report not only expressed concern about the Bennett Dam prior to its construction but also warned the Provincial Government about its detrimental affects on Alberta years ago. You will also note the report in question recommended the creation of a Board to protect the joint interests of the various governments.

It is unfortunate close heed was not paid to the Report.

Yours truly,

TRM/dd
Encl.

T. R. Maccagno


NORTHWEST TERRITORIES
WOOD BUFFALO PARK
NOT UTILIZED
SLAVE RIVER
LAKE ATHABASCA
CARIBOU MOUNTAINS
WATT MT.
BUFFALO HEAD HILLS
CLEAR HILLS
TROUT MT.
MARTEN MT.
PELICAN MT.
HOUSE MT.
BRITISH COLUMBIA
ALBERTA
SIXTH MERIDIAN
FIFTH MERIDIAN
NOT UTILIZED
NOT UTILIZED
GEOGRAPHIC DENSITY OF TRAPLINE REGISTRATIONS NORTH OF THE 55TH PARALLEL
A — FULLY UTILIZED
B — SEMI-UTILIZED

FUR AND GAME

Trapping

The demand for all fur has decreased during the last ten years and is probably at an all-time low, with the result that there has been a corresponding decrease in trapping. This is reflected in trapline registrations which for the whole Province have decreased from 3,023 ten years ago to 2,517 in 1956. As a result, for Alberta as a whole there are 663 traplines available which no one wants.

In Northern Alberta there are 1,426 registered traplines which employ 2,816 men, of which one-third are native Indians. Approximately 400 other traplines are available but are not being used so that they are unregistered at the present time.

On the basis of the above it must be assumed that the fur products of Northern Alberta are not being exploited to full potential. Reasons given for this are:

(1) Lower market prices for fur.

(2) Higher costs for equipment and transportation.

(3) Generally higher living costs.

(4) Higher wages paid for other forms of work.

(5) Reluctance of young men to follow such an arduous calling.

The gross market value of all fur for the year ending 1956 is calculated at about $600,000. It is estimated that full exploitation of available areas would increase this amount by at least 25%.

The accompanying map shows the extent of utilization of the trapping areas of Northern Alberta. This map shows the Wood Buffalo Park and the Department of National Defence Weapons range which are legally not available for trapping. Zones marked "A" are termed "fully utilized" to indicate that trapline registration covers practically 100% of the area in question. The remaining land is exploited in degrees varying from 0% to 90%. The letter "B" has been located on the map at positions generally corresponding with 75% to 90% utilization.

A rough calculation indicates the following:

(1) Certain lands are not available for exploitation because they are legally set aside for other uses, e.g. parks, agriculture. Their area is about 24,000 square miles or 19% of the total.

(2) Another 60,000 square miles, 48% of the total, is utilized in degrees varying from 0% to 90%. Registrations cover approximately 30,000 square miles or 50% of this area.

(3) An additional 43,000 square miles, 33% of the total, has been plotted as fully covered by trapline registration.

(4) Hence, a total area of 73,000 square miles, 57% of all land, is under trapline registration, while the balance, 55,000 square miles, 43%, is unexploited and largely unavailable.

The major fur bearers, in order of their present contribution to the fur market, are listed hereunder:

1. Muskrat
2. Squirrel
3. Beaver
4. Weasel
5. Mink
6. Lynx

It is noteworthy that all but one of these are "short-haired" animals. Ten years ago the contribution by "long-haired" animals to the total fur market was relatively high. Fox and coyote were marketed in amounts equal to 3% of the total value of all fur marketed in 1946-47. During the year ending 1956 their total contribution amounted to 0.3%. This drop in their contribution is a direct result of a similar drop in demand by the fur industry for "long-haired" items. It is further noteworthy that as trapping for fox and coyote decreased, the coincidental increase in their living numbers contributed significantly to the spread of rabies during the outbreak of 1952.

The present situation of the trapping industry can be summarized as follows:

(1) The area available for trapping is approximately 73,000 square miles, 57% of the area under review.

(2) Major contributors to the fur market are the "short-haired" items.

(3) "Long-haired" fur is not in demand by the fur industry.

(4) Prices paid for all fur have generally declined during the past ten years.

(5) Traplines are only being utilized to about 75% of the number available.

(6) The trend established during the past ten years in all aspects of trapping is one of decline and under-maximum utilization.

Hunting

Hunting in the area under review has little social or recreational significance. It is carried out almost entirely by residents for the purpose of securing food as required. A relatively small amount of "game" is sought by semi-urban and rural agricultural residents of the Peace River-Grande Prairie districts who travel afield in search of game on a licensed sporting basis.

Little is known of "game" potential in the area concerned. It is undoubtedly large in relation to exploitation in all game groups and particularly so for migratory waterfowl. It is expected that the major big game item would be moose, with lesser numbers of deer and caribou, and few, if any, elk.

The migratory habits of barren-land caribou make their relationship to the "game" of Northern Alberta an obscure one. Recently initiated investigations by federal authorities concerning caribou may disclose the extent of its contribution.

COMMERCIAL FISHING

Commercial fishing in Northern Alberta is not being exploited to the extent that it could be. The bulk of the fishing at present is being done in the lakes contained within the triangle marked "A" on the following map.

Two other regions may also be considered. They are located in the northwest and northeast corners of the province as indicated on the attached map, and labelled Zone B_1 and B_2 respectively. They contain relatively unexploited waters where fish in commercial quantities are known to exist.

Commercially utilized fish found in the area under study are hereunder listed in order of their importance to the fisheries market:

1. Whitefish
2. Pickerel
3. Pike
4. Perch
5. Tullibee
6. Trout
7. Ling
8. Sucker

It should be noted that tullibee make a major contribution to the fur farm industry. For example, about four million pounds annually are taken from Lesser Slave Lake for that purpose. This quantity is almost four times as great as the total amount of all other species removed for marketing. However, tullibee is a secondary item on the domestic and export fisheries market.

Zone A: There are 76 lakes which contain the important fisheries of Zone A. They range in size from small waters of less than one square mile in area to Lesser Slave Lake whose area is 462 square miles. Their total area is about 1,180 square miles. Of these 76 lakes, only about 30 have been utilized to any extent by fishermen over the past ten-year period. Further, only one lake of the 30, i.e. Lesser Slave Lake, has been exploited to near its potential. The extensive fishing at Lesser Slave Lake is attributed to the demand of the fur farm industry for mink food. It yields about 5 million pounds of fish annually. The less utilized lakes have produced varied amounts of fish from year to year over the ten-year period. Their average total annual production is calculated to be about one million pounds of all fish.

Over one-half of the fisheries located in Zone A are utilized only very occasionally or not at all. They form more than one-fifth of the water area involved, having a total of about 260 square miles. Their present average annual production is negligible.

To summarize—there are three separate fisheries groups present in Zone A, as follows:

(1) Lesser Slave Lake, 462 square miles, being well exploited and yielding 5 million pounds annually.

(2) About 30 partly utilized lakes, 470 square miles, being under-exploited and yielding about one million pounds annually.

(3) About 45 lakes, practically unexploited and yielding practically nothing.

Zone B_1: There are several lakes in this region known to contain fisheries of commercial importance. Only one, Bistcho Lake, has been exploited. Having an area of about 150 square miles, its potential yield is estimated to be 350,000 pounds annually. It has been fished during seven of the past ten years, yielding an average annual catch of 23,500 pounds.

Zone B_2: There are several lakes in region B_2 known to contain commercially important fish. A few of these have received casual survey and one, Lake Athabasca, has been exploited minutely. The region lies within the Pre-Cambrian Shield, a land generally characterized by the presence of many deep lakes. It is felt that Zone B_2 probably contains more waters per unit area than any other region of Alberta. However, little is known of their extent or fisheries potential.

Lake Athabasca has been fished three seasons out of the past ten years with an average annual catch of 130,000 pounds. Obviously this amount does not approach adequate utilization. An estimated potential of at least 2 million pounds per year is calculated for the Alberta portion of the lake. McInnes Corporation is the only company of any size fishing the West end or Alberta side of Lake Athabasca. This company fishes the west side about three or four weeks of each year and then transfers its operations to the east or Saskatchewan end of the lake.

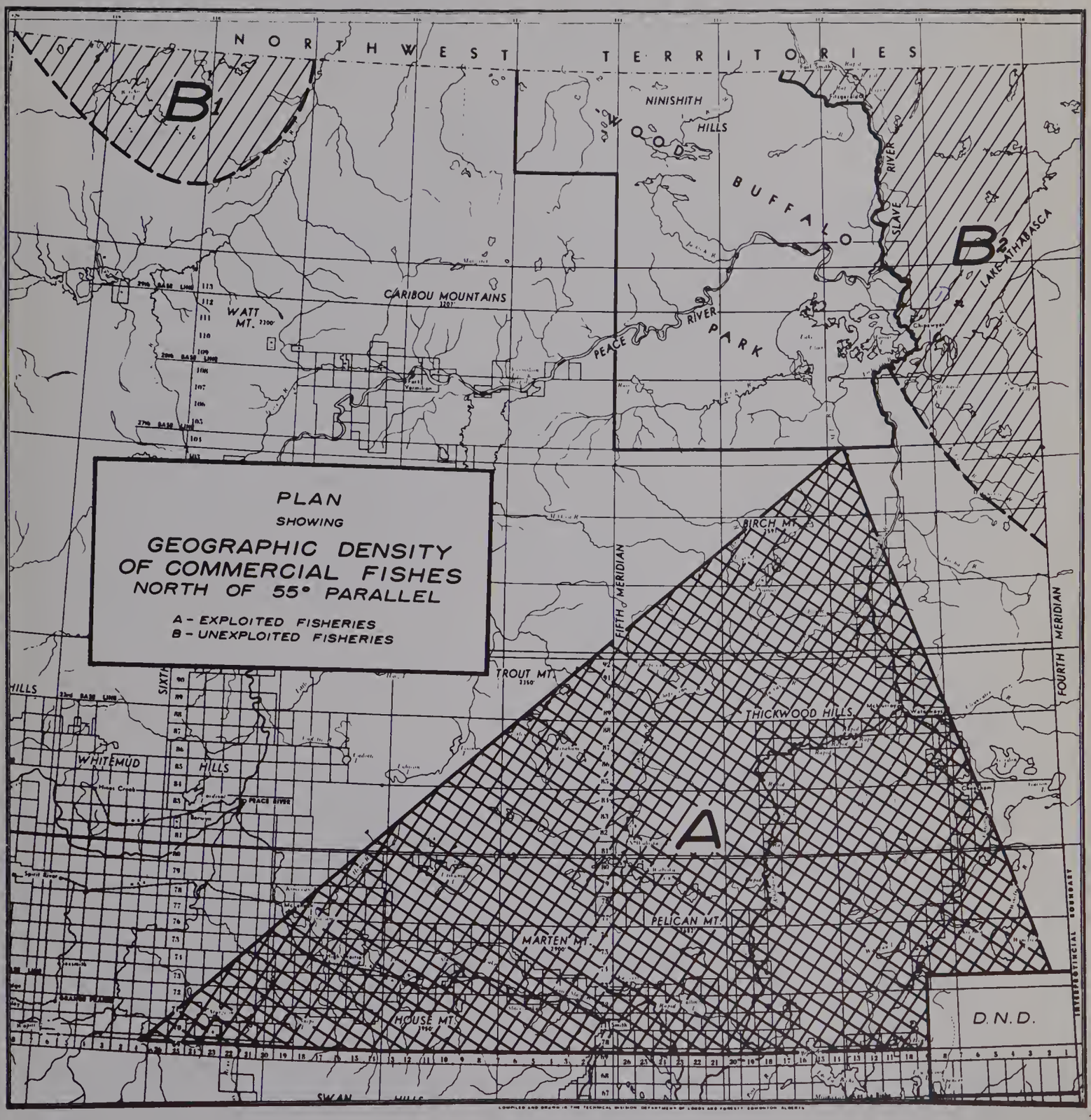
Coarse fish such as pickerel, jack, pike and goldeye, are caught at the west end of the lake, which is shallow, whereas in the east and deeper end of the lake in Saskatchewan, lake trout and whitefish are also found. These command a better price than the coarser fish so that the companies find it more advantageous to do most of their fishing in the Saskatchewan portion of the lake.

The annual production of fish in Northern Alberta is about 6,000,000 pounds, of whieh Lesser Slave Lake supplies 4,000,000 pounds of tullibee which is largely used locally and 1,000,000 pounds of other fish for the commercial market. The remaining lakes in Zone A supply about 1,000,000 pounds of commercial fish. The total value of commercial fish production in 1956 was approximately $268,000.

Of the estimated 1,000 people engaged in the fishing industry in Northern Alberta, around 350 are full-time residents in the area; roughly two-thirds of these are white while the remainder are Indians and Metis. Some 600 or 700 transients come into the North Country for the peak seasons of fishing.

The two peak seasons on Lesser Slave Lake are spring and fall. The spring season begins after ice break up late in May and lasts for around three weeks. The fall season begins early in September and lasts until the end of the month. Over 200 residents of the area are employed and they deliver their fish to five large companies who are official buyers on the lake: Alaska Fisheries, Gateway Fisheries, Inland Fisheries, W. R. Menzies and Arctie Fishing Company. These five companies purchase 95% of the fish caught north of the 55th Parallel.

Fishing does not provide full year round employment for fishermen. Therefore, most of them are engaged in other occupations as well: farming, mink ranching, lumbering, trapping, construction and other odd jobs.


NORTHWEST TERRITORIES
B1
B2
NINISHITH HILLS
BUFFALO
SLAVE RIVER
LAKE ATHABASCA
CARIBOU MOUNTAINS
WATT MT.
PEACE RIVER PARK
PLAN
SHOWING
GEOGRAPHIC DENSITY
OF COMMERCIAL FISHES
NORTH OF 55° PARALLEL
A - EXPLOITED FISHERIES
B - UNEXPLOITED FISHERIES
BIRCH MT.
FIFTH MERIDIAN
FOURTH MERIDIAN
TROUT MT.
THICKWOOD HILLS
WHITEMUD HILLS
PEACE RIVER
A
PELICAN MT.
MARTEN MT.
HOUSE MT.
D.N.D.
SWAN HILLS

Recreational Fishing

Angling for recreation in the lakes and streams north of the 55th Parallel is a very minute feature of the over-all fisheries scene at this time.

Those areas obtaining proportionately intense pressure by sportsmen are only found close to the larger centres of population or near good highways. Among these are Fawcett Lake, the west end of Slave Lake, and to some extent, the tributaries of the Smoky and Athabasca Rivers.

The angling potential is immense. There are at least 76 lakes known to contain northern pike, an attractive angling species. A large number contain perch and pickerel, also utilized by anglers. Lakes in the northeast portion contain native lake trout, a much sought-after and relatively rare sport fish.

As travel methods are developed these waters will undoubtedly provide an inestimable amount of recreation to Alberta sportsmen.

MINING

(Other than petroleum products)

Except for oil and gas activities and the experimental work going on in the Athabasca Tar Sands which will be treated in another section of the report, mining activity in Northern Alberta is practically negligible. There are, however, a number of mineral resources in that area which will be covered under the section dealing with Inventory.

Except for iron ore, it is only in 20% of Northern Alberta—the relatively unknown northeast corner, consisting of 25,000 square miles—that there is any prospect of finding metallic minerals. This is one reason that the known deposits of minerals make such a sparse showing on the map in Section 3. This will be treated more fully in that Section. The other reason is that, except for the Peace River area, the remainder of Northern Alberta is sparsely settled. As a consequence, the area has not been studied in any detail, and often the only knowledge we have was obtained incidental to the search for oil. If a railway were built, it would open up much of this area, and undoubtedly many more deposits would be looked for, found and developed.

There are very few Crown mineral dispositions in Northern Alberta.

Metallics

Iron: One permit, covering 99,840 acres, has been issued to Premier Steel Mills Limited to make a preliminary exploration of the large deposit of low grade sedimentary iron north of Hines Creek. This deposit is made up of iron oxides, hydroxides and iron carbonates and appears to vary from 25% to 40% of Fe_2O_3 so that the iron content would vary from about 18% to 28%. Limited drilling operations show that a large part of the iron could be recovered by strip mining and this would mean relatively low mining costs. Some difficulties are experienced in concentrating this material due to sliming. The high silica content may also prove to be a difficulty.

Quartz: Ten quartz claims have been filed on the north shore of Lake Athabasca in Ranges 4 and 5, West of the 4th Meridian. While the prospectors had some hopes of these proving rich in uranium, nothing of commercial importance has yet been reported.

Industrial Minerals

Volcanic Ash: One reservation has been taken out by a private individual east of Lesser Slave Lake in Ranges 5 and 6, West of the 5th Meridian. This reservation is still in the exploratory stage. This material would be used as a cement additive. The samples appear good but, as yet, there is no estimate of the amount available.

Silica Sand: An extensive deposit of high grade silica sand occurs along the Peace River about 7 miles downstream from Peace River Town. Chemical analyses of the sands show that they consist of about 98.5% SiO_2, between 0.1 and 0.2% Fe_2O_3 and minor amounts of titanium, calcium, magnesium, sodium, potassium and aluminium. According to recent information, the iron content is less than that reported above and the sand is usable as an optical sand—the highest grade of natural silica sand.

Peace River Glass Company Limited, whose plant is at Fort Saskatchewan, Alberta, have a lease on this sand although only small operations were carried out during 1957, resulting in 821 tons of sand being taken out. The sand is at present being used for glass fibre and insulation and packing purposes, as well as in foundries. This company's sand Prospecting Permit No. 3 covers an area of 1,671 acres for a term of five years from March, 1955.

Salt: A large section of East Central Alberta is underlain with common salt. The area in which salt may be encountered is approximately 400 miles long by 125 miles wide and extends from McMurray on the north to Princess on the south and from just east of Edmonton to the Saskatchewan Border. The thickness of the bed varies up to 1,000 feet. Salt is being produced at Lindberg, Alberta, and is also being imported from a plant at Unity, Saskatchewan, which is just across the border from Alberta. At one time the same company had a plant at McMurray but the high cost of freight has made it far more economical to bring in salt from Unity than to obtain it at McMurray. As a result no salt is being produced commercially in Northern Alberta.

Sulphur: Sulphur in Alberta is a by-product of wet gas. So far no sulphur is refined in Northern Alberta.

Structural Materials

Sand and gravel are the only structural materials mined in Northern Alberta. These heavy items are used in local construction in the Peace River Country and for highway construction. Sand, gravel, etc., comes under the jurisdiction of the Department of Lands and Forests because these are mined on the surface. The silica sand at Peace River falls into this category. All other minerals come under the Department of Mines and Minerals.

Claims and Permits

Claims are acquired by companies engaged in quartz mining. Any person who is 18 years of age or over may locate and prospect upon any vacant Crown lands for any naturally occurring mineral such as gold, silver, lead, zinc, uranium, etc. This does not include placer deposits, salt, sulphur, coal, petroleum, natural gas, bitumen and oil shales, limestone, marble, clay, gypsum or any building stone when mined for building purposes. A rectangular tract not exceeding 1,500 feet in length by 1,500 feet in breadth, may be staked as a mineral claim. All corners must be right angles.

A person in one calendar year in any one mining district may stake out and apply for not more than 21 claims as follows:

(a) Not more than 15 claims in his own name.

(b) Not more than 3 claims each for not more than two other persons.

Every person locating a mineral claim shall record the same in person with the Mining Recorder of the district within which the claim is situated, within 15 days after the claim was staked if it is located within 50 miles of the office of the Mining Recorder. The time for recording shall be extended by one additional day for every additional ten miles or fraction thereof in excess of 50 miles.

When the locator has complied with the staking and recording requirements including the payment of the prescribed fee, the Mining Recorder shall record the claim and issue to the locator a certificate of record of mineral claim. A person who has received a certificate of record of a mineral claim is entitled to hold the claim for a period of one year from the date of recording the same and thence from year to year without the necessity of re-recording upon payment of the prescribed fee for a certificate of work, if such person during the first year and during each succeeding year does or causes to be done on the claim work to the value of $150 and files with the Mining Recorder within 14 days after the expiration of each year an affidavit made by him or his agent stating that such work has been done and setting out a detailed statement thereof. In lieu of the work required to be done on a claim each year, the holder of a mineral claim may pay the Mining Recorder the sum of $150. If the prescribed amount of work is not done during the year or if payment is not made in lieu thereof, the claim lapses at the expiration of 15 days and shall then be open to relocation.

A permit gives a person the right in a defined acreage to make a preliminary exploration of the area to determine to what extent any specific mineral exists there. The permit issued to Premier Steel Mills Limited is an example.

ENERGY RESOURCES

Alberta is rich in energy resources. With its hydro power potential, its heritage of 48% of all the mineable coal in Canada, its reserves of oil and natural gas and, finally, the estimated 100 billion barrels of oil in the Athabasca Oil Sands, Alberta's energy resources are outstanding amongst the provinces of Canada. In addition to this, there are indications that uranium may be found in Alberta in the area north of Lake Athabasca.

Northern Alberta shares in this wealth as will be shown in the material below, which deals with present day production in that area, and also in the material under Section 3 which is devoted to the Inventory of Resources.

Oil

The Commission asked the Oil and Gas Conservation Board to supply data on the present and possible future production of oil and gas in Northern Alberta (that area north of the north boundary of Township 67). The Conservation Board made an exhaustive study of this and prepared a very complete report from which all of the following material has been taken. The only changes made were those necessary to make the Board's information fit the same format used generally throughout this report. Extracts from the Conservation Board's report are given here in quotation marks, and any interpolations by this Commission are shown without quotation marks.

Up to the present the production of oil in Northern Alberta has not been very high, because markets have not been available for the oil.

"**Production and Markets:** First production of oil occurred in 1949 when some 5,891 barrels of oil was produced and marketed in Alberta. This small production volume has increased steadily and by 1956 amounted to 2,566,344 barrels. In 1935 the Peace River Oil Pipeline was constructed from the Sturgeon Lake fields, the largest oil fiields in the area, to the Trans Mountain Pipeline. Today this area supplies some 8,600 barrels of oil per day to the markets on the West Coast via the Trans Mountain Pipeline and also supplies a local refinery at Grande Prairie with some 1,000 barrels of oil per day. In addition small volumes of oil are shipped to the Edmonton refineries by rail and tank truck."

During 1956, 2,566,344 barrels of oil were produced in Northern Alberta, having an estimated value of $2.29 per barrel at the well head, or a total value of $5,877,000.

"**Reserves**: The remaining developed reserves of recoverable oil at the end of 1956 were estimated at 122.8 million barrels for Northern Alberta. This amounted to approximately 4.3% of the total remaining developed recoverable reserves of the Province which were estimated to be 2.9 billion barrels."

"**Drilling and Exploration:** A total of some 520 wells had been drilled in Northern Alberta by the end of 1956. Of this number, approximately 330 were classed as wildcat wells. When related to the virgin recoverable reserves which had been developed, this number of wildcat wells indicates an average discovery rate of approximately 400,000 barrels of virgin recoverable reserves per wildcat well. Present indications are that the discovery rate will tend to increase over the next ten or so years but it is expected that it will decline to the present rate towards the end of the forecast period.

"Details of past drilling and exploration activity are presented in Table No. 16. These figures indicate that the majority of the drilling has been concentrated on wildcat wells and that some 14.2% of the total wildcat wells drilled have been successful in finding either oil or gas reserves. This finding rate is about equal to one-half the rate of 28.8% for all wildcat wells drilled in the Province in 1956."

The main oil fields are all in the Peace River area and are the following:

1. Sturgeon Lake
2. Sturgeon Lake South
3. Normandville
4. Red Earth

There are indications that the Virginia Hills will turn out to be another oil field but it may be some time yet before this is proven. These oil fields, together with gas fields and other related data, are shown on Map No. 13 in Section 3.

"An analysis of Discovered Oil Resources: The discovery rate of oil reserves encountered to date in Northern Alberta is below the rate established for the remaining part of the Province.

"The search for oil accumulations in the formations of the Cretaceous, Triassic and Jurassic systems has not been encouraging. In practically all known Mesozoic gas fields of Northern Alberta, it has been found that water saturation directly underlies or occurs down-dip from the gas-saturated reservoirs. However, sub-commercial but significant Cretaceous oil discoveries have been made at a few locations between 25 and 50 miles south of the western half of the area being considered. Furthermore, the discovery of a Triassic oil field immediately west of the Alberta boundary at Township 86 increases the estimated Mesozoic oil potential of this part of Alberta.

"Essentially all of the discovered free-flowing oil reserves are confined to the west half of Northern Alberta. The majority of the reserves are contained by the two Sturgeon Lake fields producing from Upper Devonian Woodbend reefs, whereas a minor part of the reserves is contained within the scattered pools that produce from the 'granite wash' zone overlying the Precambrian complex. Recent important discoveries of oil in the Devonian Beaverhill Lake and Slave Point formatios at the Swan Hills, Virginia Hills and Kaybob areas, located between 40 miles south and 60 miles southwest of Lesser Slave Lake, are highly significant as they reveal the potentiality of formation that, until recently, were not considered as highly prospective. These formations extend over a large area of Northern Alberta and can be expected to contain many undiscovered oil pools."

Gas

Natural gas, like oil, has had a very short history of production in Northern Alberta, because until recently major markets have not been available. Some gas has been supplied to communities in the Peace River Country for the last two or three years, but now, with the completion of the Westcoast Transmission Company Limited pipeline in 1957, it is expected that there will be a production of 59.2 billion cubic feet in 1958.

TABLE No. 16

Drilling and Exploration Activity*

(Up to the End of 1956)

WILDCAT WELLS				
Oil	Gas	Dry	Total	% Successful
12	35	284	331	14.2%

DEVELOPMENT WELLS Total	ALL WELLS Total	% WILDCAT WELLS
186	517	64.0%

*Test holes drilled to evaluate the Athabasca Oil Sands or to evaluate structure are not included in this table.

"Production and Markets: Details of the growth in production of, and the markets for Northern Alberta gas are presented in Table No. 17. These figures indicate that no gas from this area was marketed prior to 1951. Starting in 1951 small quantities of gas have gone to the Dawson Creek, British Columbia, export market. Commencing in 1953 and through to 1956 several local communities were supplied with gas. In 1957 the Westcoast Transmission Company Limited completed its pipeline project to supply gas to southwestern British Columbia."

During 1956, 1.899 billion cubic feet of gas were produced in Northern Alberta, having an estimated value at well-head of $142,500.

"Reserves: At the end of 1956 the total marketable reserves of natural gas in Northern Alberta were estimated to be approximately 1.3 trillion cubic feet and the total marketed production during 1956 was some 2 billion cubic feet. The corresponding figures for the Province were estimated to be approximately 18.3 trillion cubic feet and 116 billion cubic feet respectively. Northern Alberta had some 7.1% of the total reserves and some 1.7% of the total production.

"A review of the recent growth in the marketable reserves of Northern Alberta gas and its relation to annual marketed production is presented in Table No. 18. These figures are totals of carefully compiled estimates for all individual pools in the Area, each estimate being based on all available data on reservoir and production characteristics and referring to proven economically producible and marketable gas. It will be noted that the life-index figure prior to 1955 is extremely high, reflecting the large ratio existing between remaining marketable reserves and marketed production. This figure shows a marked decline in 1955, 1956 and also a similar decline is expected for 1957 as a result of an increasing export market to Dawson Creek, British Columbia, since 1951 and sales of gas to the Westcoast Transmission Company Limited for export to Southwestern British Columbia in 1957.

"The virgin marketable reserve figures given in Table No. 18 when analyzed in conjunction with the number of wildcat wells which have been drilled in Northern Alberta indicate that on the average the virgin marketable reserves have increased by approximately 4 billion cubic feet for each wildcat drilled. This figure is equal to about ⅔ of the average discovery rate per wildcat for the Province. It is expected that the discovery rate will remain near this figure for some years and then will decline as remaining undiscovered reserves decrease to a figure of some 2.5 billion or still

about equal to ⅔ of the rate anticipated for the Province by 1980."

The main gas fields are all in the Peace River area and are the following:

1. Little Smoky
2. Pouce Coupe
3. Gordondale
4. Sturgeon Lake
5. Whitelaw
6. Rycroft
7. Hamelin Creek

The West Coast Transmission Company pipeline at present runs from the Pouce Coupe field west into British Columbia. It is expected that it will be extended east to pick up further gas supplies. In conjunction with this, a line which will ultimately be a branch of the main line has been run south from Spirit River and provides natural gas for the towns of Spirit River, Rycroft, Woking, Sexsmith, Clairmont and Grande Prairie. On the north side of the river Northland Utilities have a pipeline extending from Fairview through the towns of Bluesky, Whitelaw, and Berwyn to Grimshaw. This system is obtaining its gas from the Whitelaw field.

At the present time the following towns and villages in the Peace River Country are not served with natural gas:

Valleyview	Eaglesham
Wembley	Manning
Beaverlodge	Peace River
Hythe	Falher
Wanham	Donnelly
Belloy	McLennan
Codesa	High Prairie

It is expected that service will be extended to many of these towns in the near future.

TABLE No. 17

Markets for Northern Alberta Gas

(Billions of Cubic Feet)

Year	Northern Alberta	Outside	Total
1951	—	0.268	0.268
1952	—	0.406	0.406
1953	0.098	0.438	0.536
1954	0.449	0.540	0.989
1955	0.768	0.702	1.470
1956	0.972	0.927	1.899

TABLE No. 18

Estimated Marketable Reserves and Marketed Production of Northern Alberta Gas

(Volumes in Billions of Cubic Feet)

Year	Year-End Remaining Marketable Reserves	Annual Marketed Production	Cumulative Marketed Production	Virgin Marketable Reserves	Life-Index Years*	Cumulative Wildcat Wells Drilled	Average Discovery Per Wildcat Well Drilled
1951	592.5	0.268	0.268	592.8	2,211	120	4.94
1952	787.6	0.406	0.674	788.3	1,940	178	4.43
1953	1,118.9	0.536	1.210	1,120.1	2,088	212	5.28
1954	1,222.6	0.989	2.199	1,244.8	1,236	240	5.19
1955	1,250.5	1.470	3.669	1,254.2	851	265	4.74
1956	1,348.9	1.899	5.568	1,354.5	710	331	4.10

* Ratio of Year-End Remaining Marketable Reserves to Annual Marketed Production.

Athabasca Tar Sands

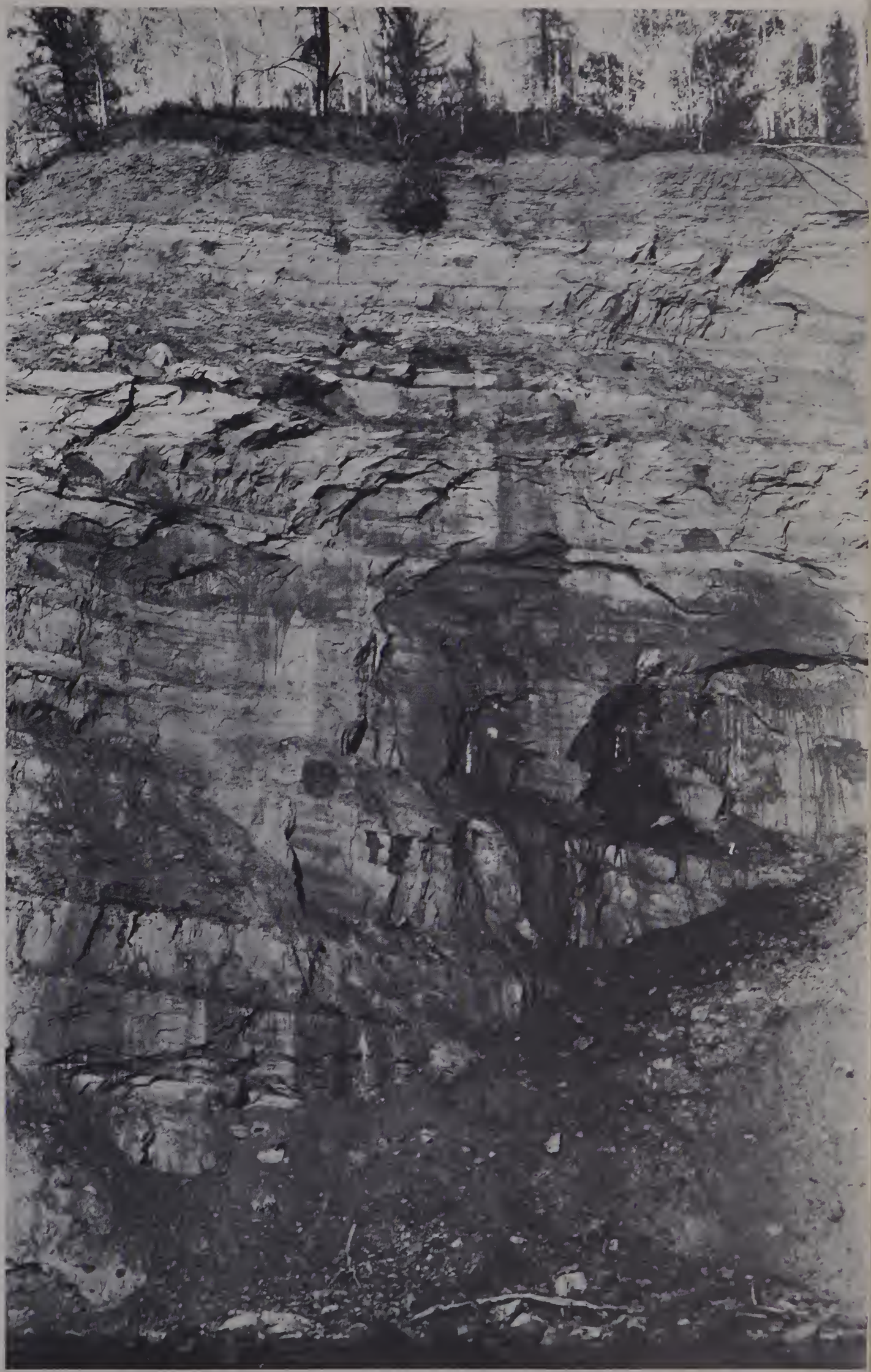
Athabasca Tar Sands occur in a formation which extends over at least 2,500 square miles and a very conservative estimate places their oil content at 100 billion barrels. While much work of a preliminary nature is under way in this area, there is no production from this field at the moment.

Coal

At present there is no commercial coal production in Northern Alberta. The coal seams in the Province extend all the way up the Foothills from Crowsnest Pass to the headwaters of the Smoky River, but do not cross the 55th Parallel. While one or two very thin seams of low grade coal occur south and west of Beaverlodge, Alberta, and may be used in very limited amounts by the local farmers, they are not worth working on a commercial scale. There are indications that coal seams may reoccur north and west of Hines Creek, but these will be discussed under Section 3.

Electrical Power

The electrical power used by Northern Alberta is at present supplied by diesel generating units, the majority of which use natural gas as fuel. The Peace River Country from Slave Lake town in the east to Hines Creek and Hythe in the west and from Manning in the north to Valleyview in the south is supplied with power from an interconnected network owned by Northland Utilities Limited and Canadian Utilities Limited. The main generating plants are at Grande Prairie, where the gas used comes from the field in the vicinity of Rycroft, and at Fairview, where the gas supply comes from the Whitelaw field. Some auxiliary plants are operated at Peace River, McLennan and High Prairie. In the late fall of 1957, Canadian Utilities put into operation their gas turbine plant near Valleyview. This contains one 10,000 K.W. unit using fuel from the Sturgeon Lake field. Canadian Utilities also operates a diesel plant to supply the town of McMurray, while Northland Utilities operates a small plant at Fort Vermilion. Both of these use fuel oil in their production.



Exposed Oil Sands.

The table below shows the size of plants and other data regarding the Central Station Industry.

At the end of December, 1957, 2,300 farms in the Peace River Country were using Central Station power.

Hydro Power

At present, there are no hydro power plants in Northern Alberta.

TABLE No. 19

Summary of Central Station Statistics in 1956 in the Peace River Country Interconnected System

	Internal Combustion Plants		Lines				
	K.W. Rating	KWH Gen. (thousands)	Miles Trans. Lines	Miles Dist. Lines	Number of Customers	Number Farms Served	Miles Farm Lines
Canadian Utilities Ltd.	7,025	18,430	367	69	5,226	1,212	822
Northland Utilities Ltd.	4,563	13,472	270	112	4,920	933	590

TRANSPORTATION

In an area so vast as the 129,000 square miles of Northern Alberta, transportation is always a problem. In the economic development of this area and of the Northwest Territories, it becomes a most difficult and sometimes a most urgent problem. This is due mainly to the long distance between settlements and the sparse population, which makes traffic density low and transportation costs expensive. The combination of these factors tends to discourage the provision of adequate services.

In developing such an area the direct burden of the expense of bringing in equipment and operating supplies, and of shipping out the products of the land and forest becomes very heavy. There is also the indirect burden of higher costs of living, due in substantial part to the costs of transportation.

One corner of Northern Alberta, the Peace River Country, is devoted to agriculture, and contains a population of 64,500. This area is reasonably well served by a railway with branch lines and by highways and air transport. The remainder of Northern Alberta, being very sparsely settled, is naturally not well served.

Highways

Map No. 19 shows the present highway system north of the 55th Parallel. In that area there are 158 miles of hard-surfaced highway and 785 miles of graded and gravelled highway. In addition to these mileages, there are a great many miles of district roads and local roads which are improved to varying degrees. Practically all of this total highway mileage is within the Peace River Country.

There are two highways by which the people of the Peace River Country can come south to the rest of the Province. These are Highway No. 2 from High Prairie around the south side of Lesser Slave Lake, and Highway No. 43 from Valleyview to Edmonton. In addition, there are two highways which might be thought of as originating in the Peace River Country and then crossing interprovincial boundaries. The first of these is commonly called the Alaska Highway, and it is reached via Highway No. 2 west from Grande Prairie to Dawson Creek. The second is the MacKenzie Highway (No. 53), which leaves Highway No. 2 at Grimshaw.

The Alaska Highway was built during the Second World War from Dawson Creek to Alaska. It covers a 1,523-mile course to Fairbanks, Alaska, and the cost was borne entirely by the United States Government. After the war it was turned over to the Canadian Army and no consideration was involved.

The MacKenzie Highway was started as a winter road from Grimshaw to the south shore of Great Slave Lake at Hay River. A few years afterwards it was decided to improve this so as to make it passable all year long and in 1948 it came into being as a narrow, graded and gravelled, road which was capable of carrying the traffic envisaged at that time.

The MacKenzie Highway is 385 miles long and commences at Grimshaw. From Grimshaw to the Alberta Border the distance is 303 miles, while from the border to Hay River town, it is 82 miles. The first 70 miles of the MacKenzie Highway from Grimshaw north was built entirely at the expense of the Alberta Government because it serves the farming area tributary to Manning. From Mile-70 to where this highway crosses the boundary of the Northwest Territories (a distance of 233 miles) the Provincial and Federal Governments shared in the cost of construction.

With increasing traffic and steadily growing loading of trucks, the MacKenzie Highway is now inadequate for the traffic it is called upon to bear. In recent years it has become obvious that at least the Alberta section of this road is not built to a high enough standard nor does it possess sufficient drainage. For either of these reasons, during the very wet years experienced recently, the MacKenzie Highway has been out of service for periods of as long as two to three weeks at a time. Moreover, the original bridges are too light to carry today's traffic. The Alberta Department of Highways has been doing considerable rebuilding of these bridges to bring them up to a standard sufficient to meet today's traffic conditions.

At a point a few miles south of Hay River, the Federal Government has started a road west towards

Mills Lake which when completed will cross the MacKenzie River, continue to Fort Rae and from there in a southeasterly direction to Yellowknife. There is reason to believe that within the next very few years this road will be extended from Fort Rae towards Great Bear Lake and beyond.

Since the construction of the Mackenzie Highway a major branch road has been built to Fort Vermilion. This consists of some 46 miles of a low standard grade which has been lightly gravelled.

Two other roads of low standard lightly gravelled grade reach out from the settled areas of Southern Alberta and cross the 55th Parallel. One is a road north from Athabasca to Calling Lake and the other is a road from Plamondon north to Wandering River.

During the winter of 1956-57 a winter road was pushed through on the east side of the Athabasca River from Bitumont, 70 miles north of McMurray, to the south shore of Lake Athabasca and $85,000 was spent on this work.

In addition to these highways various roads have been opened up by lumber and oil companies. The Government's policy is that in general such companies should build whatever roads they need to obtain access to stands of lumber or to promising oil fields. In this connection there is no rigidly defined policy and the decision as to whether or not the Government will contribute towards the cost of one of these roads depends on the circumstances in that particular case. Requests for government assistance for these roads are considered by an Advisory Committee and each road is weighed on its own merits. If the construction of such a road would serve people presently living adjacent to it who are paying taxes, then it is likely that the Government will assist by providing some money towards the cost of construction.

The main roads in Northern Alberta which have been built by these companies, sometimes with Government assistance, are the following:

1. From Upper Hay River on the MacKenzie Highway there is a road southwesterly for a distance of 65 miles to Hay Lakes. To date, oil companies have spent around $10,000 on this road. The Government proposes to expend another $10,000 next year.

2. From Grouard to Utikuma Lake there is a 70-mile winter road. The Government has spent about $25,000 in putting in culverts and small bridges in 1956. To date there is no record of oil or lumber companies spending any money on this road.

3. From Nampa there is a government-built road up through Harmon Valley, a distance of 25 miles. Then to Red Earth, about 70 miles, there is a winter road. The oil companies have spent a considerable sum of money in the last couple of years on this, but because there are no settlements along this road the government has not contributed towards its cost.

4. The oil companies have spent around $20,000 and the government $40,000 on a 90-mile winter road from Slave Lake town via Marten River and then on to Wabasca. This road serves the communities of Wabasca and Desmarais.

In addition to these, some roads have been built by the Federal authorities in the Wood Buffalo Park. One of these follows up the Slave River from Fort Smith to Hay Camp (Township 121, Range 9). From there it continues as a winter road to three saw mills located in Township 114, Range 11, Township 114, Range 12 and Township 115, Range 11. The other road runs more or less west from Fort Smith to Bell Rock to link up at the Little Buffalo River with a winter road which comes across from the MacKenzie Highway near Alexandra Falls. At a point some 20 miles south and west of Fort Smith a branch road runs in a general southerly direction to the Peace River at Peace Point. This road is then continued east to link up with the roads serving the mills listed above. It is expected that this road from Fort Smith to Peace Point will be continued along the north side of the Peace River to the west boundary of the Wood Buffalo Park at the 5th meridian (Township 111, Range 24).

Trucking

Much of the freight taken into or out of the Alberta section of the Peace River Country is hauled by truck. Additional freight goes into the Peace River Block of British Columbia and much of the freight destined to points along the Alaska Highway travels from Edmonton by truck. All of the freight for Alberta points north of Grimshaw, including that for some points in the Northwest Territories, travels by truck from Grimshaw. Since these points along the MacKenzie Highway can only be reached by truck service, most of the freight destined for them originates in Edmonton instead of being taken by train to Grimshaw and then transferred.

There are four major trucking companies distributing in Northern Alberta. These are Northern Freightways, Loiselle Transport, Bell Brothers Transport and Grimshaw Trucking and Distributing Limited. In addition, there are 20 to 30 small trucking concerns which each operates from one to four trucks in the area north of the 55th Parallel.

The Grimshaw Trucking and Distributing Ltd., which employs from 25 to 45 men is the major trucker to the Northwest Territories and intermediate points on the MacKenzie Highway. During 1956 it handled the following tonnages:

Grimshaw to Hay River:

2,000 truckloads of gas or around 24,500 tons.
2,800 truckloads of other merchandise or around 33,600 tons.

Hay River to Grimshaw:

6,000,000 pounds or 3,000 tons or 600 truckloads of fish.

Points North of Grimshaw to Grimshaw:

There are 100 to 150 cars of livestock shipped from Grimshaw every year and the large part of this is trucked from the Battle River, Paddle Prairie and Fort Vermilion districts.

According to recent figures supplied by the Alberta and Northwest Chamber of Mines for the year 1957 water transport handled 26,407 tons of freight northbound out of Hay River and handled 8,397 tons inbound to the Port of Hay River. All of this had to be trucked to or from Hay River. According to the estimates of the freight handled by Grimshaw Trucking and Distributing Ltd., some 58,000 tons were hauled into Hay River. The town of Hay River consumed around 4,200 tons on the basis of a 1956 population of 942 and a consumption of around 4½ tons of freight per person per year. A considerable tonnage—in the neighborhood of 27,000 tons—moved to Yellowknife by truck over a winter toll road across Great Slave Lake.

Bus Service

Canadian Coachways Limited operate on a regular schedule from Edmonton north and serve all the important points on highways No. 2 and 43, and all the highways in the North Country which connect with these. Not only does this company handle passengers but does considerable business in express, mail and carrying newspapers. In 1957, the total number of passengers carried by Canadian Coachways Limited in Northern Alberta was 219,140. An additional 15,000 passengers went on to British Columbia and the Yukon. On the Peace River - Hay River run, 4,948 passengers and 123,300 pounds of mail were transported by the Company.

Railways

The Northern Alberta Railways, under the joint management of the Canadian Pacific Railways and the Canadian National Railways, operates into the area north of the 55th Parallel. One line runs from Edmonton to McMurray, while another runs from Edmonton to Dawson Creek with a branch line via Peace River to Hines Creek. Considerable tonnage has moved over these railroads. In 1956, the freight outbound from the Peace River Country was 1,058,337 tons and the inbound was 586,345. Employees on the system numbered about 1,400 although not all of them resided in Northern Alberta. The variety of products handled is shown in Table No. 20.

TABLE No. 20

Tonnage By Product

		Agricultural Products	Animal Products	Mine Products	Forest Products	Manufacturers & Miscellaneous
1956						
	Outbound	617,411 tons	23,942 tons	87,122 tons	311,163 tons	18,669 tons
	Inbound	17,722 tons	1,808 tons	80,899 tons	14,742 tons	471,174 tons
1955						
	Outbound	559,918 tons	25,321 tons	54,272 tons	289,952 tons	21,395 tons
	Inbound	18,906 tons	1,958 tons	58,201 tons	15,999 tons	377,596 tons
1954						
	Outbound	740,470 tons	18,716 tons	52,577 tons	275,375 tons	18,450 tons
	Inbound	15,747 tons	1,517 tons	47,472 tons	10,953 tons	255,315 tons

The movement of grain from the Peace River Country towards Edmonton forms a large part of the agricultural produce moved by rail. Table No. 21 gives some figures on the bushels of grain moved.

TABLE No. 21

Number of Bushels of Grain

	Wheat	Oats	Barley	Flax & Rye
1956	9,345,154	4,467,618	9,595,291	1,461,897
1955	6,688,133	5,686,109	8,646,247	1,315,646
1954	7,279,990	10,740,718	10,977,138	1,382,298

The following tonnages were transported northward to McMurray by rail and thence by water to various destinations:

1956	145,318 tons
1955	90,520 tons
1954	64,374 tons

Freight arriving at McMurray by water transport and then, presumably, sent southward on the railroad was as follows:

1956	2,691 tons
1955	4,054 tons
1954	3,525 tons

Air Transportation

Scheduled air flights operate out of Edmonton to Peace River, Grande Prairie and to points along the Alaska Highway. Similar flights operate out of Edmonton to McMurray, Fort Smith, Uranium City, Hay River, Yellowknife and to all points north of these in the Northwest Territories, and chartered aircraft companies operate out of many of these Northern points. With the exception of movements by bus and automobile over the MacKenzie Highway to Hay River, all passenger traffic and a great deal of express and freight destined for the Northwest Territories goes by air. Aeroplanes have been the greatest factor contributing to Northern Development because they have made it possible to open up remote areas to prospectors.

Aircraft equipped with floats for summer work and with skis during the winter take parties into almost any part of the Northwest Territories and take in their supplies and light equipment. This form of transportation, however, is limited because for one or two months during the freeze-up and during the break-up, landing on water is impossible.

Table No. 22 gives the distances in miles by air between main centres along the principal flying routes:

TABLE No. 22

Air Distances in Miles

Edmonton to Waterways	232
Waterways to Fort Smith	235
Fort Smith to Mills Lake	246
Mills Lake to Fort Simpson	90
Fort Simpson to Wrigley	123
Wrigley to Norman Wells	174
Norman Wells to Aklavik	302
Fort Smith to Yellowknife	190
Yellowknife to Port Radium	271
Port Radium to Coppermine	143
Edmonton to Grande Prairie	244
Grande Prairie to Fort St. John	102
Fort St. John to Fort Nelson	193
Fort Nelson to Watson Lake	236
Watson Lake to Teslin	136
Teslin to Whitehorse	88
Whitehorse to Aishihik	102
Whitehorse to Dawson	266
Whitehorse to Juneau (Alaska)	164

The three following companies provide the bulk of the air transport to the North according to figures supplied to the Commission by the Alberta and Northwest Chamber of Mines and Resources:

TABLE No. 23

Air Transportation, 1956

Canadian Pacific Airlines

Northwest Territories	Northbound	Southbound	Total Carried Within Area
Passengers	6,545	6,244	3,971
Freight	1,630,343 lbs.	343,582 lbs.	1,667,982 lbs.
Yukon Territory			
Passengers	7,950	6,817	1,450
Freight	713,075 lbs.	137,432 lbs.	145,283 lbs.

Pacific Western Airlines

	Northbound	Southbound
Passengers	6,239	5,565
Freight	4,514,000 lbs.	9,794,000 lbs.

Mining Company Aircraft

Edmonton-Uranium City	Northbound	Southbound	Total Carried Within Area
Passengers	4,256	3,701	474
Freight	6,314,260 lbs.	672,016 lbs.	
Northwest Territories			
Passengers	686	661	253
Freight	1,041,397 lbs.	1,181,554 lbs.	249,619 lbs.

McMurray	Northbound to Uranium City	Uranium City S. of McMurray	McMurray South S. to Edmonton
Freight	2,952,599 lbs.	1,847,611 lbs.	2,329,269 lbs.

Water Transportation

Commercial water transportation is confined to that portion of Alberta north of McMurray on the Athabasca River. For points on Lake Athabasca and for points down the Slave River freight is shipped to McMurray by the Northern Alberta Railways and transhipped by barges to its destination. Goods for Fort Smith and points further north have to be unloaded at Fitzgerald and trucked over the 16-mile portage.

Table No. 24 gives figures on tonnages handled at McMurray in 1957.

TABLE No. 24

Company	Southbound to McMurray	Northbound from McMurray
Northern Transportation	9,917 tons	132,808 tons
McInnes Products Corp. Ltd.	541 tons	1,366 tons
	10,458 tons	134,174 tons

Northern Transportation employs around 425 people in all its operations in and north of McMurray. McInnes Products Corporation employs in the neighborhood of 20 to 25. Yellowknife Transport, operating only out of Hay River, employs in the neighborhood of 60 people.

Three companies handle tonnage out of Hay River. Until the road is completed to Yellowknife, all tonnage destined to that town will be transhipped from Hay River by winter road or by boat.

Table No. 25 gives figures on tonnages handled at Hay River in 1957:

TABLE No. 25

Company	Southbound to Hay River	Northbound from Hay River
Northern Transportation		3,068 tons
Yellowknife Transport	8,021 tons	23,164 tons
McInnes Products Corp. Ltd.	376 tons	175 tons
	8,397 tons	26,407 tons

The three companies employ over 500 people and they report $4,718,000 spent by customers on water transport in 1957. This is a gross revenue figure.

The major tonnage for the Dew Line was carried by "Sea-Lift" of the American Task Forces. However, Northern Transportation took a small part in the freight movement. In 1956, Northern Transportation moved 387 tons and in 1957, 441 tons, chiefly foodstuffs. As well, the company moved 6,694 gallons of petroleum products in 1956 and 3,921 tons in 1957 northbound from Norman Wells for Dew Line purposes.

In 1957, approximately 93% of all freight moving in the north was by water transport. While in 1938 a maximum of 10,000 tons was carried to, from and within the North, the corresponding volume in 1957 was 222,284 tons. The overall tonnage for Northern Transportation, (including movements of freight between various points in the north not included in above tables) was 188,641 tons, Yellowknife Transport 31,185 tons, and McInnes Products Corporation 2,458 tons. Of the 179,436 tons of freight moved to and from the North during the 1957 season, 90% moved northbound and 10% moved southbound, representing backhaul. Of this 90% destined for the Northwest Territories and Uranium City, McInnes Products Corporation handled 1,541 tons, Northern Transportation 135,876 tons, and Yellowknife Transport accounted for 23,164 tons.

This tremendous increase in tonnage during the last decade has necessitated large expenditures by the water transportation companies. In the last ten years, capital expenditures amounted to $14,366,000 or $1,436,600 a year.

The increased volume of freight, however, has been accompanied by an average reduction of 33.1% in Class 5 or General Merchandise rates in the last ten years. Water transportation still remains the most economical means of transporting goods where perishability and rapid delivery are not important factors.

COMMUNICATIONS

Northern Alberta is served by four organizations, two of which extend their activities into the Yukon and the Northwest Territories. Alberta Government Telephones provide the Peace River and Lac La Biche areas with telephone and telegraph services, while Northern Alberta Railways have telegraph and teletype services to the Peace River area and a telegraph service to Lac La Biche and McMurray. Northwest Communication Systems have a direct land line telephone and telegraph service between Edmonton and the Yukon-Alaska border, which actually provides service at only two points in Alberta, these being a telephone service at the repeater station west of the Little Smoky River and a telegraph service at Valleyview. The Royal Canadian Corps of Signals operates a wireless telegraphy and radio telephone system, mainly in the Yukon and Northwest Territories.

A brief description of the present and projected activities of each of these four organizations follows:

Alberta Government Telephones

This corporation at present provides two services into the area under consideration.

Peace River Country: The existing network of telephone communications in the Peace River Area extends as far north as Hotchkiss and Worsley and includes most of the communities in the area. It is at present connected to Edmonton through channels leased from Northwest Communication Systems and Northern Alberta Railways, but early in 1958 the new microwave link from Edmonton to Grande Prairie and to Peace River Town will form the main connection. As the leases from Northwest Communication Systems and Northern Alberta Railways expire, most of them will be given up, only sufficient for standby purposes being retained.

