PROVINCE OF BRITISH COLUMBIA

Report of Committee on

Resources and Railways

1945

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REPORT OF COMMITTEE ON RESOURCES AND RAILWAYS, 1945.

The Honourable John Hart,
Premier of British Columbia.

SIR,—We have the honour to submit herewith the report of your Committee on Resources and Railways, 1945, together with appendices pertaining thereto.

The Committee convened on October 29th and held its initial meetings, and reviewed the terms of reference as set forth below.

TERMS OF REFERENCE.

To review reports on the resources of Northern British Columbia and also to review surveys previously made regarding railway locations.

To review reports of the resources of those areas in the north which would contribute traffic to the Pacific Great Eastern Railway and its extensions and to indicate by which route such extensions might be projected to form part of the transportation system for northern development.

Studies will include the Pacific Great Eastern Railway and its extensions; choice of routes; traffic (origin and volume); cost of construction, equipment, and operation; settlement and development of lands and resources.

SUMMARY.

(1.) Keep the present Pacific Great Eastern Railway where it is for the benefit of the country it serves. Co-ordinate bus, truck, and railway services now.

(2.) With the present amount of traffic in sight extension will not improve the financial balance-sheet of the Pacific Great Eastern Railway. A million tons a year of available railway freight would alter this conclusion.

(3.) Increase the rate of settlement of the country and the rate of development of the natural resources.

(4.) When justified build to Hudson Hope, a future junction of lines beyond north and south of Peace River. The southern connection with Vancouver should be altered as business warrants.

(5.) Complete and revise the railway location surveys before construction.

SCOPE OF REPORT.

Through the courtesy of the directors and management of the Railway Company arrangements were made for the members of the Committee to inspect the Pacific Great Eastern Railway property.

Many reports and much data were received from members of the Committee, both on resources and railway routes. These reports which were reviewed by the Committee are listed in the appendix.

The Committee adjourned to allow time for the resources reports to be collected and collated. For this purpose that portion of the Province under review was divided into four zones, two being (B) the Peace River District and (D) the area contiguous and adjacent to the Pacific Great Eastern Railway. A description of the area and resources therein is contained in the appendix, together with a further appraisal interpreted in terms of railway tonnage.

The following maps are attached and should be consulted in conjunction with the report:—

(1.) Transportation.
(2.) Physical.
(3.) Resources, Agriculture.
(4.) Resources, Forests.
(5.) Resources, Minerals.

A study of the Physical Map discloses the areas which due to elevation might be successfully cultivated and reveals the large areas of the Peace River country in Alberta and British Columbia.

The Agricultural Map also shows the extent of this area when compared with the farming areas of the Fraser Valley. It shows that the agricultural lands of the Peace River are the major wheat and grain areas tributary to an extension of the Pacific Great Eastern Railway.

The Forest Map portrays the pattern of forest-growth and indicates what may be expected in railway tonnage.

The Mineral Map sets forth the location of certain prospects and producing mines.

The Transportation Map indicates the Peace River route as surveyed and lines that may be built in the future as development demands.

The conduct of a publicly owned enterprise is determined by other factors than those of adequate financial return to the railway. The direction of such an enterprise is outside the scope of purely railway engineering authorities as such.

The people of the Province may be willing to pay yearly in their taxes for a service to develop the natural resources of the country in the belief that the cost is warranted by the general increase in the country's wealth and business. For this reason no details of the rigid analysis of the location, maintenance, and operating costs of the possible extensions have been exhibited though they have been most carefully examined.

PACIFIC GREAT EASTERN RAILWAY.

Although railways have not yet emerged from the handicaps due to war-time conditions, such as scarcity of labour and material, examination of the Pacific Great Eastern Railway as it now exists from Squamish to Quesnel discloses that its maintenance-work has been wisely done and that properties of the railway are, taking into consideration the speed of trains and volume of traffic offering, in good condition and fulfil the requirements necessary for efficient operation. The motive power is well maintained.