Lac La Biche: In this area telephone communication does not, as yet, extend beyond Lac La Biche itself, Wandering River and Lyle Lake. The channels connecting the area with Edmonton are in part leased from Northern Alberta Railways.

Miscellaneous Services: Four mobile car radio telephone stations are situated in the area under review, at Valleyview, Saskatoon Mountain, High Prairie and Martin Mountain. These are mainly intended to serve the oil industry where feasible. Where oil companies' requests for radio telephone services are not feasible, licenses are issued by the Department of Transport for them to operate their own stations.

Telegraph services are operated throughout the area in competition with the Northern Alberta Railways.

While no equipment has been installed to transmit television to the Peace River Country over the new microwave link, provision has been made for its installation. Should a request be received from the C.B.C., broadcast radio could be transmitted to serve that region.

Future Plans: A project to extend the microwave system north to Upper Hay River and from there by scatterwave to Yellowknife, and to Fort Smith and Uranium City, is being studied. A survey carried out by the Bell Telephone Company gave a preliminary estimate of the cost at $3,500,000 and indicated that the proposed system would operate at a loss for the first few years but thereafter would become an economic proposition. The position with regard to Fort Vermilion has not, as yet, been fully investigated, but it could be connected to the microwave system either by microwave or by V.H.F. (very high frequency) radio telephone.

This proposed new system would provide the basic network necessary to extend communications throughout Northern Alberta and the surrounding territories and could be developed further as necessary.

Alberta Government Telephones has agreed with the Dominion Government to take over communications with Keg River and Fort Vermilion as the present telegraph line is old, in poor condition, and difficult to maintain because of the country through which it runs. The proposed new system would fulfill that agreement.

The new system could, if desirable, take over some of the functions at present being performed by the Royal Canadian Corps of Signals.

During 1958, it is proposed to install a dial telephone system at McMurray and Waterways which will be connected to Alberta Government Telephones network through three channels leased from Northern Alberta Railways.

The ultimate aim of all the telephone operating companies in Canada is to have a Dominion-wide telephone system whereby anyone with a dial telephone will be able to dial direct to anyone else with a dial telephone.

Northwest Communication Systems

Northwest Communication Systems was formed in 1945 to operate (under contract to Canadian National Railways) the Canadian section of the telephone and telegraph line between Edmonton and Fairbanks, Alaska, erected by the United States in 1942. The system is interconnected with Alberta Government Telephones at Edmonton, and with Alaska Communications at Fairbanks. Northwest Communication Systems' responsibility extends from Edmonton to the Yukon-Alaska border.

There are 18 repeater stations between Edmonton and the Yukon-Alaska border at about 85-mile intervals. Radio telephone services at these stations provide links with oil wells, surveying crews, etc.

Alberta Government Telephones leases some six channels from Northwest Communication Systems to provide a telephone link between Edmonton and Grande Prairie, and also leases other shorter sections in the Peace River area. With the completion of Alberta Government Telephones' new microwave link to Grande Prairie, most of these leases will not be renewed. These channels so released will enable Northwest Communication Systems to make these available for their own purposes and they can be used to increase the number of direct channels between Edmonton and Dawson Creek to 12 or 15.

The main revenue of Northwest Communication Systems is derived from U.S. military traffic. Rates to civilian users in isolated areas are about 50% higher than Alberta Government Telephones comparable rates in settled areas, but as the number of subscribers increases, rates are being reduced.

Northwest Communication Systems has considered the possibility of a scatterwave system linking Hay River, Yellowknife, Fort Smith and Uranium City to Fort Nelson, but there are no plans at present to take the matter further.

Northern Alberta Railways

Northern Alberta Railways provide a telegraph service consisting of 920 miles of pole line along the railroad with additional services to the airports at Lac La Biche and McMurray. Teletype services are provided at McMurray and at the main commercial offices at Peace River, Grande Prairie and Dawson Creek. Private wire teletypes are also in service. While no telex equipment is yet installed, this can be done as soon as there is sufficient demand.

Northern Alberta Railways leases to Alberta Government Telephones six channels to Peace River and three to High Prairie. Now that the new microwave link is ready to go into service, most of these leases will not be renewed.

During 1958, Northern Alberta Railways proposes to spend more than $400,000 on installing extra channels on the route to Waterways and McMurray, at the same time increasing the facilities at Lac La Biche and other intermediate points. Included in this expansion is the provision of three channels to be leased to Alberta Government Telephones to provide a link between McMurray and Alberta Government Telephones' main network. Extra channels are also being installed between Edmonton and Peace River, including two high frequency telephone and six teletype. During recent years, several hundred thousand dollars have been spent each year in improving the communication system.

Royal Canadian Corps of Signals

The Royal Canadian Corps of Signals operates a network of communications carrying both military and commercial traffic in Northern Alberta, the Yukon and Northwest Territories. Edmonton is the hub, with Norman Wells, Fort Simpson, Yellowknife, Fort Smith and McMurray as the main secondary stations, each controlling a number of smaller stations. Communications are mainly by wireless telegraphy and radio telephone.

Radio telephone services are maintained with river traffic during the summer and all stations guard the aircraft frequency band.

Royal Canadian Corps of Signals personnel, in cooperation with local committees, operate broadcast stations at Dawson, Aklavik and Yellowknife.

MANUFACTURING

Northern Alberta's economy is predominately agricultural. In terms of gross product and employment, manufacturing has been relatively unimportant through the years. In 1956, between five and six thousand people or between 7% and 8% of the population were dependent on manufacturing for a livelihood and the value of manufacturing production was $7,000,000 or 10% of the total.

Manufacturing activity, nevertheless, has been growing in recent years. The Alberta Trade Index reveals a wide, diversified number of small industries and a few larger operations, covering activities associated with carbonated beverage bottling, abattoirs, concrete works, bakeries, dairies, sash and door, furniture, sand and gravel, lumber, machine shops, brick manufacture, castings and fabricating steel, woodworking and signs, leather tanning, upholstery, machinery fabrication, printing and publishing, refinery products and plywood.

Northern Plywoods has a large operation in Grande Prairie, employing over 130 in the plant and around 100 in the forests. Its plant investment is one million dollars and daily production is 100,000 F.B.M. ½" base plywood or 440,000 F.B.M. 1/16" base. Last year, all the plywood was produced from black poplar. Next year, pine will also be used.

Steel Industries of Grande Prairie Limited fabricates a wide range of steel products, including sawmill and logging machinery, oilfield production machinery, pulleys, hubs, sprockets, presses, bending machines, tie mills, bulldozers, brush cutters, breaking plows, grinders and overhead loaders. Its plant investment is around $100,000 and it has from 12 to 15 employees.

Grande Prairie Iron Works is also located in the city of Grande Prairie and is similarly equipped to fabricate a wide range of steel products.

Frantzen Construction Company began making furniture last year—an offshoot of its building supplies and construction business. It uses hardwoods—walnut, poplar, mahogany, birch and oak—brought in from Edmonton. The Company makes a complete range of furniture, such as beds, cabinets, coffee tables and chairs, usually to order, although it does carry some stock on hand.

Two large lumber companies are located in Grande Prairie. These are the Grande Prairie Lumber Company and the Imperial Lumber Company.

North Star Oil Company has a $5,000,000 refinery in Grande Prairie, producing three grades of gasoline, furnace oil, stove oil and diesel oil for distribution in the area north of Valleyview. It is possible that the company may soon produce asphalt.

Denny Logging has recently completed construction of a sawmill, which will have a capacity of 85,000 cubic feet per day, at Fort Fitzgerald, in the northeast corner of Alberta near the Northwest Territories' Border.

In recent years the Industrial Development Branch of the Department of Economic Affairs has made studies of the various communities of Alberta. Included in these were several Northern Alberta communities: Peace River, Fairview, Spirit River, Grimshaw, High Prairie, McLennan, Grande Prairie, Hythe, Sexsmith, Berwyn and Beaverlodge. One of the sections in each study is devoted to industry and business. Diversified industries such as bakeries, creameries, welding and machine shops, woodworking shops, tinsmith shops, printers, and butcher shops, are to be found in most of the towns.

In summary, manufacturing in Northern Alberta is still in its embryo stage. Industries are small but active. There is much optimism that the population in the north will continue to grow with great strides, providing greater market opportunities for the products of existing firms and attracting new manufacturing enterprises.

OTHER SERVICES

The contribution of the service industries to the Northern Alberta's economy might appear rather inconsequential when compared to the more dramatic contributions of the primary industries of agriculture, forestry and petroleum production. Nevertheless, it is estimated that 13,000 people are dependent on the service industries for a livelihood.

In Canada as a whole, there has been a persistent tendency for the pattern of employment to shift out of the production of goods into the provision of services. Today, the service industries encompass more than 45% of the total Canadian labor force as compared to 38% in 1931.

The service industries include such activities as transportation, wholesaling, retailing, communication, finance, law, accountancy and advertising—to mention a few of a business nature. Others such as health, education, and religion meet the social requirements of people. Still others are essentially personal in nature, such as hairdressers, hotels, cleaning establishments and so on. Government itself provides a variety of services and accounts for a large number of personnel classified under "Service Industries".

The service industries are not, generally speaking, large users of capital equipment in relation to manpower. It is this, to a large extent, that is responsible for the steady increase in the relative importance of the service industries from the point of view of employment. In agriculture, mining and manufacturing, for instance, a significant expansion of output has been achieved with a much less commensurate increase in employment. The rise in output of the service industries has entailed a proportionate and, in some cases, more than proportionate rise in the number of people employed. The Gordon Commission forecasts that by 1980 service industries may employ more people in Canada than all other sectors combined—a situation that has already been reached in the United States.

With the exception of Grande Prairie, figures are not available on numbers of employees engaged in service industries in the communities of Northern Alberta. This one example should suffice to show the importance of service industries to the employment of a community and surrounding area.

Table No. 26 gives the most recent figures on employment in Grande Prairie:

TABLE No. 26

Grande Prairie Employment

	No. of Firms	People Employed
Oil & Gas Exploration & Production	19	235
Manufacturing	18	371
Construction	19	216
Transportation & Storage	10	75
Utilities	3	83
Wholesale Trade	17	172
Retail Trade	87	383
Garages & Service Stations	16	187
Finance, Insurance & Real Estate	12	47
Government Service	5	211
Business Service	8	52
Personal Service	19	96
Public Service	2	59
	235	2,187

822 people, or 37.5% of the working force of 2,187, are employed in oil and gas exploration and production, manufacturing and construction. The remainder of the categories in the table are assumed as service industries and accounts for 1,365 or 62.5% of the total working force. Cities, town and villages grow and prosper because of the service they perform for the countryside around them. It is the basic industries of forestry, agriculture, manufacturing, mining and so on which generates service employment. Each basic worker supports one or more service workers.

The percentage engaged in service employment would be considerably higher in the other communities of Northern Alberta where the proportion employed in manufacturing, construction, etc., is small.

PRESENT EFFECT OF NORTHWEST TERRITORIES, ETC., ON ALBERTA

Edmonton's boast that it is the Gateway to the North is no idle one. Since 1883 when the Hudson's Bay Company cut a wagon road through to Athabasca Landing, Edmonton has been the jumping-off place for the North. Over the years much sentiment has been built around this fact. A careful study of what the North means to Edmonton and to Alberta, however, proves that there is much more than sentiment to support this statement. Moreover, while Edmonton is the actual rendezvous at which men and materials assemble on their way to the North, that City is by no means the sole beneficiary, because Calgary also shares in the business done, as do such Northern Alberta points as Peace River, Grimshaw, McMurray, etc. To the extent that the business of the North provides employment for people in all of these places, the riches of the Northwest Territories, therefore, become a resource of Alberta. So long as access to the riches of the Northwest Territories continues to be from Alberta, that resource will continue to be an essential and a growing part of Alberta's economy.

In an endeavor to assess the present value of this resource to Alberta, the Commission requested the Bureau of Statistics of the Department of Industries and Labour to obtain figures showing the volume of business done with the Northwest Territories, the Yukon and Uranium City. That Department advises that the dollar volume of merchandising business conducted by Edmonton business firms with the North during 1956 totalled more than $35,000,000. In this survey, 127 firms were approached for information and 100 supplied data. While there must be very many more than 127 firms doing some business with the North, the 100 who responded with information do the bulk of the merchandising business. Of the firms which reported, 52 of them indicated that 1,183 persons were given employment as a result of trade with the Northern points. The Commission has estimated that the business done by other Alberta points would raise this to $40,000,000. This is also the opinion of the Alberta and Northwest Chamber of Mines as stated in their brief to the Commission. To this $40,000,000 should be added an

estimated $5,000,000 for the business done by the transportation companies, etc. So that we should not be too wide of the mark if we use the figure of $45,000,000 as being the amount of business done in Alberta in supplying goods and transportation, etc., to the North.

But the rendering of other services to the people of the North contributes a great deal of Alberta's economy. There is a payroll of $36,000,000 in the Yukon, Northwest Territories and Uranium City. Many of the employees in those areas may be considered as permanent residents of such places as Yellowknife and Uranium City. Much of their specialist medical and dental work is done in Edmonton. They also use other Edmonton facilities and pay for many other forms of service, such as banking, life insurance and recreation when they come out of the North on holidays or other business.

Of the transient labor supplied to the North, much is recruited in Alberta, and the wages these men earn are spent in Alberta, either to maintain their families here or to enjoy the amenities of the city when they come out for a respite from the North. Taxis, restaurants and hotels all benefit materially in this way. It is impossible to estimate what this means to Alberta, but it must be quite a large amount when we remember that the payroll of the North is $36,000,000.

One other aspect of Alberta's business with the North should be mentioned here even though as yet it is not important dollar-wise. That aspect is the proportion of agricultural production of the Peace River Country and of the Fort Vermilion Area which goes north to supply the towns of Hay River and Yellowknife. This volume may not be great today but as the population in the Northwest Territories increases the volume will increase until it may go far to becoming a major market for the Fort Vermilion Area.

A very conservative estimate of what the North means to Alberta might set the figure at about $50,000,000 per year at the present time even though its population is only 19,313.

Since 1951 the population has increased 3,309, or 20%. This increase has taken place mainly in the District of MacKenzie, which is shown on Map No. 17 in Section 3. Table No. 27 shows the growth of population of the Northwest Territories since 1911.

TABLE No. 27

Population of Northwest Territories

Year	Whites	Natives	Total
1911	1,650	4,857	6,507
1921	1,028	7,115	8,143
1931	1,004	8,312	9,316
1941	2,290	9,738	12,028
1951	5,344	10,660	16,004
1956	7,570	11,743	19,313

TABLE No. 28

Value of Mineral Production
Northwest Territories

1951	$ 8,288,747
1952	8,944,835
1953	10,300,230
1954	26,414,000
1955	25,568,000
1956	30,000,000

In 1956, 45% or $13,500,000 came from gold and silver production; 50% or $15,000,000 from uranium and 5% or $1,500,000 from oil and gas.

There are three large gold mines in the Territories: Giant Yellowknife had a 1956 production of $6,235,926 and daily production of 813 tons; Discovery had a 1956 production of $2,433,000 and daily production of 115 tons; and Con-Rycon had a daily production of 500 tons, but did not release a value figure. These three firms employed over 750 people in their operations.

There are two uranium mines in the Territories: Rayrock and Eldorado. Rayrock is in the Yellowknife area and Eldorado on Great Bear Lake. No separate figures have been published on production.

Crude oil production in the Norman Wells refinery in 1956 was 421,855 barrels. Refinery sales were 279 barrels of naptha specialties, 55,884 barrels of motor gasoline, 60,160 barrels of aviation gasoline and 211,448 barrels of fuel oils.

TABLE No. 29

Value of Mineral Production
Yukon Territories

1951	$ 9,793,170
1952	11,386,451
1953	14,738,562
1954	16,588,664
1955	14,724,950
1956	15,000,000

In 1956, 51½% came from gold and silver production, 46% from lead and zinc and the balance from other mineral production.

The figures given so far for mineral production take in the Yukon Territory and the Northwest Territories but do not include the mineral production of Uranium City, etc., where uranium to the value of $24,000,000 was produced in 1956 and to the value of $60,000,000 in 1957.

Alberta's participation in the business of the North is a fact of geography. Just as Winnipeg has become a great city because it was and still is the gateway to the rich prairies, so Alberta is in a similar position with respect to the Northwest Territories.

In the canoe age and the days of the river steamers, Alberta's position on the upper waters of the two great tributaries of the Mackenzie made it the natural point of access to the North. This position was firmed up during the First War by building the railways that are now the Northern Alberta Railways, and in more recent years by building the Alaska and MacKenzie Highways.

Alberta's 75-year old connection with the North has built up a strong mutual loyalty and a close understanding of each others problems. It has been expressed to the Commission that Alberta firms have the "know-how" of dealing with the North. But times change, and today others are casting envious eyes at the business that comes out of the North. Perhaps not for the volume of that business today, but for what it will be in a few years. The loyalties of 75 years can be broken if better transportation services should be established for the North through other provinces. At the present time the links of loyalty are being strained and it is not impossible that, as has already been demonstrated with regard to the Peace River Country, successful attempts may be made to divert the business of the North to other provinces.

The North is a resource beyond our boundary, it is true, but one that is a vital part of our economy.

SECTION 3

THE EXTENT AND LOCATION OF THE NATURAL RESOURCES OF NORTHERN ALBERTA

The Commission was instructed to "inquire into the extent and location of the natural resources of Northern Alberta", in other words, to make an inventory of these resources. The first fact that emerged as the study began was that the Commission could not do more than to ferret out all the information already known about Northern Alberta and then to assemble it all into this report, so that all known information about resources might be tabulated in one place. In other words, while the Commission might co-relate what information was already available so as to present a composite picture of Northern Alberta, it would not be justified in setting up survey parties or prospecting parties to make studies of arable soil in areas not yet studied or in trying to discover new ore bodies, etc. As its studies progressed to the stage of making recommendations it might feel justified in recommending that such survey parties be set up in the future but was not in a position to bring them into being in order to compile its report.

The second fact that emerged from the Commission's study was that, while there are bountiful resources in Northern Alberta, many of them are

(1) Too remote from markets due to the lack of transportation facilities in Northern Alberta, or

(2) Too remote from markets even if transportation facilities were provided, or

(3) Not in sufficient demand because Canada has not yet progressed population-wise or industry-wise to need these products.

Examples of these are the following:

1. The gypsum deposit in twp. 116, rge. 14, W.4 is a case in point. Alberta's requirements are manufactured in Calgary from raw materials originating in Manitoba. The gypsum deposit on the Peace River is about two-thirds the distance from Calgary that the Manitoba deposits are but is inaccessible until a railway is built into Northern Alberta.

2. There are splendid deposits of salt at Waterways, which at one time were mined extensively. Even though the refinery was located at the railhead this salt could not compete with that produced at Lindberg and a few years ago the Waterways plant was closed down.

3. There are over 100 billion barrels of oil in the Athabasca Oil Sands. Knowledge of the problem of separating this oil from the sand and of refining it has progressed to the state where this oil could be produced if a market existed for it, but at the moment Alberta cannot sell all the oil that can be produced in the rest of the province.

4. Another example is the thousands of acres of arable land in portions of Northern Alberta which cannot be opened up because markets do not exist at present for the grains or the red meat that this land could produce.

For these reasons, for the purpose of compiling this report, the Commission felt that there was no point in its speeding up the programs of survey already under way by the Department of Lands and Forests, the Research Council or other bodies, or in initiating surveys of its own.

The natural resources of Northern Alberta are very great. In this section of the report an endeavour has been made to tabulate all known information. In some cases such as as that of iron ore and gypsum, for instance, the Commission felt that this report should contain all possible information about these deposits so that anyone interested in developing them might turn to the report as a starting point for their investigations.

Even in parts of Canada that are close to centers of population it is not prudent to declare that the quantities or availability of raw materials is known. The quantity of these raw materials available for use at any given time varies with the development of technical skills and with prices and world market conditions. The purpose of the Commission's inventory is to present figures of acres, board feet, barrels and tons, so that in our economy of free enterprise these figures may be available to and may inspire financiers and industrialists to develop them for their own good. Associated with this development will be a vastly greater good which will come to the Province by way of increased population and industry brought about by the efforts of these industrialists.

The inventory of the resources of Northern Alberta follows in the order maintained throughout this report.

ARABLE LAND

Many millions of acres of fine agricultural land are lying dormant in Northern Alberta. The Peace River Country, which was defined in the Introductory Section of this report and on Map No. 4, contains much of this good land. This is also indicated in Table 5 which summarizes the three preceding tables and shows that in that area there are 4,761,000 acres of arable land, 1,606,000 acres of doubtful arable land, and 5,107,000 acres of pasture and woodland.

The land in Northern Alberta varies considerably in quality. Soil surveys of differing degrees of intensity have

been carried out by the Research Council of Alberta for a number of years and the reports of these surveys have been available to the Commission. The areas covered by these different surveys are shown on Map No. 8. It will be seen that they overlap in certain areas. Moreover, they vary because the older surveys were on a different basis to the ones performed since 1945.

In this report the various classes of soil have been reduced to three, i.e., Pasture and Woodland, Doubtful Arable and Arable. In computing the areas of each, it has been necessary for the Commission to endeavour to reconcile the various definitions used in the soil survey reports so as to reduce them to the three general categories listed above. The table below shows which of the soil classes set out in the various surveys have been included under the Commission's headings of Pasture and Woodland, Doubtful Arable and Arable.

TABLE No. 1

Classes of Soil which have been included under the Headings Used by the Commission

Research Council Report Number	Year of Survey	Name of Sheet	TYPES OF SOIL		
			Pasture and Woodland	Doubtful Arable	Arable
23	1929	Dunvegan West	W3, W2	W1	Parkland (A2)
31	1931	Peace River High Prairie Sturgeon Lake	W3, W2	W1	Parkland (A)
56	1947	Rycroft Watino	P & W	4	5, 6, 7
63	1950	High Prairie McLennan	P & W	4	5, 6, 7
74	1954	Grande Prairie Sturgeon Lake	P & W	4	5, 6, 7
Unpublished	1956	Blueberry Mountain	P & W	4	5, 6, 7
Unpublished	1956	Helicopter Survey Latitudes 55°-56°	P & W	Doubtful Arable	Arable
Unpublished	1957	Helicopter Survey Latitudes 56°-57°	P & W	Doubtful Arable	Arable

Basic classification of soils is by colour. The main classes in decreasing order of potentiality are: Black, Shallow Black, Dark Brown, Brown and Grey-Wooded. In addition, the soil survey reports take into consideration four additional factors as follows: Profile variation, density, stoniness and topography. These factors are given equal importance with the actual soil type when soils are classified according to their potential agricultural use. In Soil Survey Reports Nos. 56, 63 and 74 the soil is classified as Pasture and Woodland, and Grades 4, 5, 6 and 7. According to these reports, a soil classified as No. 4 is poor to fair, while No. 5 is fair to fairly good. Class 6 is fairly good to good, Class 7 good to very good, and Class 8 is very good to excellent. Class 8 does not occur in any of the areas not presently settled in the Peace River Country.

The most detailed soil surveys are those in reports Nos. 56, 63 and 74 of the Research Council of Alberta which cover the work done between 1945-54.

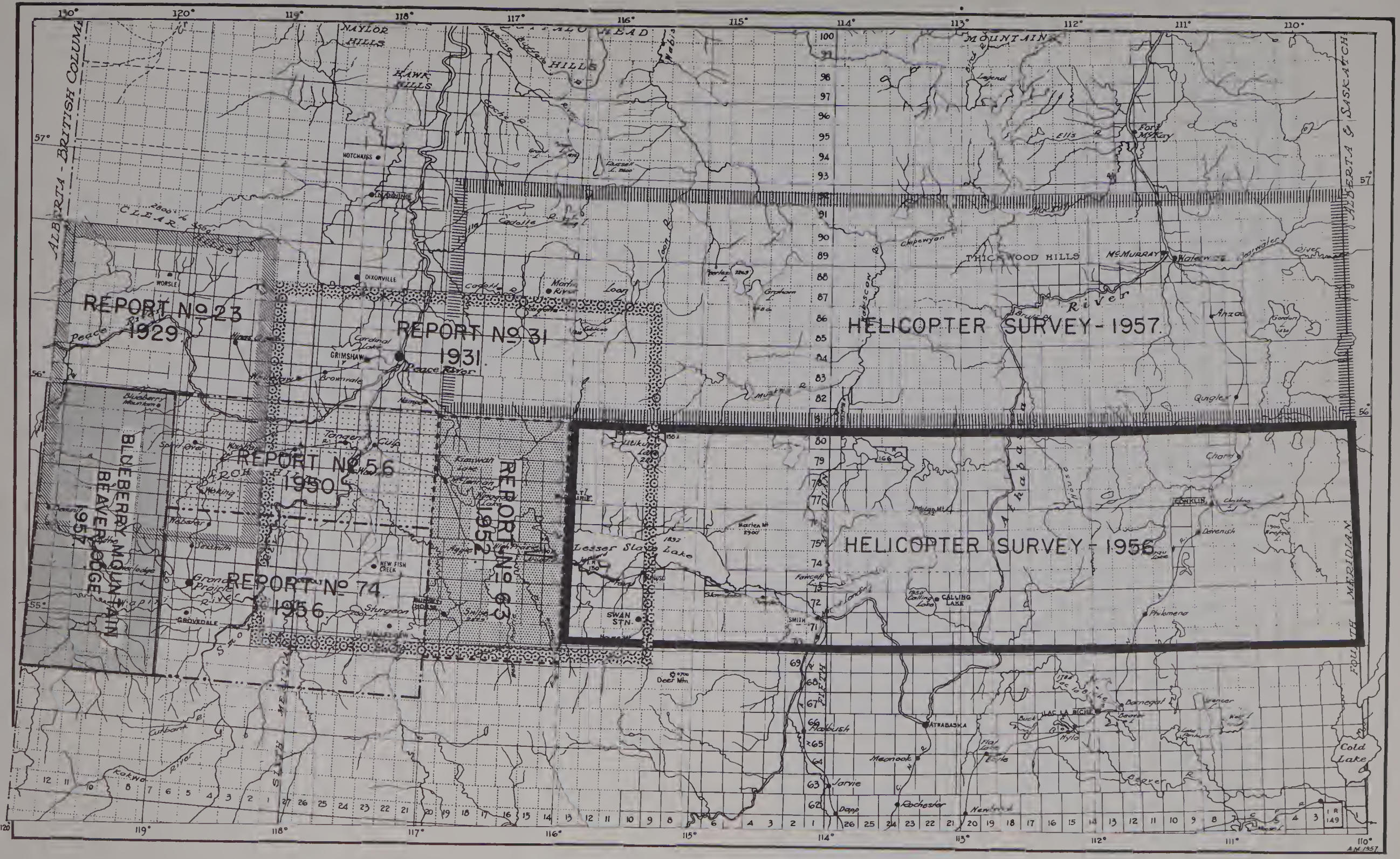
A similarly detailed survey has been carried out recently in the Blueberry Mountain - Beaverlodge area. While this report has not been printed yet and its soil map was therefore not available, the Commission was able to obtain the necessary data for its purposes.

The soil surveys covered by reports No. 23 and 31, were made in 1929 and in 1931 and were not so detailed. They classed the land as Parkland, W1, W2 and W3. The Parkland soils were assumed to be Arable, while W1 soils were put in the Doubtful Arable category and the W2 and W3 class soils were listed as Pasture and Woodland.

During 1956 and 1957 the Research Council of Alberta carried out a Helicopter Survey of the area between the 110th and the 116th Parallel of West Longitude and the 55th and 57th Parallel of North Latitude, i.e. in the area having the Swan Hills for its southwest corner, the Buffalo Head Hills for its northwest corner and extending across to the vicinity of McMurray in the northeast and of Cold Lake in the southeast.

These helicopter surveys are preliminary only, and in them no attempt has been made to give complete soil classifications as is the case with Survey Reports 56, 63 and 74. Results have been categorized as "Pasture and Woodland", "Doubtful Arable", and "Arable". The Research Council provided the Commission with a map for the 1956 survey showing the three areas, but the only information available for the 1957 survey is that there are an estimated 775,000 acres of arable, 1,235,000 acres of doubtful arable and 9,890,000 acres of pasture and woodland, together with an indication of where the areas lie.

Some years ago the Department of Lands and Forests developed a policy of dividing the unsettled Crown lands of Alberta into areas available for homestead entry and areas which were withdrawn from settlement. Almost all of the area which at present is available for settlement in Northern Alberta is in the Peace River Country. This is shown on Map No. 9, which also shows the area already settled and that withheld from settlement. Except for the Peace River Country, the only land in Northern Alberta available for settlement is some 234,000 acres in the area north of Lac La Biche.



AREA OF SOIL SURVEYS

Scale in Miles

10 0 10 20 30 40

In assessing the potentiality of unoccupied land in the Peace River Country, the Commission prepared Tables No. 2 and 3, both of which show for each municipal unit the total area, the area occupied by farms and reserves, the area withheld from settlement and the unoccupied area which is available for settlement. Table 2 then goes on to deal with the unoccupied area available for settlement and gives a breakdown of this land into the three grades of soil, i.e., Arable, Doubtful Arable and Pasture and Woodland. Table 3 gives a breakdown of the area at present withheld from settlement into these same grades of soil.

There is a considerable discrepancy between the 3,960,134 acres shown as occupied by farms in Tables 4 and 8 in Section 1 and the 4,718,000 acres shown in Table 5 of this section. It is possible to compute the acreage of occupied land in several ways, depending upon what is included in the definition used. In Tables 2 to 5 which follow, the "Area Occupied by Farms" includes all land which has been settled or leased (whether patented or not) and all land which is in use for any agricultural purpose, such as, for instance, being subject to a grazing lease. Part of the difference between the two figures is due to the fact that the first figure was obtained from the census, which was taken in the spring and summer of 1956, while the latter figure was calculated as at November 1957. This, however, does not account for all the difference. In arriving at the figures in the tables, particularly with respect to the occupied area and that still available for settlement, the Commission obtained maps from the Director of Lands. From time to time the Department of Lands and Forests publishes a booklet entitled "Public Lands Open For Settlement in the Peace River District, Alberta," which shows maps of the patented land, that withheld from settlement, and that available for settlement. That Department is in the process of producing a new booklet and new maps, and very kindly loaned copies of these maps to the Commission. These were then checked with other records to determine what further lands had been leased but had not yet been patented. These leased lands were added to patented lands to obtain the area of occupied farms and a correspondingly reduced area of land available for settlement. The figures used in Tables 2 to 5 were based on the Commission's study of these maps. Since there is little demand for agricultural land at present it was not thought worthwhile to spend the time necessary to eliminate this discrepancy.

Table No. 4 deals with the balance of Northern Alberta after excluding the Peace River Country. Except for a small area north of Lac La Biche none of this vast area is available for settlement at present and very little of it has had a soil survey. For this reason, a great deal of estimating and guessing has been done in arriving at the types of soil. This estimating has taken into account the information given to the Commission at hearings in the Peace River Country and has tried to correlate this information particularly with the submissions made to the Commission by Mr. Stacey of the Beaverlodge Experimental Station and Mr. Anderson of the Fort Vermilion Experimental Station.

TABLE No. 2

Status of Land in "Peace River Country"

(Giving Details of Unoccupied Land in Area Available for Settlement)

(All areas are shown in thousands of acres).

Municipal Unit	(1) Total Area	(2) Area Occupied by Farms	Area Occupied by Indian and Metis Reserves	Area Withheld from Settlement	Area Available for Settlement	BREAKDOWN OF AREA AVAILABLE FOR SETTLEMENT					
						In Areas of Detailed Soil Survey			In Area of Less Detailed Soil Survey		
						Lakes, Pasture and Woodland	Doubtful Arable	Arable	Lakes, Pasture and Woodland	Doubtful Arable	Arable
County No. 1	1,409	1,122	4	16	267	18	137	112	------	------	------
M.D. 130	790	450	------	54	286	86	8	192	------	------	------
M.D. 133	168	157	------	1	10	4	------	6	------	------	------
M.D. 135	233	200	5	------	28	28	------	------	------	------	------
M.D. 136	261	230	------	------	31	8	------	2	16	5	------
I.D. 124	818	56	37	670	55	------	------	------	15	11	29
I.D. 125	1,428	226	230	493	479	147	40	292	------	------	------
I.D. 126	1,475	224	23	772	456	103	30	323	------	------	------
I.D. 131	1,607	234	70	1,076	227	1	------	21	47	58	100
I.D. 132	732	379	------	192	161	56	10	74	21	------	------
I.D. 134	1,528	286	------	603	639	40	84	270	95	45	105
I.D. 138	1,632	501	------	477	654	------	------	------	519	83	52
I.D. 139	1,930	403	4	1,087	436	------	------	------	66	150	220
I.D. 146 (East of 6th Mer.)	1,669	34	403	1,056	176	------	------	------	71	40	65
I.D. 147	1,261	166	23	410	662	------	------	------	62	------	600
TOTALS:	16,941	4,668	799	6,907	4,567	491	309	1,292	912	392	1,171

(1) Department of Municipal Affairs—1955 Annual Report.
(2) From 1956 Census with some correction for land settled and leased since.

	Arable	Doubtful Arable	Pasture and Woodland
Area of Detailed Soil Survey	1,292	309	491
Area of Less Detailed Soil Survey	1,171	392	912
Totals	2,463	701	1,403

TABLE No. 3

Status of Land Within The "Peace River Country"

(Giving Details of Area Withheld from Settlement)

(All areas are shown in thousands of acres).

Municipal Unit	(1) Total Area	(2) Area Occupied by Farms	Area Occupied by Indian and Metis Reserves	Area Available for Settlement	Area Withheld from Settlement	BREAKDOWN OF AREA WITHHELD FROM SETTLEMENT								
						In Area of Detailed Soil Survey			In Areas of Less Detailed Soil Survey			In Area of No Soil Survey		
						Lakes, Pasture and Woodland	Doubtful Arable	Arable	Lakes, Pasture and Woodland	Doubtful Arable	Arable	Lakes, Pasture and Woodland	Doubtful Arable	Arable
County No. 1	1,409	1,122	4	267	16	7	-----	4	5	-----	-----	-----	-----	-----
M.D. 130	790	450	-----	286	54	22	20	12	-----	-----	-----	-----	-----	-----
M.D. 133	168	157	-----	10	1	-----	-----	1	-----	-----	-----	-----	-----	-----
M.D. 135	233	200	5	28	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
M.D. 136	261	230	-----	31	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
I.D. 124	818	56	37	55	670	-----	-----	-----	417	161	92	-----	-----	-----
I.D. 125	1,428	226	230	479	493	111	46	191	-----	-----	-----	50	25	70
I.D. 126	1,475	224	23	456	772	172	63	522	-----	-----	-----	3	-----	12
I.D. 131	1,607	234	70	227	1,076	9	2	43	239	321	462	-----	-----	-----
I.D. 132	732	379	-----	161	192	95	7	64	26	-----	-----	-----	-----	-----
I.D. 134	1,528	286	-----	639	603	274	50	200	79	-----	-----	-----	-----	-----
I.D. 138	1,632	501	-----	654	477	-----	-----	-----	-----	-----	-----	387	45	45
I.D. 139	1,930	403	4	436	1,087	-----	-----	-----	445	55	80	507	-----	-----
I.D. 146 (East of 6th Mer.)	1,669	34	403	176	1,056	-----	-----	-----	-----	-----	-----	856	50	150
I.D. 147	1,261	166	23	662	410	-----	-----	-----	-----	-----	-----	-----	60	350
TOTALS:	16,941	4,668	799	4,567	6,907	690	188	1,037	1,211	537	634	1,803	180	627

(1) Department of Municipal Affairs—1955 Annual Report.
(2) From 1956 Census with some correction for land settled and leased since.

	Arable	Doubtful Arable	Pasture and Woodland
Area of Detailed Soil Survey	1,037	188	690
Area of Less Detailed Soil Survey	634	537	1,211
Area of No Soil Survey	627	180	1,803
Totals	2,298	905	3,704

TABLE No. 4

Status of Land in Northern Alberta Outside The "Peace River Country"

(All areas are shown in thousands of acres)

Municipal Unit	Total Area	Area Occupied by Farms	Area Occupied[1] by Indian and Metis Reserves Etc.	Area Withheld from Settlement	Area Available for Settlement	Total Unoccupied Area	BREAKDOWN OF AREA OF UNOCCUPIED LAND					
							In Area Surveyed by Helicopter 1956-7			In Area of No Soil Survey		
							Lakes, Pasture and Woodland	Doubtful Arable	Arable	Lakes, Pasture and Woodland	Doubtful Arable	Arable
I.D. 102 (N. of 55th Parallel)	676	27	11	505	133	638	46	573	19			
I.D. 107 (N. of 55th Parallel)	129	16		105	8	113	35	78				
I.D. 121	4,308		1,150[2]	3,158		3,158	3,143	15				
I.D. 122	962	6	1	902	53	955	45	910				
I.D. 123 (N. of 55th Parallel)	351			351		351	251	75	25			
I.D. 128	3,341	1	38	3,302		3,302	3,302					
I.D. 129	2,834		218	2,576	40	2,616	1,621	785	210			
I.D. 137	1,117			1,117		1,117	1,117					
I.D. 143	23,484		8,604[3]	14,880		14,880	5,325			9,555		
I.D. 144	3,738		20	3,718		3,718	414			3,104	100	100
I.D. 145	4,648		6	4,642		4,642	901	274		3,017	400	50
I.D. 146 (W. of 6th Meridian)	5,266			5,266		5,266				4,746	520	
I.D. 148	6,814		1,244[4]	5,570		5,570				4,730	740	100
I.D. 149	7,085		12	7,073		7,073				6,323	450	300
TOTALS:	64,753	50	11,304	53,165	234	53,399	16,200	2,710	254	31,475	2,210	550

1 Indian and Metis reserves total 410,000 acres.
2 Air Weapons Range.
3 Includes part of Wood Buffalo Park (Approximately 8,500,000 acres).
4 Part of Wood Buffalo Park.

	Arable	Doubtful Arable	Pasture and Woodland
Area of Helicopter Soil Survey	254	2,710	16,200
Area of No Soil Survey	550	2,210	31,475
Totals	804	4,920	47,675

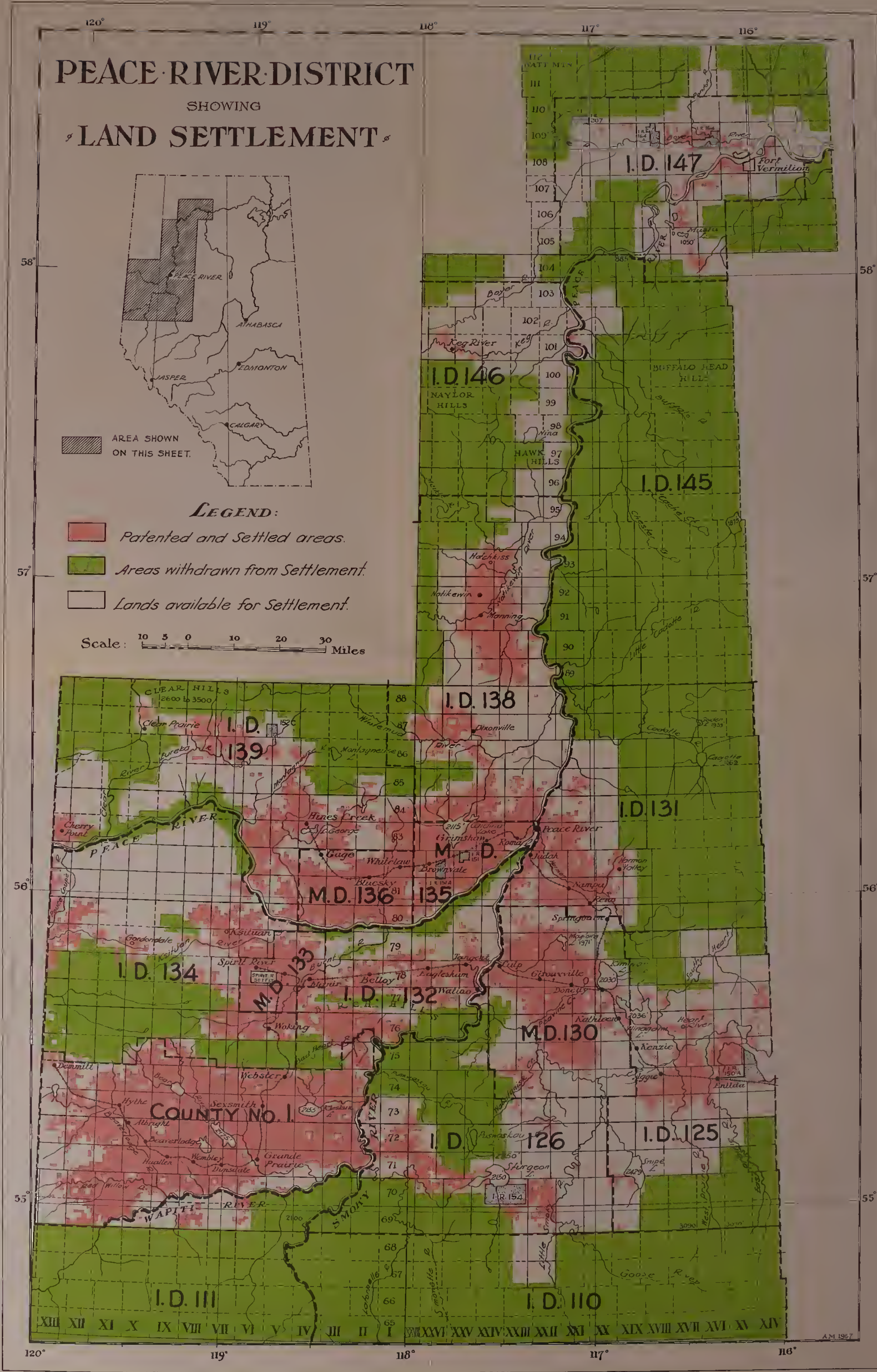

PEACE·RIVER·DISTRICT
SHOWING
LAND SETTLEMENT
AREA SHOWN ON THIS SHEET.
PEACE RIVER
ATHABASCA
EDMONTON
JASPER
CALGARY
LEGEND:
Patented and Settled areas.
Areas withdrawn from Settlement.
Lands available for Settlement.
Scale: 10 5 0 10 20 30 Miles
I.D. 147
Fort Vermilion
I.D. 146
NAYLOR HILLS
BUFFALO HEAD HILLS
HAWK HILLS
I.D. 145
Keg River
Boyer
Nina
Hotchkiss
Notikewin
Manning
I.D. 138
Dixonville
CLEAR HILLS 2600 to 3500
Clear Prairie
I.D. 139
Eureka River
Montagneuse
I.D. 131
Cadotte
Cherry Point
PEACE RIVER
Hines Creek
Gage
Whitelaw
Grimshaw
Roma
Brownvale
Peace River
Judah
Nampa
Harmon Valley
Berwyn
Bluesky
M.D. 136
M.D. 135
Reno
Springburn
Gordondale
Kshlan River
Spirit River
I.D. 134
M.D. 133
I.D. 132
Belloy
Tangent
Culp
Girouxville
Eaglesham
Donnelly
Falher
Watino
Woking
M.D. 130
Kathleen
Kenzie
Heart River
Enilda
Demmitt
Webster
Hythe
Sexsmith
COUNTY No. 1
Albright
Beaverlodge
Wembley
Dimsdale
Grande Prairie
Hunter
I.D. 126
Sturgeon L.
I.R. 154
I.D. 125
WAPITI RIVER
SMOKY RIVER
I.D. 111
I.D. 110
Little Smoky
Goose River
120° 119° 118° 117° 116°
58° 57° 56° 55°
XIII XII XI X IX VIII VII VI V IV III II I XXVII XXVI XXV XXIV XXIII XXII XXI XX XIX XVIII XVII XVI XV XIV
A.M. 1957

TABLE No. 5

Summary of Tables 2, 3 and 4

(All areas are shown in thousands of acres)

	Arable	Doubtful Arable	Pasture and Woodland	Total
Peace River Country				
Available	2,463	701	1,403	4,567
Withheld	2,298	905	3,704	6,907
Total Peace River Country	4,761	1,606	5,107	11,474
Remainder of Northern Alberta (Including 234,000 acres available)	804	4,920	47,675	53,399
	5,565	6,526	52,782	64,873
Occupied by farms				4,718
Indian and Metis Reserves				1,209
Wood Buffalo Park				9,744
Cold Lake Weapons Range				1,150
				81,694

The estimates made in Tables 2, 3 and 4 may be on the conservative side. There is a great deal of land in I.D.'s 144, 146, 148 and 149 and also some adjacent to the Peace River in I.D. 143 about which very little is known. Future soil surveys may show these areas to contain more good soil than our figures indicate. It appears, however, that in the vast area stretching north and south between the Birch Mountains (Township 100) and the 55th Parallel (Township 69) and east and west from the Peace River near the line of 117° West Longitude to the Saskatchewan border, we cannot expect to find much arable land, except in the already settled areas in the extreme southwest corner in the region of McLennan and High Prairie and extending a short distance north and east from these places. In much of this large area the most significant feature is poor drainage, as evidenced by the occurrence of large expanses of muskeg. The tree-cover consists mainly of black spruce and tamarack, which occur on most of the muskegs that cover the area, while on the better drained portion of the land, aspen, poplar, spruce and pine commonly occur. Much of the area is deemed unsuitable for cultivation by reason of excessive stoniness, rough topography, high elevation or some associated feature, as well as the presence of sand ridges covering large areas, or of gravelly out-wash material.

Some land adjacent to the lowest seventy-five miles of the Athabasca River (between McMurray and Lake Athabasca) will undoubtedly be good for pasturing cattle and for some farming. The same applies to land adjacent to the Slave River, particularly on the west side, although this area is within the Wood Buffalo Park.

There is a tendency to think of much of Northern Alberta as the Frozen North, and, although in many respects there is no very noticeable change in climate as one goes north from Peace River Town, it is a fact, nevertheless, that the frost-free days do decrease as one approaches the north boundary of the Province. While there is much fairly good land in I.D.'s 144, 146, 148 and 149, the shorter frost-free period will have an adverse effect which will tend to limit what can be grown on that land. So, for that matter, will the decreased precipitation in that area. For this reason, the actual quality of the land itself is not the only criterion which should be used in thinking of the utility of this land.

It is difficult to draw a hard and fast line between Arable and Doubtful Arable land. The grey-wooded soils improve readily under proper farming methods. Land which we may decide to pass over today will undoubtedly be brought into production at some time in the future. It would be foolish today to point to any one piece of land and declare caterogically that it is so poor that it will never be used for some form of agriculture. If it becomes economically necessary, we could undoubtedly use all of the Doubtful Arable land and start using some of the land that is shown in the tables as Pasture and Woodland.

That point, however, is not apt to be reached during the next thirty or forty years. During the immediate future there is ample scope for the expansion of Alberta's agriculture in the land classed as Arable and Doubtful Arable in the Peace River Country without going out into the more remote lands covered in Table 4.

Table 5 shows that the Arable land in the Peace River Country is 4,761,000 acres, or over 7,400 sections of land, while the Doubtful Arable is 1,606,000, or over 2,500 sections of land. All of this is accessible to long-established roads, the MacKenzie Highway, the new road from Hines Creek to Fort St. John, or the road from High Level to Fort Vermilion. Not all of the above land is presently open for settlement, but 2,463,000 acres, or over 3,800 sections, of Arable land is open, while 701,000, or over 1,100 sections of Doubtful Arable is available for settlement without changing the boundaries set up by the Department of Land and Forests.

Map No. 9 shows how the Peace River Country is divided into municipal units. In red on this map is shown the patented and leased land, while the green portions show the areas withdrawn from settlement. The white portions of the map, therefore, show those areas which have not yet been patented or are available for settlement.

Homestead Leasing

A homestead, as defined by the Department of Lands and Forests, is an area adjoining agricultural lands not exceeding one-half section granted by lease. A lessee includes any person, male or female, who has attained the age of 18 years, is not in possession or control of a farm under a certificate or agreement of sale, is a British subject or Canadian citizen or declares his intention of becoming a Canadian citizen and has resided in Alberta for at least two years immediately prior to making application. Veterans are exempt from this two-year qualification. The term of the homestead lease is twenty years and is renewable for further terms of twenty years each.

No crop share is payable for the first three years, but in the fourth and in each subsequent crop year, the rent payable under a homestead lease shall be a one-eighth share of the crops of every kind and description grown or harvested on the lands. On lands which are under cultivation at the time the granting of the lease, the lessee shall pay, for a period of ten years, a one-quarter share of the crops grown or harvested upon the land under cultivation at the date of the commencement of the term of the homestead.

The lessee in the fourth year of the term of his lease and in each year thereafter must perform on the leasehold certain minimum residence duties. Where a lessee furnishes satisfactory evidence to the Minister that

he has fulfilled the requirements of the homestead lease in each of five years, he may apply for a title to the land upon payment of the purchase price of $100 where the homestead comprises 160 acres or less and a further sum of $1.25 per acre for each additional acre where the homestead comprises more than 160 acres. When this is done, a homestead lease is said to have been patented. After five years' duties have been completed, this purchase price is reduced for each additional year's duties until the tenth year, when title may be granted free of charge. In order to complete residence duties for title the lessee has the option of performing, after the third year of the term of the lease, twelve months' residence in two consecutive years, with a minimum of three months' residence in four years.

A person who assigns his interest in a homestead shall not be eligible to apply for or acquire another homestead until the expiration of a period of two years from the date of registration of the assignment.

Under the Homestead Lease Loan Act a lessee, after obtaining his lease and completing a minimum of 35 acres of clearing and breaking may apply for a loan of $1,000.00 to be used for additional clearing and breaking. The loan is re-payable over a period of ten years with interest at the rate of 3½% per annum and on overdue instalments 4½% per annum. A veteran who has obtained a lease may apply for financial assistance under The Veterans' Land Act, 1942 (Canada).

Homestead Sales

Provision for Homestead Sales were made in the Public Lands Act in July, 1957. Under the Homestead Sale, a greater freedom of movement is allowed to homesteaders than is possible under the provisions of the Homestead Lease. Although the same cultivation duties are required for either a lease or a sale, there are no minimum residence nor payment of crop share requirements under the Homestead Sale.

The purchaser pays taxes to the municipality or improvement district, beginning with the fourth year. It is left optional whether he builds a house or not. If he does put one up and it has a value of over $1,000.00, the Department of Lands and Forests will give him a credit of $400.00 on account of purchase.

WATER

One abundant resource of Northern Alberta, to which ordinarily we pay little attention, is water. It is of economic importance as lakes and rivers and as groundwater. Northern Alberta contains many very large lakes, three large rivers and innumerable smaller lakes and rivers. In general, water is more abundant in the east half of the area.

All human activities depend upon a water supply, although some of them are more dependent than we sometimes realize. Each of the following activities is at all times contingent upon an ample and continuous water supply: agriculture, electric power generation—whether hydro or thermal—all heavy industries including mining, metallurgy and other manufacturing, forests, fisheries, recreation and wild life.

The industrial opportunity of our great supplies of fresh water should not be overlooked, for a time will come when industry and population will move to water, not because of its hydro power possibilities but to use it as a commodity costing a definite price per pound. When that time comes, possibly beyond the period covered by this report, Lesser Slave Lake, Lake Claire and Lake Athabasca, and the Peace and Slave Rivers could become the industrial centres of Alberta.

Today, these waters are largely unused and they are pure and sparkling. The Commission expects that much more use will be made of them during the next 30 years. This use will have an inevitable tendency to sully them, a tendency which cannot be eliminated entirely. This question of some degree of inevitable pollution, as well as the question of water conservation, will be treated in section 9.

The most immediate demand for water today is in the Peace River Country where supplies for agricultural and municipal purposes need more study. In that area, about 35% of the present towns and villages use a groundwater source for their water supply, while the remainder of the towns use surface water obtained by dam and dugouts. As a rule, large cities need so much water that they can be built only where they can get their supplies from a large lake or river. This does not necessarily mean that they should be built in a river valley, because building in such a location has more drawbacks than advantages. If new towns, which may grow to cities, spring up to process the resources of Northern Alberta, their location should be watched carefully, both from the angle of water supply and from the viewpoint of the disadvantages of being located in a river valley.

For many of the towns of the Peace River Country, groundwater is the cheapest water supply and, in general, it has the following advantages:

(1) Groundwater usually may be reached within a few hundred feet of where it is needed, where a surface supply may require a pipeline or diversion channel.

(2) Generally, the yield of water from springs and wells is less susceptible to seasonal variations than a surface supply that is directly dependent on precipitation during wet and dry seasons.

(3) Groundwater is more uniform in quality than surface water. Also, it is usually free from bacterial contamination and usually does not require a treatment plant for removal of impurities.

(4) In general, if a groundwater supply is available the cost is substantially reduced from that of obtaining an equivalent surface water supply.

Each locality in the Peace River district presents its own special problems in the search for a groundwater supply. However, a few generalizations can be made with the information available.

Sexsmith - Grande Prairie - Beaverlodge - Hythe Area: There appears to be no problem in obtaining a groundwater supply by drilling wells in this area. In addition, groundwater occurs in the surficial deposits in certain

A Crop in Grey Wooded Soil.

parts of this area. The drilling depths range from 50 to 500 feet. In the bedrock, the water is usually obtained from the sandstone members.

Grimshaw - Berwyn - Whitelaw Area: Groundwater is usually obtained from shallow wells and springs in glacial sands and gravels resting on bedrock. There appears to be no shortage of water at the present time. The bedrock has not been investigated for a groundwater supply.

Fairview - Hines Creek Area: West of Whitelaw the character of the surficial deposits changes to heavy bentonitic clays high in sulphate and except in certain isolated instances, a groundwater supply is very difficult to obtain from these deposits. Most of the water in this area is obtained by catching runoff in dugouts and dams. The bedrock lying directly under the surficial cover consists of shales of the Smoky River Group and is very bentonitic and high in sulphates. There is no water production from this group. At depths from 300 to 600 feet the Dunvegan Sandstone lies beneath the Smoky River Group. The water-making possibilities have not been tested sufficiently but the few wells that reach the formation have produced water that is very high in sulphates. Some test drilling is going to be done on this formation soon to determine its water-making potential.