The operation of this railway with the present amount of traffic can not be such as to greatly affect the annual deficit. Deferred maintenance during war years on account of shortage of labour and material was a condition common to all railways and whereas the transcontinental railways made provision for this by setting up an account for deferred maintenance this was not done on the Pacific Great Eastern Railway. Little or no improvement can be expected until deferred maintenance has been overtaken.

The movement of freight and passenger business from Squamish to Vancouver by water is adequate for the business that offers and is handled in a reasonably satisfactory manner. If and when a highway is constructed along Howe Sound between Vancouver and Squamish, improvement in service and substantial economies can be effected. From the studies that have been made

it would appear that the ship and barge service will be able to take care of the traffic until it reaches about four times the present quantity.

It is suggested that there is open to the management of the Pacific Great Eastern Railway a possible improvement in handling freight and passengers if a greater use of the tributary highway could be made. It is essential to the proper development of a pioneer country that railway, bus, and truck operations be co-ordinated so that altogether they provide the most satisfactory service at the least cost. As an example, suitable traffic arrangements might be made with other rail and highway facilities so that traffic might move from Ashcroft to Clinton and thence north by Pacific Great Eastern on through rates. The present highway traffic arrangements on the Cariboo Road running parallel to the railway is detrimental to both freight and passenger traffic on the railway. Truck traffic takes the higher class freight on which a railway depends to balance its commodity rates and until this is changed by regulation loss in the railway operation can be expected to continue.

It was unanimously agreed in committee that the Pacific Great Eastern Railway as existing should continue to operate, but every effort should be made to develop the entire country which it will ultimately serve.

If an extension is constructed north of Prince George and the traffic necessary for its justification is developed, economy of operation may require investigation of the merits of a connection with the transcontinental railways at Ashcroft or at Lytton; sufficient data are not available to determine the best route.

EXTENSIONS.

It was early apparent that Vancouver was the centre to which the bulk of the traffic would be directed. Vancouver has the advantage of being near the regular shipping lanes and is the choice of the tramp steamer on which a seaport depends. It was agreed, therefore, that traffic would move to Vancouver rather than to northern ports.

Previous reports in estimating railway tonnage dealt almost exclusively with agricultural products from those areas north and south of the Peace River in British Columbia and Alberta, and an economic study discloses that under present-day development the outgoing agricultural products of these areas would still move over existing lines. The present centre of known resources is taken as a point near Hudson Hope which has been agreed on by the Committee as the temporary eastern terminal for this study. As the object of this study is the future of the Pacific Great Eastern Railway, it was agreed that the route capable of serving the resources was a line north to Finlay Forks thence east through the Peace Pass to Hudson Hope. It was agreed that the Peace Pass route is strategically and fundamentally the route by which the northern resources can be tapped and at the same time serve as an extension of the Pacific Great Eastern Railway. Finlay Forks has been described as a keystone of northern areas where development may be looked for, and further railways projected north and west from this point could provide added tonnage to the extension.

It may be briefly stated here that the extension from Prince George north to Hudson Hope will not improve the balance-sheet of the Pacific Great Eastern Railway as a whole until the density of traffic has reached 1,000,000 tons per annum. This amount of traffic can be obtained should the coalfields of Carbon River and Hudson Hope be proved in volume and quality as now indicated. It has even been estimated that 1,000 tons a day can be mined and shipped and with the requisite miners and markets this amount can be doubled. Forest

products in the Finlay and Parsnip River areas can be developed to provide a tonnage of 300,000 tons. Reports indicate that Interior timber is attaining an importance in markets, both export and domestic, where the type of lumber has proved to be satisfactory for many purposes.

In considering the figures showing estimated cost of construction, equipment, and operation due weight should be given to the fact that these are ultimate figures and not initial. To extend the railway a mode of economical progression ought to be devised to reach the revenue-producing areas with the least initial expense, such as using a pioneer type of construction and second-hand equipment. Both grain and coal are commodities of low rate and it is necessary in order to operate successfully to have light gradients over which long trains can be hauled. The Peace Pass route is the only one with the requisite grades. From Hudson Hope east the railway may be produced to the agricultural areas as development takes place; incoming tonnage may be expected while these areas are being developed.