Spirit River - Rycroft - Wanham Area: Most of the water obtained in this area is from surface sources. This area is underlain by the Smoky River Group which is not too favorable for water production except in certain specific areas. The Dunvegan Sandstone lies 600 to 1,000 feet below the Smoky Group. The water-making potential of the sandstone in this area is not too well known at present.

Falher - McLennan Area: In this district, most water is obtained from dams and dugouts. A few deep wells, however, produce water from the Smoky River Group at depths of 600 to 800 feet. This water is quite soft and usually high in sulphates.

In other areas of the Peace River District, very little information is available at the present time.

FORESTS

The forest resources of Northern Alberta are indeed very large, and will be the basis of an important segment of the future economy of the area. As shown in Table 10, in 1956 there were 27 billion board feet of standing sawlog timber in the area, and 333 million cords of timber of between 4 and 11 inches D.B.H. (diameter breast high). In terms of 1957 value, it is interesting to compute what this timber would be worth if it could be marketed and if it were all cut at once.

For each thousand board feet, the Province collects about $10 in fees. It costs about $15 per thousand to cut the logs and deliver them to the mill in the bush, and about $6 per thousand to saw them into lumber. Finally, it costs about another $4 per thousand to haul these by truck to the planing mill, so that, delivered to the planing mill, this lumber is worth about $35 per thousand. On this basis, then, the 27 billion board feet of sawlog timber alone is worth:

Provincial fees	$270,000,000
Cutting and hauling to mill	405,000,000
Sawing	162,000,000
Trucking to planing mill	108,000,000
Value as delivered to planing mill	$945,000,000

This 27 billion board feet of lumber should be compared to the 400 million board feet of all timber cut in Alberta in 1956, and the 190 million board feet of all timber cut in Northern Alberta. The timber standing in Northern Alberta is well over 100 times the amount cut in that area last year.

Of course, thinking in terms of cutting all of this at once is not practical, but the above figures are given by way of showing the amount of timber that is presently standing in Northern Alberta.

Our forests, unlike mineral or petroleum products, are renewable assets in the same way that crops of wheat and other grains are. With proper management, they may be harvested at a definite rate per year in perpetuity. In this respect, they are like hydro power, which can be used over and over again, year after year, as contrasted to thermal power, which eventually consumes all of the available fuel. This one most valuable aspect of our forests tends to make a study of that industry somewhat difficult. When taking an inventory of many products or resources, one tends to think in terms of a definite quantity available for use. But although timber can be inventoried as it stands at a certain date, that is only the beginning of assessing it as a resource.

Timber grows. If at the end of 1956 there were 27 billion board feet of sawlog timber, this increases by about 1% per year, so that at the end of 1957 there will be 27,270,000,000 board feet, providing there has been no cutting, no decay, fire, storm or insect damage. The rate of growth, or what is called the rate of re-generation, varies in different parts of Northern Alberta, but it might be assumed that in that area it takes at least 100 years for a forest to grow to the stage where it may be harvested for sawlog timber.

Timber also burns—so, in keeping an inventory up to date, account must be taken each year of the amount lost by fire as well as by all other forms of loss.

While the area of Northern Alberta is about 82,000,000 acres, not all of this is covered by productive forest. To begin with, 9,744,000 acres of Northern Alberta are within the Wood Buffalo Park and the timber in the park is the property of the Federal Government. Of the remaining 72,256,000 acres, nearly 12,000,000 is land being farmed or held for settlement, or is in Indian or Department of National Defence Reserves, so that only some 60,300,000 acres is administered by the Department of Forests. This Department includes in its Northern Alberta administration area some additional 8,000,000 acres, which, while actually south of the 55th Parallel, are part of the Grande Prairie and Slave Lake Forestry Divisions. For this reason, when dealing with forestry we consider the area administered by the Department as 68,000,000 acres.

Many of these 68,000,000 acres will not grow forests and are therefore classed as non-productive land, that is,

land now covered by swamps, rivers, open meadows and muskegs. Some land is classed as potentially productive, i.e. land where forest growth is not discernable on vertical air photographs taken in or before 1950.Such land includes old burns, recent burns and areas where the timber has been clear cut. The remainder is classed as productive land, i.e. land which supports stands of timber of good growth of sapling size or greater. Viewed in this light, the total area of Northern Alberta may be broken down as shown in Table No. 6.

TABLE No. 6

Land Area Breakdown
(Thousands of Acres)

Forest and Wildlife Division		
Presently Productive Land	27,619	
Potentially Productive Land	17,413	
Non-Productive Land	23,024	68,056
Lands and Settlement Division		
Settled Area (Farms, etc.)	4,718	
Area Available for Settlement	4,801	9,519
Indian and Metis Reserves		1,209
Cold Lake Weapons Range		1,140
Wood Buffalo Park		9,744
Total Area*		89,668

*This includes nearly 8,000,000 acres south of the 55th Parallel mentioned on the previous page.

The further breakdown of land into productive, non-productive, etc., is shown by Forestry Divisions in Table No. 7. In general, except possibly for the valleys of the Peace and Athabasca Rivers, as we travel across Northern Alberta in a northeasterly direction the land produces less timber and contains more non-productive areas. This is particularly true of the extreme northeastern part of Alberta which is in the Pre-Cambrian Shield.

TABLE No. 7

Land Area Breakdown
(Thousands of Acres)

Forestry Division	Non-Productive Land	Productive Land			Total Land
		(2) Potentially Productive	(3) Productive	Total Productive	
Grande Prairie	334	938	3,060	3,998	4,332
Slave Lake	4,256	4,006	5,271	9,277	13,533
Peace River	9,273	8,565	11,539	20,104	29,377
Lac La Biche	9,161	3,904	7,749	11,653	20,814
TOTALS	23,024	17,413	27,619	45,032	68,056

(1) Non-Productive Land includes swamps, rivers, open meadows, muskegs, etc., which will never become productive.

(2) Potentially Productive Land (where forest growth is not discernable on vertical photographs taken in or before 1950) includes old burns, recent burns, and clear cut areas.

(3) Productive Land supports stands of timber of good growth, of sapling size and upwards.

Table No. 8 shows the percentage of non-productive areas by Forest Divisions.

TABLE No. 8

Percentage of Non-Productive Area

Division	% Non-Productive
Grande Prairie	8%
Slave Lake	31%
Peace River	32%
Lac La Biche	44%
Total Northern Alberta	34%

Not only is there a variation in percentage of non-productive area between the different forestry divisions, but there is likewise variation in the amount of timber which grows per acre on presently productive land. In general, the further north the less is the volume per acre. The area which shows the most timber per presently productive acre is Slave Lake. If this is taken to be 100%, the following table shows how the growth of timber compares in the other areas:

TABLE No. 9

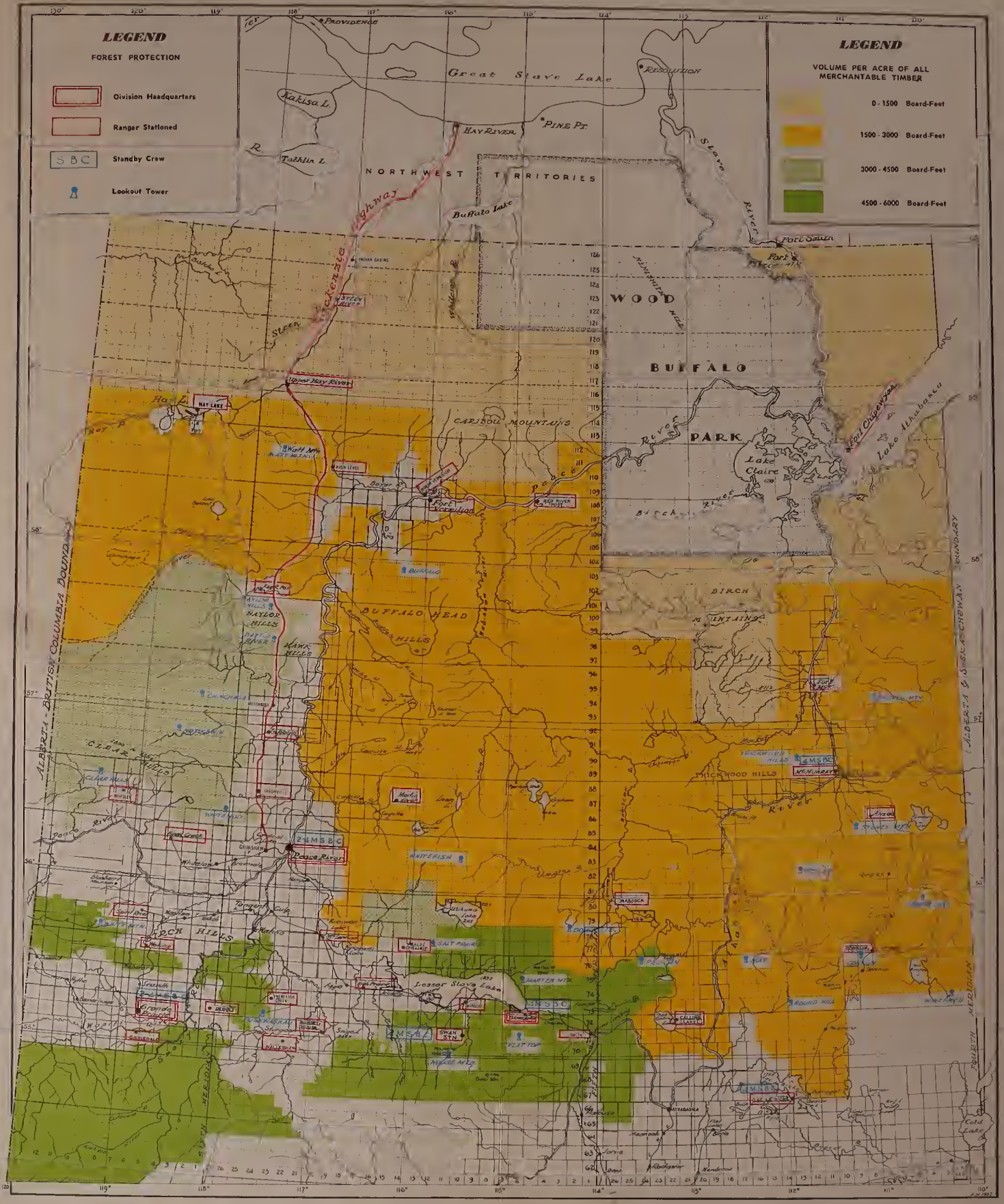
Comparison of Volume of Timber Per Acre

Divisions and Areas	Percent Productive
Slave Lake	
Areas 1, 2, 3	100%
Grande Prairie	
Area 1	86%
Lac La Biche	
Area 1	79%
Peace River	
Areas 1, 2, 3	67%
Peace River	
Areas 4, 5, 6, 7, 8, 9, 10	52%
Lac La Biche	
Areas 2, 3, 4, 5	30%

In general, the stands of timber are best in the southwest and in the southern parts of the area. There is less productive land as one goes north and east, and the amount of timber per productive acre decreases towards the north and the east as well. This variation is not surprising, as it follows the same general pattern as the suitability of the soil for agriculture, which is shown in Tables 3 and 4 in this section. The growth of timber depends upon the soil, the precipitation and the length of the growing season, and one would expect it to get poorer in the rockier parts of the country and poorer as one goes north, except that distance north is sometimes deceiving, because to some degree the shorter growing season is offset by the longer hours of daylight.

By 1956 Alberta had completed its Forest Inventory. In 1951 the Province entered into a Federal-Provincial forestry agreement by which the Federal Government agreed to pay 50%, or about three-quarters of a million dollars, of the cost of making an inventory of the forest not previously inventoried. On the basis of this inventory, Table No. 10 was prepared, showing the total volume of timber in Northern Alberta as of November, 1957.

By itself, the actual amount of standing timber is not too intelligible until it is worked out on a conservation basis, so as to show the amount of timber that should be allowed to be cut each year if we are to cut these forests in perpetuity. This amount of timber is called the "Allowable Cut" and Table No. 11 shows the Allowable Cut for Northern Alberta. The Allowable Cut, of course, depends



FOREST DENSITY AND FIRE PROTECTION

Scale in Miles

10 0 10 20 30 40

greatly on the amount of fire losses to be expected in the future. If the losses are high, the amount of timber which may be cut will be low. Table No. 11 is based on the fire losses for the last 17 years. We expect the losses to be lower than this in the future, so that we may hope to be able to cut more timber than that shown in the table. The table shows the Allowable Cut of sawlogs and of pulpwood by areas on the basis that both sawlogs and pulpwood can be cut in the same areas at the same time. For instance in Area 1 of the Grande Prairie division, 74 million board feet of lumber could be cut a year, while at the same time, 1,176 thousand cords of pulpwood could be cut.

TABLE No. 10

Total Volume of Timber in Northern Alberta*

November, 1957

	CORDS (Thousands)						BOARD FEET (Millions)		
Forestry Division	White Spruce 4"-11" DBH	Black Spruce	Balsam Fir	Pine 4"-10" DBH	Poplar	Total	White Spruce 12"+DBH	Pine 11"+DBH	Total
Grande Prairie	8,358	738	1,647	14,472	21,351	46,566	2,425	1,738	4,163
Slave Lake	17,746	3,123	2,239	8,505	64,026	95,639	5,530	1,666	7,196
Peace River	24,566	6,643	1,277	10,400	75,967	118,853	8,254	1,694	9,948
Lac La Biche	11,176	4,434	1,131	15,829	39,213	71,783	3,686	1,966	5,652
TOTALS	61,846	14,938	6,294	49,206	200,557	332,841	19,895	7,064	26,959

*Excluding Wood Buffalo Park and Air Weapons Range.

TABLE No. 11

Annual Allowable Cut Based on 1941 - 57 Average Annual Rate of Burn

	SAWLOG (Million Board Feet)			PULPWOOD ((Thousand Cords)				
Forestry Division	White Spruce 12"+DBH	Pine 11"+DBH	Total	White Spruce 4"-11" DBH	Pine 4"-10" DBH	Other Coniferous	Poplar	Total
Grande Prairie								
Area 1	39	35	74	168	382	62	564	1,176
Slave Lake								
Area 1	34	19	53	153	154	58	653	1,018
Area 2	22	7	29	102	38	28	612	780
Total	56	26	82	255	192	86	1,265	1,798
Peace River								
Area 1	29	21	50	119	173	58	511	861
Area 2	—	—	—	3	—	1	48	52
Area 3	7	1	8	24	7	3	183	217
Area 4	16	3	19	57	18	9	215	299
Area 5	9	1	10	33	16	7	99	155
Area 6	11	1	12	39	4	8	135	186
Area 7	8	—	8	30	2	6	94	132
Area 8	20	4	24	80	36	22	346	484
Area 9	1	1	2	7	3	2	43	55
Total	101	32	133	392	259	116	1,674	2,441
Lac La Biche								
Area 1	36	16	52	145	142	76	736	1,099
Area 2	5	2	7	24	17	6	69	116
Area 3	9	8	17	29	85	6	123	243
Area 4	2	6	8	4	111	1	16	132
Area 5	—	7	7	4	61	2	30	97
Total	52	39	91	206	416	91	974	1,687
Grand Total	248	132	380	1,021	1,249	355	4,477	7,102

Table No. 12 summarizes the quantities of lumber and cord wood it should be possible to cut annually from here on in Northern Alberta. If the average rate of burn is reduced, these quantities will be increased accordingly.

TABLE No. 12

Annual Allowable Cut
(Summary of Table No. 11)

LUMBER		
White Spruce	248	million board feet
Pine	132	" " "
Total	380	" " "
PULPWOOD AND OTHER		
White Spruce	1,021	thousand cords
Pine	1,249	" "
Other Coniferous	355	" "
Poplar	4,477	" "
Total	7,102	" "

These figures should be compared to the 400 million board feet of all timber cut in Alberta in 1956 and the 190 million board feet cut in Northern Alberta. At present the amount of pulpwood cut in Northern Alberta is negligible.

This table indicates that much more timber could be cut in Northern Alberta each year than is now being taken out. Various factors enter the picture to complicate it. Some of these are present inaccessibility of some of the timber, mature stands that should be cut without regard to annual allowable cut, overcutting in some areas, etc. Each of these factors is being carefully considered by the Department of Lands and Forests, and successive steps are being taken toward the goal of achieving an annual cut in conformity with the best conservation practices.

At the present time white spruce is being cut too rapidly in some areas. Obviously, the lumber industry cannot continue to over-cut white spruce timber without sooner or later exhausting the supply in the management units where this condition exists. Since white spruce is valuable, it is highly desirable that this species always constitutes a substantial part of the lumber production. The answer then is to shift the burden to pine up to the point of its capacity to produce saw-timber size material.

The time is long past when timber could safely be viewed as a reserve crop. The timber crop must be forested in trees of a size and quality suitable for commercial use, and since 96 or more per cent of all timber products from Northern Alberta are cut from trees of saw-timber size, it is important to have the timber resource divided in terms of saw-timber and timber of a size too small for this product. To maintain an annual crop of merchantable timber, there must be a succession of age classes from seedlings up to full-grown timber, so that as merchantable trees are cut, each year new ones will be ready to take their places. If the age classes were properly balanced and the amount removed each year were equal to the annual growth, the volume of standing timber would remain constant. It could then be viewed as growing stock or forest capital on which the annual crop accrues as interest. In this light, until the productive capacity of the land is reached, the more growing stock or standing timber there is, the greater the crop available for cutting each year.

Northern Alberta is blessed with an abundance of timber. Between Latitudes 55° and 60° Alberta grows far more and far better timber than any of the provinces in the same latitude to the east of it. Its timber, of course, is excelled in quantity, size and regeneration rate by that in northern British Columbia. This has a bearing on the problem of marketing Alberta's timber, but that will be discussed under the section devoted to marketing.

TRAPPING

The areas available for trapping are shown on Map No. 6 in Section 2, which is divided into zones of full and partial utilization. In general, only about 75% of some 1,800 trap-lines are registered at the present time and the number is declining due mainly to the present depressed state of the market.

The major fur-bearers, in order of their present contribution to the fur market, are listed below:

1. Muskrat
2. Squirrel
3. Beaver
4. Weasel
5. Mink
6. Lynx

While these animals are natural resources of Northern Alberta, their economic value is declining rapidly. By 1987 trapping is expected to make a very small contribution to the economy of the area.

COMMERCIAL FISHING

Lakes of commercial fishing potential are to be found in the areas marked A, B_1 and B_2 on Map No. 7 in Section 2, though only Lesser Slave Lake (Zone A) is being fully utilized at the present time. Commercially utilized fish in Zone A are listed below in the order of their importance to the fisheries market:

1. Whitefish
2. Pickerel
3. Pike
4. Perch
5. Tullibee
6. Trout
7. Ling
8. Sucker

To this list can be added Goldeye, which is caught in Lake Athabasca (Zone B_2).

Table No. 13 shows the actual yield in the various zones, compared to the potential yield.

From this table it can be seen that Zone A includes most of the commercial fishing area, and that if the full potential of the lakes in Northern Alberta was utilized, that area could sustain an annual production of 14,000,000 lbs.—more than double the amount produced at present.

TABLE No. 13
Actual and Potential Yield

Zone	Lake	Annual Yield (Lbs.) Actual	Potential
A	Lesser Slave Lake (460 square miles)	5,000,000	5,000,000
	30 lakes partially exploited (470 square miles)	1,000,000	6,000,000
	45 lakes not exploited	------	
B_1	Lake Bistcho	23,500[1]	350,000
	Others	------	250,000
B_2	Lake Athabasca (in Alberta) (900 square miles)	130,000[2]	2,000,000
	Others	------	400,000
		6,153,500	14,000,000

1 Average of 7 years since 1946.
2 Average of 3 years since 1946.

MINERALS
(Other than Petroleum Products)

Except for petroleum products, Northern Alberta is not blessed with an over-abundance of commercial minerals. There are, nevertheless, several valuable deposits of minerals which, due to their remoteness from transportation or from markets, have not been developed. It is the purpose of this report to present all available knowledge of these deposits and to make some suggestions about the possibilities of utilizing what minerals there are and of seeking to discover others.

Northern Alberta is made up of three geologic divisions, the Precambrian, the Paleozoic and the Cretaceous. These areas are shown on Map No. 11.

Precambrian: The Precambrian area is confined to the extreme northeast corner of the Province and occupies some 10,000 square miles or some 8% of Northern Alberta. Judging by the minerals found in the Precambrian area in the vicinity of Uranium City and Great Slave Lake one might expect to find uranium, copper, gold and other precious and base metals in this area.

Paleozoic: The Paleozoic area occupies the region west of the Precambrian and covers 15,000 square miles of nearly 12% of Northern Alberta. The Pine Point deposit of lead-zinc occurs in this geologic structure but, as it happens, it lies beyond the north border of the Province. Large tonnages of ore have been outlined at Pine Point and with cheaper transportation facilities this should turn into one of the largest producing lead-zinc mines on the Continent. In the Paleozoic area in Alberta geologic conditions are similar to those at Pine Point and, therefore, there are hopes that more of the same type of ore will be found in Alberta. During Paleozoic time the land surface of Alberta subsided and was invaded by marine waters. Limestone, shales, dolomites, salt and gypsum were deposited from their marine waters. In some places in this sea marine life developed reefs—much the same as the coral reefs now found in the South Seas. These reefs are well known in Alberta for their high oil potential but in some areas such as at Pine Point the reefs have been impregnated with metallic ores. Alberta's Paleozoic, however, because of scarcity of outcrop, is exceedingly difficult to prospect by ordinary methods. Metallic ores will likely be found in it either by geo-chemical prospecting or by developing some geo-physical method which will detect this type of mineralization.

Cretaceous: The Cretaceous area occupies the remaining 80% of Northern Alberta, or some 100,000 square miles. With the exception of iron, one would not expect to find metallic minerals in this vast area. This is the old sedimentary basin which will be discussed more fully when dealing with gas and oil. These sediments were deposited in the Cretaceous Seas and consist of sandstones, shales, bentonite beds and coal. The bentonite beds are formed of altered volcanic ash and mark eras of intense volcanic activity in Central British Columbia. The coal seams mark periods when Alberta was raised above sea level and was covered by vast swamps and slow-moving meandering rivers which flowed from west to east. Following this period, the total area of Northern Alberta was covered by the continental glaciers which deposited on it a layer of glacial debris consisting of stones, gravels, sands and the clay which broke down into the arable lands of today.

The thickness of the sediments varied from nothing in the East to 12,000 feet in parts of the West, as will be seen by reference to Map No. 13 shown under the portion of the report devoted to Oil. These thick sediments prevent ordinary prospectors from searching for minerals in the usual way. With the development of geo-physical methods of prospecting, however, we may find eyes that can see to the bed rock below.

Geo-physical and geo-chemical surveys are a supplement to geological studies. For example, magnetic surveys may trace certain rock formations and therefore help in working out folded or faulted structures. Such surveys may also be used to indicate whether or not a showing extends far enough under a covered area to be of interesting size. Magnetic surveys can be used for ores which contain magnetite or pyrrhotite but not for other ores, while electrical surveys detect sulphide ores. We will deal with this more fully later on.

It may be that in some parts of its Precambrian and Paleozoic areas Alberta may have an experience similar to that of the long-settled Province of New Brunswick, which as recently as 1950 was regarded as not having a chance to become a producer of metals. In 1953, however,

by means of electro-magnetic methods on the ground, in conjunction with airborne magnetic methods, the Brunswick Ore Zone was discovered. This success stimulated further extensive exploration which led to discoveries which are now being mined by various large corporations, including Kennecott Copper Company.

Except for the extreme northeastern corner, Northern Alberta can never become an outstanding metal mining area like British Columbia or Northern Manitoba or Ontario. Because of a much smaller area of Precambrian outcrop, it is not even likely to make anything like the showing that Saskatchewan will make; but in spite of that it is possible that the near future may see a considerable increase in mining activity in the area.

Metallics

There is a strong probability that metallic minerals will be found in the Precambrian and Paleozoic areas. During 1957 the Geology Division of the Research Council of Alberta carried out a detailed geological survey covering about twelve townships in the vicinity of Andrew Lake in the extreme northeastern corner of the Province. This survey was made for the purpose of mapping rock types and structures and of working out the mineralogy of the area. The Geology Division is also preparing structure maps of the whole Precambrian area, that is, the portion of the Province generally north of Lake Athabasca and east of Slave River. It is expected that these maps and reports will be printed early in 1958, and it is hoped to continue these surveys during 1958 and in subsequent years. If the map referred to becomes available before this report is issued a copy will be included.

The following is a quotation from a brief submitted to the Commission by Dr. C. P. Gravenor, Chief Geologist of the Research Council of Alberta.

> "It is the writer's belief that the area of Precambrian rocks north and south of Lake Athabasca is one of the most favorable for mineral prospecting in Alberta. The Precambrian Shield has long been known as the 'Mineral storehouse of Canada'. Such mines as Yellowknife, Eldorado and Flin Flon attest to the fact that many of the metallic mines in Canada are found in the Precambrian rocks which lie near the Paleozoic border. Although this in itself does not assure that economic metallic mineral deposits will be found in northeastern Alberta, nevertheless the possibility exists and hence in the interests of the province should be investigated."

No detailed surveys have been made in the Paleozoic portion of the Province. This area is geologically similar and contiguous to the area in the Northwest Territories which contains Pine Point and of which a geologist has said:

> "Uranium, copper and lead-zinc showings have been found in this area. Three uranium showings have been promising enough to warrant considerable drilling. One copper showing has been drilled and one lead-zinc occurrence has been drilled and partially developed by a shaft and underground workings. Other occurrences of these metals have been found, but have received little development work. None of these deposits so far developed has proven to be economical. However, they indicate that the area as a whole is favorable for uranium, copper and lead-zinc mineralization."

Dr. Gravenor, in his submission to the Commission, makes the following statement:

> "The Paleozoic limestones which are formed in northeastern Alberta belong to the same rock formation which contains the lead-zinc deposits at Pine Point, N.W.T. It is possible, but by no means certain, that similar lead-zinc deposits may exist in the Paleozoic limes of northeastern Alberta. Such lead-zinc deposits are most likely to be found in limes above fault zones in the underlying Precambrian. From the Research Council's preliminary study of the structure of the area north of Lake Athabasca, it is quite likely that major fault systems do pass under the Paleozoic limestones and these areas might be worthy of further investigation."

Nearly all of the Paleozoic area in Alberta is contained within the boundaries of the Wood Buffalo Park which covers some 17,300 square miles, of which about 15,000 are in Alberta. It was set aside by the Dominion Government for the purpose of preserving, in their original habitat, the last remaining wild buffalo herd in the world. At the present time there are over 15,000 in this herd, which appears to be thriving in this area which is possibly the most suitable wild range that could be found for them. The buffalo do not range over the whole of the Wood Buffalo Park, but seem to prefer that portion of it east of the 113th line of West longitude and south of the Northwest Territories boundary. This is possibly due to the type of pasture in that region.

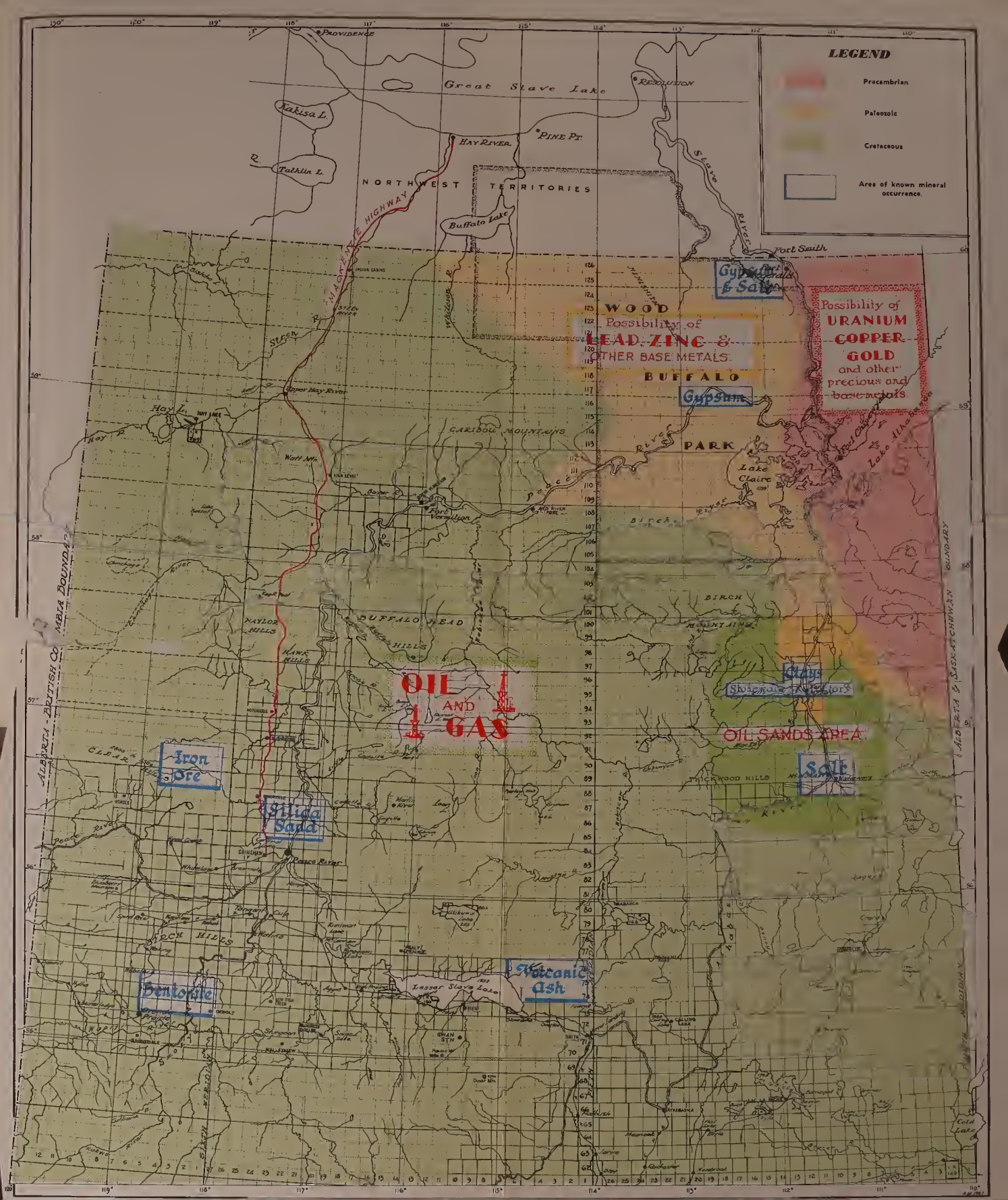
Unfortunately, this is the part of the Park that contains the Paleozoic geological division, and which will probably turn out to contain all of the minerals associated with such a geological area. This area also contains the one known large gypsum deposit in addition to other lesser deposits of gypsum and of salt. It also contains the better forested areas, i.e., those on the flats of the lower Peace River and around Lake Claire.

The Wood Buffalo Park is also the only known remaining nesting ground of the Whooping Crane. Only about thirty of these fine birds are still left in the world. Thus, this Park is the last refuge of two species of wildlife which, without it, would soon become extinct in the wild state.

Iron

There is a variety of opinion about the extent and the quality of the iron ore deposits in the Peace River Country. One opinion is that there are unlimited deposits of high-grade ore in the area. Another is that, while iron ore is there, it is not worth exploiting. The truth lies somewhere between these two extremes, and for this reason it has been felt that this report should set out rather fully all of the available information. The following material is taken from a report made for the Commission by Donald J. Kidd, a geologist with the Research Council of Alberta, and entitled "Mesozoic Iron Showings in the Clear, Saddle and Birch Hills Area, Peace River Region, Alberta". The extracts from this report are shown here in quotation marks, and any interpolations by the Commission are shown without quotation marks.

> "Low-grade iron deposits have been known since 1953 to exist in the Clear Hills area north of Hines Creek railhead in the Peace River Country. They occur in sandstone bands of two different ages (Dunvegan-delta and Badheart) within the Upper Cretaceous sediments of the Mesozoic era. Several other iron showings are known in different parts of the region in the younger of the sandstone bands plus several uncommercial bog-



MINERAL OCCURRENCES

Scale in Miles

10 0 10 20 30 40

iron deposits of Recent age. Their locations are shown on a sketch map (No. 12) which accompanies this report.

"Since March of 1954, a total of fifteen iron-prospecting permits have been issued by the Alberta Department of Mines and Minerals. The areas of the first four permits, each of over 60,000 acres, lie in the Clear Hills area on and around Swift Creek (C-1 on the map). The Mines Branch at Ottawa found that the Swift Creek material could not be concentrated by standard ore-dressing methods (Janes, 1957) and they were allowed to lapse. The Swift Creek area was reserved again in 1956 by another private company under Permit No. 10. Metallurgical testing showed the Swift Creek ores were so low in lime (and high in silica) as to make the cost of fluxing very expensive and the ground was again dropped. Another permit, for bog iron at Bog Creek north of Notikewin River (A-1) was also allowed to lapse. The latest permit issued in this region covers several of the Badheart iron showings northeast and northwest of Hines Creek village. . . ."

"Occurrence in Dunvegan-delta Sandstones: The earliest known showing (C-1) is exposed in a small canyon of Swift Creek on the east side of Clear Hills about 45 miles north of Hines Creek. It straddles the boundary between Townships 90 and 91, Range 5, west of the 6th meridian. It is an oolitic iron brackish-water sandstone deposit of either Doe Creek or Pouce Coupe age (Wall, 1956).

"A study of cores from boreholes put down by private interests in the Swift Creek area (C-1) in 1953 and 1954 indicated that the oolitic iron deposit is at least 3 miles wide across that creek and 13 miles long in the NNW-SSE direction under Kaskapau shales and glacial drift, with a thickness of approximately 20 feet, giving it a possible tonnage of nearly one billion tons. In late 1954, a field party sent by the same private interests discovered the rusty-brownish red outcropping of the oolitic iron sandstone at the same stratigraphic level in the small canyon of Swift Creek. In 1956 this writer found the oolitic iron sandstone to outcrop as a cliffed seam ten to fourteen feet thick, perhaps as much as twenty feet, along both sides of the Swift Creek canyon for an airline distance of nearly three-fourths of a mile. Another outcrop of the same iron sandstone was found half a mile to the north along the west side of the creek. The overburden is less than a hundred feet thick in many places and often is only ten to thirty feet thick, indicating that cheap open-pit mining, perhaps by simple bulldozing, would be possible.

"Except for the three small outcrops of Kaskapau shales just upstream from the Swift Creek iron occurrence, no other outcrops were seen by the writer in the area between Eureka River and Deep Creek (south of Notikiwin River) which area was crossed twice by horseback. Most of the streams have not cut deeply enough into the glacial mantle to carve distinctive valleys of their own and whatever slopes were seen were usually covered with heavy vegetation. Muskeg covers much of the imperfectly-drained Clear Hills plateau despite its fifteen-hundred plus feet height above the main watercourses in the region. Bulldozed seismic lines offer the best means of access into this portion of the Clear Hills area. A Department of Lands and Forests road north from Eureka River hamlet terminates at the new look-out-tower two miles due east of the Swift Creek outcrops.

"A bulk sample of weight 60 pounds, cut by the writer across an height of 12½ feet at a typical section of the oolitic iron sandstone on the west side of the creek gave the following analysis (by Lerch Bros., Hibbing, Minn.):

Fe_2O_3	53.1% (or 37.17% ferric iron)		
SiO_2	20.43	Manganese	0.18
Al_2O_3	5.72	TiO_2	0.04
Ferrous iron	3.51	Carbon	0.99
CaO	2.13	Combined H_2O	8.70
MgO	0.78	Na_2O	0.07
Phosphorus	0.45	K_2O	0.14

This section had just been uncovered by a bulldozing crew cutting a seismic line in the area and showed less of the surface oxidation or enrichment characteristic of the long-exposed surfaces of the same. The channel sampled was about eight inches wide and at least six inches below the surface.

"The Swift Creek iron-bearing material is an aggregate of many small brown oolites averaging almost 0.5 mm. in diameter, loosely consolidated in a matrix of quartz and dark brown mineral. The oolites consist of concentric shells of alternately the dark brown mineral and quartz, and often contain nuclei which are in nearly each case a quartz fragment. The dark brown mineral in both the matrix and the oolites was identified by x-ray diffraction methods as goethite. It is a hydrous ferric oxide, very abundant in nature and often the chief mineral in the large deposits of the Lake Superior region and other major iron deposits of the world. It has often been loosely called 'limonite', or even hematite, in the literature. Microscopic examination shows also the presence of occasional patches of brown siderite in the matrix forming up to 5% by area of the thin sections examined.

"The above section is at the north end of the three-quarter mile long out-crop. A specimen taken by the writer from a portion of the occurrence, almost flush with the surface of the creek, near the south end of the outcrop, returned 36.3% iron. A very oolitic specimen, showing less rust than the average, from the sharp bend in the creek about one-quarter mile below the south end ran 30.9% iron. A specimen of oolitic iron sandstone from an outcrop on the east side of the creek and about 400 feet south of the bulk-sampled section returned 26.3% iron. A specimen from the same outcrop, cut in a chamosite-like bed below the oolitic iron seam at a point three feet from that contact ran 11.0% iron.

"Similar oolitic ironstones of post-Dunvegan age have been observed by oil-company geologists along Peace River for a distance of about 15 miles above Dunvegan Landing in Township 80, Ranges 4 and 5, and Township 81, Range 6 (C-2). They weather 'a bright red' in color and are easily observed from a distance. They are either in the Dunvegan formation or in the Kaskapau shales just above the Dunvegan sandstones, and form bands between one and nine feet thick; two bands of presumably oolitic iron sandstone 1.8 and 3.2 feet thick at one place are separated by 1.9 feet of shale near the Dunvegan ferry.

"The Dunvegan sandstone is said to be correlated with the Pelican sandstone on the Athabasca river about 200 miles to the east though the latter formation is only 35 feet thick on that river. The Dunvegan was estimated

to be 530 feet thick at the Peace River near the town of that name (McLearn, 1918; Rutherford, 1930)). That is, the Dunvegan, like the other Cretaceous rocks, would thin out to the northeast at the rate of about two feet to the mile. Going west from the Clear Hills into northeastern British Columbia the Dunvegan sandstone thickens to 1,200 feet or more, though only a small part of it is stated to be a brackish-water origin. Southwards to the Upper Athabasca valley, the Dunvegan sandstone seems to pass into shales.

"Occurrences in Badheart Sandstones: The chief occurrence of iron in the Badheart sandstone is approximately in sections six and seven of Township 88, Range 6, west of the 6th Meridian (B-1), along the southern edge of the Clear Hills plateau, and 28 miles north-northwest of Hines Creek village. It is in the northwest part of the land covered by Iron-Prospecting Permit No. 14 issued to Premier Steel Company of Edmonton. The 1957 Research Council of Alberta investigation of such showings in the Badheart sandstones had to be postponed until next summer.

"This writer has no information on the grade or dimensions of the Badheart iron sandstone showing near Worsley. If the Worsley iron ore contains more than appreciable amounts of lime, it could be similar in chemical composition to the so-called 'minette' ores of the French and German Lorraine and Luxembourg which supplies most of the European iron, or the British Mesozoic ironstones which supply almost 97% of the iron ores produced in the United Kingdom.

"Two other iron occurrences, presumably in the same Badheart sandstones, have been reported within the area of Permit No. 14. One (B-2) is in the southeast corner of Township 88, Range 8 and the other (B-3) is near the old Hemstock sawmill in Township 86, Range 2, both west of the 6th Meridian, as shown approximately on Map No. 12. Both showings are said to be small.

"The Badheart sandstone is exposed at several points in an area to the south of the Peace River between Smoky and Spirit Rivers (as shown at B-4, B-5, B-6, B-7 and B-8, on Map No. 12). In all the exposures observed it is dark red, between 15 and 25 feet in thickness, and probably small in areal extent (Rutherford, 1930).

"In the Lesser Slave Lake area to the southwest of Peace River Landing, oolitic ironstone was reported to occur 20 feet below the top of the Badheart sandstone in an oilwell at a depth of 1,420 feet (Twp. 71, Range 11, West of the 5th Meridian [B-9], Faust vicinity). (Fuglem, 1956).

"Bog Iron Occurrences: As mentioned above, one of the bog iron showings is at Bog Creek (A-1). It is near the confluence with the Notikewin River in approximately Section 35, Township 92, Range 5, West of the 6th Meridian.

"Another bog-iron occurrence is on the south bank of Hitchkiss River in the Northwest corner of Township 94, Range 3, West of the 6th Meridian (A-2).

"In both occurrences the presence of oolitic iron has been reported but that has yet to be verified.

"Other bog-iron occurrences have been reported by hunters and bushmen in the Clear Hills plateau.

"Under present market conditions, the importance of bog-iron deposits is generally very minor."

It will be seen from this report that, while very little exploration has taken place in northwestern Alberta, it appears that relatively low-grade iron ore occurs at several places north of Hines Creek and Worsley and west of Manning. Some leases were taken out at various places, but most of these were allowed to lapse. The most favorable deposit seems to be that covered by Iron-Prospecting Permit No. 14 issued to Premier Steel Ltd., and is in the southern edge of the Clear Hills some twenty-eight miles northwest of Hines Creek. Only limited drilling operations have been carried out by that company, but these indicate ore reserves of from one-half to one billion tons. The ore grades around 33% iron. For purposes of comparison, the Steeprock iron ore and the Mesabo ore grades 54% iron. In recent years, however, Mesabi taconites containing around 29% iron have been worked. Therefore, on the basis of the total amount of iron in the ore, that from Hines Creek compares favorably with the Mesabi taconites even though the composition of the two ores is not the same. The Hines Creek iron ore deposit would be relatively easy to work by a surface strip mining operation.

At the present time, studies are being made in an attempt to solve a difficult metallurgical problem, because Hines Creek ore is very high in silica which is difficult to separate from the iron. From investigations to date Premier Steel Mills Limited states that it can make a concentrate suitable for blast furnace operation and that it is feasible to smelt this ore by means of the Krupp-Wren process. The economics of this process are not as favorable, however, as those of blast furnace operation. At the present time it appears that a blast furnace operation would be economical once markets become sufficient to use the output of such a blast furnace. These markets should be available within the next ten or fifteen years.

Undoubtedly the iron occurrences mentioned in this report and shown on the map are not the only iron ore deposits in northwestern Alberta. The known deposits were discovered incidental to exploring and drilling for oil. If drilling for oil continues at the rate forecast in this report, much more information about other occurrences will unquestionably be gained and other iron ore deposits found. This iron ore which is still undiscovered, when combined with the resources of thermal energy in the northwestern part of Alberta, may yet turn that area into a new industrial region. That time, however, is likely to be beyond the period covered by this report.

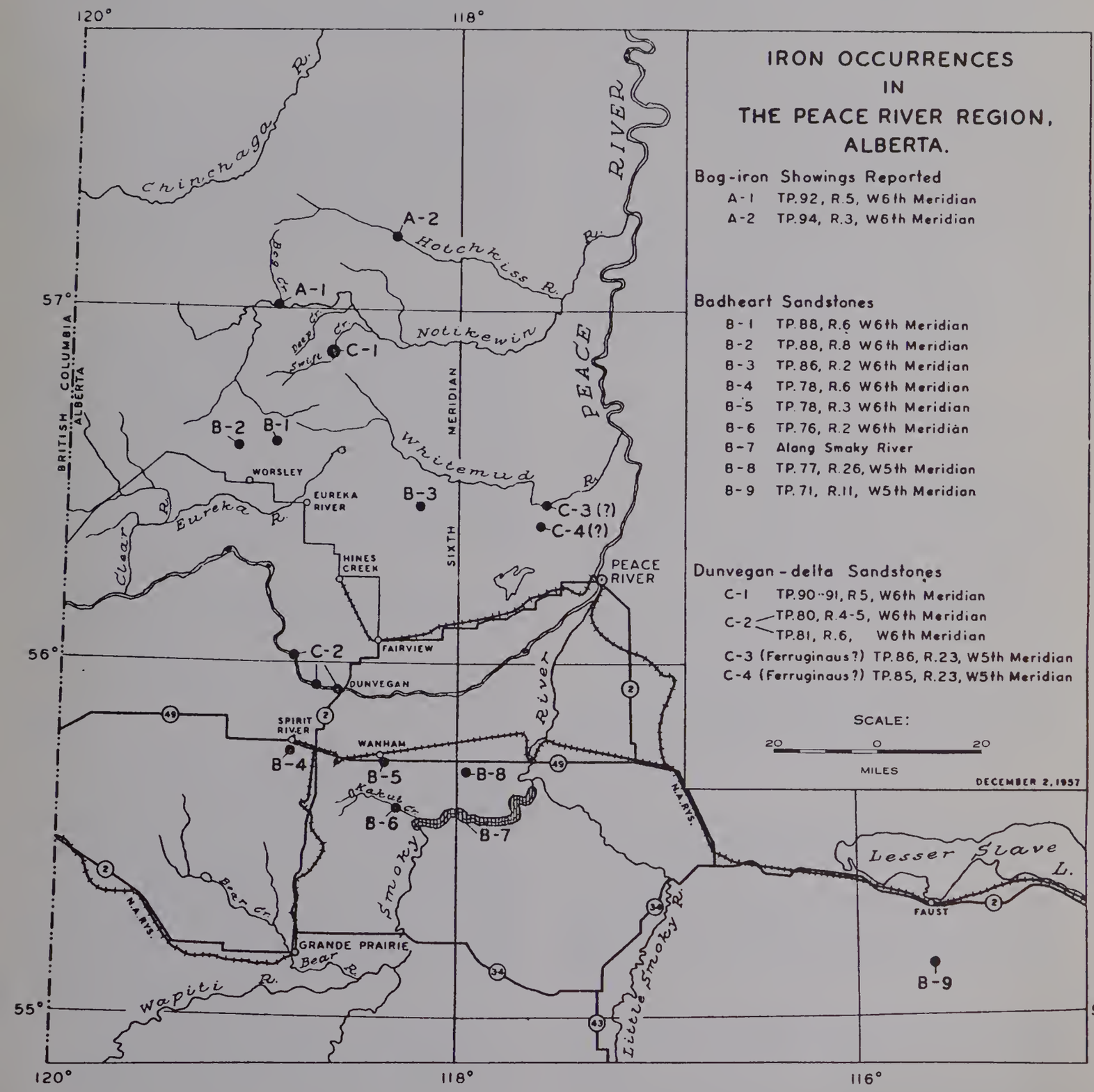
INDUSTRIAL MINERALS

Volcanic Ash

One reservation for volcanic ash has been taken out by a private individual east of Lesser Slave Lake in Ranges 5 and 6, West of the 5th Meridian. This reservation is still in the exploratory state. Volcanic ash would be used as a cement additive. The samples from this area appear good, but as yet there is no estimate of the amount available.

Silica Sand

The extensive deposit of high grade silica sand, which exists some seven miles downstream from Peace



IRON OCCURRENCES IN THE PEACE RIVER REGION, ALBERTA.

Bog-iron Showings Reported

- A-1 TP.92, R.5, W6th Meridian
- A-2 TP.94, R.3, W6th Meridian

Badheart Sandstones

- B-1 TP.88, R.6 W6th Meridian
- B-2 TP.88, R.8 W6th Meridian
- B-3 TP.86, R.2 W6th Meridian
- B-4 TP.78, R.6 W6th Meridian
- B-5 TP.78, R.3 W6th Meridian
- B-6 TP.76, R.2 W6th Meridian
- B-7 Along Smaky River
- B-8 TP.77, R.26, W5th Meridian
- B-9 TP.71, R.11, W5th Meridian

Dunvegan-delta Sandstones

- C-1 TP.90-91, R5, W6th Meridian
- C-2 TP.80, R.4-5, W6th Meridian
- C-2 TP.81, R.6, W6th Meridian
- C-3 (Ferruginaus?) TP.86, R.23, W5th Meridian
- C-4 (Ferruginaus?) TP.85, R.23, W5th Meridian

SCALE:

20 0 20

MILES

DECEMBER 2, 1957

River town, will undoubtedly be worked more intensively in the near future and could become the major source of glass for Alberta. Chemical analysis of the sands show that they consist of about 98.5% SiO_2, between 0.1% and 0.2% Fe_2O_3, and minor amounts of titanium, calcium, magnesium, sodium, potassium and aluminium. According to recent information, the iron content is less than that reported above and the sand is usable as an optical sand—the highest grade of natural silica sand. More details of the deposit may be obtained from mimeographed Circular No. 7 of the Research Council of Alberta, entitled "Geology of the Peace River Glass Sand Deposits" by M. B. B. Crockford.

Some thought has been given to the tremendous quantities of high grade silica sand which will be obtained by a by-product of the Athabasca Oil Sands when oil is produced from them. This sand is believed to be of very high quality, although there may be some question of how completely the carbon will be removed from the sand. Minute quantities of carbon might render the sand of low value for glass making.

Salt

Common salt, or sodium chloride, occurs at depths varying from a few hundred to a few thousand feet over a large part of eastern Alberta. The southern limit is probably in the vicinity of Princess (Township 20—practically straight east of Calgary), and the northern limit is at McMurray or beyond. Its western limit is a few miles east of of Edmonton and it extends beyond Alberta's eastern border. Thus, the area in which salt beds may be encountered in drilling is approximately four hundred miles long by 125 miles wide. This may not all be one continuous bed of salt, but in general, salt may be found in all of that vast area.

Further information may be obtained from mimeographed Circular No. 6 of the Research Council of Alberta, entitled "Occurrences of Common Salt in Alberta", by M. B. B. Crockford.

Dr. C. P. Gravenor, in his report to the Commission, discussed the occurrence of salt in Northern Alberta as follows:

> "In the McMurray area early records show that two beds of salt, each approximately 100 feet thick, were encountered in a well drilled in the N.E. ¼ of Sec. 17, Twp. 89, Rge. 9, W. of 4th. Approximately 2 miles east and 1½ miles south of this well in the S.E. ¼ of Sec. 10, Twp. 89, Rge. 9, West 4th, a group of four wells was drilled by Industrial Minerals Ltd. Two of these wells drilled through a single bed of salt about 200 feet thick and the other two only partially penetrated the salt bed. None of the wells was drilled through to the Precambrian so the possibility of the existence of other salt beds at this point still exists.
>
> "Salt springs occur about 26 miles north of McMurray at La Saline and also along the Salt River."

Salt River is close to Fort Smith, and for a few miles forms the northeast boundary of the Wood Buffalo Park.

While, for some years a salt plant was in operation at Waterways and during that time produced much of the salt used in Alberta, it was closed down when the salt plant was built at Lindberg, Alberta, because due to transportation costs, salt from Waterways could not compete with the same product so much nearer the market.

The McMurray area (Athabasca Oil Sands area) promises to be a tremendous source of thermal energy. The conjunction of salt, petroleum products and 1,600,000 horsepower of hydro power available on the Athabasca River close to that area is a combination that should some day attract capital to turn this into a great industrial region.

Similarly, the juxtaposition of salt at Salt River and the one million horsepower of hydro potential in the Slave River near Fort Smith, makes that an area worth watching.

So far as anyone knows, there are no outcrops of salt in Northern Alberta. More extensive exploration may disclose the existence of such outcrops. If they should exist in Northeastern Alberta, and should be close to transportation (as some day they might well be), rock salt could be mined and could have a market that might be quite attractive. As an alternative to this, it is possible that it may be worthwhile actually to mine salt somewhere in the North where the thickness of seam is great enough and the depth of overburden shallow enough. In one well at Waterways a bed of salt 199 feet thick was encountered, having an overburden of 694 feet. It is possible that the same thickness of bed might be discovered in some other region as yet unexplored which has considerably less overburden.

Potash

The following quotation is taken from Alberta's submission to the Gordon Commission:

> "Extensive deposits of potash have been discovered and are being developed in Saskatchewan. In the drilling for oil through salt beds in Alberta only minor amounts of potash were encountered. The potash could have been removed by solution after deposition, or the centre of the basin may have been shifted while the potash was still in a solution state. The latter explanation has interesting possibilities for, if true, the main body of potash still awaits discovery."

This statement throws out an interesting challenge to the people of Alberta. If such a deposit of potash were discovered in Northern Alberta the development of new and important industry would follow quickly.

Gypsum

There are several large deposits of gypsum in northeastern Alberta. According to Dr. C. P. Gravenor three of these are of particular interest.

Peace River: Gypsum outcrops along the Peace River for a distance of 15 miles in Twp. 116, Rges. 14 and 15 and Twp. 117, Rges. 15 and 16. It is estimated that there is more than 200 million tons of high quality gypsum in this deposit.

Dr. Donald J. Kidd, of the Research Council of Alberta, submitted a report on gypsum to the Commission and in this, in dealing with the deposit on the Peace River, he says:

> "Camsell estimates that over 200,000,000 tons of gypsum are present in the deposit on the basis of a total thickness of 10 to 15 feet of gypsum. Cameron (1930) measured 10 sections which indicated a minimum thickness for the gypsum of 25 to 30 feet, from which he concluded that Camsell's estimate of the tonnage in the deposit was too low.

"Camsell (1916) describes the gypsum as follows:

'The gypsum is usually white and massive. In places it is earthy and thin bedded, or holds narrow bands of dolomitic limestone. Selenite is rare, but thin beds of satin-spar are common. Anhydrite is occasionally present in rounded nodules or in thin beds. Overlying the gypsum is a fractured and broken bed of limestone, but since the structure of the beds is undulating, the gypsum is frequently brought up to the top of the cliff and has no cover except the drift, . . .'

"Camsell (1916) ascribed the undulatory nature of the gypsum to the fact that the gypsum was formed by the hydration of primary anhydrite with a consequent volume increase."

"Cameron (1930) collected channel samples of the gypsum from 10 sections along the 15 miles of exposures along the Peace River. Chemical analyses of these samples are given in Table No. 14. Cameron stated that some surface silt was unavoidably included in his samples, therefore the SiO_2 and Al_2O_3 contents given in the analyses are probably too high."

TABLE No. 14

Chemical Analysis of Gypsum from Peace River Deposit

(Cameron, 1930)

Location Number	Thickness of Bed	SiO_2	Fe_2O_3, Al_2O_3	MgO	CaO	SO_3	Ignition Loss	Gypsum Calc. from SO_3
1	15.5	2.54	0.92	2.02	31.53	42.10	20.74	90.34
1	3.3	1.10	0.74	0.30	32.56	45.30	19.95	97.21
1	3.3	1.76	0.96	4.54	32.19	34.83	25.59	74.74
1	10.0	0.82	----	----	32.63	45.60	21.00	97.85
2	17.5	1.42	----	0.20	31.82	45.00	21.37	96.57
2	8.0	4.18	1.10	0.30	31.39	43.10	19.98	92.49
3	5.5	1.34	----	0.25	31.64	45.20	21.43	96.99
3	11.0	2.04	--	0.33	31.80	44.32	21.34	95.11
3	11.0	1.46	----	0.31	31.80	44.70	21.74	95.93
4	12.0	0.58	----	0.20	32.11	46.00	20.50	98.71
4	10.4	1.48	----	0.20	32.00	45.00	21.37	96.57
5	18.0	6.28	----	0.76	30.97	41.09	20.80	88.18
5	16.5	1.04	----	0.22	32.18	46.02	20.54	98.95
6	25.0	0.64	---	0.22	32.18	45.91	21.02	97.52
7	18.0	1.42	----	0.10	32.50	45.68	20.24	98.02
9	18.0	0.88	----	0.30	32.35	45.60	20.57	97.85
10	18.0	5.02	0.60	0.40	31.24	42.50	20.15	91.20

Waterways: A number of wells drilled in the vicinity of Waterways encountered gypsum while drilling for salt. Varying amounts of anhydrite are associated with the gypsum. If gypsum is required from this part of Alberta, it would be quite feasible to carry out a shallow drilling program to prove up the reserves of gypsum.

Dealing with gypsum in the Waterways area, Dr. Kidd states that:

"The most promising bed, occurring between elevations of 285 and 200 feet above sea level in the Alberta government salt well No. 2 is described by Allan as 'mottled gypsum' between 286 and 237 feet above sea level and 'massive white gypsum' between 237 and 200 feet above sea level.

"A particularly noticeable feature of the gypsum is its tendency to grade laterally into anhydrite, a feature which is shown clearly on the logs of Industrial Minerals Nos. 1 and 3 wells which were drilled only 560 feet apart. In general, there appears to be an increase in the amount of gypsum from the westernmost well to the easternmost coincident with the decreasing depth of the gypsum. Allan (1922) has shown that the gypsum is secondary, i.e. was produced by hydration of anhydrite, so one would expect the proportion of gypsum to increase with a decrease in depth. On this basis, the chances of finding pure gypsum should increase going east or northeast towards the theoretical outcrop belt of the gypsum. The general decrease in the total thickness of evaporites passing from west to east suggests that one may be approaching the edge of the evaporate basin, but this apparent thinning may be due simply to removal of salt from the section by solution."

"From the economic point of view, the location of the gypsum deposit on the (existing) railway would be very desirable. From a combined economic and geological point of view, the best location for finding a mineable deposit of gypsum would be in the vicinity of the mouth of the Christina River. A shallow test well in this area would stand a good chance of finding a mineable bed of gypsum of reasonable purity at a moderate depth."

Salt River: According to Dr. Kidd:

"Camsell (1916) reports that about 50 feet of thin bedded gypsum with occasional thin interbeds of anhydrite and dolomite is exposed at the foot of an escarpment 'about 4 miles south of the brine springs at the forks of Salt River'. North of this locality, the gypsum appears to decrease in thickness to about 20 feet in an escarpment on the Salt River about 8 miles southwest of Fitzgerald. The surface on top of this escarpment is pitted with sink holes for a considerable distance northwards."

"Cameron (1922) describes gypsum occurrences in an area north of the Alberta boundary and assigns a Silurian age to them on rather scanty fossil evidence. It is more likely that the Salt River and Peace River deposits are correlative with the Middle Devonian Elk Point evaporites of central Alberta, especially since Camsell (1916) collected Middle Devonian fossils from the limestone immediately overlying the gypsum north of Fort Smith and on Peace River."

Of the three gypsum deposits mentioned above, the deposit on Peace River appears to be the most promising. Its market prospects will be discussed later. Unfortunately, the Peace River and the Salt River deposits are within the boundaries of the Wood Buffalo Park. If a railway were to be built from McMurray to Pine Point it would cross the Peace River right beside the large deposit of gypsum. If, then, permission could be obtained to mine this deposit within the Wood Buffalo Park the material would have a ready market in Alberta because it would be closer than Gypsumville, Manitoba, from which most of Alberta's present supply comes. It has been estimated that some 50,000 tons per year would be shipped to market.

Clay

The following description of clay deposits is taken from a report made to the Commission by Dr. C. P. Gravenor:

"Clays which would be suitable for stoneware and semi-fireclay purposes have been reported along the Athabasca River between Bitumount and Waterways. In general, these clays are underlain by the Devonian limestones and are overlain by the McMurray oil sands. Field and laboratory examination of the clays has been made by Hume, G. S. (1923, Clay deposits of Athabasca River; Geol. Surv. Canada Summ. Rept. pt. B, p. 16), and by Ells, S. C. (1915, Notes on clay deposits near McMurray, Alberta; Canada Mines Branch; publ. No. 336, Bull. No. 10).

"No whiteware or high refractory clays have been found in Alberta to date but from present knowledge of our clay resources, the Athabasca River District is one of the best prospecting areas in the province for high quality clays."

Further information on clays in Alberta is contained in "Preliminary Report on the Ceramic Importance of Clay and Shale Deposits of Alberta" by M. B. B. Crockford, of the Research Council of Alberta.

Bentonite

While some studies have been made of bentonite in Alberta and some leases were taken out in the vicinity of Grande Prairie, no deposit worth developing has yet been located. Bentonite occurrences are discussed in Report No. 71 of the Research Council of Alberta entitled "Bentonite in Alberta" by P. J. S. Byrne.

Sulphur

Generally speaking, sulphur in Alberta is produced as a constituent of oil and gas. Quantities of it are now being extracted at Pincher Creek, Jumping Pound and Fort Saskatchewan, and in a similar manner at the new plant at Taylor, B.C. If there were an increased demand for it, more would be obtained at these plants and at other suitable locations throughout Alberta.

One area in Northern Alberta which holds out such possibilities is that of the Athabasca Oil Sands.

S. M. Blair (1950), in describing the sulphur content of the Athabasca Oil Sands, reports that:

"The bitumen contains 5% sulphur. The square mile studied contains 1,500,000 tons of sulphur. The process used will recover 60% of the original amount at a cost of about $8.50 per ton, starting with hydrogen sulphide. The elemental sulphur recovered (140 tons per day) from a 20,000-barrel per day bitumen plant corresponds to the total Western Canadian sulphur market."

"It is readily seen that there are enormous quantities of sulphur available from the McMurray oils."

Structural Materials

Sand and gravel of glacial origin are widely dispersed over Northern Alberta. Although the distribution of these is not sufficiently universal to prevent local shortages, the quantity available is only limited by accessibility.

ENERGY RESOURCES

The rich energy resources of Northern Alberta hold considerable promise of being the key which will unlock its other treasures. With oil and gas liberally sprinkled over its western half, extensive hydro power in its eastern half, and, over and above these, the oil in the Athabasca Oil Sands, Northern Alberta is in an enviable position from the standpoint of energy. The folowing is a very brief summary of the quantities of this energy:

1.	OIL:	1.4 billion barrels of virgin economically recoverable oil as of 1980.
2.	GAS:	9 trillion cubic feet of virgin economically recoverable gas as of 1980.
3.	ATHABASCA OIL SANDS:	300 billion barrels of oil.
4.	COAL:	Limited quantity only.
5.	HYDRO POWER:	2,715,000 H.P. of undeveloped power, which at a load factor of 50% would yield some 9 billion K.W.H. per year.
6.	THERMAL POWER:	Very large amounts which would be derived from items 1, 2 and 3 above.

Oil

All of the material given below is taken from the report prepared for the Commission by the Oil and Gas Conservation Board. Extracts from the Conservation Board's report are given here in quotation marks, and any interpolations made by this Commission are shown without quotation marks.

The annual production of oil in Northern Alberta is expected to increase over the years from 2,566,000 barrels

in 1956 to 62,000,000 barrels in 1980. The virgin economically recoverable oil is estimated to be approximately 1.4 billion barrels as of 1980.

"Description of the Sedimentary Basin: The sedimentary deposits of Northern Alberta thicken in a southwestward and westward direction from the outcrop of the Precambrian Shield in northeastern Alberta to a thickness exceeding 12,000 feet at the British Columbia boundary.

"The strata dip gently in a westward to southwestward direction except where localized structural anomalies distort the regional configuration. The narrow and highly distorted foothills belt of Alberta is not contained in the area under discussion.

"A large geological feature known as the 'Peace River Arch' has affected sedimentation over much of the southwest quarter of the area under consideration. This feature was a land mass when the areas surrounding it were flooded by ancient seas. The sediments composing the scattered 'granite wash' oil reservoirs were derived from this feature. The Peace River arch may also have influenced reef growth within certain Devonian formations."

We are fortunate that this sedimentary basin, which is not likely to produce much in the way of metallic minerals, holds out the prospect of being a reservoir of gas and oil.

Estimate of the Ultimate Reserve Potential of Northern Alberta: The Oil and Gas Conservation Board estimated the reserves in Northern Alberta by two approaches:

1. By means of volume of sediments.
2. By means of the record of success of wildcat wells and of the area of the prospective oil and gas lands.

The Conservation Board used the second and more conservative one in its tables:

"A second approach based on the record of success of wildcat wells and the area of prospective oil and gas lands in the area leads to a figure as of 1980, of approximately 1.4 billion barrels of virgin economically recoverable oil. The details of this approach are presented in Table No. 15.

"The second approach is based upon the fact that there are some 100,000 square miles of prospective oil and gas lands in Northern Alberta and on the following three assumptions:

(a) Any large area of prospective oil and gas lands can be reasonably explored with a wildcat drilling density of one well per ten square miles. From this it could follow that approximately 10,000 wildcat wells would effectively explore the 100,000 square miles of lands.

(b) Virgin recoverable reserves of approximately 400,000 barrels may be expected, on the average, from the drilling of one wildcat well.

(c) The incentive for exploration and development in Northern Alberta will result in the continued drilling of some 100 to 150 wildcat wells each year or some 3,500 wildcat wells by 1980. On this basis the prospective oil and gas lands would be about 35% developed by 1980. This compares with an estimated development of around 75% for Alberta.

"The advantage of the second approach is that it yields figures on the development of virgin recoverable reserves at a rate that is consistent with the geological and physical nature of the area. These figures are presented in Table No. 15 for the years 1958, 1960, 1965, 1970, 1975 and 1980. The estimates are believed to be realistic.

TABLE No. 15

Estimated Proven Recoverable Reserves and Production of Northern Alberta Oil *

(Volumes in Thousands of Barrels)

Year	Year-End Remaining Recoverable Reserves	Annual Production	Cumulative Production	Virgin Recoverable Reserves	Life-Index** Years	Cumulative Wildcat Wells Drilled	Average Discovery Per Wildcat Well Drilled
1949	342	6	6	348	57.0	41	8
1950	518	34	40	558	15.2	70	8
1951	554	20	60	614	27.7	120	5
1952	15,650	24	84	15,734	652.0	178	88
1953	115,261	59	143	115,404	1,953.5	212	544
1954	116,976	163	306	117,282	717.6	240	489
1955	121,352	925	1,231	122,583	131.2	265	463
1956	122,804	2,566	3,797	126,601	47.9	331	382
1958	196,200	6,600	13,800	210,000	29.7	525	400
1960	279,700	8,800	30,300	310,000	31.8	775	400
1965	451,700	19,000	108,300	560,000	23.8	1,400	400
1970	593,100	33,600	246,900	840,000	17.7	2,100	400
1975	668,100	46,000	451,900	1,120,000	14.5	2,800	400
1980	671,100	62,000	728,900	1,400,000	10.8	3,500	400

* Includes condensate but not natural gas liquids.

** Ratio of Year-End Remaining Recoverable Reserves to Annual Production.

GAS AND OIL DEVELOPMENT

Scale in Miles

10 0 10 20 30 40

TABLE No. 16

Estimated Production, Potential Production and Markets for Northern Alberta Oil*

(Thousand Barrels Per Day)

	Production	Potential Production	Ratio Actual to Potential Production (Per Cent)	MARKETS		Total Markets
				Northern Alberta	Outside	
1949	.1	.2	50	—	.1	.1
1950	.1	.2	50	—	.1	.1
1951	.1	.3	33	—	.1	.1
1952	.1	.5	20	—	.1	.1
1953	.2	1.6	13	—	.2	.2
1954	.5	5.8	9	—	.5	.5
1955	2.5	12.6	20	—	2.5	2.5
1956	7.0	18.7	37	.4	5.8	6.2
1958	19	30	60	2.0	17	19
1960	25	40	62	3.0	22	25
1965	52	80	65	4.0	48	52
1970	92	135	68	6.0	86	92
1975	126	180	70	8.0	118	126
1980	170	225	75	10.0	160	170

* Includes condensate but not natural gas liquids.

"Production and Markets: The estimated future production of Northern Alberta oil is related to the anticipated demand for Alberta oil for the period under review and is given in Table No. 15. It will be noted that these figures indicate a life-index declining from its present value of 48 years to some 11 years by 1980. This compares to a figure of some 25 years declining to some 11 years for the Province. The breakdown of these future production figures in terms of barrels per day and related to the potential production which is anticipated is shown in Table No. 16. By 1980 it is estimated that from a potential production of 225,000 barrels per day Northern Alberta will be producing over 170,000 barrels per day. This rate of production would be equal to approximately 15% of the total 1.1 million barrels per day estimated for Alberta in 1980 as compared to the present rate of about four per cent.The year-end remaining recoverable reserves amounting to 671 million barrels, as of 1980, for Northern Alberta would be about equal to 17 per cent of the reserves of 4.2 billion barrels estimated for the Province as compared to 4.3 per cent of the 2.9 barrels estimated for the Province as at the end of 1956."

"Summary: It is believed that there will be continued incentive over the long term period to develop and exploit Northern Alberta reserves by 1980 to the extent indicated below:

	Oil (Barrels)	% of Alberta
Developed Reserves	1.4 billion	12
Produced Reserves	.7 billion	9
Remaining Developed Reserves	.7 billion	17
Annual Production (1980)	62 million	16

It is estimated that oil production in 1980 will be 24 times that in 1956."

Gas

All of the material given below is taken from the report prepared for the Commission by the Oil and Gas Conservation Board. Extracts from the Conservation Board's report are given here in quotation marks, and any interpolations made by this Commission are shown without quotation marks.

"There are 100,000 square miles of prospective oil and gas lands in Northern Alberta.

"The incentive for exploration and development in Northern Alberta will result in the continued drilling of some 100 to 150 wildcat wells each year or some 3,500 wildcat wells by 1980. On this basis the prospective oil and gas lands would be about 35% developed by 1980. This compares with an estimated development of around 75% for Alberta."

By 1980 it is estimated that the remaining marketable reserves of gas in Northern Alberta will be some 6 trillion cubic feet. The annual production of gas in Northern Alberta is expected to increase over the years from about 1.9 billion cubic feet in 1956 to 213 billion cubic feet in 1980 of which 93% will move out of the area.

Estimate of the Ultimate Reserve Potential of Northern Alberta: The Oil and Gas Conservation Board estimated the reserves in Northern Alberta by two approaches:

1. By means of volume of sediments.
2. By means of the record of success of wildcat wells and of the area of the prospective oil and gas lands.

The Conservation Board used the second and more conservative one in its tables.

"The second approach, based upon the success record of wildcat wells and the area of prospective oil and gas lands in Northern Alberta results in a figure, as of 1980, of approximately 9 trillion cubic feet of virgin economically recoverable marketable gas. Table No. 17 presents the figures estimated by this second method for the years 1958, 1960, 1965, 1970, 1975 and 1980. These figures are considered to be realistic."

"Production and Markets: Details of the growth in the production of and the markets for Northern Alberta gas are presented in Table No. 18. These figures indicate

that no gas from this area was marketed prior to 1951. Starting in 1951 small quantities of gas have gone to the Dawson Creek, British Columbia, export market. Commencing in 1953 and through to 1956 several local communities were supplied with gas. In 1957 the Westcoast Transmission Company Limited completed its pipeline project to supply gas to southwestern British Columbia.

"Estimated figures for the future production and markets for Northern Alberta gas appear in Tables Nos. 17 and 18. These estimates are based on methods similar to those used in the case of oil. The requirements for Northern Alberta are based on a projected population growth and annual per capita rates of gas consumption for domestic and commercial purposes and requirements for the generation of power. The rapid increase in markets over the next five years outside the area is based upon the sale of gas through the Westcoast Transmission project. Growth of the market thereafter is based on population growth, growth in per capita consumption as well as increased saturation in the existing and new market areas. It is significant to note that the production figures consistent with these market requirements give rise to declining life-index figures and that the estimated life-index figure for 1980 of 28 years falls above the figure of 25 years that is estimated for the Province. This seems to be realistic in view of the remote nature of Northern Alberta in relation to the rest of the Province from the point of view of early production of discovered reserves. By 1980 it is estimated that from remaining marketable reserves of some 6 trillion cubic feet, Northern Alberta will be marketing nearly 213 billion cubic feet per year of which some 93 per cent would move beyond the area.

TABLE No. 17

Estimated Marketable Reserves and Marketed Production of Northern Alberta Gas

(Volumes in Billions of Cubic Feet)

Year	Year-End Remaining Marketable Reserves	Annual Marketed Production	Cumulative Marketed Production	Virgin Marketable Reserves	Life-Index* Years	Cumulative Wildcat Wells Drilled	Average Discovery Per Wildcat Well Drilled
1951	592.5	0.268	0.268	592.8	2,211	120	4.94
1952	787.6	0.406	0.674	788.3	1,940	178	4.43
1953	1,118.9	0.536	1.210	1,120.1	2,088	212	5.28
1954	1,222.6	0.989	2.199	1,244.8	1,236	240	5.19
1955	1,250.5	1.470	3.669	1,254.2	851	265	4.74
1956	1,348.9	1.899	5.568	1,354.5	710	331	4.10
1958	2,029.0	59.2	71.0	2,100.0	34	525	4.00
1960	2,648.3	60.7	191.7	2,840.0	44	775	3.70
1965	4,184.0	88.0	576.0	4,760.0	48	1,400	3.40
1970	5,399.0	117.0	1,111.0	6,510.0	46	2,100	3.10
1975	6,024.0	161.0	1,816.0	7,840.0	38	2,800	2.80
1980	5,971.0	213.0	2,779.0	8,750.0	28	3,500	2.50

* Ratio of Year-End Remaining Marketable Reserves to Annual Marketed Production.

TABLE No. 18

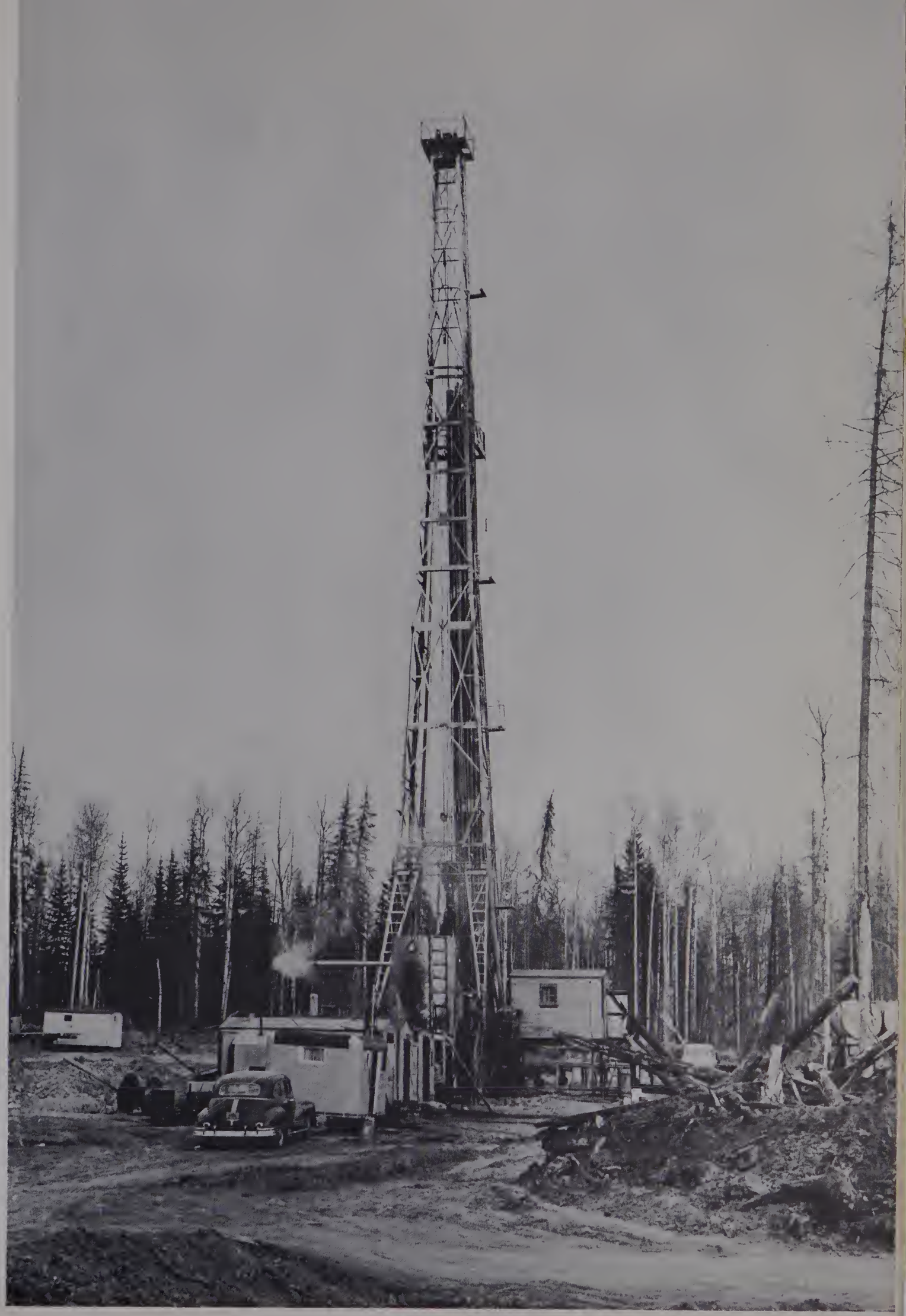
Markets for Northern Alberta Gas

(Billions of Cubic Feet)

Year	Northern Alberta	Outside	Total
1951	—	0.268	0.268
1952	—	0.406	0.406
1953	0.098	0.438	0.536
1954	0.449	0.540	0.989
1955	0.768	0.702	1.470
1956	0.972	0.927	1.899
1958	2.6	56.6	59.2
1960	4.1	56.6	60.7
1965	6.2	81.8	88.0
1970	8.2	108.8	117.0
1975	10.6	150.4	161.0
1980	13.1	199.9	213.0

"This estimated reserve and production position of Northern Alberta compares with remaining marketable reserves of some 35 trillion cubic feet and annual marketed production of 1.4 trillion feet for the Province in 1980. It is estimated that the remaining reserves and annual production of Northern Alberta would be about equal to 17 per cent and 15 per cent respectively of that estimated for the Province by 1980 as compared to 7 per cent and 2 per cent respectively today.

"**Summary:** It is believed that there will be continued incentive over the long term period to develop and exploit Northern Alberta reserves by 1980 to the extent indicated below:



An Oil Well in Northern Alberta.

	Gas (Cubic Feet)	Alberta % of
Developed Reservcs	8.8 trillion	15
Produced Reserves	2.8 trillion	11
Remaining Developed Reserves	6.0 trillion	17
Annual Production (1980)	213 billion	15

It is estimated that gas production in 1980 will be 112 times that in 1956."

Athabasca Oil Sands

The Oil and Gas Conservation Board has the following comments to make on the Athabasca Oil Sands:

"In northeastern Alberta, the Athabasca Oil Sands deposit of Lower Cretaceous age is estimated by the writers of this report to extend over a vast area in excess of 10,000 square miles. Published estimates of the oil reserves that constitute the deposit have ranged between 100 and 300 billion barrels of oil in place. Although the deposit has not been adequately delineated by drilling, the writers believe that the actual reserve could well exceed the latter value. If adequate markets should exist in the future and if technological methods are perfected to enable an economical 'in situ' method of producing this oil through a well bore, it is possible that developing and producing operations could be extended over a substantial part of the vast area underlain by the deposit."

The area outlined on Map No. 13 in Northern Alberta indicates that these oil sands cover an area of some 7,000 square miles but this portion is only that which appears to hold the greatest concentratian of oil. The smaller map (No. 14) has been given to show the permits, leases and patents presently in existence in the oil sands area.

Bituminous Sands Permit: The term "Permit" applies only to the Athabasca Tar Sands area of the Province. The permit grants the holder the exclusive right for a period of three years to carry on exploratory work over a wide area not exceeding 100,000 acres. The fee for a permit is $250.00 and a deposit of $2,500 for each 20,000 acres held is also required. At the conclusion of exploratory operations, the holder of the permit may elect to apply for a bituminous sand lease.

Bituminous Sands Lease: The term of a lease is 21 years renewable for further terms of 21 years. Rental is charged at the rate of $1.00 an acre a year. The bituminous sands lease is similar in all other respects to the more common petroleum and natural gas leases issued in the other parts of the Province.

Patented Areas: The areas shown as patented are grants made by the Dominion Government some time prior to 1932 when Crown lands were transferred to the Province. These patents give the grantees the right to the petroleum, natural gas and asphalt.

Dr. K. A. Clark of the Research Council of Alberta has made the following remarks on the oil sands:

"Mining and 'In Situ' Approaches: It has been assumed in past thinking about the pattern that oil sand development would follow that the oil sands would be mined by open-pit methods and that the oil would be removed from the mined sand in a separation plant. This assumption was a natural one so long as knowledge about the oil sand formation was derived almost entirely from examination of outcrops in the banks of the Athabasca River and its tributaries. The impression gained from such examination was that the formation consisted of a mineable grade of material throughout most of the section and that the overburden was light. Information about the formation that has been obtained in recent years by exploratory drilling and from other field work makes it obvious that only a small portion of the oil in the formation as a whole is amenable to recovery through the mining approach. The oil content of the average grade of material encountered in the average section through the oil sands is too low for mining. Also, it is only in the immediate vicinity of the rivers that light overburden occurs. An 'in situ' method of recovery will be required for getting at the main oil content of the Athabasca Oil Sands.

"Mining and Separation: It should be pointed out at once that the quantity of oil that can be recovered by mining is far from being insignificant. Two areas where high grade sand occurs throughout the section and where overburden is light are known. One is the Mildred-Ruth Lakes area that was found and thoroughly examined by the exploratory drilling of the Federal Government. (Drilling and Sampling of Bituminous Sands of Northern Alberta, Vols. I, II, III, Report 826, Bureau of Mines, Department of Mines and Technical Surveys, Ottawa, 1949.) This area is on the west bank of the Athabasca River about twenty miles downstream from McMurray. It is about 4½ miles in extent and contains about 900 million barrels of oil. The other area is on the Firebag river in Twp. 98. No drilling has been done on it as yet but the section is well revealed by exposure along the river. It is estimated that this area contains at least one billion barrels of oil. There are a number of other smaller mineable areas.

"The technology of mining oil sand and then recovering the oil in a separation plant is quite well understood. Although mining has not been done to date except on a small scale, it is considered that the experience in large scale open-pit mining of other material can be adapted to the oil sands. The recovery of oil from the mined sand is accomplished, readily, by the hot-water-washing method. Several small plants have demonstrated the workability of the method. The only problem involved is the design of equipment that is mechanically reliable. The Government of Alberta built a well engineered plant at Bitumount and operated it successfully during 1949. It handled about 500 tons of oil sand per 24 hours.

"The 'Blair' Report: The oil contained in the oil sand is low in grade compared to the crude oils obtained from most of the Alberta oil fields. It is very viscous and contains about 5% of sulphur. However, the oil refining industry has developed processes that will convert it into a high yield of gasoline and other fuels.

"The Government of Alberta made a thorough engineering study of the whole sequence of operations that would make up a complete oil sand development, estimated the cost of producing a saleable product delivered to the Great Lakes market and evaluated the selling price of this product. The findings of the study were published in a 'Report on the Alberta Bituminous Sands. S. M. Blair associated with Bechtel Corporation and Universal Oil Products Company, Government of Alberta, 1950'. This report is commonly called 'The Blair Report'. It was received by the oil industry with much interest

and was widely distributed. The sequence of operations chosen for a complete development were: open-pit mining of the oil sand; separation of oil from the mined sand by the hot-water-washing method; coking of the crude separated oil by the fluidized solids technique to produce a pumpable cracked distillate; desulphurization of the cracked distillate by mild hydrogenation; transportation of the desulphurized oil to market by pipeline. The product to market was a mixture of about 13% naphtha and 87% No. 2 furnace oil. The total cost of producing this product and delivering it, on a minimum scale of 20,000 bbl./day, was estimated to be $3.10 per bbl. Its selling price was appraised at $3.50 per bbl.

"The overburden over the oil sands in the vicinity of the Athabasca River below McMurray consists of loose material of Pleistocene or recent origin. Further away, the Clearwater marine shales that were deposited over the oil sands are present. On high ground, such as the Bireh Hills to the west of the Athabasca River, succeeding formations occur. Overburden conditions on the area of 2,500 square miles over which the oil sands undoubtedly extend are, approximately as follows:

0 - 150 feet of overburden	800 square miles
150 - 500 feet of overburden	800 square miles
500 - 1000 feet of overburden	900 square miles

"From this summary it can be seen that, quite apart from the erratic nature of beds making up the oil sand section, excessive overburden makes mining impracticable for most of the oil sand area.

"Progress is being made with the development of an 'in situ' method applicable to the general oil sand situation. The Magnolia Petroleum Company has published encouraging information about its work on underground combustion. (Kuhn, C. S. and Koch, R. L. Oil and Gas Journal 52 No. 14 92 (1953).

"The procedure is to drill holes into the heavy oil formation and to establish communication between them by applying air pressure. Then the oil sand is ignited at the face of alternate holes and combustion is maintained by controlled addition of compressed air. Oil and water vapors are driven forward before the fire front carrying heat to make the viscous oil more fluid and to thin it by dilution with the condensed oil vapor. The fire is maintained by the coke that remains on the sand when the heavy oil is destructively distilled. A mixture of the formation oil and cracked distillate is forced into the production holes. The method has been tested in the field on an actual heavy oil reservoir and results were sufficiently encouraging to justify further trials.

"The average mixed Athabasca oil sand section made up of interbedded oil sand and shale of 6% oil content along with beds of better grade material should be suitable for the application of this 'in situ' combustion method of recovery. A 6% oil content is probably as great as that in most oil fields developed by conventional drilling. Overburden is desirable since it allows the use of pressures in proportion to overburden thickness.

"**Economic Outlook:** The urge to find further sources of crude oil is variable. It was strong when the Blair Report was issued and the oil companies gave serious thought to the possibilities of oil sand development. However, because of increasing discoveries of oilfields in Alberta, the interest has fallen. The present outlook is that so long as Alberta crude oil production continues to grow and the problem of finding market outlets for this oil persists, there will be little incentive to bring on oil sand development. The oil sand reserve is there, however, to be turned to when needed. Enough is known about the Athabasca oil sands and how to deal with them to allow of quite prompt development when their time arrives. The mining approach will probably be the first to be used followed by the main development by 'in situ' methods. The oil industry is awake to their potential importance to oil supplies for the future and study is being given to them constantly although leisurely. How soon it will be before oil from the oil sands will be wanted is difficult to predict. The demand for oil on this continent is growing at a rapid rate and the glut of supplies in Alberta could disappear much sooner than can be foreseen now."

Further details regarding the problems of mining and refining this oil are contained in the proceedings of the Alberta Oil Sands Conference, September 1951. This was published by the Provincial Government Board of Trustees, Oil Sands Project.

Considerable work of a highly technical nature has been done during the last year by a number of companies working in the Oil Sands area. One company has applied for approval for a route of a pipeline from Mildred Lake to Edmonton. It appears that as soon as markets justify producing this oil we may see considerable activity in the oil sands area.

Coal

While some Group 3 coal (non-coking, domestic type) is reported to be in the Halcourt area, just north of the 55th Parallel and west of Grande Prairie, very little of it has been mined. Considering the high cost of coal in the Peace River Country, the fact that this coal is not used to supply the local market would seem to indicate that it is not feasible to mine these deposits on a commercial basis. This is all the coal in Northern Alberta about which we have any definite information.

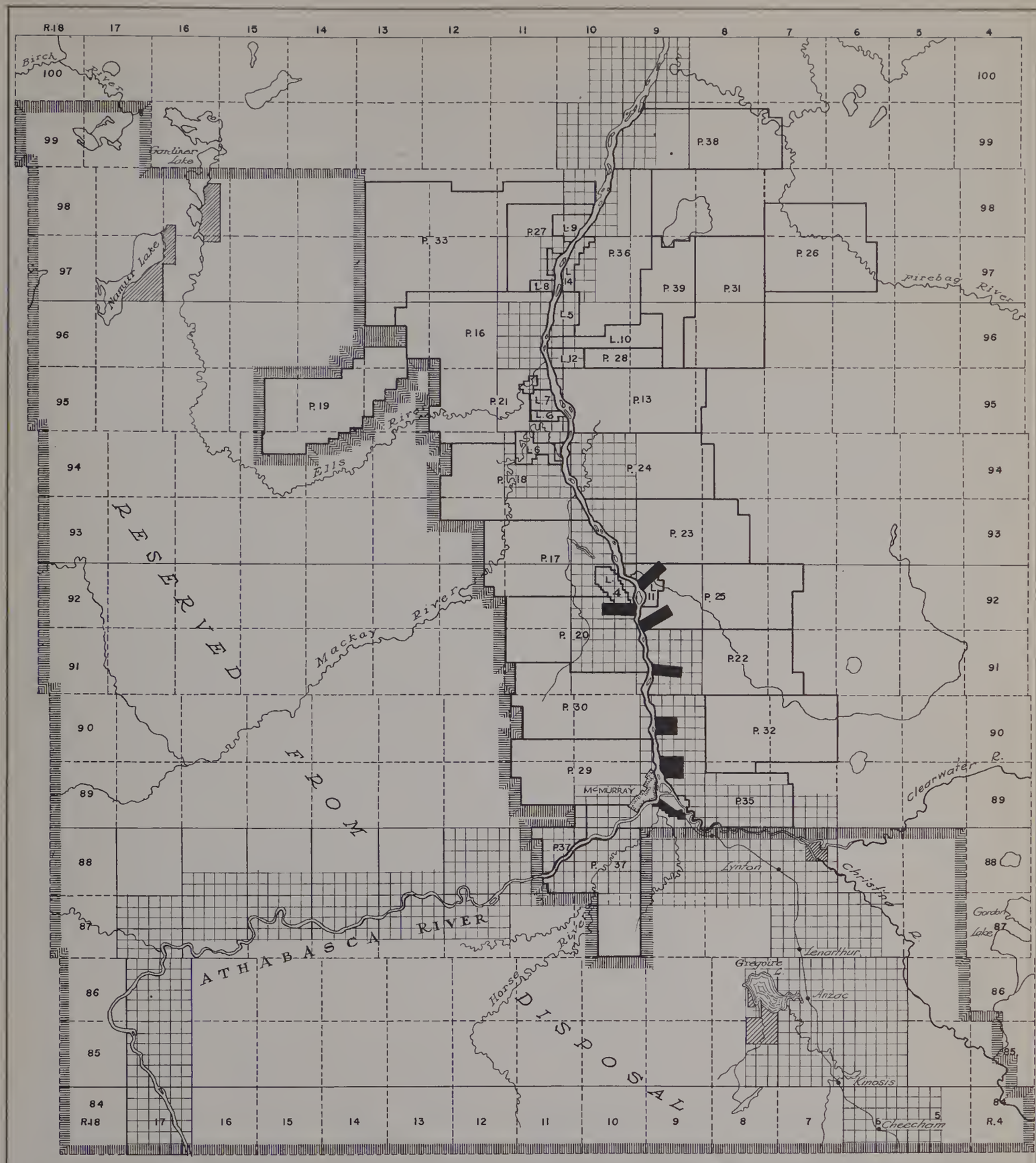
There are indications that coal is exposed along the headwaters of the Notikewin River and possibly along the Chichaga River, (North of Hines Creek and West of Manning) but a geological study has never been made of these deposits. There is no geological reason why coal of possibly Group 3 quality should not be found in this area, but because of lack of markets it has not been worthwhile for anyone to study the possible deposits in any detail.

ELECTRICAL ENERGY

Hydro Electric Resources

There are at least 2,715,000 horse power of undeveloped hydro electric power in Northern Alberta, which is the amount that it might be reasonable to expect to be developed when viewed in the light of today's economy, because one outstanding aspect of this economy is that Alberta is bountifully blessed with fuel for thermal power stations.

Along much of the Peace and Athabasca Rivers and along many of their tributary streams additional hydro



LEGEND

- Patented Areas.
- L.9 — Bituminous Sands Leases.
- P.25 — Bituminous Sands Permits
- Indian Reserves.

ATHABASCA OIL SANDS AREA

McMURRAY ~ ALBERTA

Scale: 5 0 5 10 Miles

AM. 1958

power not included in this figure could be developed but it would be high-cost power which, in the specific location, could be obtained much more cheaply by burning natural gas or oil. If in the rather remote future our fossil fuels become exhausted so that we have to develop every possible small hydro-site, these high-cost sites could be developed. Even this, however, does not seem likely because by that time nuclear power plants will have reached the point costwise where that form of thermal power will be cheaper than power from the hydro sites in question. For these reasons we feel that in tabulating our resources, we should list only that hydro power which it seems economical to develop. Experience over the years proves that even such a tabulation will turn out to be conservative because once industries that need large blocks of power arise, the hydro sites included in the above total will be developed to meet their demand for power. Once these industries are in existence the need for power will increase. This need will call for fresh studies aimed at diverting rivers and creating artificial reservoirs on a scale not now anticipated. The result will be that at that time stupendous hydro projects will be conceived and carried out on a scale far beyond that originally planned. For this reason the 2,715,000 horse power of undeveloped hydro electric power quoted above is conservative.

With the possible exception of the Clearwater River east of McMurray, the only rivers which it is practical to develop are the Slave and its two main tributaries, the Peace and Athabasca. The last two both arise in the mountains and because they are fed by glaciers, have a much more reliable and steady flow of water throughout the year than streams not so fed. In general, rivers in Alberta with headwaters at an elevation of less than 7,000 feet have flow characteristics that make them very much less desirable for power development than those that rise at a higher elevation. Such rivers have to depend on the annual precipitation which in Northern Alberta averages from 12 to 17 inches per year. As a result, in winter their flow is reduced to an almost negligible trickle. Even large rivers such as the Athabasca and the Peace have their drawbacks. A study of the following table which gives the maximum and minimum flows for the North Saskatchewan, the Athabasca, the Peace and the Slave—all measured at specific points—will help to throw some light on this problem:

TABLE No. 19

	N. Sask. at Edmonton	Athabasca at Athabasca	Peace at Peace River	Slave at Fitzgerald
Drainage Basin Area Sq. mi.	10,500	29,640	72,000	234,000
Average Annual Total Runoff—(Acre-feet)	6,000,000	11,000,000	42,700,000	80,000,000
Runoff per square mile (Acre-feet)	570	372	593	----
Maximum discharge (cfs)	204,500	199,600	374,480	**296,080
Minimum discharge (cfs)	*220	1,660	6,350	18,600

* A most unusual flow probably caused by a short duration ice jam.

** Due to Lake Athabasca acting as a reservoir this is less than the sum of the flows in the Peace and the Athabasca.

On the Athabasca for instance, the minimum recorded flow is 1,660 cfs or less than 1% of the maximum flow. The minimum flow naturally occurs during the winter months so that then at the very time when the demand for power is greatest the water flowing down the river is least. This tremendous variation between summer and winter flow is much greater than is found in the rivers in Eastern Canada. It is this variation that makes it necessary to build large reservoirs so as to hold back water during flood time and release it down the river or through power houses during the periods of normal low water.

In developing any of these rivers for power purposes, it is not only necessary to dam them, but it is equally necessary to find places where water can be stored in large amounts. It is true that a dam across a river stores up some water and in doing so makes the flow of the water through the turbines that much more reliable; but in many cases all the water that can be stored behind one dam built across a river may not be much help in providing a regular flow of sufficient magnitude for all year operation. In such cases water must be stored in a series of dams along the river or, better still, in some natural lakes. The Alberta portion of the Peace River is an example of a river which has no large lakes tributary to it to provide natural storage. The Athabasca on the other hand is a good example of a river which has some natural storage because it has Calling Lake, Lac La Biche and Lesser Slave Lake (area 462 sq. miles) in which at relatively little expense water can be stored. We will discuss this river in more detail later.

Not only must a river have storage facilities before it can be used for the generation of low-cost power but, in addition, it must flow through territory which provides natural rock footings for dams. The Athabasca River has a fortunate combination of dam sites with good footings and natural storage. For this reason we will deal with this river in some detail so as to illustrate some of the problems of developing a river for power.

The Athabasca River: The Athabasca rises in the mountains near Jasper, Alberta, and on its headwaters has some good natural storage—Maligne, Jasper and Brule Lakes. Being glacier fed and having head-water storage are factors very much in its favor from a hydro power standpoint. Offsetting these factors, however, is the fact that the upper two lakes are in Jasper National Park and cannot be touched for power purposes and the level of the third cannot be raised because of the highway and railway.

After leaving Jasper National Park, the river flows for several miles through an area in which there is no apparent foundation for a dam. At the Image Rock Site (Township 58, Range 20, West 5th) and some 20 miles up stream at the Goose Neck Site (Township 56, Range 22, West 5th) points on the river are reached where rock outcrops may provide footings for two dams. These two dams could be built with heads of 130' and 170' each capable of providing 18,000 and 23,000 horse power, respectively. Due to the lack of storage above these sites and to their relatively small size and also because there are still some doubts about the foundations it is doubtful if these sites will ever be developed. From the Image Rock site, some 70 miles up stream from Whitecourt, all the way down to the nineteenth baseline site (Township 72, Range 18, West 4th) no footings for a dam have been found and for this reason, on this 300-mile stretch of river, it would not be practical to develop power. On this stretch the river drops 1,625 feet. In an average year enough water flows in this

section of the river to generate over a quarter of a million horse power, but because there are no footings for a dam this power has to go to waste.

The story is quite different for the 180-mile stretch of river to McMurray. In this distance the river drops over 800 feet and there are several good dam sites. This section of the river has been studied since 1910 and during 1952-3 was studied carefully by Calgary Power Limited, the Provincial Water Resources Branch and the Power Commission. Data on these dam sites is given in the table below, it being assumed that concrete gravity dams would be built and that the tailwater level of one plant would be the full supply level of the next plant lower down the river. The plant at the nineteenth baseline would back water up almost to the town of Athabasca. These dam sites are shown on Map No. 15.

TABLE No. 20

Power Sites on Athabasca River Below 19th Baseline

Site Name	Location	Full Supply Level	Maximum Head	Continuous Plant Output, K.W.	Installed Turbine Capacity, H.P.
19th Baseline	Twp. 72-18-4	1,675	100	28,800	104,000
Pelican Rapids	Twp 79-17-4	1,575	155	59,400	222,000
Grand Rapids	Twp. 84-17-4	1,420	203	93,300	378,000
Mile 193	Twp. 87-15-4	1,217	137	81,000	305,000
Crooked Rapids	Twp. 87-12-4	1,080	168	97,000	365,000
Mile 236	Twp. 88-10-4	912	92	62,700	223,000
	TOTALS			422,200	1,597,000
					(Say 1,600,000)

From McMurray the Athabasca flows a further 160 miles before it spreads out into Lake Athabasca and in that distance it drops another 120 feet. While this section of the river has not been studied in as great detail as the previous 240 mile stretch there do not appear to be any power sites on it. In any event any power development in the near future would conflict with navigation.

The total power that we may expect to generate on the Athabasca, therefore, can be taken as 1,600,000 horse power.

This then gives a brief outline of how one of the large rivers of Northern Alberta will be developed and at the same time serves to point out that some stretches of any such river are pre-eminently suited for power development while others are definitely not.

Storage of water in natural lakes is a very important part of the hydro electric development of a river. The six dams mentioned above would provide 1,498,000 acre feet of artificial storage. These dams and power houses which might be built at an investment of about $340,000,000 would store up enough water to produce 2,700 million k. w. h. in a year. Now if an additional $7,000,000 were to be spent in order to utilize the possible storage obtainable in Lesser Slave Lake between a high water elevation of 1895.0 and a low water elevation of 1889.0, then 1,770,000 acre feet of water could be stored there. This would be greater than the storage in all six power dams and this if permitted to flow through the six plants mentioned above would generate an additional 1,000 million k. w. h.

A word or so about the feasibility of storage in Lesser Slave Lake might be in order here. This lake having an area of 462 square miles, has a drainage area of 5,370 square miles, and lies in a flat depression. It is surrounded by a silt and sand shoreline, with the sand deposits at the lake outlet being reported to be the largest in the province. Large areas of the land around the lake are used to grow hay and the lake is used for commercial fishing.

Lesser Slave River flows from the southeast corner of the lake as a sluggish stream with meanders and oxbows particularly common in the first 15 miles. In the first 27 miles, that is to the Saulteaux River, it drops only 14 feet. At the junction of the Saulteaux River there is a marked change in gradient and thereafter the river flows in a well defined valley. From the Saulteaux junction the river drops 75 feet in 19 miles to join the Athabasca River at Smith. The only indication of bedrock is a weathered shale outcrop in a highway cut 36 river miles below the lake outlet. Lesser Slave River is classed as navigable but, when the railway was completed in 1916, it ceased to be important as a navigation route.

The storage on Lesser Slave Lake is controlled by the following factors:

Minimum Lake Level

Commercial fishing interests require a minimum permissable regulated elevation of 1889.0.

Maximum Lake Level

From "Report of the Storage Potential Lesser Slave Lake" dated 1952 and prepared by the Department of Water Resources in conjunction with Calgary Power Limited, the maximum permissable lake elevation is considered to be 1895.0.

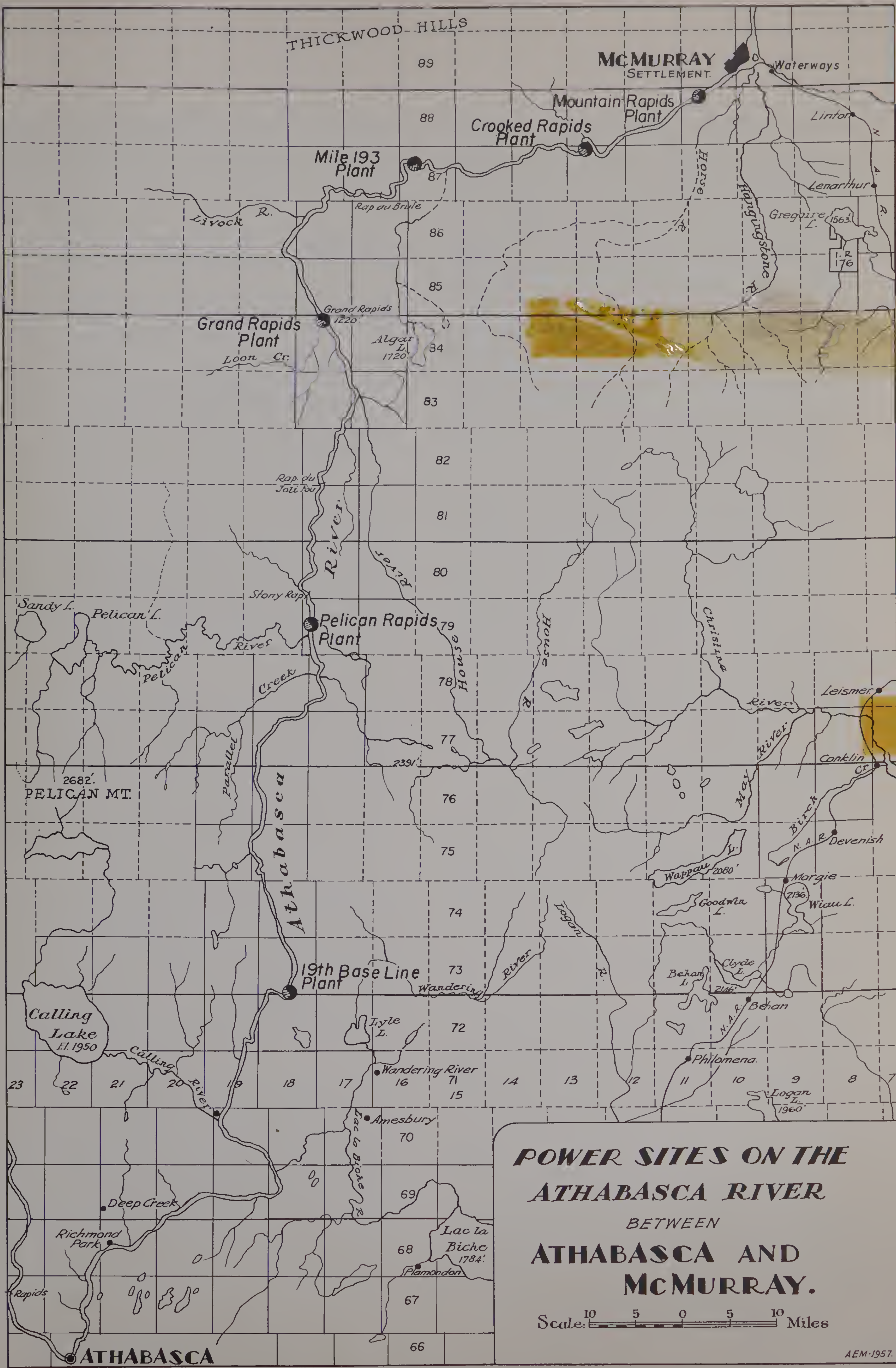
Discharge Capacity of the Lesser Slave River

In a study of the discharge curve for Lesser Slave Lake, it can be seen that the discharge at elevation 1895.0 is 3,500 c. f. s. and at 1889.0 it is practically zero. The volume of storage between elevations 1895.0 and 1889.0 is 1,770,000 acre feet.

If 6 feet of storage is to be established on the lake it will be necessary either to lower the outlet by excavation or install a pumping station at the outlet. The river downstream from Lesser Slave Lake has a very flat gradient for about 15 miles. Excavation to increase the capacity of this channel to, say 4,000 c. s. f. when the lake is at elevation 1889.0, would be extremely costly, but the same result could be obtained by pumping.

Development of storage on Lesser Slave Lake has been based on the assumption that a pumping station would be built at the lake outlet. In order to keep down the amount of protective work required on the railway track it has been assumed that the maximum elevation to which water can be raised on the discharge side of the pumping station would be 1899.0. From information available it appears that a flow of 7,000 c. s. f. corresponds to an elevation of 1898.7 and this flow has been assumed to be the maximum permissible.

The basic consideration in this case is that the reservoir should be operated so that, in the flood season, it is never higher than it would have been in nature. Records show that the worst flood on record was in 1935. However, the lake elevation early in May 1935, just before the



POWER SITES ON THE ATHABASCA RIVER BETWEEN ATHABASCA AND McMURRAY.
Scale: 10 5 0 5 10 Miles
AEM·1957.
THICKWOOD HILLS
McMURRAY SETTLEMENT
Waterways
Mountain Rapids Plant
Crooked Rapids Plant
Mile 193 Plant
Linton
Lenarthur
Gregoire L.
1563
I.R. 176
Horse R.
Hangingstone R.
N.A.R.
Livock R.
Rap au Brule
Grand Rapids 1220'
Grand Rapids Plant
Algar L. 1720'
Loon Cr.
Rap. du Joli Fou
River
Stony Rap.
Sandy L.
Pelican L.
Pelican River
Pelican Rapids Plant
Creek
House River
House R.
Christina River
Leismer
Conklin Cr.
May River
Birch
Devenish
2391'
2682'
PELICAN MT.
Parallel
Athabasca
Wappau L. 2080'
Margie
2136
Wiau L.
Goodwin L.
Logan R.
19th Base Line Plant
Wandering River
Clyde L.
Behan L.
2146'
Behan
Calling Lake El. 1950
Calling River
Lyle L.
Wandering River
Philomena
Logan L. 1960'
Amesbury
Lac la Biche R.
Deep Creek
Richmond Park
Lac la Biche 1784'
Plamondon
Rapids
ATHABASCA
89
88
87
86
85
84
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spring run-off, was 1895.3 which is higher than full supply level. It is extremely unlikely that if the lake was operated as a reservoir for a power development, it would be at its full level in the spring.

Providing storage in Lesser Slave Lake would have three beneficial effects:

(1) For an expenditure of seven million dollars it would provide an additional 1,000 million K. W. H. year after year.

(2) It would help to regulate the flow of water in the Athabasca, which in turn would be most beneficial to navigation near the river's mouth.

(3) It would tend to reduce the area around the shores of Lesser Slave Lake which floods every few years. If this were operated as a power storage reservoir, the level of the lake would be brought down low enough each spring that the run-off into the lake would never produce a flood as bad as that of 1935, when the lake rose to an elevation of 1899.5. Without this control on the lake, however, a flood similar to 1935 will occur again.