In not advocating immediate tapping of the agricultural areas of the Peace River District both in British Columbia and Alberta the Committee had in mind that wheat is a commodity moved at very low freight rates and it is only as the area is developed that adequate revenue can be obtained from other activities, including incoming tonnage.

The Committee does not consider it within its terms of reference to state whether the extension should follow development or precede it, but whatever is decided, the need of population in the area is the problem which should receive first consideration. The present immigration policy determined by world war conditions; improved agricultural methods requiring less man-power; the tendency of population to drift into the cities; all these subjects had a place in the discussions of the Committee, resulting in a cautious approach to its problems.

ENGINEERING AND TECHNICAL.

Three members of the Committee have intimate knowledge of the route of the Pacific Great Eastern from its inception in 1912 until now. These men have been actually engaged in the technical examination of not only the railway location but also of its tributary natural resources. They are trained practical railway locating engineers.

The Committee had before it the technical results of the engineer's report of 1925 as well as the engineering details of the surveys of 1930–31. This last report was complete in all its engineering details and gave a technical picture of the entire route—Quesnel, Prince George, Hudson Hope, and beyond to junctions with the Northern Alberta Railway north and south of the Peace River. Beside these complete engineering reports there were available reconnaissance reports covering the line north from Finlay Forks to the boundary of British Columbia and westwardly from Finlay Forks to Stewart at the head of Portland Canal.

For the most part in addition to the recorded details of the surveys there were available the knowledge and judgment of those who were actually in the country in charge of the engineering parties engaged in making these instrumental surveys.

North of Prince George there are no serious construction difficulties to Hudson Hope. From Finlay Forks to the Liard River the construction-work is comparatively light. It can be said that over these routes, except for a short distance at the base of Mount Selwyn, the construction costs would approximate those of the average heavy prairie line.

The costs in question were based upon the figures of 1931. It is probable that in 1946 there will be an upward move in these figures, though it must be remembered that improved machinery and improved technique tend to keep down costs. There have been no major construction projects recently which would give accurate figures for this year's cost. For the purposes of this report the figures used can be taken as a reliable guide.

The type of railway covered by these costs would be considered secondary main line where the grades would be held to about 0.4 per cent. and the curvature not greater than 10 degrees. The lines are considered to be laid with 85-lb. rail.

Should it be considered that the extensions should be made it is desirable that the surveys should be revised prior to construction so as to have all minor details corrected to obtain as a result the best possible alignment. Particularly the line from Lillooet to Lytton should be located to discover whether it is not the best southern connection with the transcontinental main lines. The line from Quesnel northerly to the new Cottonwood crossing should be examined to ensure the best detailed location. On the new Cottonwood crossing there is no serious construction difficulty. The entrance of the line from the south into Prince George should be relocated. In addition, the location survey north from Prince George leaving the line at Willow River should be gone over as far as Hudson Hope to ensure that all minor improvements capable of reducing cost are incorporated in the final location.

SETTLEMENT AND DEVELOPMENT.

To obtain the full development of the resources of the country to be served by the railway directly and by its tributary highway facilities it is necessary that the country be settled by a sufficient number of the right type of people to furnish traffic to the railway. In this connection the present plan of land tenure should be examined to discover if there can be a more satisfactory arrangement made so as to aid a future settlement of the area. There are a number of plans designed to allow settlers on the land without immediate cost to the settler in any way and in such a manner as to enable him by his work to pay for his land over a period of years until such time as he is able to pay for it entirely. The Province of Alberta has such a plan, and other Provinces in Canada have variations of an arrangement to enable the settler to enjoy the use of his land at the same time paying for it by the produce of his labour.

Adequately to extend the present Pacific Great Eastern to make it pay and to justify expansion of the present railway it is necessary that people move into the country and develop its natural resources.

In general terms the whole country has resources in land, forests, fisheries, and minerals that will support population. The forests can be seen and have been examined; the type of soil is known; the fisheries have been used by the pioneers; the minerals have been appraised—surface indications show coal, silver, copper, lead, uranium, gold. The most apparent is the coal—some nineteen outcrops have been located and examined. The extent of the fields in the north-west is greater than the coalfields now worked commercially in Canada. (*See* Resources Survey, 1929, pages 190–195.)