The Peace River: The Peace River rises in the mountains which drain into the Rocky Mountain Trench in B.C. It is the only river which cuts through these mountains to reach Alberta. At Hudson's Hope its average annual run-off is 26,000,000 acre feet, while by the time it reaches Peace River town its drainage basin area is 72,000 square miles, and its average annual run-off is 42,700,000 acre feet. At Fort Vermilion its drainage basin area is 86,000 square miles and its average annual run-off 50,000,000 square feet.

There is not a great deal of natural storage on the headwaters of the Peace, but at a point in B. C. somewhere below the junction of the Finlay and the Parsnip Rivers, the Wenner-Gren interests have proposed the construction of a dam which would retain a tremendous amount of water. If this dam is ever to be constructed, it will provide headwater storage and will have the effect of making the Peace River much more attractive for power developments below the dam by increasing its average flow to something of the order of 40,000 c. f. s.

Fortunately for British Columbia the Peace River flows through outcrops of rock ages old and there should be no difficulty in getting a good foundation for a dam. Some alarm has been expressed in case such a development might have an adverse effect upon the flow of the Peace River in Alberta. The river would not be adversely affected unless water from its watershed were diverted so as to flow west towards the Pacific Coast instead of flowing east through Alberta. The recent announcement by the Government of British Columbia states that no water will be diverted.

So long as no water will be diverted, the construction of a dam which will store water during periods of high run-off and release it during periods of low run-off will have a beneficial effect on the flow of the Peace in Alberta. The effect will be to make the Peace River in Alberta more attractive from a hydro development standpoint in the same way that storing water in Lesser Slave Lake will improve the power potential on the Athabasca. Such a dam on the headwaters of the Peace River will also be beneficial from the standpoint of navigating that stretch of the river below Vermilion Chutes.

The portion of the Peace River in Alberta is not very favorable for power generation for the reason that it has carved its channel through cretaceous formations which are interbedded sandstones and shales. Rocks of these formations are prone to slump, so that it would be most difficult to get foundations for a dam. The recent collapse of the Alaska Highway bridge at Taylor and the frequent slides on highways built in the immediate valley of the Peace are indications of the type of material of which the river valley is composed. Moreover, any power development on the Peace would have to be a large one, possibly of the order of something well over 100,000 H. P. Since the total power load in the Peace River Country at present is of the order of 10,000 H. P., there has been no justification for thinking of building a power plant on the river. When, in the course of time, we approach the point where the power load reaches 100,000 H. P., detailed investigation of the river may disclose sites that are suitable for development, but at present, the existence of such sites appears doubtful. This applies to the 450 mile stretch of the river from the British Columbia border to Vermilion Chutes (Twp. 108, Rge. 6, W. 5th).

The Chutes, some fifty miles downstream from Fort Vermilion, is the only power site which appears to be practical to develop in the light of today's economic thinking. The fall of water is concentrated chiefly at two points; the upper one, which is in the form of a rapid with a total drop of eleven feet in a distance of nearly half a mile, and a second drop one and one-half miles downstream from the first, where the water falls abruptly thirteen feet over a limestone ledge. A dam might be constructed at Vermilion Chutes with a total head of from thirty to fifty feet. J. L. Reid, Supervisor of Hydro Electric Development for the Provincial Department of Water Resources, advises that considerable power could be developed there. When asked to comment on the effect of the Wenner-Gren scheme on the Peace River, he stated that:

> "The Wenner-Gren storage and power development in British Columbia does not alter the situation in regard to potential sites but does make the Vermilion Chutes more attractive on the basis of firming the average flow to some 40,000 c. f. s. If this volume of flow were available, I believe an effort would be made to create a structure of not less than fifty feet of head, which would be capable of 180,000 H. P. at average flow and would probably call for a plant of some 250,000 horse power."

For the purposes of our inventory, we may consider the power available at Vermilion Chutes as 100,000 horse power if the Wenner-Gren scheme does not go ahead and 250,000 H. P. if it does.

The Slave River: The Slave River, which strictly speaking is formed by the confluence of the Peace and Rocher Rivers, actually carries away the waters of the Peace, the Athabasca and the water which flows into Lake Athabasca from the east. The total drainage area of the Slave River at Fitzgerald is 234,000 square miles. It flows for approximately 285 miles in a generally north-westerly direction and discharges into Great Slave Lake. Its first seventy-five miles lie in Alberta, which it leaves at Fort Smith after descending most of the Smith Rapids.

The Smith Rapids form the only obstruction to navigation along the Slave River, but they are a formidable barrier and to avoid them a sixteen-mile portage is necessary from Fitzgerald, Alberta, to Fort Smith, Northwest Territories. They consist of a series of four important rapids, namely: Cassette, Pelican, Mountain and Rapids des Noyes. The total descent is 110.5 feet but it does not

appear feasible to develop all of this drop. These rapids could be developed at two sites to utilize ninety-six feet (one million H. P.) of the total drop in the rapids, i.e. Pelican Rapids 61.5 feet of drop (640,000 H. P.) and Mountain Rapids, 34.5 feet of drop (360,000 H. P.).

In a communication from J. L. Reid of the Provincial Department of Water Resources, in which he discusses the possibility of storage on Lake Athabasca and the effects of this on developing power at Smith Rapids, he says:

"Lake Athabasca forms a natural reservoir and it is fed by the Athabasca, Fond du Lac and Peace Rivers. The outlet is the Rocher River and a minimum flow indicated is 22,300 c.f.s. Storage possibilities of the lake have not yet been investigated. No run-off records are available but inflow is probably sufficient for 5 foot regulation. It is quite possible to dam the outlet of the lake but provision would have to be made for Peace River flow, as during periods of high water the Peace backs up into the lake. Normal rise and fall of the lake is about 4 feet.

"It has been estimated that the top five feet of water surface would contain 8,960,000 acre feet. Using the figures of 1930-31 on the Slave River it would require additional storage of less than 1,000,000 acre feet to increase the average flow to 125,000 c. f. s. which would produce 1,000,000 H. P. over 90 feet of head. Therefore, using the figures available it does not seem to be excessive to rate the Slave River at 1,000,000 H. P. potential."

The development of power from the Smith Rapids will have to await mining development in northeastern Alberta or the Northwest Territories. One of the drawbacks of the development is the immense size of each of the two power sites which do not lend themselves to piecemeal development. It is true that there is one good small site where a part of the Cassette Rapids could be developed to deliver up to 50,000 H. P. and that a power house might be constructed there if the Pine Point Mine is opened up. If this were developed and then some years later it were decided to develop the river fully, this site would be drowned out.

While dealing with the large rivers in northeastern Alberta, a few comparisons may serve to give a better idea of how large these rivers really are. The following table was compiled by J. L. Reid and gives the annual run-off of some Canadian rivers in the order of their magnitude. Their drainage area is also shown.

TABLE No. 21

River	Drainage Basin In Square Miles	Total Annual Run-off In Acre Feet
Slave (At Fitzgerald)	234,000	80,000,000
Nelson (Below Sipiweskh)	389,000	62,500,000
Columbia (At International Boundary)	59,700	61,500,000
Peace (At Fort Vermilion)	86,000	50,000,000
Ottawa (At Grenville)	55,600	47,500,000
Winnipeg (At Slave Falls)	48,880	18,500,000
Saskatchewan (At The Pas)	149,500	17,700,000
Athabasca (At mouth)	59,480	17,000,000

It will be seen that the annual run-off of the Slave River at Fitzgerald is one and a quarter times as large as that of the Columbia at the boundary between British Columbia and the United States, and it is nearly twice as large as the Ottawa River where it enters the St. Lawrence. The drainage area of the Slave River at Fitzgerald is 234,000 square miles, which is nearly as large as the whole of Alberta.

While the Peace, Athabasca and Slave are the major power rivers of Northern Alberta, some power could be developed on the Clearwater. The Wabiskaw, too, could probably contribute some power. There do not appear to be any sites that could be developed on that part of the Smoky River north of the 55th Parallel, and while there may be some sites on the Hay River where it would be possible to put a dam, the lack of large natural storage, combined with the fact that the winter flow in the Hay River is practically negligible, rules it out as a river worth considering in terms of hydro power. Even at Alexandra and Louise Falls, where the river drops 109 and 50 feet respectively in beautiful waterfalls there is scarcely any flow of water in the wintertime when power is most needed.

We know that the Wabiskaw is a river some 320 miles in length which drops 1,300 feet in this distance and drains an area of 15,000 square miles, but beyond ascertaining the fact that its discharge into the Peace River is at times very low, no studies have been carried out to see what its power potential might be. If there are any sites for dams, the power which could be generated at them would be relatively low.

Of the four rivers mentioned above, the Clearwater is the best from a power standpoint, in terms of total horse power which could be produced, but even it does not make any significant contribution to the power potential of Northern Alberta. The Clearwater enters the Athabasca at McMurray. Upstream some 40 miles there are five rapids or falls in the Alberta section of the river and above these the drainage is some 5,000 square miles. These power sites are all in Township 89, Ranges 1, 2 and 3, West of the 4th Meridian, and data for them is given in Table No. 22. The "low flow" in the table is an abbreviation for "Estimated Low Water Flow During Open Season (May to November) Second Feet", while the "horse power" shown is the "Available Theoretical Horse Power (May to November)."

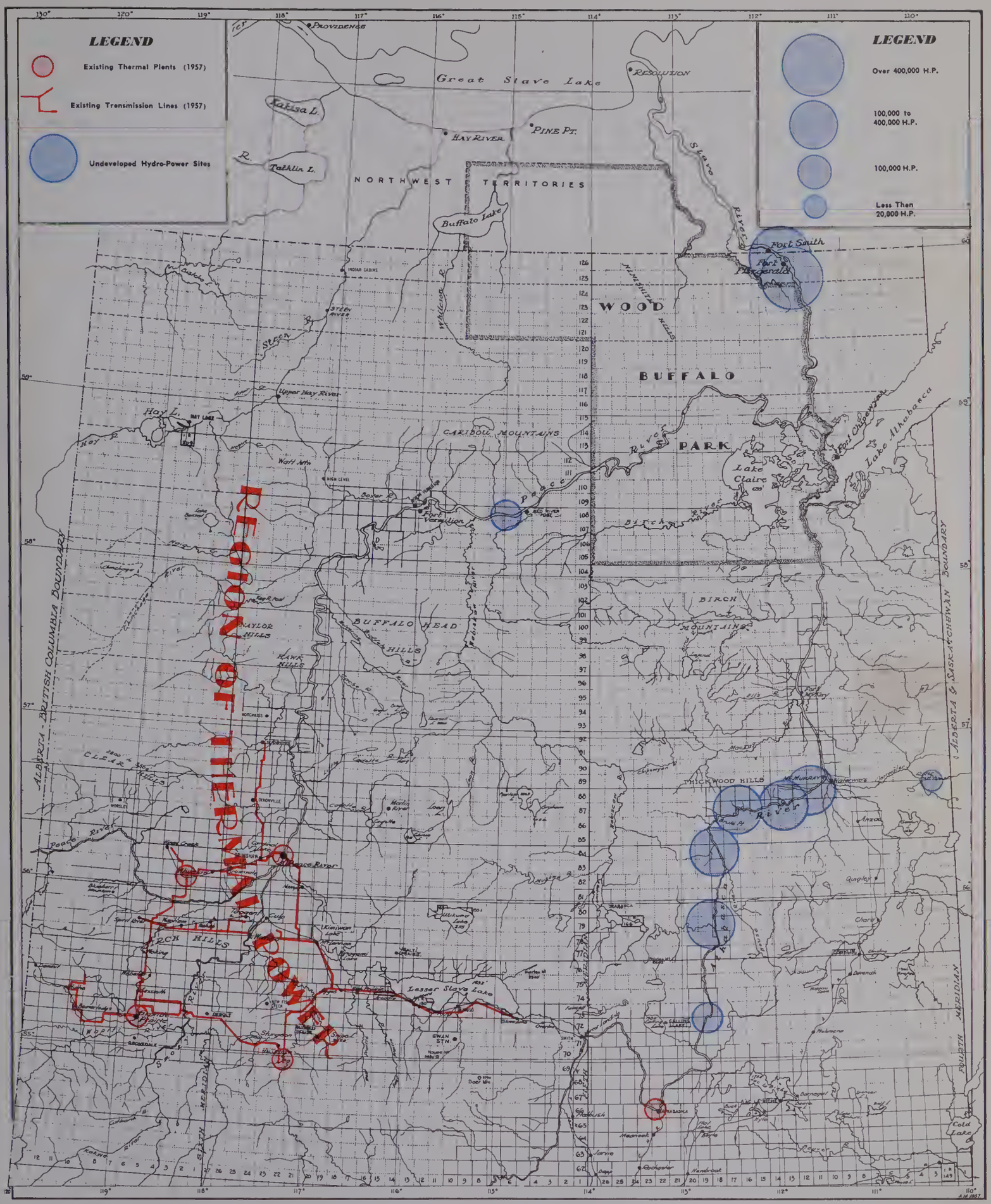
TABLE No. 22

Power Sites on Clearwater River

	Head (in feet)	Low Flow	Horse Power
Cascades Rapid	16	1,120	2,000
Le Bon Rapid	31	1,120	3,900
Big Stone Rapid	7	1,120	900
Aux Pins Rapid	21	1,120	2,700
Whitemud Rapid	41	1,120	5,200
Total			14,700
			(say, 15,000)

It will be seen that a total of 15,000 horse power might be developed by using all five of the rapids. Further studies might show that this total horse power could be increased somewhat, but the area around McMurray has such abundant potential power with 1,600,000 horse power on the Athabasca River and the tremendous potential of thermal power in the Athabasca Oil Sands that it is doubtful if the Clearwater will be developed.

A Portion of Vermilion Chutes.



POWER RESOURCES

Scale in Miles

10 0 10 20 30 40

The total hydro power potential in Northern Alberta then, amounts to 2,715,000 horse power, as shown by Table 23. This table includes the power potential of the Clearwater even though it is so small that it probably will not be developed, but the table does not show any potential for smaller streams, such as the Wabiskaw and the Hay River, because their contributions of power would be so small and so expensive that it is doubtful if any development work will ever be done on them.

TABLE No. 23

Total Hydro Power Potential in Northern Alberta

River	Horse Power
Athabasca	1,600,000
Peace	100,000
Slave	1,000,000
Clearwater	15,000
Total	2,715,000

Thermal Power

Thermal power can be generated in small or large quantities anywhere that a fuel supply in the form of oil, gas or coal is available. Coal is very scarce in Northern Alberta and oil is an expensive fuel, unless use is made of some by-product such as will be available when refining the Athabasca Oil Sands. The two fuels available for thermal power in Northern Alberta, then, are liquid coke in the area around McMurray and natural gas which in a general way may be said to be available south and west of a line drawn diagonally across Northern Alberta from the vicinity of Cold Lake in the southeast to Hay Lakes in the northwest corner. This means that thermal power in unlimited quantities could be generated in large steam plants located near the Athabasca Oil Sands area, or it could be generated from natural gas by using diesel engines for small lots of power, gas turbines for larger quantities and large steam plants for tremendous outputs. The cost of power generated by steam plants using this cheap fuel is about the same as the cost of hydro power in Alberta.

It will be seen, then, that

(1) A bounteous supply of thermal power of reasonable cost is available to the whole of the west half of Northern Alberta.

(2) A similar supply of thermal power will be available in the area around McMurray.

(3) Hydro power totalling 1,615,000 H. P. is available in the area around McMurray.

(4) Hydro power to the extent of 100,000 H. P. is available in the area around Fort Vermilion.

(5) Hydro power amounting to 1,000,000 H. P. is available to the area around Fort Smith.

Generally speaking, all the potential hydro power which it would be practical to develop in the light of the economics prevailing today lies in the east half of Northern Alberta, while thermal power is available to the west half. This angle will be discussed more fully under the section of the report devoted to Electrical Requirements and Resources (Section 7).

TOURIST ATTRACTIONS

One resource of Northern Alberta that is not yet tapped is its potentially great value to the tourist industry. This tertiary industry is apt to receive less consideration than is its due. During 1957 tourists spent over $63,000,000 in Alberta, so that this industry is the means of supporting an important segment of the Province's population. The influx of tourists benefits all branches of our economy from the hotels which serve food, to the farmers who produce it, and from the service station, which dispenses gasoline, to the workers in the oilfields who produce the crude oil.

Southern Alberta has its mountain playgrounds—tourist attractions unexcelled in Canada. Northern Alberta also has its attractions, but these have not been organized nor advertised. The only area of Northern Alberta receiving any part of the tourist business is that adjacent to Highways No. 2 and No. 43 which give access to the Alaska Highway. As far as tourists are concerned, the remainder is still a terra incognita. This situation is not true in Saskatchewan, which, lacking mountain parks, has very successfully played up its lakes and rivers in its northern half, with their attractions in the form of fishing, hunting and canoeing, and their remoteness and solitude. In a similar manner, the tourist resources of Northern Alberta might equally well be played up with considerable economic benefit to that area and to the rest of the Province.

Northern Alberta has six features which, as tourist attractions, are unexcelled:

1. Lakes with splendid beaches.

2. Lakes with unexcelled game fishing.

3. Solitude and remoteness which attract a money-spending tourist clientele.

4. Unexcelled canoe routes which merely await exploitation.

5. Historic rivers by which the first white men crossed the continent, together with some well known historic sites that might be preserved.

6. Access to the fascinating mystery of the great North Country.

In short, it has most of the elements that attract tourists. As yet none of these have been developed.

FUTURE EFFECT OF THE NORTHWEST TERRITORIES ON ALBERTA

The portion of the Northwest Territories tributary to Alberta has been proven to contain rich mineral resources, including gold, copper, lead, zinc, silver, uranium, lithium, tantalum, columbium, beryllium, cobalt, nickel, cadium, etc. Today, in spite of the handicap of lack of transportation, some of them are being mined and, with

proper transportation facilities, all of them could be produced. Many potential mines in this area only await transportation to become producers.

In many respects the Northwest Territories is similar to the vast Northern areas of the U. S. S. R. as has been set out so well by Mr. R. G. Robertson, Commissioner of the Northwest Territories, in his brief to the Gordon Commission:

"Canada and the Union of Soviet Socialist Republics have many things in common. Their vastness of size, their northern continental climates, their great Arctic regions, their long transportation systems—all have been remarked upon by many observers. For the future of both countries—and of millions of people outside their borders—a common feature of much greater significance is that each, almost alone in the world, has a vast undeveloped frontier region that is overwhelmingly larger than its developed area. In a world where population is rapidly increasing and where the demand for resources is growing at an awesome pace, these two countries have the greatest possibilities of tapping and developing new and untouched reserves of wealth and strength.

"While little is known in detail of the efforts that are being made in the U. S .S. R. to develop the resources of its northern areas, it is clear that the Soviet Union is making great strides."

Both the Paley Report and the preliminary report of the Gordon Commission indicate in no uncertain terms the increasing demand for metals. The latter estimates that by 1980 the demand for copper will be doubled, while the demand for nickel will be more than doubled. It estimates that both lead and zinc will be needed in quantities varying from 200% to 400% of the amounts marketed in 1955.

John Parker, in his address to the Northern Development Conference of the Edmonton Chamber of Commerce in May 1956, summed up this matter of the demand for metals very accurately as follows:

"The argument that it is economically important to develop the Canadian North hangs on the belief that the world demand for minerals shows every sign of increasing at a pace far in excess of the development of sources of supply. If Canada is to maintain her place as a great consumer and exporter of metals, we must get ahead with a vigorous programme of northern development immediately. . . . The studies of the (Gordon) Commission suggest that the total value of the output of the mineral industry by 1980 should be about three and one-half times present levels, and exports—now amounting to over $1,000,000,000 annually—may be four times that amount. It is the view of the Gordon Commission that exports of metals and industrial minerals should account for as much as one-third of all commodity exports from Canada by 1980. We have great mines already in production in Canada, but their maximum output will not provide more than a reasonable fraction of what is going to be required. If we have not developed sufficient oil and metals ourselves by that time, we shall not be able to meet the cost of our imports, and we shall have to accept a lower standard of living. An immediate start on large-scale development of the Canadian North is not a scheme to benefit simply those people now living in that area—indeed they must be joined by many times their number. Northern development must get underway now, or Canada as a whole will suffer within the life time of most Canadians living today. As one observer has put it: 'We must encourage exploration of our mineralized areas now because between five and ten years often elapse between the discovery of a promising mineral prospect and the time when a mine comes into full production.'

"The past ten years have seen considerable prospecting and some preliminary development in base metals in the Northwest Territories. These are what Canada and the world will need and these we shall be able to supply on a scale which to most people today would appear incredible.

"The International Nickel Company has been given a concession of 600 square miles known as the Coppermine River Reservation. This Company—far and away the biggest industrial concern of any description in Canada—has undertaken a multi-million dollar development programme on its concession. It is too early yet to say whether the copper and nickel in this particular concession are available in sufficient quantities for commercial production, but from the size of the operation undertaken by International Nickel—the biggest copper and nickel producer in Canada—you can be sure there is some reasonable prospect of success. Hundreds of tons of equipment and supplies are now being flown to the property from Yellowknife and Norman Wells.

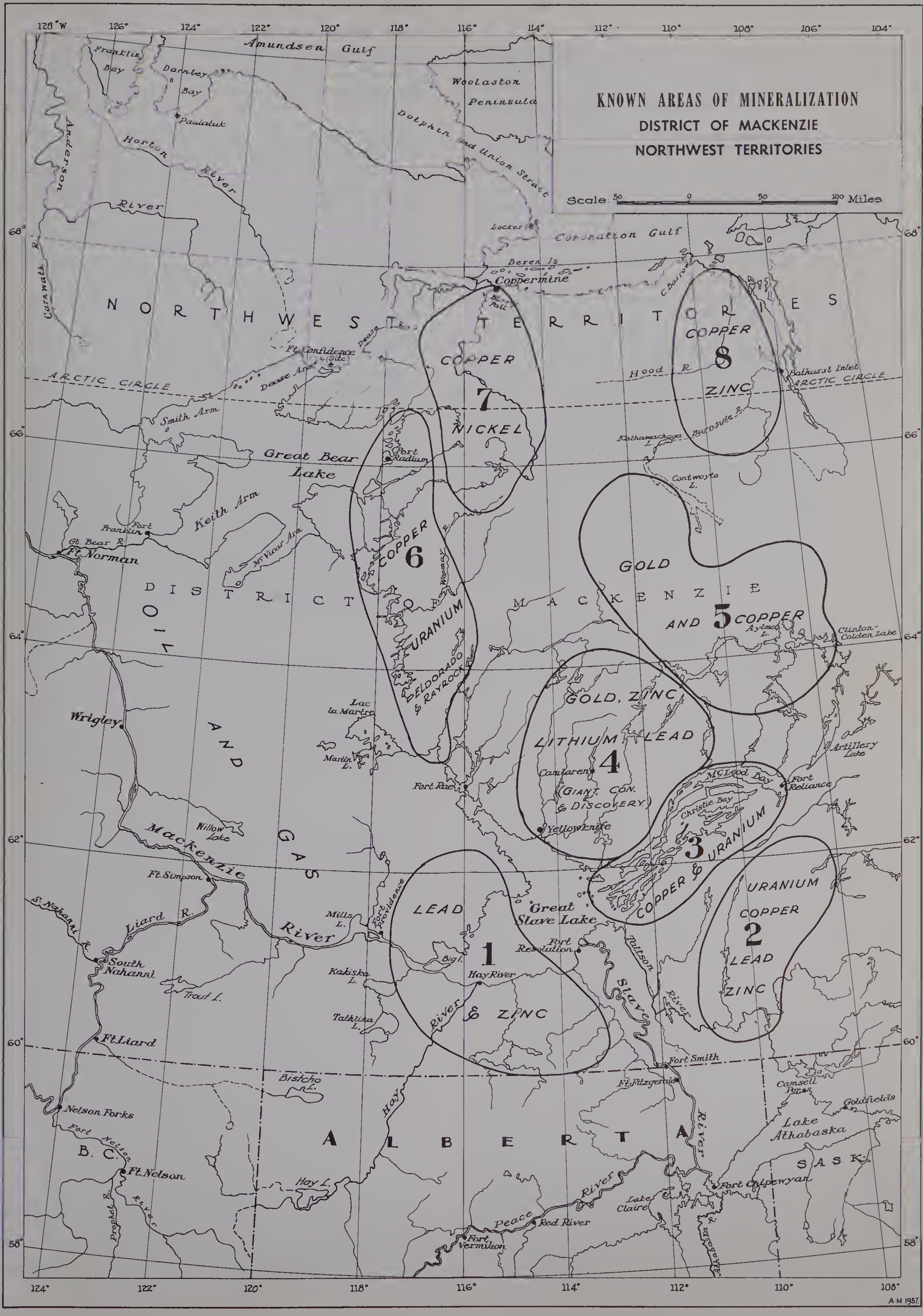
"Pickle Crow Gold Mines has obtained a concession of 500 square miles known as the Coppermine Mountain Reservation. This area also contains copper and nickel, and a vigorous programme is planned for this season.

"Kennecott Copper — one of the largest of the United States copper companies, has a concession of 620 square miles known as the James River Reservation. This concession is located only ten miles south of Coronation Gulf, which is part of the Arctic Ocean. The Company has committed itself to spend more than $1,000,000 on this concession alone, which is known to contain substantial highgrade copper as well as zinc and nickel."

The district of MacKenzie, while possibly not being what enthusiasts call a "vast storehouse of minerals as yet unscratched", nevertheless contains many great mineral deposits to which Canada's economy—with its increasing industrial requirements—is even now turning. The following gives a very brief outline of the minerals in the areas of the District of MacKenzie which are illustrated on Map No. 17.

Area 1: This is the area containing Pine Point. Exploratory work on this discovery has indicated an ore potential of 60 million tons, much of which will be mined by open-cut methods. Geological conditions over this area are similar to those at Pine Point and while this area is difficult to prospect because of scarcity of outcrops, more ore will likely be found by the new geo-chemical or geophysical methods.

Area 2: Uranium, copper and lead-zinc showings have been found in this area. Three uranium showings have been promising enough to warrant considerable drilling. One copper showing has been drilled and one lead-zinc occurrence has been drilled and partially developed by a shaft and underground workings. Other occurrences of these metals have been found but have received little de-


KNOWN AREAS OF MINERALIZATION
DISTRICT OF MACKENZIE
NORTHWEST TERRITORIES
Scale: 50 0 50 100 Miles
NORTHWEST TERRITORIES
DISTRICT OF MACKENZIE
ALBERTA
B. C.
SASK.
OIL AND GAS
LEAD 1 & ZINC
URANIUM COPPER 2 LEAD ZINC
3 COPPER & URANIUM
GOLD, ZINC LITHIUM LEAD 4
Cantaren (GIANT, CON. & DISCOVERY)
GOLD AND 5 COPPER
COPPER 6 URANIUM
ELDORADO & RAYROCK
COPPER 7 NICKEL
COPPER 8 ZINC
Amundsen Gulf
Franklin Bay
Darnley Bay
Paulatuk
Woolaston Peninsula
Dolphin and Union Strait
Coronation Gulf
Coppermine
Great Bear Lake
Great Slave Lake
Yellowknife
Fort Rae
Fort Reliance
Fort Resolution
Hay River
Fort Smith
Fort Providence
Ft. Simpson
Ft. Norman
Fort Franklin
Wrigley
South Nahanni
Ft. Liard
Nelson Forks
Ft. Nelson
Fort Chipewyan
Fort Vermilion
Red River
Lake Athabaska
Goldfields
Camsell Port
Port Radium
Bathurst Inlet
ARCTIC CIRCLE
Mackenzie River
Liard R.
Peace River
Slave River
A-M 1957

velopment work. None of the deposits so far developed have proven to be economic. However, they indicate that the area as a whole is favorable for uranium, copper and lead-zinc mineralization.

Area 3: A large number of small copper showings and a few uranium showings are known to occur in this area. Few of these occurrences have been impressive enough to warrant anything more than preliminary development work. However two copper deposits have been drilled—without success—and one uranium deposit has been partially developed underground by an adit. Both the copper and uranium deposits are related to regional faults in the area and these faults are largely covered with overburden. Therefore, much of the potential ground in the area has, as yet, not been prospected. Modern geophysical methods have only recently been used in the area and so far have not been used on a large scale. It can be seen, therefore, that there is a possibility of copper and, to a lesser extent, uranium being found in economic quantities in the future.

Area 4: This is the area which includes the Yellowknife District. Large portions of the area are underlain by rocks similar to those found around Yellowknife and therefore are favorable as far as ore deposits are concerned. The limited work done in the area, however, makes it difficult to predict its true potential. It may be said, however, that it is favorable for gold. However, because of the economic conditions of the gold mining industry, there has been no prospecting for the metal in the past seven or eight years. With improved conditions it is to be expected that more gold mines will come into production.

Large tonnages of lithium are available. The geologist with whom the Commission discussed this area stated that "At the present time it is unlikely that this ore can be mined economically but, with cost reducing improvements in lithium milling techniques, with favorable transportation rates out of the Territories and with the development of new uses for the metal, these lithium deposits will be mined."

In area 4 several zinc-lead and copper showings have been found. Two of these occurrences have been tested with a diamond drill. In one, 800,000 tons of zinc-lead ore has been outlined and drilling is still in progress. In the second occurrence, results for lead-zinc and copper are favorable enough to consider the deposit of future economic interests. It is likely that with further prospecting more of these deposits will be found in the area.

Area 5: This area which adjoins No. 4 on the northeast has, because of its remoteness, only recently received much attention from the prospector. Gold showings and sulphide deposits containing some copper are known to occur. Much of the area is underlain by rocks similar to those around Yellowknife and its geology therefore can be considered favorable as far as ore deposits are concerned. The limited work done in the area, however, makes it difficult to predict its true potential. It may be said, however, that it is favorable for gold and, possibly, base metals.

Area 6: Two uranium producers are included in area 6—Eldorado Mining and Refining at Port Radium on Great Bear Lake and Rayrock Mines Limited in the Marian River district, about 100 miles northwest of Yellowknife. A number of other uranium showings are known to occur in the area and a few copper showings have been found. The chances of more uranium production from this area are good. It is also possible that there will be some copper production in the future, particularly from the areas in the immediate vicinity of Great Bear Lake.

Area 7: A number of copper showings and copper-nickel occurrences have been found in this area and three copper showings have been drilled with disappointing results. One nickel occurrence is now being tested by a large geophysical and drilling program but there has not been enough work done on the nickel occurrence to fully test it or to allow conclusions to be drawn about the economic possibilities. Much of this area, because of its remoteness, has been prospected only in a very reconnaissance manner. It can be said, however, that this area is favorable for prospecting and has base metal potential.

Area 8: Until a few years ago, this area was unknown and even yet has not been systematically geologically mapped. However, in the past three years a considerable amount of work has been done on base metal occurrences which are located northeast of Bathurst Inlet, and extensive diamond drilling by the company has outlined fairly large tonnages of copper-zinc ore. Several other companies have done preliminary work in the area and, while they have not made any discoveries of economic interest, consider the area promising enough to continue their programs. Geology of the area is favorable and, since one deposit has been proven, more work will be done over the years in this region. On the basis of geology and known mineralization, this can be considered another potential area.

The region between 7 and 8 is unmapped and has been prospected only in a limited way. The few facts that are known suggest that it is a favorable prospecting area. The same can be said of the region northeast and east of Fort Reliance.

The western third of the District of MacKenzie is underlain by rocks similar in age and other respects to those which occur in Alberta. This area is a potential oil producer. One oil field is now in production at Norman Wells and supplies the oil and gasoline requirements for the Territories. In recent years a number of large oil companies have obtained concessions in various parts of the potential area. The work at first was, of necessity, of a preliminary fact-finding nature because the area was practically unknown geologically. Work has progressed, however, to the point where some companies have drilled or are drilling. It is the opinion of oil geologists that the area between the Alberta border and the Arctic coast, underlain by favorable Paleozoic rocks, has excellent possibilities for oil production.

R. G. Robertson, Commissioner of the Northwest Territories, states that:

> "A few years ago the wave of oil exploration which was moving northward in Alberta surged over the boundary into the Northwest Territories, and now exploration permits have been granted covering an area of some 19,000 square miles running down the MacKenzie Valley as far as some 50 miles north of Norman Wells. In addition there is an exploration reservation straddling the Northwest Territories - Yukon boundary westward of Fort Good Hope, of which the Northwest Territories portion covers 2,400 square miles. There are indications of oil in the northern islands of the District of Franklin. During the summer a gas well of limited extent blew in southwest of Hay River and further exploration in the area is expected to go on.

"Oil is produced at the Norman Wells field at approximately 350,000 barrels per annum. This is refined locally and the products shipped to points along the MacKenzie River and mining districts on Great Bear and Great Slave Lakes. Reserves of the field of 64 wells are estimated at 36 to 60 million barrels, of which 4.3 million barrels have been produced to date. Recent drilling in the vicinity of Rabbit Lake west of Hay River has resulted in the discovery of natural gas, the volume and extent of which has not yet been determined. Coal of bituminous rank is mined at Moose River, 200 tons being shipped annually to the town of Aklavik for use as domestic fuel."

There is no doubt that minerals are present in the Northwest Territories, and particularly in the District of MacKenzie. There is equally no doubt that during the next ten or twenty years Canada's economy will need these minerals, and that, as soon as a railroad from Alberta to Pine Point gives access to them, we will see a great boom in the economy of the Northwest Territories. The only question is, when will such a railroad be built?

Not only is the Northwest Territories important economically, but, in spite of intercontinental ballistic missiles, etc., it is vitally important to the defence of this continent. Recent developments may have made some of the instruments of the D.E.W. Line obsolete but have hardly lessened its value for defence purposes or our necessity for it. We may expect to see the D.E.W. Line revamped to fall in line with a changed strategy but it will not be discarded.

In trying to assess the future importance of the Northwest Territories to Alberta possibly we should do so (1) on the assumption that a railway will not be built from Alberta to Pine Point, and (2) on the assumption that construction of the railroad will be started soon.

(1) If the railroad is not built, we may expect the Northwest Territories to struggle along much as it has been doing during the last fifteen years, and we might forecast its population, including whites and natives, to be somewhat as follows:

1956	19,313
1967	22,000
1977	25,000
1987	30,000

But this is an assumption that is not valid because the demand for metals is going to make it necessary to build a railroad.

(2) All the available evidence, including the Paley Report and the Report of the Gordon Commission, indicates that world demand for minerals, particularly base metals, is going to increase and increase rapidly. It is the concern of our statesmen to see that when the demand arises, as it soon will, the Northwest Territories gets into a position to meet it. Canada does not have a corner on all economic minerals. South America, Cuba, Indonesia and South Africa are all strong competitors in the supply of these products. We live in a world where technology is continually finding substitutes for our various raw materials. The time to sell our minerals is now, before substitutes arise. We could find ourselves in the position of having neglected or hoarded the minerals of the North to the point where, due to substitution, there will be no demand for some of them. In not opening them up now when they will pay for the transportation facilities necessary to get at them, we may miss the opportunity of using them as a means of paying for the development of our North country.

By preparing now to take advantage of the coming demand for these minerals, we will be richer by the opening up of a vast new area of Canada. Our statesmen know this. It seems impossible that they will overlook this opportunity to open up that part of Canada that lies north of the 60th Parallel—fifty per cent of Canada. For this reason, it seems advisable to assume that it will not be long before a railroad to the North is started.

Assuming that a railroad is started now and completed within five years, a great deal of development would take place in the Northwest Territories immediately and the population of the District of MacKenzie would accordingly jump. The first mine to develop would be Pine Point. This would employ 250 men, and would mean a population of 1,000 directly dependent upon the mine. With the service personnel necessary to supply those employed in the mine, the population would very soon grow to about 1,500. At the same time, whatever re-arrangement of water transportation facilities affecting Fort Smith or Hay River would be brought about by the railroad, there would be no decrease in population. The total amount of water transportation would probably increase over what it is now due to more mines coming into operation. The net result of the railroad then would be a town at Pine Point having a population of 1,500 which would be a straight addition to the present population.

The cost of getting labour, machinery and supplies into the North would decrease by 25% to 30%. The very high inventories which the mines now have to carry would be sharply reduced. As a result, it would be economically possible to develop new mines which are today lying dormant. These mines, scattered all over areas 1 to 8 on the map, would require personnel, and in all, several hundred people would have to go in to work them. Points like Hay River, Yellowknife, Pine Point and Fort Smith would increase in population to provide services to these miners and to the mines.

In addition to metal mining, it is expected that there would be considerable development in the oil industry in the sedimentary basin along the MacKenzie River. This, too, would require a population to carry out this work. It is to be expected, also, that the defence requirements of the North would tend to increase rather than to decrease.

Based on all of the above, a conservative estimate of the growth in population of the Northwest Territories for the next thirty years would be as follows:

1956	19,313
1967	35,000
1977	45,000
1987	60,000

Today with 19,313 people, 11,743 of whom are natives, the North does business in Alberta that amounts to about $50,000,000. If the population increased to 60,000, of which some 15,000 only were natives, a very conservative estimate of the business Alberta would do with the North would be $150,000,000.

From the standpoint of food alone, to supply 60,000 people in the North would require the following products annually, based on figures given in the 1956 Canada Year Book for per capita consumption;

	Lbs. Per Capita Per Annum	Consumption 60,000 People
Flour	148	8,880,000 lbs.
Beef	72	4,320,000 lbs.
Pork	54	3,240,000 lbs.
Potatoes	145	8,700,000 lbs.
Whole Milk	406	24,360,000 lbs.
Eggs	24 (doz)	1,440,000 doz.

While much of the produce required to meet these needs might originate at almost any point in Alberta, it is interesting to conjecture about the possibility of the Peace River Country, including the Fort Vermilion area, supplying all but the flour. This food might be trucked to the Northwest Territories, or any of it that might be produced in the Fort Vermilion area could be hauled by road to the Railway. In any event it would be originating from 300 to 600 miles nearer to the Northwest Territories than Edmonton.

To meet a 1980 consumption in the Northwest Territories of 4,320,000 pounds of beef and 3,240,000 pounds of pork, a yearly marketing of 8,000 beef cattle and 21,000 hogs would be required.

To meet the requirements of 1,440,000 dozen eggs would require 72,000 hens. The North's requirements of 8,700,000 pounds of potatoes by 1980 would mean that approximately 800 acres should be planted to potatoes. The growth which we anticipate in the Northwest Territories would therefore present considerable challenge to the farmers of the Peace River Country.

In trying to arrive at some figures to show what the development of the North could mean to Alberta, our forecasts have been on the conservative side because they go on the assumption that the Northwest Territories or the MacKenzie District will develop in an orderly, matter of fact, way. Three things, however, might have the effect of boosting the economy of the North and suddenly doubling or trebling its effect on Alberta.

(1) If, as a result of our highly scientific uses of metals, some metal which can be obtained in the Northwest Territories should spring into the limelight just as other new metals have in the past, new mines would suddenly develop and new concentrations of populations would bring new towns into being.

(2) If, in this age of rockets and rocket fuels, lithium might suddenly loom as a most strategic metal, then the large lithium deposits in area 4 would be mined. Refining lithium requires very large amounts of sulphur and of electric power. The additional sulphur could probably be produced at McMurray and the power could be obtained either by developing the hydro sites on the Lockhart River on the east end of Great Slave Lake, or by developing the one million H. P. in the Smith Rapids. The chances are that the Smith Rapids would be preferred. We would then have a sound basis for a concentration of population in the Fort Smith-Pine Point-Uranium City area based on the power produced at Fort Smith.

(3) The Sherrit Gordon Plant at Fort Saskatchewan has shown what can be done by new ideas in the metal refining industry. It seems probable that if the mines in the Northwest Territories develop, a time will come when some of their ore will be shipped to some point in Alberta where fuel is abundant and cheap and the ore will be refined there. Pine Point ore, however, will not be refined in Alberta because Consolidated Mining and Smelting Company already has facilities for doing this at Trail and is not likely to duplicate its facilities by building a plant in Alberta. It is probable that a development of this sort will take place within the next fifteen years and after that Alberta could become increasingly important by becoming the smelting centre for the mines of the Northwest Territories.

The resources of the Northwest Territories are, in effect, the resources of Alberta. They will continue to be, so long as the lines of communication into the North continue to be from Alberta. And they are resources that are on the threshold of extensive development.

SECTION 4

THE MARKET TREND IN RESPECT OF THE RESOURCES OF NORTHERN ALBERTA

Those resources of Northern Alberta currently being exploited nearly all come from the Peace River Country, where the present economy is largely based on extracting and exporting basic raw materials, including agricultural produce.

It appears that during the 30 years covered by this forecast this process of reaping the resources and exporting them from the Peace River Country will continue without any marked change in manner but with an increase in volume. While, in the past, exploitation of the resources of Northern Alberta has been almost wholly confined to the Peace River Country, this process will extend to other parts of the area.

The materials exported from Northern Alberta are at present agricultural and forest products, and minerals in the form of oil and gas. All of these will be produced in the future and, except possibly for fur, will be produced in greater quantities. But new products are appearing on the horizon. To the present production will be added minerals—both precious and base—from the Precambrian and Paleozoic areas, as well as iron ore and industrial minerals such as gypsum. The Athabasca Oil Sands will be opened up and marketed, and finally large quantities of hydro power will be generated. Some of this power will be used locally in oil refining, pulpmills, etc., but much of the large part of it that is within transmission distance will be exported to the Edmonton area.

The market outlook for all Canadian products will depend in a large measure upon world demand and especially upon demand in the United States of America. Northern Alberta will be affected equally with the rest of Canada. At present, many products, especially lumber, paper products and metals (copper, lead and zinc), are facing a period of slackness and wheat, of course, is overhung by the surplus. The pickup in demand for these products depends largely on events in the United States and in other industrial countries. A declining premium on the Canadian dollar will enable Canadian manufacturers to regain a larger share of the domestic market, and it will no doubt help Canada's export trade. How fast the export trade for lumber, wood products and metals will pick up, depends mainly on the trends of housing and defence spending in the United States and also on how soon the United Kingdom and other countries relax their restrictions against these products.

However, indications are that demand will pick up and will go on to new highs. Although it can be expected that for the next very few years there will be an oversupply in most primary products, this will be corrected eventually by the normal forces of supply and demand. There will be an increasing demand for Canada's natural resources and much of this will come from the United States.

While Northern Alberta, along with the rest of Canada, will share in this increasing demand, it will nevertheless continue to be handicapped because of its remoteness, which adds to the cost of shipping its resources to the centres of population and the regions of manufacturing. For this reason, those products that have a high value in relation to their weight, i.e., minerals and oils, will stand a better chance of being marketed than other products, such as grains and lumber. For instance, due to the cost of freight, we may expect an increase in meat export from the Peace River Country relative to the export of wheat.

In the Commission's opinion, the following factors will apply to the various resources and exportable products of Northern Alberta:

AGRICULTURE

In a study of the potential development of agriculture in Northern Alberta, a few fundamental considerations are applicable as in almost any other agricultural areas in Canada. Some of these are the local, national, and international increased demand for food products such as can be successfully grown in this area, the strength and trend of this increased demand, the advances of science in plant breeding, livestock improvement, and engineering, the relative balance of agriculture to that of the general economy of Canada, farm credit, economic farm units, probable population increase, and the national fiscal policy. Another basic factor not so important in other areas is the semi-remote location of this area. The importance of agriculture to this area can be appreciated when it is noted that approximately 48% of the population tion is engaged in agriculture, and another 13% is, in the main, indirectly dependent upon it.

With the general universal increase in population commented on elsewhere in this report, and with particular reference to the projected population increase in Northern Alberta and the Northwest Territories, a continued increased demand for more and more food is assured. The habits of consumption will alter slightly from time to time with changes and fancies in living standards and tastes, but the present trend towards greater per capita consumption of meat, dairy and poultry products, and fruits and vegetables, should continue at the expense of reduced consumption of cereals in the diet. National and international markets will continue to take a large share of cereal grains grown in this area, but it is expected that as a result of increased local, provincial and national demand, the proportion used for feed grain will increase.

Until recent years, farmers and extension field men have given almost their entire efforts to the problem of bringing land under cultivation and to improving methods of production. In the immediate past farmers have been greatly concerned over marketing. This matter is now receiving the attention of responsible officials at all levels, which argues well for the hope that advances in market-

ing techniques will help to balance the agricultural economy. The national fiscal policy will affeet favorably or otherwise the levcl of employment and the development of business and industry—all of which will be reflected accordingly in population growth, trade and the demand for food and services.

The present cultivated or improved area of over 2,200,000 acres embraces a large portion of the most fertile soil of the Peace River Country. Development thus far has followed somewhat of a ribbon pattern of settlement, starting first along water, then railway and later highway routes. The greatest concentration of population centers are in these agricultural areas—briefly, along the southern part from the Beaverlodge area through Grande Prairie and Valleyview to High Prairie. Then from there north through McLennan and Falher to Peace River Town on the Peace River. From there west to Grimshaw, north to Paddle Prairie, then east to Fort Vermilion, and also from Grimshaw southwesternly, to Fairview and Rycroft and back to Grande Prairie. Another area of development reachcs through the middle section from Bay Tree on the west through Spirit River and Eaglesham to Falher. With the present scientific knowledge of field cropping, animal husbandry, mechanical equipment, and "know-how", the ultimate productive potential of Northern Alberta is virtually unlimited, particularly so, when considered in the light of the anticipated demands on it during the next 30 years. In addition to over 2,200,000 acres of eultivated land, Northern Alberta contains 14,500,000 acres of arable land not yet in cultivation. (This includcs that shown in Table No. 5, Section 3, plus land occupied but not yet eultivated.)

The City of Grande Prairie, situated on the southern border of this area, 287 miles from the heavy coneentrated population and the capital city of the province, and Fort Vermilion, some 550 miles from Edmonton, and still some 100 miles south of the northern border of the province, illustrate more than the central area the advisability and necessity of economic farm units. The Commission recognizes that an economic farm unit cannot be determined in terms of acres. Rather it can be more properly determined by the productive capacity of the enterprise undertaken, and one in which the farm family ean manage and operate in periods of unobtainable farm labor.

TABLE NO. 1

Value of Production in 1956 and Potential Production 1966

	1956	1966
Wheat	$ 8,586,338	$ 8,586,338
Barley	8,873,065	8,873,065
Oats	7,526,594	7,526,594
Rye	71,315	142,630
Flax	3,397,336	6,000,000
Miscellaneous Crops	2,400,000	5,000,000
Cattle	3,515,300	15,000,000
Hogs	4,663,000	20,000,000
Sheep	59,000	300,000
Poultry	1,905,100	10,000,000
Dairy	2,042,700	10,000,000
Wool	17,600	85,000
Fur	750,000	750,000
Honcy	295,000	600,000
	$44,102,348	$92,863,627

Note: The above calculation is based on the present market for cereal grains being maintained, and the assumption that there will be a greatly increased market for other farm products.

The lack of adequate markets for agricultural products is overshadowing and rctarding development in Northern Alberta as it is elsewhere throughout the world. Notwithstanding this, it is of interest to note that in reeent years both the numbers of improved acres and the numbers of occupied farms have increased in this area. Improved acres have increased from 1,879,412 in 1951 to 2,216,819 acres in 1956. The number of farms has increased from 9,400 in 1951 to 9,454 in 1956. Improved acres per farm have also increased from 195 in 1951 to 234 in 1956. Homestead entries from 1952 to 1956, inclusive, total 3,648, though in the same period 2,304 of these were cancelled, leaving a net increase of 1,344.

The potential inereased value of agricultural production by 1966, compared with the actual value in 1956, is shown in Table No. 1.

This increase is to come from specialization, and better and more complete use of lcgumes both in soil building and in feeding practices. The experience both of institutions and practieal farmers has proven that the production of cereal grains grown on existing land can be at least doubled. This would provide additional feed grain for the increased production of other products. To supplement this calculation the extensive use of fertilizer would assure this increase and add to this potential under normal climatic conditions.

To complete the potential for 30 years, or if and when needed, the 14,500,000 acres of uncultivated arable land could be utilized. On the above basis, this would increase the potential some $600,000,000 or yield a total productive capacity of $690,000,000 by 1988. It is quite possible that a considerable amount of marginal and timber land of today may, as time and circumstances dictate in 100 years or longer ahead, be reclassed as agricultural, but for the next several decades these will be more useful and serve the best interests of the province as forests.

While this is the potential increase which could take place in the next 10-year period if there were markets enough to justify this much production, the Commission feels that the Peace River Country will not be called upon to produce anywhere near this amount.

The long-term outlook for agriculture in the Peace River Country is good. It appears that farms in that region will switch to more intensive farming, produeing more red meat, poultry and dairy products, part of which it is anticipated will be shipped to the Northwest Territories. Even with this increase in production, there will be little demand for opening up more land that is presently not settled. This aspect is discussed more fully in Section 5.

Fur Farming

It is believed that the fur industry in Northern Alberta will remain pretty well static over the next couple of deeades at between 100,000 and 120,000 pelts a year. The peak years were in the 1940's. Since 1947, there has been a marked levelling off in the quantity of fur-bearing animals raised in order to bring them into line with the food available. In only one area in the Provinee, Lac La Biche, has there not been a fall-off in production. In fact, the number of fur farmers there has increased.

If mink priees maintain their present level, and if feed prices remain the same, we ean expect a continuation of around 100 to 125 fur farmers through to 1980, producing in the neighborhood of 120,000 pelts. Pelt value is also expected to remain the same, at about $2,500,000 a year. No increase in the demand for fur is expected.

Under present conditions, there is scarcely a nation of the free world which is economically independent of all other societies. The life of all nations is now closely interwoven and they are constantly interchanging their products. It is, therefore, impossible to form a clear idea of the possibilities of the development of Northern Alberta's forest resources without taking into account the forest resources and the general economics of other parts of the world, especially the rest of Canada. The means of transportation and the cost of it also must be considered.

The Honourable Gordon Sloan, Chief Justice of British Columbia, in his recently completed report on the forest resources of British Columbia, has this to say in regard to future world markets for forest products:

> "From the studies and reports or exhibits as brought to my attention during the hearings of the Commission, it is, I think, reasonably clear that world demand for wood and wood products is far from being satiated. The potential future demand for paper products, should it materialize, is beyond the capacity of present existing mills to meet. The secular trend, despite periodic recessions, gives no indication that world demand for wood products in one form or another will diminish.
>
> "It is, however, equally clear, I think, that, in time, present centres of demand and supply will shift in accord with future economic currents even now taking form and substance and seeking new channels. Looking out of our windows at the world, we can see, in almost every direction, vast new areas of forested land growing into production and yielding ample supplies of low-cost raw materials for large modern conversion plants. These areas, until recent years, looked to us for their supply of lumber, for their pulp and newsprint, and for the other wood products. They are becoming self-sufficient and those that have achieved that objective because of expanded production or shrinkage in their own domestic demand are now exporters in competition with our mills in the markets of the world."

Although much timber not now being utilized in Northern Alberta may find a market as forest depletion and world timber shortage become more acute, and although the pulp industry is turning towards Alberta, we cannot count on using all the timber included in the inventory. There will always be some timber beyond economic usability. Small size and sparse growth, that is scattered stems, make some of our stands uneconomical. The present utilization of saw timber in the Northern Alberta Divisions is very much unbalanced so far as species and location are concerned. The most disturbing feature of this situation is the over-cut in the Slave Lake Division in Area No. 1 (Map No. 5). Although the expected reduction in fire losses will overset this unfavorable position to some extent, it will not solve the problem in some Management Units. The same condition exists in some of the Management Units in the Grande Prairie, Peace River and Lac La Biche Divisions.

However, the figures for annual allowable cut shown in Table 11, Section 3, make it plain that there is considerable room for expansion of forest-products industries even under average conditions as they have been for the past 17 years in regard to fire losses. On the other hand, these figures also make it plain that indiscriminate development would do more harm than good. It is essential for the development to be fitted to the resource so as to make the most of the timber surpluses where these are located and not to aggravate the shortages where these also are apparent.

In appraising timber growth and depletion, care should be taken not to over-emphasize or misuse generalized growth-depletion balances. The quantity of timber in Northern Alberta and the extent of permanent forest land are the two fundamental aspects of the forest situation. Timber volumes are similar to a storekeeper's stock. These present volumes are the material from which current utilization and other depletions are drawn. Because timber grows and thus is a renewable resource, present volumes have great significance for the future as well as for the present. They constitute the capital to which growth is added. And because of the long-term nature of forestry, trees now growing will necessarily constitute the available supply for some time to come. Neither should it be considered that because fire has destroyed large quantities of timber growth in certain localities that these areas should be deducted from future consideration. Barring further denudation by fire, they will be re-generated and become part of the future growing stock and future harvest.

Even assuming, then, that everything possible is done to harvest the forests in Northern Alberta in a manner most compatible with good conservation practices, we cannot forecast with any degree of certainty how and when all this timber will be used. Some of the many factors that come into play are discussed below, and, finally, an estimate has been made of the probable use of the timber of Northern Alberta.

Timber operators are holding berths that may overcut the allowable annual cut in many areas by nearly 50% in the next four years. This, however, is confined to the larger diameters of over 12" rather than the 7" of earlier years. Although for the past 12 years there has been overcutting and there are commitments for overcutting for the next four years, this trend should not continue much beyond that time. Conditions in each Management Unit have been analyzed insofar as white spruce and pine are concerned and the possible corrective measures set on foot to place these areas on a sustained yield basis. In some years in some areas this will mean the selling of decadent timber only, and in others, the selling of only mature spruce or possibly complete restriction. It will mean the opening up of other areas reasonably accessible, and of areas hitherto considered inaccessible through lack of roads or of areas hitherto thought to be too far away from markets.

The percentage of pine timber marketed should be increased. There seems to be no question but that pine is equally as good as spruce in appearance, strength and workability, and in some instances, slightly better. The lack of large quantities of pine of sawlog size is one of the reasons why this species has not been cut to a greater extent. The other is the fact that the consumer is not aware that pine is equally as good as white spruce. Further, it is more difficult to export pine to the United States on account of their regulations governing its use. It would thus appear that the promotion of pine as an alternative to white spruce is necessary if Alberta forests are to be kept on a high productive level on a sustaining basis. If this is not done, the white spruce sawlog operators may eventually find their business decreasing.

These, however, are local problems of production. Because of the high percentage of the production of our forest industries which is exported, it is obvious that any assessment of the future prospects of these important industries must rest very largely upon estimates of future world demand for forest products and the share of this demand which is likely to be obtained by Canada and by Alberta. To meet the expected domestic and foreign demand for Canadian forest products, Canada's production will have to double by 1980, but this does not mean that this will make it possible for Northern Alberta to double its production and to market this larger output.

Because the population of North America is increasing and therefore the amount of construction is increasing, we may expect the demand for Northern Alberta lumber to increase over the next ten or fifteen years and possibly to remain fairly steady after that. A substantial increase in the over-all demand for lumber of various kinds is forecast. This is based on the expectation that Canadian exports will gain a somewhat larger share of the United States market and that domestic requirements will increase by approximately 50%. However, in the European markets for lumber, it is possible that Canada may from time to time meet some competition from the Soviet Union.

The most important forest product exported is newsprint. More than 90% of Canadian newsprint production is exported, and over 80% of such exports are to the United States. It is expected that until 1960 the production of newsprint in Canada will exceed purchases, but after that there should be an increasing demand for it. The total demand for Canadian newsprint in 1980 should be about double what it is at present. By that time it is estimated that the United States' demand for it will be only half again as large as it is now, that domestic demand, however, will more than double and that foreign demands will increase fourfold. The expansion of the newsprint industry in the Southern States and the development of techniques to utilize the hardwood resources of the Northeastern States will result in some relative decline in the dependence of the United States on Canadian supplies of newsprint.

To meet the increased demand for Canadian forest products, the total cut of wood in Canada will probably increase by about 60% by 1980. The future development of the Canadian forest industries rests, in a large part, on their ability to maintain their competitive position in world markets. This means that there must be deep and constant concern about competitive costs. Improvement in forest management practices is essential if future wood supplies are to be obtained at competitive prices.

In trying to relate all that to the forest industries of Northern Alberta it appears that the future position will be somewhat as follows as compared to the year 1956-57 when the total cut of timber was 190 million board feet cut for sawlogs and a negligible amount of non-mature timber cut as cords. By 1967 the annual cut of sawlogs is expected to increase to 330 million board feet, and it is expected to remain at that for the succeeding ten years. The comparable figures for pulpwood are 3,238,000 cords in 1967 and about 5,000,000 in 1977.

As these figures indicate, it is expected that there will be a considerable swing to a pulpwood economy during the next twenty years. Table No. 2, as well as showing the type of operation, shows the areas where cutting is expected to take place in 1967 and in 1977. These areas were defined in Section 2 and are shown on Map No. 5 in that section.

TABLE NO. 2

Areas and Type of Forest Production

	1956-7	1967	1977
Grande Prairie			
Area 1	Sawlog	Sawlog Pulpwood	Sawlog Pulpwood
Slave Lake			
Area 1	Sawlog	Sawlog Pulpwood	Sawlog Pulpwood
Peace River			
Area 1	Sawlog	Sawlog Pulpwood	Sawlog Pulpwood
Area 2	Sawlog	—	—
Area 3	Sawlog	—	—
Area 4	—	Sawlog	Sawlog
Area 6	—	Sawlog	Sawlog
Area 7	Sawlog	—	—
Lac La Biche			
Area 1	Sawlog	Sawlog	Sawlog Pulpwood
Area 3	—	Sawlog	Sawlog Pulpwood
Area 4	—	—	Pulpwood

It is felt that there will not be enough demand for lumber or pulpwood during the next thirty years to utilize fully all the forest resources of Northern Alberta. In other words, taking the area as a whole, the actual cut of lumber will not be as much as the allowable cut which represents the amount of lumber which could be taken out if there were a sale for it. In the opinion of the Commission, we may expect to cut about 330 million board feet of lumber in 1967 as compared to 190 million board feet in 1956-57. The amount of lumber cut in Northern Alberta is expected to reach its maximum about 1967 and then, in spite of the fact that more lumber could be cut, it is expected that the annual cut will continue at about the 1967 level. The increases in lumber production are expected to be obtained from the following areas, which in 1967 are expected to supply the following percentages of what they did in 1956-57.

TABLE NO. 3

Increase In Lumber Production

Grande Prairie	
Area 1	200%
Slave Lake	
Areas 1 & 2	No increase.
Peace River	
Areas 1, 2 & 3	Small increase
Areas 4, 5 & 6	No appreciable cut in 1956-57, increasing to 48 million feet by 1967.
Areas 7, 8 & 9	No appreciable cut in 1956-57, or in subsequent years.
Lac La Biche	
Areas 1 & 3	300%.
Area 2	No appreciable cut in 1956-57 or subsequent years.
Areas 4 & 5	No appreciable cut in 1956-57 or subsequent years.

It will be seen, then, that it is expected to cut considerably more lumber in the vicinity of Grande Prairie and in the Lac La Biche area, which extends as far north as McMurray, while in Peace River areas 1, 2 and 3 there will only be a slight increase in lumber cut. In the area tributary to Fort Vermilion (Peace River areas 4, 5 and 6) a large increase is expected, while in the extreme northeastern and in the extreme northwestern sections of Northern Alberta very little lumber is expected to be cut.

The ultimate future of the pulpwood industry in Northern Alberta is not very clear. There are areas which would support pulp mills, but due to competition in this industry from the rest of Canada, the United States and other foreign countries, including New Zealand, it does not seem probable that all the pulpwood resources of Northern Alberta will be used during the next thirty years. In the Commission's opinion, it seems likely that pulpwood mills will be built as outlined below, but there are so many factors that complicate the situation that this opinion could turn out to contain a large margin of error. Pulp mills could be located prior to 1975 as follows:

Lesser Slave Lake, Area 1
Grande Prairie, Area 1
Peace River, Area 1

It appears that an additional pulp mill could be located in the McMurray area by 1977, and that it would draw its timber from Lac La Biche Area 3 and from parts of Areas 1 and 4.

The timber in Slave Lake Area 1 could be used within the next ten years to supply a pulp mill which might be located along the Athabasca River, although it is possible that that timber might be used for a reserve for the pulp mill which cuts the timber in the Whitecourt area.

Assuming the building of a pulp mill in the Slave Lake area, then the order of priority of construction of the other mills would probably be governed by the length of rail haul for the finished product. In that event, the next mill would probably be built near Grande Prairie and its production could be shipped to the east via Edmonton, or to the west via the P.G.E. Railway. The succeeding pulp mill might be in the Peace River area, while the last one would probably be built along the Athabasca River at or near McMurray. A pulp mill near McMurray will probably be the last one to be built because stands of timber in that area are more sparse than in other areas.

In the case of Grande Prairie we might assume that a mill will be constructed along the Smoky River, both because that river will supply the water requirements of the mill itself and because logs could be driven down the river to the mill.

A pulp mill to use the timber in Area P1 might be built along the Notikewin River downstream from Manning, or on the Peace River near the mouth of the Notikewin.

WILD FUR

The future market for wild fur does not appear too favorable. Both synthetic, or artificial fur, and farm fur—that is, taken from animals raised on fur farms—are proving stiff competition for wild fur and will probably replace it. One of the reasons for this is that the supply of wild fur fluctuates year by year, whereas farm fur can be raised in fairly constant quantity. It is likely that there will always be some market for wild fur and that muskrat and squirrel will continue to be the most important animals in the fur economy.

As civilization moves further northward it does have some effect in the direction of decreasing the area available for trapping. Moreover, with our growing industrial civilization men are taking other jobs instead of going trapping. Most of the registered trappers today are older men and very few young men are replacing them. To an increasing degree Indians are displacing white men in trapline operations. While in 1942 on registered lines in the Province there were 3,000 white and 200 Indian trappers, the ratio has changed so that in 1956 there were 1,400 white and 1,000 Indian trappers.

In 1980 registered trapping will probably be a thing of the past except for the fact that possibly 500 Indians and Metis may still be engaged in operating 250 to 300 trap lines.

FISH

The per capita consumption of fish is only a small proportion of the total proteins in the diet of both Canadians and citizens of the United States. Even at that, present market requirements are pressing upon the physical quantities that can be taken each year from most of the stocks of both sea and fresh water fish. North America is almost exclusively the market for the fresh and frozen products of the Canadian industry and is likely to remain so.

The projected demand for fresh water fish caught in Canadian lakes is based upon exports and domestic consumption in the years 1949 to 1955 as related to the forecast population increases in the United States and Canada. The total demand for Canadian fresh water fish in 1980 probably will be in the neighborhood of 150 million pounds, round weight. In product weight, the United States demand would represent 77 million pounds of fillets, fresh and frozen (comparable export figures in 1955 were 49 million and 14 million pounds, respectively). Domestic demand in 1980 is expected to approximate 28 million pounds, round and dressed fish, and 5 million pounds of fillets.

Both fresh and frozen lake fish are subject to more erratic fluctuations in price over short periods than are fresh and frozen sea fish. The cause of price fluctuations lies in factors peculiar to the market and to the industry itself which tend to accentuate the effect of the general economic factors of supply and demand. Fish caught in

Northern lakes have an added handicap in having to be shipped by rail or highway over great distanees. Shipping over long distances frequently involves irregular arrivals at distribution points, thereby creating a temporary shortage which results in a sharp price rise. Distance, of eourse, also inereases the difficulty of preserving quality, inducing an additional hazard to price stability.

It is expeeted that future consumption of fish per capita will continue to increase. There has been a marked upward trend in the use of frozen fish in homes and restaurants in recent years. Refrigeration facilities are constantly being improved and expanded not only by the wider coverage provided by commercial facilities in smaller cities and towns, but also by the adaptation of deep-freeze units in the homes. Restaurant eating is becoming more popular in both Canada and the United States, and there is evidence that the restaurant market is an important outlet for fresh and frozen fishery products. If this particular trend continues, it should be aecompanied by a commensurate growth in demand for these products.

As the population of the Province increases, there will be an increase in the demand for fresh water fish. It is quite possible that within the next twenty years all of the fish that can be produced in Northern Alberta will be consumed in the Province. At the present time, the fishing industry is geared mainly for export to the United States. Very little seems to have been done in developing the local market. It would seem that there is an excellent opportunity for local firms to develop this potential market.

It appears then that we may look for increased markets for the fresh water fish from the lakes of Northern Alberta.

MINING
(Other than Petroleum Products)

The following extracts are from the "Preliminary Report of the Royal Commission on Canada's Economic Prospects" and are quoted to show the growth which that Commission thought would take place in Canada's mineral requirements between now and 1980.

"Estimates of the growth of the Canadian mining industry must rest essentially on estimates of the probable world demand for metals and industrial minerals and the share of this demand which Canada may be able to obtain. There are grounds for optimism on both these counts. Everywhere the demand for building materials, for machinery and equipment, and for consumer durables is rising; and rising with it is the demand for minerals. Canada should become a major supplier to meet this increased demand because of her geographical location relative to the world's major markets (particularly the United States), favorable geological conditions, and relatively low costs of produetion.

"The total value of the industry's production by 1980 may be about three and a half times present levels, compared with an increase in the Gross National Product to about three times the current figure. Exports may be four times as large as at present if the United States market is not restricted and if purchases by overseas eountries are not limited appreciably by exchange diffieulties. On this basis, exports of metals and industrial minerals would account for as much as one-third of all commodity exports by 1980 compared with one-quarter at the present time.

"Twenty-five years from now the production of iron ore might be four times as great in value as in 1955. . . . Other more important non-ferrous metals, the output of which by 1980 could be two to four times the present level, include lead, zinc and magnesium.

"The output of potash, whieh is insignificant today, may also reach very substantial proportions. Sulphur production, both as a by-product of metal mining and from natural gas, should beeome an important industry. The output of gypsum is also likely to increase considerably both for domestic needs and for export to the United States. Production of the various structural materials such as cement, sand and brick for the domestic market will increase with construction expenditures in Canada."

The demand for raw materials, especially metals, has been increasing so steadily that there is some fear that we will arrive at a point within the next two or three decades where this demand cannot be met. The following extracts are from an article entitled "Factors Affeeting Mineral Production", which was presented to the Natural Resources Conference of British Columbia in 1956, by L. G. R. Croueh, Professor of Mining at the University of British Columbia. While they deal with British Columbia, they apply with equal foree to the minerals of Alberta or of the Northwest Territories.

". . . It is an elementary economic fact that nothing will be produced unless there is a market for the product or products in question, and unless the market price is high enough to pay all costs of production and transportation. In essence, most of the metals produced in British Columbia are sold into the world market to the south of us. The United States is, and will continue to be for as far ahead as can be seen, the largest single producer and consumer of metals and other mineral products. As that country's demand for metals continues to grow, an increasing proportion of the requirements must be imported; and, because of its location and its mineral potentialities, Canada is looked upon as an important source of supply. Long-term market conditions will be favorable, therefore, for Canada's mineral production, for its own internal market will be growing at the same time. As Canada's growing population increases the size of the local market; also as capital is acquired and facilities are brought into being for further proeessing of raw materials, and fabrication of products, a decreasing proportion of the minerals produced will be exported in the raw state. Though the trend in this direction may not be welcomed by some groups within the United States, undoubtedly that country's need for the metals will be the dominant factor in the long run. Thus, long-range market eonditions are favorable for increased metal production from British Columbia.

"Provided, therefore, that no drastic change takes place in our outlook or our scale of values, a steadily in-

creasing production of a great variety of minerals can be expected in this rovince. Technologic progress and growing populations are increasing the demands for these minerals; technologic progress is making possible the production to meet these demands by enabling a shift in demand to more plentiful materials, by enabling more complete recovery of valuable minerals, and by keeping down production and transportation costs so that deposits of lower grade may be worked. In addition, rapid progress is being made in the development of techniques for the location of the hidden mineral deposits from which the supply must come."

From what Dr. Crouch says and from the opinions expressed in the Paley Report and in the Gordon Commission Report we may conclude that there is going to be an increasing demand for any minerals that are present in Northern Alberta. The pressure of this demand will bring an incentive for more intensive exploration and that pressure will make it desirable to utilize mineral resources that in the past may have been passed up in favor of more promising ore bodies. This unanimity of opinion is most encouraging when thinking of the development and the opening up of Northern Alberta.

It appears to the Commission that there will be an increasing demand for any minerals that may be found in the Pre-Cambrian or Paleozoic areas of Alberta. It also appears more than probable that such minerals will be found in those areas. Certainly these minerals exist and have been found in the Mackenzie District immediately to the north of the boundary and in the area around Uranium City, which is immediately east of Alberta.

If such minerals are found in Northeastern Alberta there will be ample market for them. If the enthusiasm of geologists about that area turns out to be too optimistic Alberta will still be able to benefit from the market demand for the proven riches of the Northwest Territories.

Lead and Zinc

The present depressed market for lead and zinc and its effect upon the possible development of Pine Point has been causing some concern. This depressed market is only temporary because students of metal markets have reported that the demand for lead in the United States during the next two decades is expected to grow about 60% as fast as the total natural output of goods and services. Allowing for the concomitant growth in scrap availability, an increase at this rate would by 1975 require about 200,000 tons more new lead per year from domestic mine production and imports than were available in 1950.

The United States import demand of this magnitude, plus the likely growth in the demand for lead in the rest of the free world, would require a doubling of mine production in the other free countries.

It is conceivable that a continuing lead shortage might arise within the next 25 years, particularly insofar as substitutions away from lead have already gone far, and in view of the fact that the opportunities for further price-induced substitutions are limited. The result would be a tendency toward a severe rise in the real price of lead, though the rise might be kept down somewhat by intense exploration for new deposits and by research in additional substitutions, particularly in the two most important uses indicated for 1975—batteries and anti-knock compounds for gasoline.

Five principal uses absorb almost three-quarters of the total consumption:

Storage batteries	34%
Cable covering	11%
Solder, pipe, sheets and extrusions	11%
Tetraethyl lead (anti-knock agent in gasoline)	10%
Paint and colors	7%
Others	27%
	100%

With a real rise in price, there should be a stimulation in both exploration for new lead deposits and the exploration of previously submarginal deposits. Increased exploration in the United States will undoubtedly result in the discovery of some new ore, but in view of the few significant additions to known lead deposits in the past few decades, it is also probable that the net results will be relatively modest. Also many submarginal deposits are small, so their combined contribution to total output would be small.

The demand for zinc in the United States can be expected to grow roughly two-fifths as fast as the total national output of goods and services. Known zinc deposits cannot meet this increased demand and it is forecast that consequently the United States demand for zinc imports can be expected to increase vigorously, possibly to 800,000 tons annually in 1975. An increased demand in the rest of the free world as well as in the United States may require as much as a doubling of mine production in other free countries.

Extensive substitutions of other materials for zinc are now taking place, and additional substitutions of the same sort have been assumed in assessing the future.

Five principal uses of zinc account for nearly 90% of the total consumption:

Galvanizing	33%
Die Castings	20%
Pigments and Salts	18%
Brass and Bronze	10%
Rolled Zinc	7%
Others	12%
	100%

With the major exception of rolled zinc, the consumption of zinc in most uses is expected to rise through the period to 1975. The single largest increase is expected to be in galvanizing. Little increase is expected in use of zinc for bronze and brass and for die-casting, because favorable prices will permit greater use of aluminum in products now using brass or zinc-base alloys. In particular, substitution is already well under way in die-casting. The use of rolled zinc is projected to decline on the expectation that magnesium, because of its superior performance, will substantially displace zinc in dry cells and engraving plates.

Over-all, the total demand for zinc is projected as increasing by 38% through the next 25 years, to 1.6 million tons. A considerably larger share than in the past will have to be supplied from imports. The 1975 import level in the United States may likely exceed the 1950 level by about 400,000 tons.

It appears, therefore, that there is no need for concern that Pine Point and other lead-zinc mines will not be developed soon.

Uranium

For the last year or so there has been uncertainty about what might be the future market for uranium. This uncertainty now appears to have been resolved and the outlook is brighter. It appears that military requirements are likely to expand. Civilian atomic programs are also expanding and there does not appear to be any possibility in the near future of replacing uranium as an atomic fuel.

Iron Ore

The Commission expects that the iron ore in the Hines Creek area will be mined in 15 to 20 years time, and that then a minimum of 1 to 1½ million tons will be mined each year. This amount of ore would produce a minimum of 350,000 tons of pig iron and would give employment to 200 men at the mine. It is possible that the ore would be concentrated in the Peace River country and this would employ another 300 men. The smelting would probably be done by Premier Steel Mills Limited in Edmonton and would mean the employment of some hundreds of men.

When markets are sufficiently large to justify smelting operations, the question of whether or not it will be cheaper to make a finished product in the vicinity of the ore body, or ship the ore concentrates to Edmonton, must be answered. At the moment it looks as if Edmonton would be the logical place to do this smelting. The rate at which development proceeds in the whole of the Northwest Territories and in the Yukon, however, will have a decided bearing on the smelter location. If more adequate transportation is provided into the north country, it will undoubtedly spur on the growth of activity in that region which, in turn, will bring about an increased demand for iron products.

If it should be decided to smelt this ore in the Peace River Country, there are bounteous supplies of natural gas and water available. Locating such an industry in the Alberta section of the Peace River Country might be an impetus which would bring on the development of the hydro power site in the Peace River Canyon at Hudson Hope, British Columbia. Anthracite coal could be obtained from that area, if necessary, and undoubtedly limestone could be brought in from somewhat the same vicinity. While hydro power has been mentioned, it might be more economical to generate power by using natural gas at or near the site of the smelter, but this is a question of economics which would have to be decided at the time the project was under consideration.

Gypsum

Market prospects for the gypsum deposit at Peace Point appear very good once transportation is available. This is an enormous deposit of high quality. According to the preliminary report of the Gordon Commission, "The output of gypsum is also likely to increase considerably both for domestic needs and for export to the United States". High transportation costs will probably prevent the export of any of this gypsum to the United States, but Alberta's supply of raw gypsum now comes from Manitoba and British Columbia and is processed in Calgary. Once a railway to the Northwest Territories is constructed the gypsum at Peace Point will have a shorter rail haul to Calgary than supplies from other sources, and the high quality may lead to some export out of the Province. The Commission estimates that at least 50,000 tons will be mined annually as soon as this deposit comes into production and that there will be a considerable increase in the amount mined as the years go by.

Silica Sand

While the market for the Peace River sand will continue to expand, nothing in the way of greatly increased production is anticipated.

Salt

Since there is an abundance of salt in Central Alberta it is believed that no further developments of salt will take place in Northern Alberta unless further study of the area north of McMurray reveals a deposit of rock salt close enough to the surface to be mined. If such a deposit were found it could lead to a mine employing possibly 20 men.

Clay

It is possible that further knowledge of Northern Alberta will lead to the discovery of deposits of clay that could be used for stoneware and semifire clay purposes, or to a good brick clay which would probably be exported to Edmonton. In either event the resulting industry would not be very large.

Sulphur

Sulphur is a by-product of wet gas and receives consideration secondary to that of natural gas, although some sulphur might be produced from the Sturgeon Lake field. The gas from this field, however, is low in H_2S as compared to that from Southern Alberta. Because sulphur is a bulk product the cost of transporting it is a vital factor and the production of sulphur in Northern Alberta would not compete with that produced in the south of the Province, unless the demand for sulphur in the mines of the Northwest Territories brings about a big market there. At the present time there is an oversupply of sulphur.

ENERGY RESOURCES

Oil and Gas

Table No. 4 is taken from a report by the Oil and Gas Conservation Board and shows the quantities of oil and gas from Northern Alberta for which it is expected that there will be a market.

Athabasca Tar Sands

It appears that it may be a few years yet before any oil is marketed from the Athabasca Oil Sands area. By the end of 30 years production from that area should be in full swing and the Commission estimates that by that time some 60,000 barrels a day might be produced there.

TABLE No. 4

Forecast of Drilling and Production Activity in Northern Alberta

Annual Production—1958 to 1980

	Wells Drilled (1)	Oil Bbls.	Well Head Value (2)	Marketed Gas MCF	Well Head Value (3)
1958	208	6,935,000	$ 16,644,000	59,200,000	$ 5,920,000
1960	227	9,150,000	21,960,000	60,700,000	6,070,000
1965	280	18,980,000	45,552,000	88,000,000	8,800,000
1970	335	33,580,000	80,592,000	117,000,000	11,700,000
1975	460	45,990,000	110,376,000	161,000,000	16,100,000
1980	460	62,220,000	149,328,000	213,000,000	21,300,000

(1) Total wells drilled to end of 1956 was 517. Estimated total wells drilled in the period 1957 to 1980 is 8,000.

(2) Assumes an average well head value of oil in the order of $2.40 per barrel based on a laid down price at Edmonton.

(3) Assumes an average well head value of gas in the order of 10 cents per MCF.

Coal

It appears unlikely that any appreciable quantity of coal will be mined in the Peace River Country during the next 20 or 30 years.

Electrical Power

Map No. 18 in Section 6 shows the five regions referred to in that section, and in addition shows the Commission's forecast of what the population and electric load requirements will be in each region by 1987. In addition to this, it shows in which regions, in the Commission's opinion, thermal and hydro generating plants will be built and generally where the flow of power will take place as at 1987. While at the expiration of 30 years the loads in the different regions and the actual flow of power may be found to vary considerably from our estimate, it nevertheless does have the merit of showing in a general way the availability of power in Northern Alberta.

SECTION 5

THE AGRICULTURAL AND INDUSTRIAL OPPORTUNITY IN NORTHERN ALBERTA

AGRICULTURAL OPPORTUNITY

While the agricultural potential of Northern Alberta is tremendous, the agricultural opportunities are limited in the first place by the fact that the market for many years to come will not be large enough to absorb all the agricultural output that could be produced in the Prairie Provinces. The second limitation on opportunity is Northern Alberta's distance from markets. As the years go by, and possibly much sooner that is generally realized, Canada's rapidly increasing population will bring about a marked increase in demand for agricultural products. As this demand increases, the output of all agricultural products of the Prairie Provinces will increase. Because of Northern Alberta's remoteness from large markets and thus its increased freight costs, its agricultural production will not increase in the same proportion as that of the rest of the Prairie Provinces. Now that the Peace River Country has a direct connection to the Coast, it is possible that it will get a larger share of the market at Vancouver. In other words, when increased agricultural output becomes necessary most of that increase will take place south of the 55th Parallel and due to its remoteness the Peace River Country will not obtain its proportionate share.

As will be discussed later, in trying to estimate the increased agricultural population and production during the next 30 years, the Commission has tried to take that factor into its calculations. In the decades beyond 1987 the increasing population of Canada and the world will become so great that it is more than likely that every available acre will be pressed into service. Looking at Northern Alberta from this angle, it is interesting to try to estimate what agricultural opportunities the area does hold.

Table No. 5, which was given under Land in Section 3, shows that in all of Northern Alberta there are 5,565,000 acres of arable land and 6,526,000 acres of doubtful arable land, without counting the land which is not under cultivation on existing farms and which the Commission estimates amounts in all to some 2,500,000 acres. If this amount is added, then the total arable and doubtful arable land is approximately 14,500,000 acres. It is the opinion of the Commission that when the day comes that it is necessary to bring all of this land into production the better land classed as "arable" will be used first and after that the land classed today as "doubtful arable" could be farmed successfully under modern farm practices. The Commission estimates that this area of land could produce some $600,000,000 of agricultural production based on today's price level. While the present value of agricultural production in Northern Alberta is some $44,000,000 only, the Commission estimates that if market conditions were favorable the output of the present occupied land could be increased to $93,000,000. The total possible production of Northern Alberta viewed in the light of today's knowledge would then approach $700,000,000. This could be compared to the net value of agricultural production in the three Prairie Provinces in 1953 which was as follows:

Manitoba	$ 174,749,000
Saskatchewan	632,758,000
Alberta	418,053,000
TOTAL (1953)	$1,225,560,000

The ultimate agricultural potentiality of Northern Alberta then is very great without giving any consideration whatever to the land now classed as "Pasture and Woodland" which could conceivably be utilized in an agricultural way.

Dealing only with the 14,500,000 acres mentioned above, most of this land is within the Peace River Country which was defined in Section 1 and which is largely covered by Map No. 9. This is shown in the following table:

TABLE No. 1

Location and Extent of Good Land

(Thousands of Acres)

Peace River Country	Arable	Doubtful Arable	Total
Available for settlement	2,463	701	
Withheld from settlement	2,298	905	
Plus uncultivated land on present farms	2,500	----	
Total Peace River Country	7,261	1,606	
Remainder of Northern Alberta	804	4,920	
	8,065	6,526	14,591
			(Say 14,500,000 acres)

For the next 30 years, for all practical purposes it may be assumed that any expansion of agriculture in Northern Alberta will take place only in the Peace River Country. In the area presently available for settlement as shown on Map No. 9 there are some 2,463,000 acres of "arable" and 701,000 acres of "doubtful arable" land or a total of 3,164,000 acres. Even if only the "arable" land were homesteaded this would provide enough land for over 7,000 new settlers at the rate of half a section each.

The Commission does not foresee that amount of new settlement during the next 30 years. It has forecast that in that period some 6,000 new homesteads will be filed on. Of these new settlers possibly something over 4,000 will remain on their homesteads. Many of the other 2,000 will leave their land although most of them will dispose of it to neighbors. Moreover, there will be a further consolidation of existing farms so that some of the farmers now in the Peace River Country will withdraw from farming by disposing of their land to neighbors. As a result of the combination of these two movements, the Commission esti-

mates that the number of farm operators in the Peace River Country will increase by 3,000 to bring the total number to about 12,500 by 1987.

In the Commission's opinion most of the increase in new land being homesteaded will be in the following municipal units which are listed in decreasing order of anticipated settlement; i.e. I.D. 134 is expected to gain the most new settlers and I.D. 147 the least.

Municipal Unit	Location or Centering Around
I. D. 134	Blueberry Mountain
I. D. 126	Valleyview
I. D. 125	High Prairie
I. D. 139	Hines Creek
I. D. 146	Keg River
M. D. 130	McLennan
I. D. 138	Manning
I. D. 147	Fort Vermilion

But the expansion of agriculture in the Peace River Country will not take place solely by new settlement, which is only one of five possible avenues towards an increased agricultural production. Most of this increased production will come from bringing under cultivation more of the unimproved land presently settled, from using existing cultivated land more intensively, from technological advances which will result in higher output, and from improving the efficiency of farms by better organization of them as more specialized business enterprises.

The Commission estimates that in Regions 1, 2 and 3, as shown on Map No. 18, Section 6, there will be a total population of 210,000 of which some 46,000 will be on farms. In 1956, over 50% of the total population of 69,970 in the Peace River Country or some 35,200 persons were on farms. The division of the population in 1987 is expected to be 46,000 or 22% of the population on farms, while the remainder will be obtaining their livelihood by other means.

But the outlook for these 46,000 people or 12,500 farm operators is expected to be vastly improved. In meat, eggs and dairy products, they will have the opportunity of supplying 210,000 people in the Peace River Country alone (Regions 1, 2 and 3) plus the possibility of supplying a population of 60,000 in the Northwest Territories. In 1956, there were 91,000 cattle on Peace River farms. Some of these were slaughtered for local consumption and some were exported to Edmonton. By 1987 if the farmers in the Peace River Country supply the meat for 270,000 people and continue to export the same amount as they did in 1956, it will mean that the cattle population of the Peace River Country will have to double. At the same time there will be a large increase in the number of hogs.

It may be thought that producing these quantities of food, plus an additional 5,000,000 dozen eggs and a large increase in dairy products, will place a rather heavy burden, even if a welcome one, on the farmers of the Peace River Country. This increased output per farm, however, is in line with increases expected in Canadian agriculture generally, where today each Canadian farmer supplies food for some 28 other Canadians plus what is exported from Canada, and by 1980 every farmer is expected to grow food for 50 people. If, as is estimated, there will be only 12,500 farms in the Peace River Country in 1987, each of the farmers, in order to supply a population of 270,000, would be producing food for only 22 people.

In any event, this is the direction which in the Commission's opinion farming in the Peace River area will take. It is expected that the export of wheat from that country will not diminish even though farmers will turn to the production of cattle, hogs, poultry and dairy products.

While these estimates on increased livestock production have been based on the increase in the population of the Peace River Country and of the Northwest Territories, the fact that the Peace River Country now has a rail outlet to Vancouver should not be overlooked. This could probably have the effect of increasing agricultural production in the area.

The Peace River Country has always suffered from the disability of having to ship its products at least as far as Edmonton and in many cases these products have been processed in Edmonton and returned to the Peace River Country. At the present time a large part of the meat and flour consumed by people in the Peace River Country has been shipped out, processed and returned.

A strong demand exists in the area for better processing facilities, more particularly for livestock packing plants. Thus far there does not seem to be sufficient numbers of livestock and a domestic market large enough to command the favorable attention of large packing companies. Small local abbatoirs, however, are being undertaken.

One of these is presently operating at Grande Prairie. The operations indicate success but difficulty is being experienced in not having adequate meat inspection. Improved meat inspection services would assist in making it possible for abbatoirs to develop elsewhere as well and improving the competitive marketing position of the Peace River Country as suppliers of meat to the Northwest Territories. The opportunities for plants of this kind will be discussed more fully under the section on Industrial Opportunity.

In order to assist farmers in the continued improvement of their farms so that they will be able to meet the requirements which we hope will be placed on them by 1987, a number of factors should be taken into consideration.

Agriculture, like business and industry, has since the beginning been mainly dependent on credit for development purposes. Northern Alberta is no exception. Indeed the long haul and heavy traffic charge for all required services places it in an equal, if not a preferred position, to expect farm credit assistance. The important function of developing economic farm units and their maintenance rests on adequate farm credit being made available. This was recognized by the Provincial Legislature passing at the 1956 Session "The Farm Purchase Credit Act". The provisions for administration of this act are now being organized, but it is too early as yet to ascertain to what extent it will meet the credit need for the development of agriculture in this area. There are, however, a few features that the Commission feels could be improved to speed up the service provided and to make the provisions of the act more applicable to farming. If a central Board of Administration assisted by advisory boards, similar to the present Municipal Loan Board, were set up under the Act, it would make for uniformity, would facilitate coordination and would expedite the processing of applications. The necessity of the seller accepting 10%

of loan risks will cause some sellers to side step this medium in selling their land or to add this amount to the selling price to the disadvantage of the buyer. Father and son transactions could be an exception by utilizing this act to their mutual advantage.

The "Canadian Farm Loan Board" has not thus far met this credit need. The provisions of this Act should enable satisfactory processing of farm loans in Northern Alberta provided realistic values are placed on farms, on the ability of the applicant and on the productive earning power of the enterprise. However, the present formula or basis in use seems to apply more to 1930 valuations and earning power. There is a need for farm credit in the Peace River area. The Commission feels that some changes in the "Farm Purchase Credit Act" might be made to help in this direction but this will be dealt with in the recommendations.

The development of community pastures for livestock during summer months would assist farmers in livestock production, and allow some of the cultivated areas now being used for seeded pasture to be employed in the production of other products. It would also facilitate farmers now growing grain to supplement this with cattle raising should they wish to do so. These pastures could be easily organized by the Province setting aside a tract of uncultivated land adjacent to the more improved areas for this purpose. Interested farmers could then form local organizations for administration purposes. Similar projects have been successful in other areas within the Province.

Seed cleaning plants—jointly financed by resident farmers, the municipality and the province—such as those at Morinville, Leduc and elsewhere, would greatly assist the present and future development of agriculture in Northern Alberta. This area has been an important contributor of good seed grain and grasses, and efficient and convenient community cleaning plants would improve the quality of these products and expedite their marketing.

While the actual setting aside of community pastures and the consideration of seed cleaning plants are both movements which have to be started on the initiative of the farmers themselves, the Commission feels that these are two developments which should be taking place very rapidly in the Peace River Country. It feels that more stress might be laid on these by the Extension Branch of the Department of Agriculture.

The number of District Agriculturalists and Home Economists in the Peace River Country compares favorably with the number of these in the rest of the Province, but because of its remoteness and newness, and because of the vast distances between one agricultural community and another, Northern Alberta might be entitled to expect consideration to be given to augmenting the number of district agriculturalists.

River valleys offer opportunity for low cost irrigation projects for the production of potatoes and many varieties of vegetables. These possibilities are well known of the valleys of the Peace River. Extension work would be of benefit in discussing with interested communities suitable irrigation methods, sprinklers and storage facilities such as properly ventilated and heat-regulated (propane or oil) earthern root houses. Such projects would help in encouraging the local growers to supply a greater portion of the market for vegetables, both in Northern Alberta and the Northwest Territories.

The discussion so far has dealt mainly with the Peace River Country which we have defined as extending as far North and East as Fort Vermilion. It has been pointed out in one of the tables, however, that there is some arable land in other parts of Northern Alberta. For instance, there is a stretch of good land along the Peace River downstream from Fort Vermilion. There are some river flats along the Athabasca River below McMurray where vegetables and coarse grains could be grown and which might some day lend themselves to cattle raising. The same applies to the area along the Slave River although the best agricultural land there is in the Wood Buffalo Park. Some day settlement will work north along the Mackenzie Highway and the Meander and Hay Rivers. The soil appears to be of fair quality but that area does suffer from the disability of less frost-free days per year than, for instance, the area around Peace River Town.

In the meantime the Commission believes that agriculture in the Peace River Country will swing more and more to producing cattle, hogs, poultry and dairy products, and that as the population of the Peace River Country grows through developing its natural resources of timber, gas and oil, agriculture will come into a new era which will be more stable and prosperous

INDUSTRIAL OPPORTUNITY

The opportunity for the successful operation of industrial plants in Northern Alberta is increasing and the next 30 years should see marked changes in the direction of a more diversified economy. Most of the industrial expansion will take place in the Peace River Country, which was defined in Section 1, but although industries pertaining to the processing of agricultural products, timber, oil and gas will be built mainly in that region, it will not become what might be called an "industrial area" within the period covered by this report. Hydro electric power plants and industries processing minerals and the oil sand should be built in the McMurray area and possibly in the northeast corner of the Province.

In trying to foresee the development of Northern Alberta the Commission has come to the conclusion that there will be five regions in which the population will concentrate. After trying to assess all available information about natural resources, it feels that these five regions will be those shown on Map No. 18 in Section 6. These regions will grow in population because they will form the focal point for the development of the resources of oil, gas, pulpwood, power and minerals. Except in Region 1, which embodies the bulk of the Peace River Country, it is too early yet to foresee where towns will grow up. Their locations will be governed by the discovery of new oil fields (such as Red Earth, for instance), by the site

chosen for the Athabasca Oil Field's operations (such as possibly Mildred Lake) and by the spot, probably on a large river, where a pulpwood mill will be built. While the exact location of these future towns is still in doubt, it is possible to forecast that they will be built in certain regions.

Agricultural Products Industries

Industries processing agricultural products may be expected to be started as soon as there is a marked increase in the population of the Peace River Country and as soon as agriculture in that area begins to increase its production of meat and dairy products. One of the industries needed there is a packing plant so that animals do not have to be shipped to Edmonton to be killed and then the meat returned to the Peace River Country. At the present time, however, the market in that area is not large enough to support a fully integrated packing plant, i.e. one which includes an operation set up to make maximum use of the numerous products derived from animals. It is hoped, however, that as the population increases it will be economically feasible to build a packing plant in that area. Something over 35,000 beef cattle and nearly 100,000 hogs will be necessary each year to feed the estimated 1987 population of 210,000 in the Peace River Country and an additional 60,000 in the Northwest Territories. These amounts should certainly warrant a small-scale packing plant.

In the meantime, there appears to be a need for one or two new abbatoirs. One of the difficulties in operating an abbatoir is that while the local authorities can inspect it well enough to protect the needs of the local people, such inspection does not carry any weight if the meat is to be exported to other communities or to the Yukon or the Northwest Territories, for instance. At the larger packing plants the Federal Government provides inspectors. Meat inspected by these men, and marked with the proper symbols, is acceptable to butchers everywhere. Before the Federal authorities will provide meat inspection it is necessary that 1,000 animals per month be slaughtered and that the plant have a minimum of 12 employees and, of course, that the building and equipment comply with certain sanitary regulations.

There is a need for a number of small industries such as egg grading stations, cold storage facilities and even root cellars, etc. At the present time eggs, poultry, fresh milk, vegetables and potatoes are often brought into the Peace River Country from Edmonton. This means an unnecessary waste of effort. The Commission feels that the stage will soon be reached where it would pay to establish some of these small industries. One of the drawbacks appears to be the problem of financing such operations, but the Commission understands that these could be financed through the Industrial Bank which was set up by the Federal Government to assist just such operations. These enterprises, however, must be initiated by local people who feel there is a need for services of this kind and who feel that they could operate these services over the years without losing money. Some of these activities might well be carried on by cooperatives composed of members who would benefit by these facilities.

Forest Products Industries

Lumber: From figures presented to the Commission it appears that the cut of lumber in Northern Alberta will increase for about 10 years and after that will stay constant at the level attained at that time. The amount cut will increase at different rates in different areas. It is predicted that there will be no increase in the Slave Lake area, a small increase in the area where cutting is in progress now tributary to Peace River Town, and a large increase in both the Grande Prairie region and in the Lac La Biche-McMurray region. A considerable increase is expected in the amount of lumber cut in the area tributary to Fort Vermilion and High Level in Region 2. With the possible exception of Region 2, in which a new sawmill could be built, the lumber in Northern Alberta will be processed at existing large mills. A number of small sawmills may be established but large operators are more able to conform with long-term conservation practices and it is expected that the number of small sawmills in the area will decrease.

It is also possible to enlarge the employment and income from the forest products industries by closer utilization. Studies show that when lumber alone is sawed from the average white spruce log and no by-products are made, one-third of the usable wood is wasted in slabs, sawdust, edgings and trims. Here again is a case of developing markets to use the by-products. Employment could also be increased if the sawmills enlarged their operations by selling less of their output as lumber and diverting part to remanufacture. For instance, a Montana publication states "Lumber gives 18.4 man-hours of employment per thousand board feet of production, boxes and shook 29.9 hours; window frames and sash 42.4 hours. All these figures include the labor from tree to finished product."

One of the many products that can be made is laminated wood. The advance in glues and gluing techniques, and the opportunity for tailoring the product for a specified use has brought laminated wood into the industrial picture. It is reported that the decline in quantity of large, high quality timber is gradually increasing the demand for laminated wood.

Plywood mills are already established and drawing material, particular poplar, from Northern Alberta. Peeling or slicing a log rather than sawing it, makes for very much less waste. But it is doubtful if much expansion of the veneer and plywood industry is possible because of the small size and cull factor of the poplar species, and pine of sufficient size is a rarity.

Lodge pole pine makes excellent power poles, and since this species is plentiful in the required size there is an excellent opportunity for expansion, particularly for rural electrification.

The above are some of the possibilities of expansion. The forests of Northern Alberta offer opportunities for considerable variety of combined operations about which generalization is impossible. Variations in the forest cover, its maturity, distance from markets, accessibility, capital costs and special interest of investors, make it essential to deal with each situation on its merits.

Pulp: A major shortcoming of the timber industry in Northern Alberta is the lack of diversification in manufacturing. At least nine-tenths of all timber cut is white spruce, which is all used for lumber.

The most obvious solution is a greater expansion of pulpwood production, because pulp mills can utilize the predominant small trees and species of timber not suited for lumber. This material will be a drug on the market until such time as there is use of it for fibre. The tables in

Plywood Mill at Grande Prairie.

Section No. 3 and the above brief comments show that there is an abundance of poplar and pine in particular, of a size suitable for fibre production.

Opposing these favorable resource figures are the economic realities which have so far prevented any pulp mill from being established in these northern areas; although there are possibilities of one being established to utilize some of the material in the vicinity of Lesser Slave Lake in the very near future. The most unfavorable economic reality is the distance from large consuming centres.

The Commission expects that a pulpmill will be built in Region 3 (Slave Lake) by 1965; in Region 1, in the Grande Prairie area, by 1970, and in the Manning area by 1975; while the last pulpmill will be built in the vicinity of McMurray by 1980.

Fish

The Commission is of the opinion that the increase in demand for fish in Alberta will be such that, by the end of 20 years, all that Northern Alberta can produce will be absorbed locally. There would appear to be an opportunity for local capital to develop this potential market.

Minerals

From what the Commission has learned of the geology of the Pre-Cambrian and Paleozoic areas, there seems to be a good possibility that more intense prospecting of these areas will get under way shortly and that some metal mines may be opened. If these turn out to be large and successful, it is probable that much of the ore might be smelted either at Edmonton or else in the Athabasca Oil Sands area where fuel would be plentiful and where large supplies of hydro power are available. The mines themselves are apt to be the only industries in Region 5, although it appears that a power plant of the order of 30,000 H. P. capacity might be built along the Smith Rapids to supply Pine Point. Beyond that, of course, there is always the possibility of mining developments in the Northwest Territories leading to a much greater development of the 1,000,000 H.P. of hydro potential in the Smith Rapids.

The next 15 to 20 years should see the beginning of an embryo iron ore industry in the vicinity of Hines Creek. If this ore is mined it is likely that between 1 and 1½ million tons will be strip-mined each year. This ore might be shipped to Edmonton for treatment but there is also a possibility that it could be concentrated somewhere in the Hines Creek area. The combination of mining and concentrating should employ 500 men.

Energy Resource Industries

Oil and Gas: The search for oil and gas in Northern Alberta, which it is believed will result in more than 8,000 wells being drilled by 1987 and in employment being given to some 15,000 men by that time, will bring with it a number of ancilliary industries, such as machine shops, etc. The opportunities in this field alone should produce many small industries located mainly in the northwest portion of the Province. It is doubtful, however, if added oil activity will result in any more refineries being built in the Peace River Country. The availability of markets for refined petroleum products is the chief consideration in planning future refineries. It is more economical to bring the crude oil by pipeline to refineries in market areas than to refine the products in the North and then bring them out for marketing. As population grows in Northern Alberta, increased refinery capacity will be necessary. At the present time, however, it is difficult to foretell whether this need for increased capacity will be met by enlarging the facilities of the present refinery at Grande Prairie, but it seems more likely that this would happen than that any additional refinery would be built.

With the exception of the Sturgeon Lake field, the sulphur content of the known gas fields is relatively low, so that it does not seem probable that sulphur will be refined in Northern Alberta, unless in the treating of the Athabasca Oil Sands it becomes available as a by-product.

Athabasca Oil Sands: It is difficult to see what developments may take place in the Athabasca Oil Sands area. At the moment, it appears that the cost of producing oil from the Sands will be higher than the cost of oil from wells. Present oil marketing restrictions will not persist indefinitely, nor will prices stay at today's level, so that the Commission expects oil to be produced from the Oil Sands before ten years has elapsed. It has been assumed that separating plants will be built in the McMurray area (Region 4) capable of producing 60,000 barrels per day by 1987. These plants will bring added employment to the area north of McMurray.

Hydro Power: The development of the 2,715,000 horsepower of potential hydro power in Northern Alberta is itself an opportunity but its main importance lies in the fact that it will pave the pay for and be a means of attracting other industry to Regions 4 and 5. In this energy-hungry continent such power will not long be left undeveloped even though it is in Alberta, which is so rich in other energy resources. The juxtaposition of petroleum products and 1,615,000 horsepower of hydro power in the one locality near McMurray is a combination that should attract other industries and should do so in the relatively near future. The huge potential of one million horsepower in the Fort Smith Rapids will some day supply energy to a mining area within a radius of 150 miles. At the present the drawback of both of these large potential power areas is their remoteness from populated centres, although within a very few years, much of the power from the Athabasca River will be transmitted south to the Edmonton area. Power generation will be discussed more fully in Section 7.

Tourist Industry

Providing accommodation and recreation for tourists is a very important industry. Northern Alberta presents many and varied opportunities, whose development will require vision on the part of various bodies such as the Provincial Government, local Chambers of Commerce and enterprising individuals. All of them working together, however, could convert the many tourist attractions of Northern Alberta into a lucrative and flourishing industry.

Miscellaneous Industries

Thus far we have touched on the industries that will result as a direct use of the natural resources of Northern Alberta. Based upon the needs of the population which will be attracted to this area by these resources, there will arise a number of small secondary industries. The creation of these will in their turn provide added industrial opportunity. Some small industries are now estab-

lished in the Peace River Country, and as the population grows, many more opportunities will be found to build up prosperous small factories in the general categories listed below:

Concrete blocks, pipe and tile
Carbonated beverages
Bread and bakery products
Common brick
Home and office furniture
Dairy products
Millwork (sash and door)
Machine industries associated with logging and petroleum
Printing establishments
Sheet metal products
Woodworking

One resource which is a prerequisite for an industrial area but which is very often overlooked, is water—that is, water as a commodity as distinct from its usefulness in operating hydro electric power plants. The eastern half of Northern Alberta has water in abundance and, in the course of time, water available as a raw material to be used in processing other materials will attract industries and population, although this trend may not become too evident during the thirty years covered by this report. Since irrigation is not likely to be developed on anything but a very minor scale in Northern Alberta, there will not be any competition between industry and agriculture for the use of water.

Before arriving at a proper idea of the great value of water, it is necessary to remember that water is already a limiting factor to further development in many places in the United States and, indeed, even in parts of Canada. Arizona, for instance, which in the past has used its scant supply of water for irrigation, is now beginning to question the wisdom of using it to grow foods which could be imported from other States and to wonder if the State's economy should not be changed so as to switch this water over for use by industry. For industry requires tremendous quantities of water for cooling and processing purposes. One ton of steel or one ton of sulphite paper in their manufacture each require 32 tons of water, while one barrel of oil requires 18 barrels of water in its manufacture.

A time will come when industry and population will move to water, not because of its hydro power possibilities but to use it as a commodity costing a definite price per pound. When that time comes, possibly beyond the period of this report, Lesser Slave Lake, Lake Claire and Lake Athabasca, and the Peace and Slave Rivers could become the industrial centres of Alberta. We should not overlook this, the industrial opportunity of our great supplies of fresh water.

In assessing industrial opportunity, one factor perhaps more important than all the others is the favorable economic climate which the policies of governments and the thoughts of educators and financiers and an enlightened democracy help to create. Alberta holds out three opportunities not related to natural resources but of equal importance to vast forests, super-charged oil fields and bubbling tar sands. They are the trinity of sound democratic government, private enterprise and security for the investor. The area of the world in which these political philosophies breathe is becoming more circumscribed. As a result, foreign investors are turning their eyes away from developing the minerals and the diverse resources of many other promising countries and turning them towards the security of Canada and Alberta. In the near future the benefit of such a move should become more pronounced and should take tangible expression in an even more rapidly increasing tempo in the development of our resources. The greatest resource of all in bringing about the development of our natural resources for the benefit of all is human ingenuity, so long as it receives encouragement and scope.

SECTION 6

THE POPULATION TRENDS AND LIKELY AREAS OF CONCENTRATION OF POPULATION IN NORTHERN ALBERTA

The Commission estimates that the population of Northern Alberta is going to increase rapidly and that by 1987—30 years from now—there will be 270,000 people in the northern half of the Province. In other words, during that period the population will more than treble—in fact it will increase by 260 per cent. It has been estimated that by that time the population of the whole of Alberta will have increased by 75 per cent to 1,925,000. Population-wise then, Northern Alberta will grow over three times as fast as will the rest of the Province.

This is not surprising when it is remembered that a large proportion indeed, of its total resources in timber, oil, gas, Athabasca Oil Sands, and hydro power has not been developed but is even now on the verge of development. The demands of a rapidly increasing population in the rest of Canada and in the United States will bring on development of these resources at a much faster rate than we have ever experienced in the past.

In many other areas, when trying to estimate the future population, it is possible to deal with such factors as birth, death and marriage rates, rate of natural increase, etc., and then to project these trends into the future. It has not been possible to do this for Northern Alberta because much of its increased population will come from immigration from the rest of Canada to that area in order to develop its natural resources at the pace at which we believe they will be opened up. It has been necessary, therefore, to build up our estimates of population by starting with the present figure and then superimposing on this the increases which will result from the influx of workers necessary in sawmills, pulp mills, oil and gas production, etc., to produce the output which it is expected will be marketed.

Unfortunately much of this estimating is of the crystal-ball variety. If world demand reaches a certain level and then if that demand turns towards Northern Alberta instead of to New Zealand or Texas, Venezuela or Rhodesia, and if, finally, transportation is provided to get our resources to markets, then we may expect so many men to be employed to process our resources. If any of these components change, favorably or unfavorably, these estimates will be influenced accordingly. The Commission has tried to assess each of the many conflicting factors and, based on the many assumptions it has had to make, has arrived at the following estimates of population. These are given in Table No. 1 for the regions shown on Map No. 18 in this section.

TABLE No. 1

Distribution of Population 1956, 1967, 1987

	1956	1967	1987
Region 1	43,800	58,000	121,000
Region 2	4,300	13,500	30,000
Region 3	21,500	37,000	61,000
Region 4	3,800	12,000	47,000
Region 5	300	4,500	11,000
	73,700	125,000	270,000

The Commission is aware of the tremendous remoteness of the probability that by the end of the next thirty years its forecasts will prove accurate, but feels that such an estimate as that given below will at least have the merit of helping to bring Northern Alberta and its resources into focus and of throwing some light upon what steps should be taken to further their development.

Table No. 2 shows the basic occupations upon which the present residents of Northern Alberta depend for a livelihood, and the Commission's estimate of how the proportion of people depending upon these occupations will vary by 1967 and 1987.