The climate is quite suitable and there is no great hardship in living in any part of the north-west. A few white men and more natives have enjoyed life here for many years. They have gardens and grow most vegetables, berries, and grain. It should be realized that the country is very large. It is

1,400 miles from Edmonton to Great Bear Lake and still farther to the mouth of the Coppermine River. It is about 1,000 miles from Prince George–Finlay Forks–Alaska. There is roughly 735,000 square miles of country under consideration, nearly one-fifth of the whole of Canada.

It must be borne in mind that facilities do not make traffic, inhabitants make traffic. There must be people to furnish goods and to provide the need for transportation. Given the people willing to pioneer, this country will support a great number in comfort. The details as to what part of the country will be served first, and when this service will start depends upon when the people will come in and where. There is no doubt that potentially this is a reservoir of raw materials and can support a large number of people. As we see it now these people have to come from the overpopulated areas in Europe.

Southern and Eastern Europe are overpopulated, the standard of living would be improved if there were fewer people. Taking the post-war probable natural changes in population of the next generation, coupled with the general economic background, there is a case for considerably more migration than during 1929–39, so far as the general interests of the people who do not migrate are concerned. Latin America, Canada, and probably the United States are underpopulated.

The incentive to migrate exists and will remain. The three areas named above offer better standards of living to the emigrants from Southern and Eastern Europe. Whether this would attract people from Western Europe depends upon the speed of recovery from the war effects there—especially the avoiding of unemployment. The level of employment in Canada will be one of the major factors in attracting immigrants. The pull of prosperity here will bring people. If manufacturing countries do not subsidize their own agriculture, permitting Canada to export freely its agricultural products, farmers will come to this country and enjoy a rising standard of living.

In Canada there must be an intelligent regulation of national development. If immigrants be directed into all occupations in the right proportions there will be no dislocation of trade and the immigrants will be assimilated. The ideal is to receive immigrants steadily so as to develop the country's economic life to give the best results in domestic and foreign trade.

Migration, it seems, will have a big part to play. Whether Canada will get large numbers of new settlers depends upon:—

(1.) Whether the Old Lands can regain their former prosperity.
(2.) Whether we can maintain our present standard of living.
(3.) Whether Europe allows its people to migrate.
(4.) Whether we can absorb the people as they come.

If these factors are all favourable the north-western part of Canada will be filled and its resources will be developed.

Careful examination of all the relative factors indicates that there will be no immediate improvement in the present financial situation of the Pacific Great Eastern Railway by building an extension now, northerly to Prince George and into Hudson Hope. The initial capital construction expenditure would be in the neighbourhood of $20,000,000 and there would be additional money needed for equipment. With the present foreseeable traffic immediately available there would result an annual payment of about $1,000,000 on account of this extension. This deficit, in a decreasing amount, would persist until the traffic volume reached approximately 1,000,000 tons a year.

It is the opinion of the Committee that the forest products will produce when developed some 300,000 tons of railway traffic a year. The Peace River

coals when developed would furnish 750,000 tons a year. There would be incoming freight of about 75,000 tons making a total of 1,125,000 tons.

It should be recognized that freight originating on any Pacific Great Eastern extension from Prince George to Hudson Hope will, when it reaches Prince George, move possibly east or west, to Vancouver via Kamloops, as well as on the Pacific Great Eastern to Vancouver. It is unlikely that all freight will move by the Pacific Great Eastern to Vancouver. It is to be expected that there would be an interchange point for traffic at Prince George, and that through rates will be the same from Prince George to Vancouver by Kamloops as by Pacific Great Eastern by Squamish. For through competitive traffic the policy of the Pacific Great Eastern Railway should be to handle this business through its own terminals only.

The division of the freight will depend upon the routing made by shippers, assuming the rates are the same. This routing will be influenced largely by the speed of delivery at Vancouver. The Pacific Great Eastern route should be the speedier as it is shorter by about 180 miles.

In developing a country filled with attractive natural resources a railway may be built ahead of settlement and the cost of the road paid by the Province until settlement is enough to carry it, or efforts may be directed to getting the population into the country ahead of the railway so that it would pay practically from its commencement. It may be possible to have the settlement and the railway construction go on at the same time. It is a matter of judgment which of these three courses is most desirable. When settlement justifies it, the Pacific Great Eastern should extend from Quesnel to the coal deposits at Carbon Creek and Hudson Hope and into the Peace River area serving the country both north and south of the river.*

The Pine Pass Highway now under construction should be designed and operated as a pioneer route in advance of the railway to bring the development of the country up to the point where the construction of the railway is justified. The highway should then become a feeder to the railway and an integral part of the transportation system, rail and highway, to serve the territory.

In order to fully understand this report it is necessary to read the appendix on Resources. This is the basis of our conclusions regarding prospective railway tonnage.

All of which, Mr. Premier, is respectfully submitted herewith.

RUSSELL YUILL.
H. C. TAYLOR.
J. M. STEWART.
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T. C. MACNABB.
S. W. FAIRWEATHER.
C. R. CRYSDALE.

Victoria, British Columbia, January 22nd, 1946.

* Mr. Fairweather's signature is subject to the following qualification, that the remarks in the last sentence in this paragraph of the report are made from the standpoint of the Pacific Great Eastern Railway.

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APPENDICES.

APPENDIX A.

REGIONAL CHARACTERISTICS.

INTRODUCTION.

The broad objective is a study of the possible development of the natural resources of British Columbia and the relationship of the Pacific Great Eastern Railway and its projected extensions thereto. This includes reference to territories tributary to and beyond Northern British Columbia.

In order to portray these resources on map-sheets, to prepare appraisals and to outline descriptions, part of the Province concerned has been divided into four regions: A, Northern British Columbia; B, Peace River Country; C, Canadian National Railway; D, Pacific Great Eastern region south of Prince George. It will be noted on the maps that these regions comprise well-defined drainage-basins.

Regions B and D only are discussed in detail, being directly concerned with railway transportation facilities. The following ten sections outline the general characteristics of the regions.

I. HISTORY.

In 1792–93 MacKenzie followed up the Peace and Parsnip Rivers, down the Fraser to Quesnel, and then across to Bella Coola. Fort McLeod and Fort George were founded as fur-trading posts in the early 1800's. Fraser navigated the river as far south as Fort Langley about that time. In 1887–88 Dawson traversed the Dease and headwaters of the Liard through to Frances Lake and on to the Pelly River.

Placer-gold was discovered in the Cariboo in 1859 and a road completed to Barkerville in 1865. The Trail of '98 on the way to the Yukon gold-rush followed up the Finlay through Sifton Pass. The fur trade in the Peace River country merged into agriculture when settlement expanded north-west of Edmonton.

The Edmonton, Dunvegan and British Columbia Railway operated to Spirit River in 1916, increasing the influx of settlers of Region B. The Pemberton Trail and Cariboo Road served as access to Region D until the Pacific Great Eastern reached Clinton in 1915 and afterwards into Quesnel, the present northern terminal. This railway was intended as the Vancouver connection for the Grand Trunk Pacific. Its plans were filed covering surveys into the Peace River District as far as British Columbia's eastern boundary.

II. PHYSICAL.

The country tributary to the Pacific Great Eastern Railway should in time include certain northern regions (*see* Map 2) extending from the drainage-basin of the Rocky Mountain Trench to that of the Peace River. This report reviews two regions: (1) Pacific Great Eastern—Squamish to Prince George—and (2) Peace River drainage-basin in British Columbia, continuing as far east as the Smoky River in Alberta.

(1.) The bulk of Region D, generally known as the Cariboo and Chilcotin countries, is a great Interior plateau, with prevailing high altitudes, centrally drained by the deep valley of the Fraser. Excepting the Squamish River all drainage is towards the Fraser, including Lillooet, Bridge, Chilcotin, West Road, and Quesnel waterways. Stream origins on the plateau are wide and flat but become deep where they join the Fraser. To the south-west the plateau rises to a spur of the Coast Range and in the north-east to the Cariboo Mountains. One-half the area is over 4,000 feet altitude.