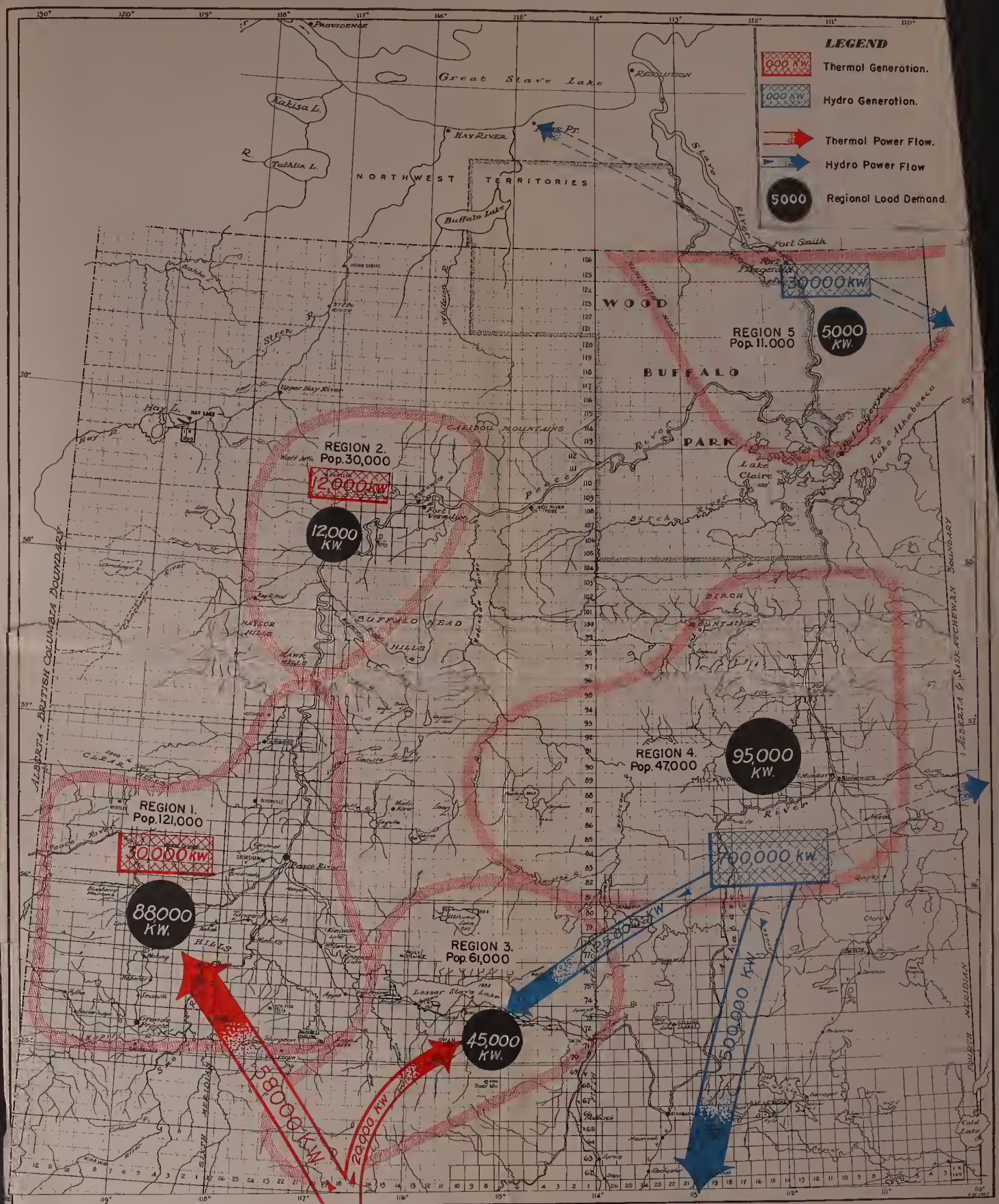
TABLE 2

Occupation upon which the population of Northern Alberta depends for for a living

Occupation	1956	%	1967	%	1987	%
Agriculture	35,200	47.8	38,900	31.1	46,300	17.1
Fur-Farming	500	0.7	500	0.4	500	0.2
Forestry	6,000	8.1	17,300	13.8	35,500	13.1
Trapping (Wild)	4,000	5.4	2,100	1.7	300	0.1
Commercial Fishing	1,000	1.4	1,200	1.0	1,700	0.6
Oil & Gas & Oil Sands	4,500	6.1	24,000	19.2	67,000	24.8
Other Mining	----	----	----	3,000	2.4	7,700	2.9
Manufacturing	5,500	7.5	9,000	7.2	27,500	10.2
Construction	2,000	2.7	3,500	2.8	8,000	3.0
Transportation	2,000	2.7	3,500	2.8	8,000	3.0
Other Services	13,000	17.6	22,000	17.6	67,500	25.0
TOTAL	73,700	100.0	125,000	100.0	270,000	100.0

It is interesting to observe the changes that it is believed will take place during the next thirty years in the relative importance of the various industries. Agriculture, for instance, which today is the means of livelihood for 47.8% of the population, will by 1987 be the direct source of income for 17.1% only. Employment-wise, the oil and gas industry will be the most important primary industry at the end of the period, followed in order by agriculture and forestry. It is expected that manufacturing and other services will increase in relative importance as Northern Alberta begins to fall in line more and more with the changes becoming evident in Canadian standards of living. The Commission believes that the trend, particularly in the Peace River Country will, in common with the rest of Canada, be to more urban living, with a consequent increase in the relative importance of the larger towns in that area.

It should be noted that in 1956 trapping and commercial fishing was a means of livelihood of a total of 6.8% of the population of Northern Alberta. Much of this work was done by Metis and Indians. By 1987 it is expected that these activities will support only 0.7% of the population. Not only will the percentage decline drastically, but the number of people drawing their living from these occupations will dwindle from about 5,000 persons to about 2,000. This change in the economy of Northern Alberta brings into focus a problem which will be discussed elsewhere—that of our Indian and Metis people. It should be noted, however, that with their increasing birthrate, the present 8,000 Metis and Indians will increase until by 1987 they will represent a population of 14,500. Their traditional employment of trapping will have practically passed away, while the small increase in employment in the fishing industry will not go far towards supporting them. We must find other employment for them.



REGIONS OF CONCENTRATION OF POPULATION - 1987.

Showing Estimated Population. Power Demand. Generation and Flow of Power.

Scale in Miles

10 0 10 20 30 40

SECTION 7

THE ELECTRIC POWER RESOURCES AND REQUIREMENTS OF NORTHERN ALBERTA

The electric power resources were discussed in Section 3 where it was set out that in the eastern half of Northern Alberta there were 2,715,000 H.P. of undeveloped hydro power, and that in the western half, by using natural gas, almost unlimited thermal power could be generated at a cost competitive to that of hydro power delivered to that region. Northern Alberta then has abundant power resources. How and when these will be developed depends upon how rapidly the other resources are exploited and where the concentration of population is likely to take place. In Section 6 it was forecast that there would be 5 regions in which the population would concentrate. At the same time as these regions develop, power plants will be built to serve them and to assure that cheap power in sufficient quantities is available.

Some of the power generated in Northern Alberta will be exported to Saskatchewan, the Northwest Territories and to the Edmonton industrial area. Some of the requirements of the Slave Lake region and of the Peace River Country could possibly be supplied from British Columbia but will most likely be fed from thermal plants such as the one at Wabamun, some 40 miles west of Edmonton.

In any event, the cost of delivering power to the ultimate customers is made up of many components, including the expenses of transmission and distribution, meter reading, accounting, etc., and the actual generating costs represent only some 15% of the total cost. For this reason, slight changes in generating cost either by hydro or thermal plants mean little in the consumer's bill. What does reduce the consumer's bill is the presence of large industries, because the cost of power depends upon the size of the load, and therefore, the larger the load the less the cost per unit. In Alberta the costs of generating power either by hydro or thermal means are so nearly equal that at any given location the type of power delivered will depend mainly upon some other factor such as the length of transmission line. For instance, it will cost about 2½ mills per K. W. H. to transmit power from the Athabasca River plants to the Edmonton area. If additional power can be obtained in the Edmonton area more cheaply by using the vast coal beds of Lake Wabamun, then that is where it will come from. Since the distance from the Athabasca hydro sites to Peace River Town is about equal to that from these sites to Edmonton, power may some day be transmitted from the Athabasca River to the vicinity of Peace River Town once the load in that area builds up far beyond what it is today.

Map No. 18 in Section 6 shows the five regions referred to previously and, in addition, shows the Commission's forecast of what the population and electric load requirements will be in each region by 1987. In addition to this, it shows in which regions, in the Commission's opinion, thermal and hydro generating plants will be built and generally where the flow of power will take place as at 1987. While at the expiration of 30 years the loads in the different regions and the actual flow of power may be found to vary considerably from our estimate, it nevertheless does have the merit of showing in a general way the availability of power in Northern Alberta.

Generally speaking, thermal plants fueled by natural gas will be operating in Regions 1 and 2 supplemented by power from Calgary Power's Wabamun Plant, which will also supply some of the power for Region 3. The balance of the power supply for Northern Alberta will come mainly from hydro plants on the Athabasca with some part of the Fort Smith Rapids being used to supply the mining areas of the extreme northeast part of the Province, as well as those in Saskatchewan and the Northwest Territories.In addition to the arrows showing the flow of definite amounts of power to certain regions, power in large, but as yet unknown, amounts may well be transmitted north from Region 4 and east to Saskatchewan. Similarly, other power may be sent in various amounts from the Fort Smith Rapids. On Map No. 18, these blocks of power are shown by arrows indicating generally where this power may go without specifying definite quantities.

Looking at the power resources and requirements for the next 30 years in a general way, there will be more than adequate power available—either thermal or hydro—to meet all requirements in any part of Northern Alberta where industry demands it. The hydro plants on the Athabasca will be well along the road to complete development before the end of 30 years. The Vermilion Chutes will probably not be developed because of lack of markets, although some time after the period of this report it will be developed and then some of its power could be transmitted to the vicinity of Peace River Town. The development of the Fort Smith Rapids depends on the growth in mining in the North. This power site lies some 500 miles north of the Edmonton area and while technology will undoubtedly advance to the point where the physical problem of transmitting power that far will be solved, the question of economics will remain. Even supposing that extremely low cost hydro power could be generated at Fort Smith, its cost by the time it was transmitted to Edmonton would be so great that it would not even approach a competitive position with power from the coal beds of Southwestern Alberta.

SECTION 8

THE TRANSPORTATION AND COMMUNICATION REQUIREMENTS OF NORTHERN ALBERTA

TRANSPORTATION

Transportation is the key that will unlock the resources of Northern Alberta. The more quickly it is provided and the more efficient it is when provided, the more rapidly these resources will start to be used and to be added to Alberta's effective economy. Not only will efficient transportation release the locked up resources of Northern Alberta but it will start the flow of wealth out of the Northwest Territories to and through the Province. Thus Alberta has a twofold interest in transportation to the North.

Every effort which is financially possible should be made not only to provide transportation between points in Alberta but also to provide access to the Northwest Territories by way of Alberta. This Province provides the natural avenue of access to the North. While it is quite true that construction of transportation facilities will benefit the North as well as Alberta and thus should be shared in by the Dominion Government, the construction of these facilities through Alberta now will ensure a continuation of the economic benefits Alberta derives from the North.

Alberta, then, appears to have two problems:

(1) To provide extra-provincial transportation to the Northwest Territories and to the area north of Lake Athabasca, and

(2) To provide intra-provincial transportation.

Transportation can be provided by railways, highways built to one standard or another, water navigation and by air. All of these must be taken into consideration. The problem of extra-provincial transportation will be treated first because whatever is done in that way will provide part of the framework on which to hang the intra-provincial transportation.

EXTRA-PROVINCIAL TRANSPORTATION

Air Transportation

Existing air transportation was discussed in Section 2. The frequency and quality of the present service to points in Northern Alberta and the Northwest Territories appears to be in line with the extent and present state of development. Airstrips exist at most of the larger communities and will be built at others as they grow in importance. The airfield at Yellowknife has recently been extended to serve as a stop-over point for Trans-Polar flights and the main airfield at Edmonton has also recently been included in Trans-Polar schedules. These two points are thus very important in the overall Canadian air picture.

Water Transportation

This also was discussed in Section 2. Water transportation from McMurray to Uranium City, Fort Smith and beyond, today forms an important supply link to the North. Some difficulties are experienced in navigating the delta of the Athabasca due to low water and shifting channels. Other than dredging, various schemes for remedying this condition by increasing the stream flow have been studied.

The future of water transportation in the Athabasca and Slave Rivers is somewhat clouded. When a railway is built north from McMurray, there will be very little necessity for water transportation on either of these rivers, although it will still be necessary to supply the Uranium City area and other points on Lake Athabasca by barge. This might be done from a new port built at or near where the railway crosses the Peace River. If that does happen, navigation of the Athabasca delta would no longer be a problem as it would be replaced by navigation on the Lower Peace where conditions are not so difficult.

So far as ground transportation is concerned, one extra-provincial route already exists in the MacKenzie Highway, and it seems certain that another, in the form of a railroad to Pine Point, will soon be built. The location of this railroad will have a tremendous bearing on future highway development and, for this reason, it is proposed to deal with the question of railways first.

Railways

In any study of the North two factors quickly become clear. The first is that a railway to the shore of Great Slave Lake is necessary not only for the development of the North but also for defence. The second is that a railway will not be self-supporting for some years. In other words, for a start at least, the railway will have to be subsidized.

From the standpoint of Canada, such a railway is a necessity. Canada and the Union of Soviet Socialist Republics have many things in common, not the least of which is that each, almost alone in the world, has a vast undeveloped frontier region. Russia is and has been most active in developing its North, while Canada, in proportion to its financial means, has been much less active. We must develop our North or, as someone has said, we will lose it. Over and above that, we must develop it for the riches it contains and which it will pour into the rest of Canada. The North is developing at a snail's pace now and the reason for this is inaccessibility and high-cost transportation. A railway to the shore of Great Slave Lake would not only cut freight rates to existing enterprises in the North but would be the talisman that would unlock the vast resources of that area.

The railway is also a necessity for Alberta. In Sections 2 and 3 the Commission has established that at present the

North does business in Alberta totalling $50,000,000 annually and that if a railway were built to the North this amount would increase to $150,000,000 by 1987. A railway built north from Alberta would retain this business and would also ensure that Alberta's agricultural produce continues to flow into the North.

There are ten possible routes for a railway to the North:

(1) From Fort St. John via Fort Nelson and Trout Lake to Pine Point.

(2) From Fort St. John via Fort Nelson, Hay Lakes, Upper Hay River and thence down the MacKenzie Highway.

(3) From Fort St. John to Upper Hay River and then along the MacKenzie Highway.

(4) From Fort St. John via Fort Vermilion to Pine Point.

(5) From Grimshaw to Alexandra Falls and thence to Pine Point.

(6) From Grimshaw to the Boyer River; thence through North Vermilion and northeast to Fort Smith and Pine Point.

(7) From Athabasca more or less straight north to Pine Point.

(8) From Waterways west of Lake Claire and on to Pine Point.

(9) From Prince Albert via Lac la Ronge, Stony Rapids, Uranium City, Fort Smith to Pine Point.

(10) From Lynn Lake via Brochet, Stony Rapids, etc., to Pine Point.

The two eastern routes, numbers 9 and 10, appear unlikely to be suitable for developing either the Great Slave Lake area or the Lake Athabasca area, mainly because of initial cost of construction and longer distances. The four proposed extensions of the P.G.E. numbers 1, 2, 3 and 4, would be relatively competitive in distance to Trail, B.C., but only if a cut-off were built between Clinton and Ashcroft. Route 7 from Athabasca north would be through most difficult country until it reached the Peace River, and does not seem practical, while route No. 6 would be too long. The Waterways and Grimshaw routes are the shortest and have other attractions.

It is, then, the opinion of the Commission that the choice will narrow down to either the Grimshaw route or the McMurray route. The region along the proposed Grimshaw line is already served by the MacKenzie Highway but a railroad would substantially lower transportation costs. This railroad would traverse the best agricultural land that remains in the North, but the need to stimulate agricultural development in the next few years is open to question.

Rather detailed studies have been undertaken during the last few months in a joint effort on the part of the Canadian National Railways and the Canadian Pacific Railways to try to determine which is the best route for a railway to Pine Point. These studies have included a fairly careful reconnaissance survey to pick possible routes so as to be able to estimate the actual cost of the line with a fair degree of accuracy and an economic study to try to determine the amount of freight available. This study is now reaching its final stages and it is hoped that the final report will soon be released. According to the press, the estimated cost of either the Grimshaw or Waterways route will be slightly over 60 million dollars.

Since the Northern Alberta Railways are owned and operated jointly by the Canadian Pacific Railways and the Canadian National Railways, any extension may be expected to be under the name of the Northern Alberta Railways with equal participation by the two major railway lines. The route chosen will, of course, be determined by the economics involved by these studies but, for the reasons stated below, this Commission is of the opinion that the extension will take place from McMurray. The distance from Pine Point along this route will be slightly under 400 miles as compared to about 430 miles from Grimshaw via Alexandra Falls to Pine Point. Offsetting this shorter distance, however, is the fact that from McMurray north two major bridges—one over the Peace and the other over the Athabasca—will have to be constructed if this route is taken. In spite of the fact that such a railway would have to pass well to the west of Lake Claire, the Commission, after discussing the terrain with many engineers, is of the opinion that the cost per mile would average the same as the cost per mile along the MacKenzie Highway. Except for the bridges over the Peace and the Athabasca, then the railway from McMurray would cost less because it is 30 miles shorter. But the bridge over the Peace would probably cost about 5 million dollars, while the one over the Athabasca would be considerably less, possibly half as much. When the bridges are taken into account, the railway from McMurray will likely be slightly more expensive than if it were built from Grimshaw.

If the railway were built from McMurray, it would seem sensible to make sure that the two large bridges are built with highway traffic decks. It is most important to get access across the Athabasca River at McMurray. At the present time it may not be so important to be able to cross the Peace River at Peace Point with highway traffic, but nevertheless it would seem advisable to design this bridge with that in mind. The railway bridges at Clover Bar and Fort Saskatchewan to serve to illustrate the soundness of building railway bridges with provisions for highway traffic. If years ago when they were built they had been designed to carry highway traffic, they would have been of untold benefit to the people east of Edmonton and might even have made it unnecessary to duplicate them with highway bridges.

No matter whether the railroad runs from Grimshaw or from McMurray, the Province would be well advised to give the railroad free right-of-way over Crown Lands. The Commission understands that this is more or less a standing offer by the Province anyway. At the same time the Province might consider some form of subsidy to the railway by means of contributing part of the cost towards the above two bridges. While it is true that this railroad gives access to the Northwest Territories, it is nevertheless of sufficient importance to the Province that if the difference between the railroad being built or not should hang on the question of some subsidy on the part of the Province, then that subsidy might take the form of sharing the cost of these two bridges.

Assuming, then, that the McMurray route is adopted, the railway would serve as the supply route for Uranium City and the points now served by water transportation via Lake Athabasca. Looked at from a national viewpoint such a railway must provide access to Uranium City, which

is one of the fastest growing mining areas and is expected to triple in population within the next few years. The railway crossing Peace River at Peace Point will give access to Uranium City by water transport down the easily navigable Peace River. As well as that, if, as is recommended by this Commission, a highway is built from High Level via Fort Vermilion and continued east to meet the proposed highway which is under construction in the Wood Buffalo Park, this main east and west highway will before long be continued east to Uranium City. This mining area will then have access to the railway by highway along the north side of Lake Athabasca as well as having access by water transport. It would also provide a north and south route of transportation some 100 miles from the Saskatchewan border just as the MacKenzie Highway runs north and south a similar distance from the British Columbia border. No point in Northern Alberta would then be more than 100 miles from either a railway or the MacKenzie Highway. A railway in this location would provide access to the large Gypsum deposit at Peace Point, on the Peace River, and what is far more important, would provide a means of opening up Alberta's Precambrian and Paleozoic areas for prospecting and development. It would also open up some timber areas which, due to increased accessibility, would be more readily developed and, finally, it would pass by the Athabasca Oil Sands developments at Mildred Lake.

The metals most likely to be produced in the area to the south of Great Slave Lake are lead, zinc and copper, with nickel as a strong possibility. Any lead and zinc produced will undoubtedly be sent to Trail, British Columbia, for smelting, and copper could go to Sudbury, Noranda or Flin Flon. Alternatively, a new copper smelter might be established at Fort Saskatchewan in conjunction with the nickel smelter there. In all these cases, the McMurray route would be the shortest one.

Due to the fact that the railway from McMurray would follow a water-level route, its grades and, therefore, its operating costs should be somewhat lower than if it ran north from Grimshaw when it would have to cross the height of land near Dixonville and another north of High Level, and, in addition, would have to cross the deep valley of the Notikewin River, some 20 miles north and east of Manning.

The factor which will finally weigh most heavily in determining the choice of route, however, will be the volume of freight to be hauled. Pine Point concentrates will be hauled in either case and will make up the bulk of the load on the railway. The freight destined for or originating in the Northwest Territories and that of Pine Point will be common to each route, i.e. whether the railroad goes via Grimshaw or McMurray. The Commission has tried to estimate the amount of freight which the railroad would carry if built from either of these points of origin and has experienced difficulty in obtaining very definite estimates. It appears to the Commission that the volume of freight destined for or originating at points within Alberta, including that generated by the gypsum deposits at Peace Point, will be about equal. That being the case, it appears that the freight to and from Uranium City and adjoining areas on Lake Athabasca will tip the scales in favor of the McMurray route to the extent that the freight in sight on the route from McMurray will be 15 or 20 per cent more than if the railroad were to start at Grimshaw.

The Uranium City area is growing and if estimates recently made by consultants who made a report to one of the Provincial Government Departments are correct, it will continue to grow until it is three or four times its present size. The mining activity in that area and the consequent growth of population will undoubtedly mean that the railways' decision, based purely on economics, will be to build the road from McMurray.

From the standpoint of the Province as a whole, if the railroad is built from McMurray it will provide a route of transportation which will serve the east half of Northern Alberta while the MacKenzie Highway serves the west half. Such a railroad would make it possible to open up and develop all the northeast quarter of Alberta in a way which has never been possible before. While the building of a railroad from McMurray will be a great disappointment to the people in the Manning area, nevertheless it appears to the Commission that considering the good of the Province as a whole, the most good will come by a railroad from McMurray. This does not preclude the possibility that a railway may some day be extended to Manning when increased settlement and increased activity in the oil and timber industries lead to sufficient increase in population and amount of freight in sight to warrant its construction.

While the final decision on this route and of the question of when and where this railroad will be built is beyond the power of this Commission, it seems logical, after assessing all the facts, to assume that it should and will be built north from McMurray and, therefore, that the orientation of a system of highways should be laid out with that in mind.

A railway to Pine Point is a necessity. It is of great economic importance to Alberta, as well as to the Dominion of Canada. The route chosen should be that from McMurray north, as in that location it will be of greater service and value than if built along any other route. The Commission therefore recommends:

(1) That the Provincial Government approach the Federal Government in an endeavor to have construction of such a railway started immediately, and

(2) That the Provincial Government subsidize such a railway to the extent of granting it free right-of-way over all Crown lands, and in addition, discuss with the Federal Government and the Northern Alberta Railways the possibility of having the bridge over the Athabasca River near McMurray and the bridge over the Peace River near Peace Point built so as to be used jointly for railway and highway traffic, and that the Provincial Government subsidize the railway to the extent of sharing in the cost of these bridges, which are estimated to have a total cost of about $7,000,000.

Highways

Assuming that the railway will be built north from McMurray, this will provide one main route of transportation up the centre of the east half of Northern Alberta, while the MacKenzie Highway will remain the main route up the centre of the west half. In spite of the fact that the railway will carry much of the tonnage now trucked over the MacKenzie Highway, traffic over this road will increase due to the influx of population which the Northwest Territories will experience as soon as the railway provides access to Great Slave Lake. When built many years ago, the MacKenzie Highway was constructed to a

standard sufficient for the traffic in sight at that time. Since then, traffic has increased tremendously and the highway is no longer adequate. The Provincial Department of Highways has been rebuilding the bridges along this highway so that they will be able to carry the heavy loads demanded of modern highways. The Commission understands that discussions are under way between the Provincial and the Federal Governments which are aiming at some plan of sharing the cost of rebuilding the highway to a higher standard. This rebuilding is essential and when it has been done the MacKenzie Highway should be a reliable all-weather artery.

The people of the Manning district have long lived in hopes that a railway would be built at least as far as the town of Manning. If now it turns out that this long awaited railway goes north from McMurray, it would seem that a logical step might be to hard-surface the MacKenzie Highway at least as far as Manning in the very near future.

A second extra-provincial transportation route should be built to connect the MacKenzie Highway at High Level with the roads being built in the Wood Buffalo Park by the federal authorities and which are shown in Map No. 17. These roads will permit the people of Fort Smith to come out as far south and west as the point where the 5th Meridian strikes the Peace River. A secondary highway should be built by Alberta authorities along the north side of the Peace River from High Level to the 5th Meridian to connect with the highway being built in the Wood Buffalo Park. The construction of this road would then provide an east and west highway across the northern part of Northern Alberta. It would serve High Level, Fort Vermilion, Peace Point and Fort Smith, and could some day be continued east to link up with Uranium City and other mining areas in Northern Saskatchewan.

The last extra-provincial highway which was brought to the attention of the Commission was the connection through from Hines Creek to Fort St. John. The section of this road from Fairview to at least as far west as Clear Prairie should be taken over by the Provincial authorities and rebuilt as a secondary highway. From Clear Prairie it should be continued west to the British Columbia border as a lower standard gravelled road.

INTRA-PROVINCIAL TRANSPORTATION

Highways

There are a number of intra-provincial highways which should be constructed. These are the following:

Lac La Biche to McMurray: At the present time a market type road leaves highway number 46 in the vicinity of Plamondon, and goes north to Wandering River. This should form the start of an all-weather secondary highway to McMurray. It has been suggested to the Commission that it would be quite feasible to construct such a highway keeping well up on the height of land between the streams that flow into the Christina River and those that flow into the Athabasca. The Commission has not been able to make any direct studies of such a route, feeling that studies of this sort should be left to engineers in the Department of Highways. The Commission, however, is satisfied that such a highway should be built and that it should be commenced very soon. One factor which might be taken into consideration by the engineers of the Department of Highways is that ultimately a pipeline will be built from McMurray to Edmonton. The Commission understands that at the present time a permit has been granted for a pipeline which would follow the route of the railway. If this pipeline were not built for a few years, its location might be changed to fit in with that of the proposed highway. Moreover, it should not be long before we see the development of a power site on the Athabasca River in the vicinity of Township 87, Range 15, West 4th. When the power plant is developed, it will be necessary to build a major transmission line from it to the vicinity of Edmonton. While the terrain along the route of this transmission line may not be suitable for the construction of a highway, nevertheless, the possibility of the new highway and this transmission line using a common right of way should be explored.

Fort Vermilion to the MacKenzie Highway: This road should be constructed to the standard of a market road, and should run from the town of Fort Vermilion south and west through Buffalo Head Prairie and across the Peace River to strike the MacKenzie Highway somewhere in the vicinity of Keg River. This would necessitate putting in a ferry to cross the Peace, but the Commission understands that a ferry will be available as soon as the Dunvegan bridge is completed. This road is a necessity because many farmers live 40 miles south and west along the route this road would take. In order to get "outside" with any products they may wish to sell, these farmers have to go 40 miles more or less north to Fort Vermilion and thence west to the MacKenzie Highway and south along it, travelling around three sides of a square each about 40 miles long.

Sunset House to Valleyview: It appears to the Commission that the farmers in the Sunset House country, which lies a few miles east across the Little Smoky River from Valleyview, should have an outlet to Valleyview. It is true that their nearest railway point is some 40 miles north and east of them, but their nearest hard-surfaced highway is at Valleyview, some 6 miles to the west. It would appear logical to put a bridge across the Little Smoky and to give these farmers an outlet to Valleyview.

Two other roads which should be graded and gravelled up to the standard of market roads should be built south from the Hines Creek-Fort St. John Highway. One of these would give access to Cherry Point and the other one should be built south somewhere on the east side of the Clear River. Considerable work has already been done, particularly on the road to Cherry Point, but the Commission feels that these are important enough to mention here.

There are a number of roads, built mainly by either the Forestry Branch, sawmill operators or oil companies, that reach into such isolated communities as Wabasca, Atikameg, Calling Lake, Red Earth oil field, Hay Lakes and south several miles from the vicinity of Grande Prairie. From the standpoint of people living in the area, there does not appear to be any immediate necessity to improve or extend these roads. Possibly an extension of these roads will take place at the behest of the Forestry Branch, because while these roads are important as a means of access to forests they do not form an important part of the transportation picture in Northern Alberta.

TRANSPORTATION

(SHOWING MAIN HIGHWAY SYSTEM)

Scale in Miles

10 0 10 20 30 40

It might be wondered why the Commission is recommending so few highways. The answer is that the existing highways, together with those proposed above, will be adequate to serve existing communities and those which it can be forecast will become important during the next few years. Further, the existing and proposed roads will form a basic network from which further developments can take place as required. New oil fields or important mining developments could change the picture and new roads, such as one from Peace Point to McMurray, could be built to serve them as the need arises but it would be somewhat idle at the moment to try to guess where these roads should run. In the meantime, however, it is sufficient to point out that as far as possible good highways should be built into new centres of population in Northern Alberta as soon as these centres take on an appearance of permanency.

The Commission is of the opinion that with the exception of two or three relatively minor roads listed below, the Government of Alberta is adequately meeting the needs of the Peace River Country for roads, or has even given some special emphasis to road-building in that area. It feels, however, that the remainder of Northern Alberta should receive more attention in future, and recommends that construction of the following main and secondary highways and market roads should be commenced immediately and carried through with all possible expedition.

Extra-provincial Highways

(1) Re-build the MacKenzie Highway to a standard sufficient to carry the present heavy loads and the increased traffic of the future during all states of weather. The Federal Government should be expected to share in the cost of doing this work from Mile 70 to the northern border of the Province.

(2) Hard-surface the MacKenzie Highway from Grimshaw to Manning.

(3) Re-build the stretch of road from High Level to Fort Vermilion into a secondary gravelled road and continue this east along the north side of the Peace River to join up with the road being built within the Wood Buffalo Park.

(4) Re-build the present road from Fairview to Clear Prairie to the standard of a secondary highway. The portion of road from Clear Prairie to the British Columbia border should be well gravelled but could be built to a lesser standard.

Intra-provincial Highways

(1) Build a secondary highway that will be passable in all conditions of weather from Highway No. 46 near Plamondon to McMurray.

(2) Build a highway to the standard of a gravelled market road from Fort Vermilion, via Buffalo Head Prairie, and west to the MacKenzie Highway.

(3) Build a highway to the standard of a market gravelled road from Sunset House to Valleyview.

(4) Build two standard gravelled market roads south from the Hines Creek-Fort St. John Highway, one giving access to Cherry Point, the other to the east of the Clear River.

(5) As rapidly as expedient, market type gravelled roads should be built to lakes having tourist possibilities.

COMMUNICATION

The need for a common carrier telephone network into the Northwest Territories and Northern Saskatchewan has been apparent for some ten years. Due to the large mining and transportation developments which have taken place in recent years, the necessity of such a network becomes more obvious all the time. A radio system from Edmonton to Yellowknife was actually completed by the Fisher Brothers in 1956, after the Edmonton-Peace River section had been placed in operation in 1954. The operating costs on the initial section of this system were found to be so high that in 1956 Fisher Brothers decided to replace the whole system with scatter equipment. As the Alberta Government Telephones decided to build a competing microwave system from Edmonton to Peace River and Grande Prairie, Fisher Brothers offered to build a scatter system from Peace River into Yellowknife, Fort Smith, Uranium City, Fort Vermilion and Hay River, and then to turn this system over to the Alberta Government Telephones for operation after it was proved to be successful. This offer was not accepted by the Alberta Government Telephones. The Fisher Brothers system from Peace River to Yellowknife was removed in 1956.

For many years the Dominion Government Telephones operated telegraph circuits over a network extending from Edmonton through Athabasca to Peace River and Fort Vermilion. This system became obsolete and the Federal Department of Transport, which operated it, gave notice to the Alberta Government Telephones of their intention of abandoning the service, as most of the system parallels public carrier systems. The Alberta Government Telephones have undertaken to provide local radio-telephone service to Keg River and Fort Vermilion from Peace River by March 1958.

Other public communication is provided over a radio network from various points in the territories into Edmonton by the Royal Canadian Corps of Signals, who provide a telegraph service which can be forwarded beyond Edmonton over regular railway telegraph facilities. Numerous private radio systems are operated by transportation companies, Government agencies and private firms.

All of these agencies combined, however, do not provide satisfactory service as they are not connected into the toll network and all messages have to be repeated either by telegraph or by voice. Service is often delayed and with excellent air transport it is not unusual for actual travel to be faster than the message.

The present demand for service from the world to points in Alberta north of Manning is believed limited to Fort Vermilion, several places along the MacKenzie Highway and to oil exploration companies scattered throughout the area. Alberta Government agencies such as the Department of Highways and the Health and Welfare Department would also benefit from such facilities. It is estimated that a total of 8 circuits entering Peace River from these points would handle the business until 1961.

In the territories, however, the demand is much greater. The towns of the Beaverlodge area in Saskatchewan and the towns of Hay River, Fort Smith and Yellowknife all are served by telephone exchanges with a total of over 1,500 subscribers who are potential toll service users. In addition there is a demand for leased circuits by the Federal Department of Transport for weather reporting and air transport control, by airlines, the R. C. A. F., and trucking concerns. It is probable that, if available, broadcast circuits would be leased by the C.B.C. A study of the total potential indicates that by 1961 more than 44 circuits entering Peace River from the north would be required.

Reliable communication is urgently required all over the North and from an economic standpoint it appears reasonable that the Alberta Government Telephones should have a microwave system into Peace River of sufficient capacity to handle the foreseeable demand from the North into its toll network. The Department of Transport, who handle licensing of radio frequencies, have gone on record as desiring a common carrier to provide toll services because the hundreds of private radio system now in the area are using up all available frequencies. If the Alberta Government Telephones were to put in its proposed scatterwave system, the majority of these radio frequencies would become available for other purposes. In addition to this, under the nation-wide dialing plan, there is a tremendous advantage from the standpoint of cost and from that of control if one system such as the Alberta Government Telephones were to handle all tele-communications.

For all these reasons, therefore, it appears highly desirable that all communication into the North should be funnelled through Alberta Government Telephones' system. Doing this would be to the advantage of Alberta, Northern Saskatchewan, and the Dominion Government as far as it is concerned with communication to the North. The Commission understands that the cost of installing the proposed equipment would be in the neighborhood of $3,500,000 and that it would have to be in service for some three to four years before the revenue from its operations could make the system self-supporting.

Because the Alberta Government Telephones is a common carrier and is a member of the Trans-Canada Telephone Association, connected by voice circuits provided over radio and land lines to all points in Canada, the United States and the world, and because it has already constructed a microwave system into Peace River, we feel that this trunk route system should be extended by the Province of Alberta into the Northwest Territories as part of the overall network. The Commission recommends that:

(1) The Alberta Government endeavor to work out an arrangement with the Federal Government, so that service to the Northwest Territories, etc., shall be provided through the network of the Alberta Government Telephones.

(2) The Government should urge that as rapidly as possible television service should be provided for the Peace River Country, possibly with stations at or near Grande Prairie and Peace River.

SECTION 9

MISCELLANEOUS PROBLEMS

There are a number of problems which come under the general terms of reference of the Commission which, because there has not seemed to be any specific category into which to put them, have not been dealt with in any previous section of the report. These will be treated in this section.

Also included in this section are items such as fire fighting, surveying, etc., which the Commission feels are of such importance that a brief discussion of them is warranted here at the point where the Commission is formulating its recommendations.

ROADS FOR NEWLY SETTLED AREAS

Several suggestions were made to the Commission to the effect that the roads leading into newly settled areas were not sufficiently passable to meet the requirements of the homesteaders. The normal first reaction to suggestions of this sort is that in newly settled areas roads do not spring up overnight and that people taking up homesteads in these areas do so with the knowledge that they cannot expect first class roads giving access to their township which will remain passable in virtually any weather.

The first reaction, however, may be short-sighted. For many generations one of the bases of our Canadian society has been the fact that if a man wished to homestead or to pioneer on the land, it would be available for him to do so. We should continue to hold out this opportunity to any who wish to take up a homestead, although restrictions are and should be placed on where it may be taken up.

While we could probably get along quite well in an agricultural way for the next 10 or maybe 20 years if, during that period, no new land were homesteaded, we must nevertheless provide the opportunity so that anyone who wishes to homestead in our areas of grey-wooded soil which are available for settlement may do so. Perhaps, however, we should do more than that. Perhaps we are being somewhat unfair in doing so much for a man who wishes to farm on a piece of irrigated land owned by the Crown while we do rather little for the man who wishes to clear a homestead out of the bush.

In the irrigated areas, the Dominion and Provincial Governments spend large sums providing the facilities for irrigation so that land "under the ditch" costs the government some $60.00 per acre. This land is then sold to a farmer at about $10.00 an acre so that between them the two governments absorb about $50.00 per acre. In other words, they subsidize the farmer on irrigated land to the tune of about $50.00 per acre. Homestead land in the grey-wooded soil areas, however, costs the government practically nothing and is turned over to the homesteader at a nominal fee. The Province then undertakes to provide education for the homesteader's children and, in general, to give him the same social services as are given to the farmer on irrigated land or to any other citizen of Alberta.

It is true that the irrigated land is more productive and that farmers on that land soon after they take it over should be in a position to relieve the Province of much of their own municipal and school expense, while for many years to come the homesteader will not be in a position to recompense the government for these costs that it assumes on his behalf. Nevertheless, it is still open to question whether as much is done for the homesteader as is done for the man buying irrigated land.

Our consolidated schools and many other services to homesteaders depends upon roads; so do the homesteaders and their wives. When the bulk of Alberta was opened up settlers made their own roads and endured isolation and loneliness. Such roads as they could afford to build could be travelled in winter or in summer by horses or oxen. But in ways too numerous to mention, conditions have changed. Horses have been replaced by trucks and cars and the modern homesteader, even if he wanted to, would be foolish to depend on horses for his transportation or motive power. Consequently, the homesteader needs roads which he can travel all year round with cars and trucks. While he and his neighbors can easily make their own roads from their homesteads to some central main road in a township, they cannot build the twenty or so miles of market road to town or to the nearest highway. This should be provided for them.

A new township should not be opened up for settlement until there is reasonable expectancy that several settlers will want the land and will homstead it. As soon as a relatively small number of settlers do homestead in the township, a gravelled market road should be constructed from some point in or touching the township to the nearest main gravelled highway. Such a road should be considered as part of the Government's obligation to these settlers and should be considered as part of the cost of the land which the government is giving to them.

In the course of time such a road will be built anyway and when it comes to be built, the cost of it will be borne nearly or wholly at Provincial expense. Because settlers go through enough toil and hardship anyway, the lack of roads should not be added to their difficulties or stand in the way of access to hospitals or consolidated schools. Building such a road at the beginning of settlement would mean a contribution to them of Government money at the start of their experience as homesteaders equivalent in intent, even if not nearly equivalent in amount, to the $50.00 per acre spent on irrigated land.

There are some townships in which new homesteading has taken place in fairly recent years. These townships also should have a gravelled market type road built now to some point adjacent to them. There may be some townships in which many of the settlers have abandoned their land. These townships should be studied to see

whether or not it might be advisable to consider some plan of inducement to the remaining settlers to trade their land for similar land in a more settled area. If they would do this it would save the expense of a costly road.

The Commission recommends:

(1) that in future, at the commencement of settlement in a township, a gravelled road to the standard of a market road should be built from the nearest existing gravelled highway to some point in or alongside any such township;

(2) that all townships in which homesteading has taken place recently and which do not have such gravelled access roads should be provided with these roads as soon as this work can possibly be done, and that the money necessary to do this work should be taken from the general revenue of the Province rather than from any money which otherwise would be allocated to Municipal Districts or Improvement Districts.

FIRE FIGHTING

The question of fighting fire in our forests has already been discussed in Section 2, but the subject is so important that even at the expense of repetition it is well to mention it again. Perhaps no words can give as graphic a picture of the losses of timber by fires as the map in the pocket at the back of this report. This map has been published recently by the Department of Lands and Forests of the Province and that Department very kindly agreed to permit the Commission to have enough extra copies printed so as to include it in this report.

The light and dark green areas show the existing stands of coniferous trees, while the yellow shades show similar stands of deciduous trees. It will be seen that the stands of coniferous timber, the most valuable, are rather sparsely distributed over the map, with a heavy concentration in the foothills area south of Latitude 55°.

But the startling shade on the map is red, which indicates areas burned up by forest fires. And north of 55° it is the predominant color. The areas burned since 1941 are in the deeper shade of red. The timber destroyed in this area was worth untold millions of dollars. It was destroyed because neither the physical nor the financial means were available to put out the fires. Those charged with the operation of our forest and its protection from fire knew that these losses were taking place but were powerless to prevent this devastation. Much of the area was entirely inaccessible and to have built access roads and to have prevented or extinguished the fires was beyond the financial ability of the Province. Even if it had been within its ability, there remained the question of economics. Is it good economics to fight fires in remote areas of the Province where the timber may never be used because of lack of future markets? The situation is not one for recrimination.

Nevertheless, what a pity it is that millions of acres of forest were destroyed. Even if all future fires are held to the irreducible minimum, nearly a hundred years will elapse before these red areas will grow enough to be shown on future maps in dark green symbols. Nothing, however, is to be gained by crying over spilled milk, but now that we have so little forest left it behoves us all the more to protect it.

All fires have a small beginning when it would be possible to control them with but a handful of men. In the past, large inaccessible areas in Northern Alberta have suffered because no one could ever be on hand in time to do much good. Main highways and roads built by oil and lumber companies are making all areas of Northern Alberta more accessible. The Department of Lands and Forests, very conscious of its responsibility, is spending a great deal of money to good advantage in pushing roads through the forest areas and its yearly fire-fighting budget is increasing by leaps and bounds.

That Department has realized for some time that the solution to many of its fire-fighting problems is air transportation of men, equipment and supplies, and a small beginning for providing this was made last year by the purchase of one small aircraft and the full-time rental of a helicopter during the months of May and June, which period is usually the most hazardous of the year. The undertaking was unquestionably a success, principally because the equipment was on call at all times, weather conditions were not so unfavorable as to overtax it and fortunately there was no great concentration of a large number of fires at one time in inaccessible areas. This type of transportation, however, must be augmented many times if the margin between success and failure is to be widened.

Forest fires differ from one another in incidence, speed and destructiveness. As forest crops require many years to reach maturity, it follows that even an occasional year of large fires may nullify the results of years of adequate protection. As an example, in a particular area of 1,280,000 acres, fire over a ten-year period destroyed only 6,000 acres, which works out at an annual rate of burn of only .05 per cent of the productive land, but in a subsequent year of high hazard, two or three fires which could not be reached in time, due to poor access and inadequate transportation, destroyed over 43,000 acres (3.36%) of forest growth in one year. It is such high hazard years which constitute the most difficult task.

In all studies and discussions of fire protection, the fundamental fact emerges that successful protection consists not in putting out big fires but catching the fires when they are small, which simply means sufficient staff and equipment to provide for at least average worst conditions. During the past five or six years, much has been accomplished toward providing adequate protection. Many more look-out towers have been built and forest protection personnel has increased twofold. The use of aircraft—both for detection and suppression—is being more and more depended upon for the protection of remote areas. Many more access roads are being built and, last but not least, suppression equipment is being augmented.

The present policy of spending increasing amounts on fire fighting and suppression must be continued if we are to save the stands of timber that still exist. Perhaps more important even than that will be saving the trees

that are trying to cover the red areas with a new mantle of green so that the future of the forest industry may be assured for as long as men need lumber.

It is recommended that the amount of money spent annually on fire fighting and fire protection in Northern Alberta be greatly augmented, so as to make possible the establishment of more watch towers, a larger annual program of construction of access roads and an increase in the number of aircraft owned by the Department of Lands and Forests for use in fire protection and fire fighting.

WATER RESOURCES

Water Conservation

Although shortage of water is not a problem that is likely to confront Northern Alberta, it is a prevalent condition in large parts of North America, and it is well now to keep this problem in mind. The following quotation from the Journal of the American Water Works Association, by L. K. Sillcox, shows how serious this condition can become:

> "With the surprise that comes from any new experience, some 40,000,000 Americans, living in various regions and communities, are now actually face to face with problems of water—either those of real shortage or of unsatisfactory quality or both. During the last half century our per capita consumption of water has doubled, and, in view of the fact that our population has also doubled during this period, it is evident that our water needs have increased fourfold since 1900. Although part of this is due, of course, to domestic and municipal demands, the larger part is brought about by the tremendous drafts that are being placed on available water by the expansion of industry and the extension of agriculture, including huge irrigation projects.
>
> "We can—indeed, we will be forced to—adopt better practices in the development and use of the water resources available; but, even then, water, like crops, forest products, and mineral resources, will limit population and industrial expansion.
>
> "The United States is not running out of water, but the seventeen Western States, as a whole, are using about 70 per cent of all the water they may expect to develop at reasonable cost. Arizona's water use already exceeds the dependable supply available within its borders. Texas is talking of importing water from the Mississippi, and Oklahoma plans a 450-mile water supply and irrigation canal linking the abundant water shed of eastern Oklahoma with the drier central and western sections."

It is not beyond reason to believe that some day not too far away the industrial area of Edmonton may turn its eyes towards Northern Alberta in its search for a greater water supply. Certainly, before that time comes, industry will be locating along the Athabasca River and on Lesser Slave Lake to take advantage of the abundant water supply. Everything, therefore, indicates that all reasonable water conservation practices should be adopted and everything done to safeguard the wealth of water bestowed upon us.

Diversion of Water

The recent announcement from the Province of British Columbia, that a dam is to be built on the Peace River downstream from Finlay Forks, helps to focus this problem. Several organizations in the Peace River Country expressed concern over the possible diversion of some of the headwaters of the Peace River to the Fraser or to some other stream making its way to the Pacific Ocean. Such diversion would lessen the annual flow of the Alberta portion of the Peace River and, while the effect of this might scarcely be noticed in the next decade, it would nevertheless have a detrimental effect on Alberta and the Northwest Territories in three ways:

(1) It would diminish the flow of water through future power plants at Vermilion Chutes, Fort Smith and any other power site which might in the course of time be developed on the Peace River.

(2) It would diminish the water available for future industry in Northern Alberta.

(3) It would have a bad effect on navigation on the Lower Peace (below Vermilion Chutes) and on the Slave River.

So long as the water stored behind the dam downstream from Finlay Forks continues to flow down the Peace, no harm will be done to Alberta—in fact a great deal of good will result from firming up the low flows of the river. It may take some years to fill the storage reservoir created by this dam, but with proper precautions this filling of the reservoir could be done without any objectionable temporary lowering of the flow in the Alberta section of the river.

The Government of the Province of British Columbia has announced that none of the headwaters of the Peace will be diverted into any other watershed, and this appears to be the present plan. It may turn out, however, that further study of this project might indicate that due to some problem at present unforeseen, it might be desirable to change these plans and once more to contemplate diversion of this water towards the Pacific Ocean. At this point the interests of Alberta and of the Northwest Territories could be affected.

The Commission inquired of the Department of Water Resources and, in a letter from J. L. Reid, Supervisor of Hydro-Electric Development, received the following reply regarding the position of Alberta in such an event:

> **"Interprovincial Rivers:** In the case of the three prairie provinces, there is an advisory board known as The Prairie Provinces Water Board. This Board is made up of representatives from each of the prairie provinces, the Federal Government and the Prairie Farm Rehabilitation Administration, and is strictly advisory. There is no legislation that protects the province's water rights.
>
> "In recent months the subject of the Peace River has come up, which would require a board between British Columbia, Alberta and the Northwest Territories. No such board has been created.
>
> "Under the Federal Government, control is held over all streams considered navigable and permission must be obtained from them for any development. The Peace, Athabasca and Slave Rivers all fall into this category."

From this is appears that there is no legislation which would automatically give direct protection to the interests of Alberta except through the rather roundabout channel of making use of the Navigable Waters Act.

It is recommended that the Province of Alberta enter into discussions with the Federal Government and with the governments of British Columbia and the Northwest Territories with a view to the creation of a Joint Advisory Water Board, along the same lines as the present Prairie Provinces Water Board, which would be charged with the duty of studying and protecting the joint interests of these governments in any interprovincial waters, such as the Peace and the Slave Rivers.

Irrigation

There are many river flats on the Peace River which could possibly benefit from irrigation. It appears doubtful if dams and other irrigation works could be constructed at reasonable cost to supply water to these flats. In general, it would seem that they could be irrigated more cheaply by means of pumps taking their water direct from the Peace River.

Soil Erosion

Much of the Peace River Country is more subject to soil erosion by water than the rest of the Province. Instances of this are to be seen in the Kleskun Hill area, along the Little Smoky River, and in the vicinity of Dunvegan. Because of the present indications of this phenomena, steps are already beginning to be taken to counteract it, and the Water Resources Branch has spent considerable money in the Kleskun Hill area. The peculiar nature of the soil coupled with the steep gradients running into the deeply incised valleys are the major factors. The control of erosion is very expensive and the only answer seems to be sound agricultural tillage following the contour of the land. The steeper hillsides should be kept in forest cover.

Soil erosion in the Peace River Country will become much more acute unless the farmers themselves take steps to control it by means of terracing, contour ploughing, etc. One of the difficulties is that where the run-off on its way to the river passes through five or six farms in succession, there is little that one farmer can do unless the farmers above him co-operate. The present approach to this problem of water erosion is one of increased education through district agriculturalists, etc., and depends upon voluntary co-operation of the farmers. In the Commission's opinion this may not achieve the desired results and since water erosion is increasing in the Peace River Country, it might be well to consider some other approach to the problem.

One general way, of course, of keeping down water erosion in known farming areas is by means of encouraging forest growth in the upper watersheds of the numerous streams. The protective influences of the forests include the stabilization of the soil, the promotion of clean and well distributed stream flow and the recharge of ground waters. At the present time, the Forestry Branch and the Lands Branch of the Department of Lands and Forests have drawn a boundary between those areas which they consider should be maintained in forest cover and those lands which in their opinion should be left available for settlement. Every encouragement should be given these branches to maintain this line over a period of a great many years. In this way the Forestry people can plan the administration of the forest areas on a long term basis secure in the knowledge that their plans would not be upset by repeated changes of these boundaries.

Navigation

The need for navigating the rivers of Northern Alberta has disappeared, except for the Athabasca River below McMurray, the Slave River and that portion of the Peace River below Vermilion Chutes. If, as the Commission expects, a railroad will be built to Pine Point, the only need for navigation on a commercial scale will be to ship goods into Lake Athabasca to serve the mining communities around it. If this railroad should be built from McMurray, the need for navigation on the lower Athabasca would be eliminated. Its place would be taken by navigation of the Peace River below the point where the proposed railroad will cross it. While the delta of the Athabasca River has always presented difficulties to navigation, the lower portion of the Peace River seems to be satisfactory at all seasons. Each year the Dominion Government spends considerable money trying to improve navigation on the lower Athabasca and has gone so far as to consider utilizing the storage in Lesser Slave Lake during periods of low flow for this purpose. If the railway were to run from McMurray to Peace Point and on to Pine Point, this expense would be eliminated.

Settlement in Flood Plains

There are numerous examples in the Province of towns being flooded out during the high water of the spring or summer seasons or due to ice conditions during the winter or spring. Among these are the City of Calgary, the Town of High River and the Town of Sundre, a town of fairly recent origin. Floods of alarming proportions have also been known at Athabasca, McMurray and Whitecourt. In years gone by it was natural for towns to be built on the banks of rivers because the streams acted as highways. It is no longer necessary, however, to build them down at the edge of the river and when the creation of any new town is mooted, steps should be taken to ensure that it is built above the highest possible flood level.

In future, particular pains should be taken around the margins of the larger lakes to ensure that no one obtains ownership to hay marshes, etc., in the low-lying lands adjacent to the lake. If it is necessary or advisable to cut hay on this land, the land can be leased but the Crown should retain ownership of it. This would prevent a recurrence of the problems that are going to have to be faced around Lesser Slave Lake and Lac La Biche where, for one reason or another, it may be advisable to raise the level of these lakes with the consequent disruption of haymaking on the adjoining marsh land.

Many people and agencies are devoting considerable thought and effort to problems of water conservation. Ducks Unlimited is doing very valuable work in this connection, always with an eye to conserving water in Northern Alberta to which ducks and other wildlife may retreat when another period of drought strikes the Prairies. Ducks Unlimited have dammed up many streams and restored many lakes, of which a typical recent example is Hay Lakes (Township 113, Range 5, West 6th). Many of Ducks Unlimited's projects have been built jointly between the Alberta and Saskatchewan Provincial Governments and Ducks Unlimited under the Water Stabilization Committees in each Province. Costs of building and maintaining these projects have been shared between the Governments and Ducks Unlimited. Thousands of acres of excellent "wild life territory" have been preserved through this co-operative program.

One problem which did not confront Ducks Unlimited on the Hay Lakes project but which is of concern to them in other areas, is the fact that, as our population develops and the demand for more agricultural land increases, there is a continuous pressure to drain wet lands. Then again, when lake areas are temporarily low, farmers will intrude on the accrued lands and when the lakes return to their normal level these farmers, now depending on the additional land for their livelihood, drain the smaller lakes illegally or demand action from the government to lower the level of the larger lakes or drain them completely. This has already been done in a number of cases and the same thing will happen around lakes in Northern Alberta unless everyone is vigilant.

The situation is well in hand at the moment because, generally speaking, title to all of the land, except that used in farming operations, is still vested in the Crown. Before anyone can build a summer cottage or a hunting lodge, or decide to cultivate some of the land, permission must first be obtained from one or another of the branches of the Departments of Lands and Forests. This is as it should be and as long as these Departments do not allow anyone to settle in areas which are subject to natural flooding, or in a river basin which may some day be used as a power storage reservoir, there will be no problem. The Commission is pointing this out, however, because occasions could arise when pressure might be put on these Departments by people interested in settling in these hazardous locations. All such demands should be vigorously resisted after consultation between the above Departments, the Water Resources Branch of the Department of Agriculture and the department in charge of town planning.

From time to time someone living in a river valley and owning the land, feels that it would be desirable to sub-divide this into a village site. This situation is controlled at the moment by the Department of Municipal Affairs and, before anyone can sub-divide his land in this way, he must obtain the approval of that Department. This is a wise provision and undoubtedly is going to prevent a recurrence of towns being built in localities subject to flooding.

While there are already enough provisions in various provincial acts to prevent settlement or farming operations in the flood plains of rivers or around the margins of lakes and along stretches of rivers which may in future have to be flooded by the construction of dams for hydro power purposes, the Commission recommends that extreme vigilance be exercised by all departments of government having any responsibility for the preservation of these water for pleasure or industrial purposes.

Water Pollution

It was suggested to the Commission that, since some pollution of water is inevitable in an area seeking industries, certain rivers such as the Smoky be set aside as pure water streams and that no industries be permitted to locate on them. In the opinion of the Commission such a policy is not practical. Certain lakes might be reserved for water supplies and for tourist facilities but a moderately large river such as the Smoky would be difficult to earmark in such a way. The Smoky, for instance, would be a logical river on which to build a pulp mill and this brings up the whole problem of water pollution. Unfortunately, we cannot make an omelette without breaking eggs. Similarly, we cannot have industry without some degree of water pollution. The degree of pollution we tolerate depends upon how anxious we are to obtain industries and hence population. Possibly the extreme examples of pollution occur in some of the industrial regions of the United States east of the Mississippi River where towns and industries adjoin each other for as much as 100 miles along the course of a river and where one town's water supply inlet is immediately below the sewer outlet of the town above it. Even in circumstances like that, the water can be purified and treated so as to become perfectly potable and sanitary. The treatment problem can be solved but the expense of doing so is very high.

In such rivers fish cannot live and conditions are bad for water fowl, but the people of the area much choose between industries and fish and game. Such a decision between commercial fishing, for instance, and industry, may some day have to be made in some of the lakes and streams in Northern Alberta. The picture as a whole, however, is not all as black as that because in a new country like Northern Alberta industries can be controlled and can be forced to dispose of their waste in such a way as to reduce pollution to an acceptable level. Finally, however, the industry concerned comes to the point where it has to decide whether or not the added cost of excessive treatment of its waste is the last straw that breaks the camel's back and whether, under the circumstances, it would be better to abandon the idea of building up the industry in that area. Due to the distance from markets and to the fact that the costs of operating industries in Northern Alberta will be high, small added costs of this nature may be enough to tip the balance against locating in the area.

This should not be taken to suggest that industry be allowed to pollute water indiscriminately but to be an endeavor to point to the need for tolerance of some degree of water pollution.

In a similar manner, while hydro power plants do not pollute water, their needs for storage in large lakes do present problems of fluctuating water levels, sometimes with disastrous effects upon the spawning of fish or indeed their existence after spawning. Sometimes, as in the case of Lesser Slave Lake, it appears that fish would benefit if the water level were raised during the summer, fall and early winter months, as would be the case if this lake were used as a power storage reservoir. But, even if for the sake of argument we suppose that the use of this lake for power storage purposes would kill the fish, the sacrifice might be well worth while. At present Lesser Slave Lake produces four million pounds of coarse fish, which is used by fur farmers, and one million pounds of commercial fish valued at about $250,000 per year. When the time comes that the Athabasca River power plants are all built, use of Lesser Slave Lake as a storage reservoir will add one thousand million kilowatt hours annually over and above the electric power generated by water held back by the power dams. If these are valued at half a cent a kilowatt hour at the plants, they will be worth 5 million dollars per year as power. Not only will they have that value, but they will have the further value of making other industries possible and of giving employment to thousands of people.

To return to water pollution, it appears that effluent from pulp mills, for instance, may be discharged into such rivers as the Athabasca providing the effluent does not at any given time exceed one-twentieth of the amount of water flowing in the stream. In times of low water the Commission understands that the pulp mill at Hinton, for example, discharges as much effluent to the river as is

permissible. For this reason, no other mill could be permitted to be built on the Athabasca River until at least Athabasca is reached. If it became necessary for another mill to be built on this stretch of river, possibly some readjustment of the amount of effluent discharged by the Hinton mill would have to be made and the new mill would have to take measures to cut down the amount of effluent it would discharge.

This could be done by such a mill discharging its effluent to a nearby depression, such as a small lake or an area of muskeg, and storing the effluent in that basin during the winter and then releasing it at a controlled rate during periods of high flow in the river. Questions of oxygen content of the waters of rivers and lakes also come into the picture but, between the Provincial Sanitary Inspector and the Department of Lands and Forests, satisfactory arrangements can be made to control the discharge of effluent so that at one and the same time we can have both the relatively pure water and industry.

Groundwater

Many of the towns in the Peace River Country depend upon groundwater for their water supply. Groundwater studies have occupied the attention of the Research Council of Alberta for many years and, during 1957, it made a detailed investigation of a supply for Hines Creek with the object of finding a cheaper alternative than building a surface reservoir and water treatment plant. A similar study is being undertaken of the Dixonville area. In addition to this work, a reconnaissance has been made to obtain insight into the general groundwater conditions in other areas of the Peace River Country.

The immediate object of such studies is to try to help those communities which have the most pressing need for a water supply. They include examination of the geology, records of flowing seismic shot holes, electrical resistivity, the interpretations of air photographs in order to study sand and gravel deposits to see if they are potential groundwater producers, the study of bed rock geology and the setting up of test drilling programs to give knowledge about the stratigraphy of the area.

The Commission feels that this activity is definitely worth while and should be continued. If more were known about the presence or absence of groundwater, for instance, when choosing a townsite, the location for a new town could be moved two or three miles in one direction or another to ensure that it would have a supply of groundwater available to it.

Such groundwater studies might also include a program to keep a careful check on groundwater levels in existing wells with the object of keeping track of what is happening to the water supply, so that if remedial measures are necessary they can be taken in time.

In future, it is hoped that, with adequate groundwater studies, the known groundwater resources will be increased and new ones found, thereby alleviating shortages that exist in certain areas and opening other areas for new or greater development.

It is recommended that further groundwater surveys be carried out in the Peace River Country.

High Prairie Flooding

The Town of High Prairie is built in an area that is subject to flooding by the West Prairie River. Undoubtedly, flooding occurred in this area occasionally before the town was built, but the progress of civilization has greatly increased the frequency of these floods and their severity. When large areas of the forest in the Swan Hills were destroyed by fire, the run-off from the hills became fast and violent. Such spates of water result in dumping sediment and rocks where the West Prairie River changes gradient and flattens out, with the result that the stream gets blocked and carves out a new channel. This situation also prevails on the East Prairie River which at present flows between High Prairie and Enilda. A long-term cure for the problem would be to wait until the forest reestablishes itself along the headwaters of these two rivers, but steps of a more immediate nature will have to be taken. One solution might be to clear away the trees and logs along the banks of these rivers to prevent their being carried down and forming jams which endanger the town of High Prairie. Another solution might be to encourage them to jam at points higher up and thus to clear the river of them before they reach the flatter stretches and jam there, with a resulting hazard to the town.

Once the logs and debris were dealt with, consideration might be given to building a canal in such a way as to divert the East and West Prairie Rivers to Lesser Slave Lake by a route less liable to cause trouble. This would remove most of the risk of flooding in the vicinity of High Prairie and Enlida. Such a canal, however, would be very expensive. The Commission has been informed that it would cost approximately one million dollars and an expenditure of this magnitude is not to be taken lightly.

The Commission recommends that prompt attention be given to the flood problem as it affects the town of High Prairie. This problem stems from logs being washed into the East and West Prairie Rivers and eventually clogging the streams at critical points. A continuous program of selected tree removal along the river banks to prevent these logs from getting into the water is recommended. This should be combined with other efforts aimed at preventing logs from reaching the lower portions of these streams which have a flatter gradient. After the timber problem is solved, then the problem of building a canal to divert both the East and the West Prairie Rivers might be considered.

Lac La Biche

A problem of a different type involves Lac La Biche. Representations have been made to the Commission indicating that a dam should be built across the La Biche River to raise the level of the water in the lake. It was stated that at times the level of the lake falls and remains at a low stage for several years. The brief submitted by the Lac La Biche Chamber of Commerce made the following statement:

> "The result of low water is to activate the growth of weeds which in the wintertime remove the oxygen from the waters of the lake and kills the fish and their spawn. On the other hand in more recent years there has been a threat that the water might come too high causing serious flooding of low lying areas adjoining the lake."

The Fisheries Branch of the Department of Lands and Forests states that there have been unstable and erratic catches of thin fish. The cause of this situation is believed to be at least partly due to low water which leads to the death and decomposition of weeds and thus to the

reduction of dissolved oxygen to below the level necessary for fish life. The only possibility of increasing the reservoir of oxygen appears to be to increase the volume of water by damming the outlet and thus raising the level.

From information supplied to the Commission, it appears that the value of fish caught in Lac La Biche varied from nothing in the extremely bad year of 1949 to $153,000.00 in the best year on record which was 1947, and that the average over a 16-year period has been $61,515.00 per year. Slightly more than half of the value of the fish caught was used for mink feed and slightly less than half was commercial fish.

It appears that a dam could be constructed on La Biche River at a cost of between $50,000.00 and $100,000.00. Part of this cost would arise from having to purchase low lying hay lands which would be flooded if the level of the lake were raised. If this level were raised it is also possible that some money would have to be spent on the main highway approaching Lac La Biche from the west where for a mile or so it crosses low lying land beside the lake. It would appear that it would pay to construct the dam if the value of the fish catch was increased by some $30,000.00 or $40,000.00 per year. It was pointed out to the Commission that Lac La Biche, now that a good highway leads to it, is developing as a summer resort. If action were taken now on a dam aimed at stabilizing the level of the lake, it would avoid the possibility of cottages being built too close to the water.

The Commission understands that the construction of a dam on the La Biche River would soon pay for itself in improved commercial fishing in Lac La Biche and would, as well, bring other benefits to the residents of the area. It is recommended, therefore, that such a dam be built.

SURVEYS

In a Province like Alberta, which in a great measure depends for its livelihood upon the primary exploitation of its natural resources, surveys form an important part of its endeavor. These surveys take many forms and, as the years go by, the necessity for new surveys constantly presents itself. Surveys dealing with natural resources which are underway at present or have been in the recent past have included a complete inventory of our forest resources, soil surveys, geologic and groundwater surveys, basic legal surveys and many others. Our industrial civilization is based on measurements, and depends upon our ability to comprehend such measurements and to interpret the resulting statistics.

A number of these surveys have been discussed throughout the report but it might be well to recapitulate them here:

Soil Surveys

Reference was made to these surveys in Section 3 when discussing the extent of arable land. Good progress has been made on these surveys during the last few years and the Research Council of Alberta is following out a logical plan for its future work. This program is keeping well ahead of the current demand for arable land.

It is recommended that soil surveys as conducted now be continued at the present rate.

Groundwater Surveys

These have been carried out with considerable success in parts of the Peace River Country. It is to be hoped that they will be carried on in future so that existing groundwater resources will be increased and new ones found. This would alleviate shortages of water that exist in certain areas and would open up other areas for new or greater development.

It is recommended that further groundwater surveys be carried out in the Peace River Country.

Hydrometric Surveys

The situation with respect to stream flows records or studies seems to be well in hand. The hydrometric station at Peace River has been re-established recently and a new station has been started at McMurray. It would be interesting, of course, to obtain stream flow records on a number of smaller rivers in Northern Alberta but it does not seem too practical to take steps to get these. Any hydro development will, undoubtedly, be on the larger rivers because the cost per K. W. H. of operating small hydro power plants is generally higher than in large plants. It does not seem practical at present to set up gauging stations to procure records that may never be used.

In the event that at some time it is throught advisable to study any other rivers, requests for additional stream flow records or studies would be handled by the Department of Water Resources who in turn would request the hydrometric section of the Federal Department of Northern Affairs to install the stations. Any costs would be borne by the Department of Water Resources.

Geological Surveys

Alberta today may be considered as having a dual economy. Wheat and agriculture are now fortified by the great development of the oil and natural gas industries developed over the last decade. There is thus a strong, stable agricultural industry and a virile oil industry with as yet little secondary industry stemming from the recent oil and natural gas discoveries. Looking ahead to further industrialization, it is important to bring into development such other natural resources as are available in Alberta. In considering the Northern part of Alberta one already sees the beginnings of a plywood, pulp and paper industry from the timber resources. However, there is one possibility which as yet has not been evaluated and the exploitation of which requires considerable preliminary study, particularly along geological lines.

Alberta shares with Prince Edward Island the distinction—if we can call it that—of not having a metal mine. However, in the northeast corner of Alberta north of Lake Athabasca lies some 4,000 square miles of the Precambrian Shield which, by analogy with proven mineral potential in other parts of Canada in general and with the uranium district of Saskatchewan in particular, presents a real challenge to Alberta. In addition, there is a further area of the shield to the south of Lake Athabasca, bounded by the Saskatchewan border to the east and

approaching the Athabasca River on the west. Several thousand square miles here are covered with sand in the main but also offer an interesting region for studies which may possibly lead to the development of a metals industry in the Province of Alberta.

In 1957, geological investigations were commenced by the Research Council of Alberta in this northeast Precambrian Shield area of Alberta. Two reports, with maps, will be issued early in 1958. If this map is printed in time it is planned to put one in the pocket at the back of this report. It is, however, going to take many years to complete the necessary rather detailed geological study and mapping of this area. It is hoped that the publication of Research Council reports may lead to a gradual increase in interest in this area and an influx of prospectors and mining companies. This should assist in the determination of the true mineral potential of this part of Alberta.

Careful geological studies to outline map and otherwise evaluate both the Precambrian Shield area and the adjacent Paleozoic sedimentary regions of Alberta seem to be of urgent importance. Adequate geological work in these areas of Alberta will, it is believed, encourage prospectors and mining companies to expend large amounts of money and effort in order to follow up the initial geological studies. It seems reasonable to conclude that expenditures for such studies will lead directly to many times the sum being invested by private enterprise in the detailed exploration required in the search for economic mineral deposits in the northeast area of our province.

There will undoubtedly be many benefits to the whole provincial economy if significant metal finds are established within Alberta, because, stemming from such finds there is bound to be industrial development. An example of this kind is the present Sherritt Gordon Nickel Refinery which was located in Alberta because large quantities of low-cost gas are available. The ores processed are shipped 900 miles by rail from the Lynn Lake area of Manitoba. If metal sources are proven up in Alberta we may expect that these will lead to the establishment of communities for the processing and manufacturing of the refined product and thereby making usé of at least a part of the great store of thermal energy present within the Province.

Because the addition of metal mining to Alberta's industrial picture could have such a great impact, it appears that the program of geological surveys and mapping should be stepped up in quantity and speed and such surveys should include studies of the northeast corner of the Province by airborne geo-physical means. A determined attack to endeavor to unlock some of nature's geological secrets is bound to pay off.

It is recommended that the present program of geological surveys being carried out in the Precambrian and Paleozoic areas of the Province be increased in quantity and speed, and that such surveys should include studies by airborne geo-physical means.

Basic Legal Surveys

The Alberta Land Surveyors' Association submitted a brief to the Commission recommending that the process of basic legal surveys should be speeded up. The following extracts are taken from their brief:

"The development of the natural resources of any area involves in every case the occupancy and use of specific tracts of land. When land becomes occupied it it necessary that the boundaries of each tract be physically and legally defined so that orderly records of land tenure may be kept and so that each occupier may 'enjoy peaceful and undisputed possession' of his holding.

"In newly settled territory, this requires that the boundaries and corners of each occupiable unit of land be plainly marked on the ground by reasonably permanent monuments and that the location, dimensions and area of each unit be measured to an acceptable standard of accuracy and be recorded in the least ambiguous and most readily interpretable manner, namely in the graphic form of a plan. For the successful fulfilment of these aims, the execution of legal surveys—sometimes also referred to as land surveys, property surveys or cadastral surveys—is a prime necessity.

"The various governments which have been responsible for the administration of lands and real property law in Western Canada have always recognized the fundamental importance of a sound system of legal surveys and have enacted legislation and adopted policies that have been designed to ensure that such a system shall be established and maintained. Various Dominion and Provincial Acts contain detailed requirements governing the execution of legal surveys, the filing of plans and the professional qualifications of land surveyors, and all governments concerned have retained the responsibility of carrying out the original land subdivision surveys which are required to define Crown lands being made available for settlement or development and which serve as the foundation on which later subdivisions for such purposes as townsites are based.

"Latterly, one of the most valuable functions of the legal survey system, so far as it physically exists on the ground, has been its use as control for the extensive aerial photographic mapping carried out in Alberta since the war.

"In recent years the system has assumed added importance by reason of the aid it provides to the oil and natural gas industry in serving as a frame of reference for the conduct of seismic explorations, for the location of drilling sites and for defining the boundaries of leases. In almost every aspect of the province's administration and the conservation and use of its resources, the system of legal surveys is of fundamental significance—so much so that it is impossible to imagine how affairs could be managed without it."

The brief pointed out that in Northern Alberta some base lines had never been surveyed and that parts of others remained to be finished. It also recommended that the central meridians of the unsubdivided townships between the baselines be established. The brief then went on to suggest ways and means of carrying out this survey and set out estimates of the cost of completing it. The estimated cost of surveying the base lines, the central meridians and considerable triangulation in the foothills was thought to be in the neighborhood of $8,000,000.

There is no doubt of the desirability of having these lines surveyed. Alberta is fortunate in having a combination of our splendid system of survey with the Torren's system of Land Registration. Land titles are a sacred trust based on land surveys under the direction of the Director of Surveys for the Province and the Land Titles Office.

Their sanctity depends upon reliable surveys as called for by the Alberta Surveys Act. Alberta can be proud of the fact that of all the provinces it has the least litigation over land. Steps must be taken by way of additional surveys to maintain this valuable record and to ensure that persons in Northern Alberta laying claim to rights involving land can locate their claims accurately with reference to base lines and meridians already surveyed within a reasonable distance of their operations.

The development of our natural resources must also rely upon accurate surveys. For example, oil wells are usually located in the center of a legal subdivision. For orderly oil development, therefore, properly surveyed lines must be available. Many oil wells, for instance, are 30 miles and more from the nearest surveyed line and the cost of locating these wells accurately places a serious financial burden on the development of the area.

As rapidly as finances permit, the Director of Surveys has been having these lines surveyed and, in some measure, keeping abreast of the demand, but the efforts in this direction are on the basis of expediency. It would appear desirable to start a definite program of completing the surveying of base lines in Northern Alberta.

After the base lines have been run the projection of central meridians from the base lines could be considered in areas of immediate or prospective development as thought necessary by the Department of Mines and Minerals. Any further subdivision of townships beyond central meridians should be done when the Department of Lands and Forests propose to open more land for settlement.

While there is a definite need to complete the surveying of base lines as soon as possible, it would not appear advisable to start an inflexible program of surveying central meridians with the object of completing it within 20 years or even a much longer period. The resources of some areas are such that for a long time to come there may be no need of such surveys, while in other areas the demands for more detailed survey may be more pressing. Where there is no immediate need for central meridian surveys, this work could be delayed and used to create employment during a period of recession. If such a modified program of surveying as that suggested above were initiated, it would also provide much needed work for our Metis and Indians and steps should be taken to see that as far as possible they are employed on this work.

The Commission recommends that a program of surveying be established having as its objective the completion of the surveying of all base lines in Northern Alberta within five years. After all base lines have been established it is recommended that more money be made available for the projection of central meridians from the base lines so that these meridians may be established in any area sufficiently in advance of the requirements of development.

INDIANS AND METIS

A provincial study directed to assist the population of and the orderly development of, the natural resources of Northern Alberta, must, of necessity, give consideration to the part Indians and Metis play in such development.

In general, the average layman recognizes little difference between the Indians and their partical off-spring, the Metis. In fact, the Metis is usually treated as an inferior person, less intelligent, less ambitious than the Indian. Officially they are recognized as White people. Of interest too is that the off-spring of an Indian male and white female is officially an Indian and is given Indian status under the Act; while the off-spring of an Indian female and a white male is enfranchised as a white or ordinary citizen.

The Indians enjoy certain inherent and traditional rights which are not received by the Metis. Indians under the Indian Act are given treaty rights amounting to monthly cash payments and land is provided through declaring certain areas as Indian Reserves. The Metis are not eligible for Indian status but are receiving some assistance from the Provincial Metis Betterment Act.

While the problems presented by the Metis are not confined to Alberta and while Alberta has been one of the most forward looking provinces in its concern over the Metis and its positive approach to the problem, nevertheless much is left to be done. The general condition of the Metis is one of privation, actual hunger and unhealthy living conditions. In spite of considerable efforts to better their lot and in spite of the goodwill on the part of those officials who come in contact with the Metis, the living standards of these people are not rising appreciably. In most cases it may be said that Metis live in shacks on a hand to mouth basis and are shunned and suspected by the White population. It does not help their problem for us to charge them with improvidence or for us to regret that in this generation at least they are in many ways constitutionally unable to compete. Something more must be done. They and their cousins, the treaty Indians, are now more than ever at the parting of the ways. We have recently witnessed what everyone agrees is the practical extinction of the fur trade. The opportunity which that provided for a continuation of their old semi-nomadic life has gone with it. From now on they must adapt themselves to white men's ways. They have no alternative—yet they cannot accomplish this without more help than we are now giving them.

Little has been said or heard in Canada of integration, yet integration between Indian and White people has been a condition in Canada since settlement first came to North America. Some of this has been at official levels, successful, and beneficial to Canadian society. However, too much integration has been through the increase in the Metis population in the outlying and fringe areas of our civilization, which, accompanied by other contributing factors, has had a degrading effect, resulting in embarrassment on the one hand and an inferiority complex on the other. This is a condition of considerable importance confronting those charged with the education, welfare and economic lot of both the Indians and Metis. It is a condition in which no-one can take pride, a condition with which all citizens should be concerned.

Evidence of the interest of the people of Northern Alberta in this problem — particularly the Metis — was shown in a brief submitted by the Peace River Bar Association, and in discussions with various representative bodies, including the Peace River and High Prairie Chambers of Commerce. The problem is presently becoming increasingly more acute. It is accruing from two basic factors: (1) a doubling of population in the next 30 years

and (2) because the end of their traditional environment and way of life is in sight. While it may be possible to retain fishing for a few years in such a way as to provide one of their basic foods, trapping and hunting are fast disappearing as mineral and petroleum development push further and further north. Already the problem of meat, foods and hides for garments is present.

We may have reached the point where we should take a new look at the whole Metis and Indian question as one combined operation which should be placed on a new level. The 5,000 Indians and the 3,000 Metis in Northern Alberta are residents of Alberta. If they prosper, Alberta gains. If they suffer, Alberta suffers. Their problems are similar and perhaps should no longer be dealt with separately. They cannot be solved for one satisfactorily without consideration of the other. If a body could be set up with the sole aim of integrating these people regardless of the thin paper line which splits them into Metis and Indians, many paths are open for exploration. If a new joint approach by the Provincial and Dominion Governments could be made to their common problem—with the Dominion Government contributing the equivalent of its expenditure on the Indians—it might be that, first, the standard of living of these people could be raised, and, second, having done that, integration could begin to make some progress. If this could be done, some noticeable improvement could be brought about before the end of the next thirty years. If nothing is done, these 8,000 people will increase to 14,500 by the end of that period and their position will have continued to deteriorate. The resulting social problem will be all the greater and all the more difficult to solve.

There is an opportunity to do something now. Within the next thirty years we expect the population of Northern Alberta to increase over three times to reach a figure of 270,000. Today the Indians and Metis are over 10 per cent of the whole population. By 1987 they will be slightly over 5 per cent of the whole, or 14,500. Of this number, between 3,000 and 4,000 will be heads of households. If Northern Alberta obtains the primary industry which we have every reason to expect, it will mean that in the occupations associated with forestry, oil and gas, mining, manufacturing, construction and transportation alone, there will be employment for some 36,000 more men than there is today. It should not be too difficult to absorb between 3,000 and 4,000 Indians and Metis in this labor force—one man in every ten.

Is it too much to hope that, rich and successful as we Albertans are, deliberate steps will be taken to employ 3,000 to 4,000 Metis and Indians—one in every ten—in our labour force? The goal is a bright one. It is not less than seeing 4,000 Indians and Metis working as equals with us—men who, if given a chance, could work along with their white compatriots to develop their homeland of Northern Alberta and, in doing so, would hold up their end of the work and their heads, no longer an alien people shunned and despised, but people proud of their Indian blood.

This is not a dream. It is a matter of economics. If we find the right path and follow it, we could, in thirty years, go a long way towards solving this problem. The Indians and Metis know that economics are forcing them to work at white men's jobs. We know that if we do nothing economics will force us to deal with a social problem of a magnitude that will double every thirty years. If we are realistic, we will face up to this problem now instead of postponing it. We can provide these people with work and most of it can be in their natural environment—in forestry operations, survey jobs, mining and oilwell work. After rubbing shoulders with white fellow-workers, many will strive to emulate them, some will seek more education and some may even seek of their own accord to set up as farmers. But, first of all, we must hold out a helping hand, and in spite of rebuff and discouragement must continue to hold it out.

We feel sure that the wish of society is that these people may ultimately enjoy and participate in Canadian life on a comparable basis with other members of our society. This will mean that they will be influenced by and will influence the standard and mode of living generally in Canada. Then, what assistance can we provide that will enable them to make their greatest contribution to society? Our programs should be directed to this end. This cannot come about overnight. It will take years. It will mean eventually that these people will be absorbed in our labor force, our professions, and business and industries. To endeavor to place or load responsibility on them without years, even decades, of training and changed environment, would be irresponsible on our part.

Until quite recently it was assumed that the greatest good we could do either Metis or Indians was to change them into farmers. It is only in the last two decades that we have come to realize that farming, as distinguished from mere subsistence, is a specialized undertaking requiring above all other aptitude that of management. Except in rare instances, neither Indians nor Metis at present possess this aptitude.

During the last two decades we have witnessed a remarkable flight from farms. This has been caused in part by a surplus of agricultural products, and, in part, by a realization on the part of settlers themselves that farming is not a panacea for all ills and that many of them do not possess the management skill necessary to compete in this highly skilled business. Lacking that skill, they are happier and more prosperous as employees in some other occupation. They are turning to industry.

The same condition applies to Indians and Metis. In a well-meaning attempt to help the Metis, they are being encouraged to segregate themselves in some six Metis reserves where it is hoped that they will develop as farmers. However, there is little demand for their produce and they have little aptitude for that occupation.

What is needed is a policy of adjustment to provide new incentives and new ways of self-maintenance, in the light of experience gained from policies pursued so far. Any new policy must be a long term one, as it will probably take some generations before habits and traditions are fully changed.

It may seem to be asking too much of these people to change their way of life, but not if we are correct in accepting that they are doomed to extinction under existing circumstances.

Opportunities are available. A number of Indians and Metis are taking places of merit in the trades and professions, and in virtually every walk of life, but to accommodate the general need of the great majority, more comprehensive programs are necessary—programs offering both invitation and inducement. We do not wish to criticize the present programs of assistance to either the Indians or Metis. We do feel that recent changes in circumstances have so altered their position in society that present policies are out-dated.

To start with, a review of the principal of isolation embodied in both the Indian Act and Metis Betterment Act should be made. The use of Indian Reserves and Metis Settlement Associations should be reconsidered as to whether they are leading to or from the ultimate objective. Under both of the above Acts—one federal, the other provincial—isolation and segregation is being practised and promoted. Employment offers closer association, understanding and greater opportunity for adjustment.

We might try what is already being tried in the United States, where steps are being taken to move some of their Indian people to cities, where, under supervision, they are being employed in industry and in the trades.

The Crown might insist that, when given permits to entrepreneurs to exploit the natural resources of timber, gas and oil, or minerals, they employ a quota of these people. To do so would probably decrease the efficiency of the operation. In Northern Alberta, where distances from markets already provide a handicap to such enterprises, some compensation might be made to the employer to make it worth his while to employ these people.

Much fine timber land remains in the name of the Crown. Some of this might be reserved for the sole purpose of being exploited for Indians and Metis. The operation might be supervised by government appointed managers, but the labor force could be exclusively Indian or Metis. For a generation its efficiency might be low, but this loss would more than be offset by the benefits to these under-privileged people and by the gain to our society brought about by integrating them.

In connection with the suggestions made in the above two paragraphs regarding employment for these people, the question of giving some sort of apprenticeship status should be investigated. This suggestion is not made with any thought of using Indians and Metis as a cheap labor supply or of a two wage system in which they would always be paid on a lower scale, but something of this nature might help to compensate the employer until various individuals among them graduate to being steady and reliable employees.

Much surveying of all kinds remains to be done in Northern Alberta. The labor force of such parties might be heavily weighed with Indians and Metis. If the efficiency is lower, compensation could be made for that fact.

Forestry and allied government occupations might be canvassed to see if more of these people could not be employed.

At the present time, the Department of Indian Affairs endeavors to place as many Indians as possible on construction and allied jobs. If a closer liaison could be set up between industry and that department, so that the latter could be advised of when such undertakings are about to begin, it might be possible to employ a great many more Indians on these works.

The Commission is of the opinion that a careful study of the problems of both Indians and Metis in Northern Alberta should be started and that some body should be appointed and charged with the responsibility of making such a study. In addition to the actual recommendations which the Commission is making, such a body might consider the following suggestions which have occurred to the Commission.

(1) That no additional land be set apart as Indian reserves.

(2) That Indians' land rights be sustained and allocated on an individual basis.

(3) That programs of assistance to Indians be directed towards integration rather than towards isolation.

(4) That Betterment Associations for Metis be organized and operated more along the lines of institutions of training for employment.

(5) That educational facilities for Indians and Metis be patterned on the same basis as in other large school areas, and that educational policies be so directed as to further encourage mixed student attendance in areas of Indian and Metis population.

(6) That additional and perhaps special medical attention be set up to cope with the particular health problems posed by Indians and Metis.

(7) That part of the program of integrating these people might well be a campaign directed exclusively towards the apparent attitude of non-acceptance on the part of all of us.

The problem of the status of Indians and Metis is not peculiar to Northern Alberta, nor indeed Alberta as a whole, but it is acute in that area. The Commission recognizes that Alberta cannot solve the problem on its own, but believes that it could take the lead in initiating negotiations between the Federal and Provincial Governments for remedial measures to be taken both jointly and independently. The need is there and the time is opportune.

It is recommended:

(1) That a careful combined study of both Indian and Metis in Northern Alberta should be made, and that some body should be appointed and charged with the responsibility of such a study which would include consideration of the points mentioned in this Section;

(2) That a review of the principle of isolation embodied in both the Indian Act and the Metis Betterment Act be made inasmuch as through both of these acts—one Federal and the other Provincial—isolation and segregation are inevitably practised;

(3) That employment be recognized as a fundamental necessity in providing the environment and atmosphere which will lead to the ultimate adjustment of the Indians and Metis, and that work programs of a nature which will invite and induce the Indians and the Metis to work with other citizens of Canada should be offered;

(4) That, so that the growing labor potential of Indians and Metis be more fully utilized, a liaison committee be formed, composed of representatives of industry, government departments and the Indian Affairs Branch, and that it be charged with the duty of coordinating all efforts towards employing these people in industries involving forestry, fire prevention and fire fighting, highway clearing and construction, pipeline and railway construction and maintenance, surveying, sawmilling, the building trade and agriculture, and utilizing all possible means of doing so.

(5) That officials of Improvement Districts, Municipal Districts, Counties and School Divisions be encouraged to accept their responsibility to the Metis in their areas in respect to health, social problems and employment services.

WOOD BUFFALO PARK

This National Park, which occupies some 15,000 square miles of Northern Alberta, has hitherto been an area remote from the every day affairs of the Province, and one to which very few Albertans have given any thought. An idea of its size may be obtained by a look at Map No. 5, Section 2.

The Wood Buffalo Park was originally set aside as a refuge for the last remaining wild herd of Wood Buffalo in its original habitat. At the present time there are over 15,000 in this herd, which appears to be thriving in this area which is possibly the most suitable range that could be found for them. The buffalo do not range over the whole of the park, but seem to prefer that portion of it east of the 113th line of West Longitude and south of the Northwest Territories boundary. This is probably due to the type of pasture in that region. This park is also the only known nesting grounds of the Whooping Crane and about thirty of these fine birds are all that are left in the world. Thus, this park is the last refuge of two species of wildlife which, without it, would soon become extinct in the wild state.

Now that there is a prospect of a railway which may traverse it and that our system of highways will reach out to connect up with highways being built by the park authorities, the park is coming more into focus. It presents some problems for those interested in seeing Northern Alberta develop. It contains a large quantity of good sawlog timber and during the last few years permits have been granted to private companies to cut and saw this timber. The park also contains the only known large deposit of high quality gypsum in Alberta.

The only areas in Alberta where there is any real prospect of finding valuable metallic minerals are in the extreme northeast corner. These are the Precambrian and the Paleozoic. Most of the 10,000 square miles of the Precambrian are outside the Wood Buffalo Park. Unfortunately, most of the 15,000 square miles of the Paleozoic are within it, as may be seen on Map No. 3, Section 1. Out of a total of 15,000 square miles, 11,000 square miles are in the park. Eminent geologists hold out the hope that this region is rich in minerals, and some large metal-mining corporations have already made enquiries about the possibility of prospecting in the area. At present, prospecting is very naturally not allowed in a National Park.

The question of provincial surveys of various kinds is treated in another section of this report. While the Wood Buffalo Park is outside the jurisdiction of the Government of Alberta as far as geological surveys are concerned, it would seem highly desirable for such a survey to be carried out in this area.

If this area could be prospected and if lead and zinc, etc., were found there, Alberta would prosper because of the influx of population necessary to mine these metals. Mines in this area would bolster the economy of Northern Alberta and of the Northwest Territories, and the revenue which the National Park would derive from this activity would undoubtedly be a great help in financing development work in the park.

The nesting grounds of the Whooping Crane occupy a relatively small area in that part of the park within the Northwest Territories. The Wood Buffalo do not range over a very large portion of the park. It should be relatively easy to prevent prospectors from destroying the Wood Buffalo, and, if as a result of their efforts, mines were found and then developed, the resulting communities could be confined to a relatively small radius of the mine and this should not interfere too much with the buffalo. This is not to suggest that the Wood Buffalo Park be thrown open to indiscriminate development. Our National Parks are a sacred trust for ourselves and for posterity, and in general all efforts to encroach upon that trust should be resisted. The Wood Buffalo Park, however, is not a park in the same sense as Jasper and Banff and, in its entirety, is never likely to be. Timber is now being exploited within the park and such exploitation is an eminently practical move. It would seem that the purpose of preserving the Wood Buffalo could be accomplished without preventing the development of mines in that area.

If the paleozoic area of Alberta contains valuable minerals and if these could be mined, it would mean a great deal to the economy of Northern Alberta. Thought should be given to the possibility of permitting prospecting and mining within the boundaries of the park.

The Commission recommends that the Provincial Government approach the Federal Government or the Department of Northern Affairs and Natural Resources with a view to having the restrictions in the Wood Buffalo Park relaxed so as:

(1) to permit the exploitation of the gypsum deposit there in the same way as the restrictions have been relaxed so as to permit logging operations within the Park; and

(2) to allow geological surveys to be carried out within the Park, and if these surveys indicate interesting mineral or oil probabilities, to endeavor to work out some means of permitting prospecting and the development of mines in certain limited areas of the Park.

ABATTOIRS AND MEAT INSPECTION

As mentioned in Section 5, the lack of federal meat inspection in the Peace River Country deprives that area of the opportunity to export meat to the Northwest Territories and other places. Not only would such inspection help farmers but it would also be a great benefit to all consumers in that area. In many ways it would help the economy of the Peace River Country.

Federal inspection of packing plants is administered by the Veterinary Director General, Health of Animals Division, Canada Department of Agriculture, under authority of the Meat & Canned Foods Act Regulations. In order to qualify for inspection under the above legislation a volume of slaughter of 1,000 animals per month is required with a minimum of 12 plant employees engaged

in slaughtering, processing and packing of meats and meat food products. Buildings and premises must conform to Departmental standards as to construction layout and sanitary installations. Blueprints in quadruplicate showing all these items are required for Departmental approval.

The advantage of federal inspection is that products may be moved not only in the Province, but also to other provinces and to the export market. There is, however, a Federal Government proviso for inter-provincial shipment in that a man may slaughter his own produce and ship inter-provincially without federal inspection or grading.

There are no federal inspectors in Northern Alberta as none of the abattoirs or slaughter houses there meet the requirements for federal inspection. Any inspection is done under a by-law of a local government. Grande Prairie County is the only local government in Northern Alberta that has passed a by-law making it unlawful to slaughter livestock without inspection by a veterinarian appointed by the county. In a similar manner, the veterinarian for the City of Edmonton inspects three small packing plants in North Edmonton which do not qualify for federal inspection.

It is doubtful whether the Federal Government would relax their minimum regulations in order to accommodate communities in the North Country with federal inspection of meat so that they could ship into the Territories. For one reason, there would be difficulties in supplying enough veterinarians and graders to visit the many slaughter houses there and in other parts of Canada wishing to take advantage of the Northwest Territories' or a similar market. In spite of this, there is a definite need for meat inspection in the Peace River Country.

Perhaps the inter-provincial marketing problem in that area could be attacked in the following manner:

(1) The Government of Alberta might consider the establishment of standards of construction for abattoirs and consider methods of providing veterinary inspection for those businesses which do not qualify for federal inspection.

(2) Once provincial inspection has been obtained, the Provincial Government might take the matter of inter-provincial marketing up with the Federal Government, asking for the privilege of inter-provincial shipments to designated points such as Yellowknife, Norman Wells, and Aklavik in exchange for the province undertaking the responsibility of seeing that, on the one hand, slaughter houses are built to proper specifications and, on the other, that the meats are inspected by a provincial inspector once or twice a week—the only days on which killing could take place.

(3) The Provincial Government might consider financial assistance for buildings suitable for slaughter houses, similar to the present government policy of contributing one-third to municipal seed cleaning plants while the farmers pay one-third and municipal taxes the final third. An approach such as this would likely get rid of any inferior slaughter houses now operating in the Province, and help solve the marketing problems of the farmers in Northern Alberta as well as protecting the health of the residents.

The Commission understands that in 1954 the Alberta Veterinary Medical Association submitted a resolution to the Alberta Government to the effect that legislation be provided for minimal requirements for slaughter houses and suggested the possibility of establishing centralized municipal slaughter houses and the possibility of providing some financial assistance for them.

It is recommended:

(1) That the Provincial Government consider establishing standards of construction for abattoirs and consider providing inspection for abattoirs and slaughter houses which are too small to obtain Federal Meat Inspection.

(2) That the Provincial Government approach the Federal authorities in an endeavor to devise some means of meat inspection which will permit meat dressed in the Peace River Country to be sold to wholesale and retail meat outlets beyond the borders of Alberta, and

(3) That the Provincial Government consider financial assistance for abattoirs and slaughter houses where necessary.

TOURIST PROMOTION

There are many features of Northern Alberta which only need exploiting and publicizing to become major tourist attractions. Among these may be listed:

Lakes with beautiful beaches and unexcelled game fishing.

Solitude and remoteness.

Unexcelled canoe routes awaiting exploration.

Historic rivers by which the first white men crossed the continent, and many historic sites.

Access to the fascinating mystery of the North Country.

Lesser Slave Lake, Calling Lake and Lac La Biche, to name only three of the outstanding lakes, have tremendous possibilities for tourists and people from Edmonton who seek an ideal holiday. On Lesser Slave Lake holiday resorts could be built up on the north shore at Shaw's Point and also for a distance of some twenty miles along the east end. A passable road is in existence to Calling Lake. Now that good highways are reaching the vicinity of Lac La Biche, that lake, with its unexcelled beaches and its beauty, is becoming more of a resort centre. Beyond Lac La Biche to the east and north are numerous other lakes that should soon receive attention from tourists. These are all within a relatively short distance of Edmonton's rapidly expanding population and are becoming more accessible year by year as the network of highways is being extended and surfaced.

Since the completion of the Alaska Highway, many tourists have passed through the southern part of the Peace River Country en route to Northern British Columbia, the Yukon and Alaska. The MacKenzie Highway, which extends from Grimshaw north for 385 miles to Lower Hay River on the southwest shore of Great Slave

Lake, provides a wonderful opportunity for tourists to see another part of the North. Not only does this highway penetrate some of the most wild and unsettled areas in Canada, but it rewards the tourists with a view of Alexandra Falls, where the Hay River plunges 109 feet from a wide ledge into a gorge. Louise Falls, 46 feet high, about a mile further down the river, is another beautiful tourist attraction.

The Federal authorities are in the process of building a highway from a point near Hay River, west across the MacKenzie River at Mills Lake. From there it will run north into Rae and then on to Yellowknife. It is expected that the portion of the road from Hay River to Yellowknife will be completed in a year or so. After that, it is proposed to continue the highway north from Rae to Port Radium on Great Bear Lake, and then on to Coppermine. The extension of these roads in the Northwest Territories all provide a tourist potential for Alberta.

Alberta's MacKenzie Highway, together with the Athabasca, Peace and Slave Rivers are all avenues of approach to the unknown and fascinating Northwest Territories. Little if anything has been done to capitalize on this fascination. One of the surest ways to incite development of Northern Alberta and the Northwest Territories is to make its attractions known to tourists. These natural features are there, but they do not become tourist atractions in the highest sense of the word until they are organized. Many of the well known tourist playgrounds, which we all know and visit, did not reach this status until a great deal of effort and organization had gone into bringing them to their present state of perfection.

What is needed is a policy of promotion and advertising, and funds for this purpose should be made available for at least the next few years. All forms of advertising should be used, including press, radio, television and motion pictures, and special campaigns should be organized, if possible, throughout the continent. It is time to realize that the area's hunting, fishing and other facilities will serve not only Albertans alone, but many thousands of visiting sportsmen who could find relaxation in the peace and solitude of Northern Alberta.

At present, except for the Peace River Country, tourist accommodation in Northern Alberta is very limited. Hand in hand with advertising should go a program designed to help finance the provision of tourist facilities. As fast as new highways penetrate new areas, Provincial Parks of the type of Saskatoon Island should be set up and administered with an eye to tourists. Wayside tables, kitchens and campsites should be set up.

Developing such resort areas would fit in well with the seasonal nature of much of the employment in the North. Cutting trails and building a series of camp sites at places where hunting and fishing are best could give much needed employment, much of which could be done by Metis and Indians.

Active steps are already being taken to promote the tourist trade in Southern Alberta, and it is time that similar steps were taken in the North.

It is recommended:

(1) That the Province embark upon a program of promoting and advertising Northern Alberta and indeed the North as a whole, with a view to attracting a lucrative tourist trade for Northern Alberta. Such a program should extend over a period of several years and, while it should be handled by the existing tourist promotion department, it should have a separate and distinct budget, so that it does not become submerged in general tourist promotion,

(2) That since there are a number of good fishing lakes east and northeast of Lac La Biche which present wonderful tourist possibilities, highways should be built to them so that as opportunities offer they can be exploited to help build up our tourist potential,

(3) That steps be taken to reserve beaches, etc., for public use before any settlement is permitted around lakes with good tourist potential such as Lesser Slave Lake (in the vicinity of Shaw's Point and along the east shore), Margaret Lake and many others,

(4) That the Province accelerate its activity in Northern Alberta in the way of providing wayside tables, kitchens and camp sites and the setting aside of Provincial Parks, and

(5) That efforts be made to assist the financing of tourist facilities and accommodation in Northern Alberta.

NORTHERN DEVELOPMENT ADVISORY BOARDS

In its brief to the Commission and in subsequent correspondence, the Edmonton Chamber of Commerce submitted:

"That the Government of the Province of Alberta establish a continuing Northern Development Advisory Board to be composed of not less than six members of those Government departments as may be deemed advisable and an equal number of representatives of business and industry.

"It is further recommended that terms of reference of such an Advisory Board be:

"To maintain a watching brief on all matters relating to Northern Development with particular reference to the effect of such development both in and on Alberta and to publicly make recommendations from time to time bearing in mind the following—

(i) Major rail and highway transportation facilities; their necessity for the development of Northern Alberta and their planning for the integration of other parts of Canada's great Northwest with the economy of Alberta.

(ii) Development roads to provide access from main transportation facilities to areas of potential development.

(iii) Reservation of land suitable for such facilities as airfields, parks, transportation and for other uses.

(iv) Control of the use of existing fresh and unpolluted water supplies to ensure their adequacy for the long term future.

(v) A continuing orderly inventory of natural resources in order that the economic development of Northern Alberta can be properly planned.

Alexandra Falls (along Mackenzie Highway).

(vi) Adequate communication facilities."

The Edmonton Chamber's brief also urged the creation of a Federal Northern Development Advisory Committee and pointed out that it had submitted a similar resolution to the Canadian Chamber of Commerce, which had been considered and passed by that body. The Edmonton Chamber's brief to this Commission stated:

> "At present there is no broadly representative body in Canada primarily concerned with Northern Development through which advice may be offered to the Governments of Canada, interested Provinces, and the Territories. Therefore, we recommend that this Commission urge the Government of the Province of Alberta to initiate and support the appointment by Federal statute, of a body named the Northern Development Advisory Committee representative of industry within the Territories and interested Provinces to meet not less than semi-annually to report publicly to the Federal Cabinet its findings and recommendations on matters affecting Northern development."

The Edmonton Chamber thus urges the creation of two Northern Development Advisory Boards: one at the Provincial level and the other at the Federal level. These ideas were presented to this Commission on other accasions by organizations and persons in Northern Alberta and also in the Northwest Territories.

Provincial Northern Development Advisory Board

It appears that the creation of such a body would serve a useful purpose. Except for the Peace River Country which occupies some 41,000 square miles, the remainder of Northern Alberta, which includes some 88,000 square miles, is to a large extent a terra incognita. In this area of 88,000 square miles the present population is slightly over 9,000. This Commission believes that many of the resources of this large area will be developed during the next 30 years and that by that time its population will reach at least 60,000. This will mean that a great deal of development work in the way of highways, surveys, etc., will have to be done to open up this vast area. Moreover, its opening up will have to be co-ordinated with similar activities outside the boundary of the Province—both in the area north of Lake Athabasca and in the Northwest Territories. In this respect, Alberta is perhaps in a unique position in that historically and economically it is at present the Gateway to the North. It is to its advantage to remain in this position but it is faced with stiff competition from adjoining provinces who wish to improve their economic position by obtaining more of the business of the North. For this reason alone, it seems desirable for the Province to create a Northern Development Advisory Board which will be in a position to assess the requirements of the North in relation to those of Northern Alberta, and to advise on questions involving co-ordination of provincial activities with those going on outside its boundaries.

The present Northern Development Commission has had an unusual opportunity to discuss matters with the Research Council of Alberta and to get acquainted with the work of various government departments which are charged with the responsibility of administering the resources of Northern Alberta. All of these departments have extended the utmost co-operation to the Commission. In dealing with them, the Commission has been impressed with their competence in administering the resources, their devotion to the best interests of the Province and the extensive liaison between various departments. At its hearings in Northern Alberta the Commission tried to unearth any legitimate dissatisfaction with the operation of natural resources in that area and found a remarkable agreement on the part of the people of Northern Alberta with the policies of these departments. But these departments are concerned with affairs within the whole Province and with the spreading out of funds available to them to cover the more immediate and the more pressing demands made upon their facilities. These officials must confine their activities to provincial problems and cannot give much time to considering problems beyond the borders of the Province. It would seem advisable to create a body such as the proposed Northern Development Board, whose purpose would be to keep in touch with broader developments and to advise accordingly.

The demands upon all branches of government are so heavy and pressing that the funds needed for the development of this vast, sparsely settled, areas of 88,000 square miles, with its population of only 9,000 could easily be diverted into more immediately needed projects. This lack of development of our North could be detrimental to the Province as a whole.

To some extent the development of Alberta can be likened to that of a large mining corporation which, even though its present mines are producing and paying well and it has sufficient reserves to last for many years, remains a successful corporation only in so far as it continues to carry out exploration and development work aimed at ensuring the discovery and development of ore bodies which may not come into operation for many years ahead. In a similar manner, Alberta should be developing its North Country considerably ahead of the needs of the present.

Proper development of Northern Alberta is dependent upon determining where its resources are and what is needed to develop them. While a considerable amount of information about natural resources is included elsewhere in this report, it is not pretended that it represents a complete inventory. And while the Commission has made various recommendations with regard to the development of known natural resources, it is also recommending that further exploration and investigation be expedited. Even so, enough is known to enable the Commission to endeavor to forecast the probable locations of future industries and centres of population. This forecast could form a basis for preparing plans for orderly development, for unless this is done, development will be haphazard and piece-meal. It must be realized that while there may be several years between the preparation of plans and their coming to fruition, the gap will always remain. The longer it is before a start is made, the worse the problem will become.

To take roads, for instance, it would of course be wasteful to go building roads hither and yon all over the North Country but, on the other hand, before the country can develop it must become accessible. The proposed Northern Development Advisory Board might be in a position to advise on problems of this nature; and where a decision has to be made between spending funds for development of this vast area and spending them on the more vociferous populated areas which, in relation to similar areas in less fortunate provinces, are already well served, this board might be a voice tending to show the North in its proper perspective.

The public in the more thickly settled areas of Alberta, being naturally concerned with its own local problems, knows very little about our North and its possibilities. Misconceptions are widespread, varying from "vast and unlimited resources" to "the inaccessible and frozen north". One of the tasks which might be assigned to the proposed Northern Development Board might be that of publicizing the North and attempting to place it in its proper light in relationship to the rest of Alberta. Alberta is very fortunate in that its geology, soil and climate permit it to expand to its full 750 miles north and south.

The proposed Northern Development Advisory Board would then fulfill several functions. It would hold a watching brief over the general development of Northern Alberta and the country further north, it would act as an advisory body to Government, business and industry, and it would help to make the facts known to the general public. If and when a Dominion Northern Development Advisory Committee is set up, it would co-operate to the full with that body.

Dominion Northern Development Advisory Committee

It would appear that the creation of such a Dominion Board would also serve a very useful purpose. There are many common interests between the Territories, the Province and the Dominion and to discuss them at the level of the proposed committee would seem to be highly desirable.

Institute for Northwestern Canadian Research

The Provincial Northern Development Advisory Board and the Dominion Northern Development Advisory Committee as proposed above both seem to have their place in the future development of the North. There also appears to be a place for the organization of some sort of body to deal with problems that are more of a scientific nature.

The promise of adequate transportation in the North in the form of extensions to railways and much improved road transportation means that northern development will go ahead at an unprecedented rate. It can be anticipated that the orderly development of the North—with its peculiar climatic and soil conditions—will give rise to a series of problems. Already we have a hint of what is to come with the present-day difficulties of construction on permanently frozen ground and muskeg.

The development of the North will mean not only the modification of construction techniques, but will also mean the finding of materials for construction. In some areas of Northern Alberta and the Northwest Territories we now know that such commonplace — but vital — materials as sand and gravel are quite scarce. Unless we accept the idea that construction costs in the North will skyrocket beyond all reason, then we must either find and utilize substitutes for sand and gravel or find additional local supplies.

Large scale ventures in the North will also need local supplies of industrial minerals—such as sand, clay and limestone. At present, we have a very poor picture of the availability of such industrial minerals in the Northland, but it is evident that such materials must be found. While the Northland has great reserves of these, they are of a confined nature, and lack of other materials may make development of the resources quite difficult.

At present, many government organizations are studying various aspects of the Northland. Building and construction problems are being looked into by the National Research Council, the Canada Department of Public Works, and the Alberta Department of Highways. Mineral resources of the North are being studied by the Geological Survey of Canada, the Saskatchewan Department of Mineral Resources and the Research Council of Alberta. Other problems of a basic scientific nature, as well as social welfare and education, are being handled by the Arctic Institute and various federal and local governmental departments. Contributions are also received from the United States Army and from various governmental departments of the United States from their comprehensive studies in Alaska. Unfortunately in some instances there is rather poor liaison and co-operation between these groups. It often happens that two or three groups are conducting separate studies and investigations of specific problems quite unaware of each others existence or of the fact that some other body has made and reported on such studies. It would appear that the time has come for the initiation of a permanent co-ordinating agency to gather available data to advance fields of knowledge on Northwestern Canada.

Such an agency could be supported by the Federal Government and the Provincial Governments of Alberta and Saskatchewan and should have its headquarters in the West. This agency—which for the moment we may call the "Institute for Northwestern Canadian Research"—could be set up in four stages. Stage one would call for a high-level meeting between the governments of Alberta and Saskatchewan and the Government of Canada to decide the responsibilities of the governments involved, and to appoint a Director for the agency. In stage two, a permanent board of directors could be set up and this board might appoint a series of experts in the various fields of northern development and research. One expert should be appointed from each of the fields of Geology, Mining, Construction (buildings and highways), Forestry, Agriculture and Biology.

In state three, the various experts could assemble all available data from various governmental departments (including Russian data) on the North and set up a permanent reference library on northern development. At the end of stage three, a full-scale report would be presented to the Director on the present status.

Stage four would depend largely on the result obtained from stage three. At this point, decisions could be made on the most useful line of approach to be taken in the future. Stage four, then, would be the initiation of practical research programs which would aid in northern development.

One of the most practical studies which should be undertaken first would be an air photographic interpretation of Northwestern Canada. Areas of rock outcrop, muskeg, surface materials (including clay, sand and gravel) and topography could be determined from photographs. This information would be invaluable in the routing of highways, the location of townsites, etc., and would be quite distinct from geological surveys which were mentioned in other sections of the report and which, to some extent, are under way now.

Other fields of research might include:

(1) Muskeg studies.

(2) Permanently frozen ground studies.

(3) Reconnaissance studies for economic industrial minerals, (i.e. limestone, salt, gypsum, silica sand, etc.).

(4) Water supply and pollution studies, (water supply systems will be quite a problem in areas underlain by granite, due to costs of excavation).

(5) Highway and railway construction methods under northern conditions.

(6) Biological and agricultural studies.

(7) Building methods.

(8) Fly control.

Such an Institute for Northwestern Canadian Research would not only initiate studies on its own account but would act as a clearing house for all such scientific information as will be needed by governments or other corporations or persons interested in developing the North.

Alberta has much to gain from taking the initiative in setting up an Institute of the kind outlined above. Not only would the accumulated scientific knowledge help in solving the problems of developing Northern Alberta, but in doing so Alberta's prestige could be considerably enhanced and the traditional bonds of loyalty between Alberta and the Territories to the north would be greatly strengthened. Alberta should become a clearing house for information on the North and from motives purely economic, if for no other reason, should assume a position of leadership in its knowledge of the North and as an advocate of the greatness of the North.

It is recommended:

(1) That the Province set up a Northern Development Advisory Board to be composed of representatives of business, industry, and government departments. Its duties should be to make a continuous study of the requirements of Northern Alberta in relation to the rest of the Province and in relation to the Northwest Territories and adjoining areas, so as to be in a position to act as spokesman for Northern Alberta and to advise the Provincial Government and the public on the needs of Northern Alberta, its development and its publicity,

(2) That the Province of Alberta urge upon the Federal Government the creation of a statutory body which might be named the Northern Development Advisory Committee, and which would be made up of representatives of industry, both within and without the Territories, and of the governments of the Territories and of the provinces adjoining them, and which would meet at least twice a year to report to the Federal Cabinet its findings and recommendations on matters affecting Northern development, and

(3) That the Province of Alberta take the lead in bringing into being and urging the creation of an "Institute for Northwestern Canadian Research", which would be a permanent co-ordinating agency for the purposes of:

(a) Gathering together all available data on Northwestern Canada in the fields listed below, tabulating it and co-ordinating the many separate studies being made along these lines.

(b) Initiating research in such fields of knowledge as:

1. Muskeg studies.
2. Permanently frozen ground studies.
3. Reconnaissance studies for economic industrial minerals.
4. Water supply and pollution studies.
5. Highway and railway construction methods under northern conditions.
6. Building methods.
7. Fly control.