(2.) In Region B the main features from west to east are the plateau, Rocky Mountain Trench, mountains with eastern foothills, and the plains. The western plateau is rough and drained by rivers into the Parsnip and Finlay; the latter two

join at Finlay Forks to form the Peace which flows east through the Rockies. In the eastern foothills and plains the Pine, Halfway, and Beatton have eroded deep valleys towards the Peace. The neighbouring area in Alberta is roughly bounded on the north by the Clear Hills and on the east and south by the Smoky and Wapiti Rivers. In the former Dominion Block over 40 per cent. of the area is under 3,000 feet altitude.

III. CLIMATE.

In both Regions B and D the climate is continental and influenced by periodical warm winds. Generally the summers are hot and the winters cold, but this condition may have local variations due to altitude. Snowfall is light, especially in the lower reaches of the Rocky Mountain Trench.

The summer season with long hours of sunlight, more pronounced to the north, affords a short but intense growing season. In the stock-range areas of Region D, especially in the valley of, and west of, the Fraser, irrigation is required to produce forage-crops. The Peace River farm districts usually have sufficient moisture in early summer to give the crops a good start. In the commercial forest areas there is sufficient rain and snow to sustain the yield—e.g., upper Parsnip Valley 30 inches and east Cariboo up to 40 inches mean annual precipitations; snow and ice prevail for winter logging in these areas.

The average annual precipitation varies considerably—Lillooet 12, Williams Lake 16, Prince George 21, Pouce Coupe 17, and Hudson Hope 21 inches. Both regions have healthful climates and although there is a wide range in temperature severe storms are rare. Chinook winds tend to relieve the extreme cold of the winter.

IV. RESOURCES.

The Agricultural Map 3 shows Region D mainly as a stock-range country and Region B as suitable for grain-farming, mixed farming, and stock-raising. These regions are the largest agricultural areas of their type in the Province of British Columbia.

The Forest Map 4 shows that under present commercial standards, limited areas only are favourable to the growth of forest products. A large area should remain under forest-cover as watershed protection and as a possible future economic asset.

Both regions are interspersed with gold placer-workings; Region D is now the major lode-gold producer in the Province. Non-metallics are widely distributed, especially high-grade coal in the Peace River and petroleum possibilities east of the Rockies. West of the Rocky Mountain Trench are areas favourable to prospecting for metallic minerals. Some prospects and producers are shown on Map 5.

The major potential water-power sites will be on the Peace and tributaries of the Fraser; these will afford power for the development of natural resources.

With the exception of farming areas both regions are still in a natural state, but accessible by roads and waterways; there are many attractions to offer the sportsman and tourist, but with more primitive accommodations than in older settled countries. British Columbia is conserving both sport and commercial wild life.

V. TRANSPORT.

(1.) Transportation facilities now in the Cariboo and Chilcotin country include considerable mileage in relation to the population of Region D (*see* Map 2). The Pacific Great Eastern, from Squamish to Quesnel, has no rail connection with the transcontinental railways. The Cariboo Road is part of the Provincial highway system.

Existing branch roads may be said to serve adequately outlying areas and to feed the railway and highway. Waterways are little used for commercial navigation; boat service from Soda Creek to Prince George was discontinued after completion of the highway. Because air transportation in this region has not developed in comparison with Northern British Columbia, rail and road will be the principal means of access for some time.

(2.) The Peace River Region B west of the Rockies is still served by shallow-draught boats from Summit Lake north of Prince George and aircraft with water

landings in the Rocky Mountain Trench. Pack-trails are falling into disuse. The Vanderhoof–Manson Creek Road now gives access to the Finlay Forks country.

The Pine Pass Highway under construction will link Prince George with Dawson Creek and the highway system of the former Dominion Block which has extensions to the north and east. The Northern Alberta Railways extend to Hines Creek (60 miles east of the British Columbia boundary) and to Dawson Creek (10 miles west of the boundary). The Alaska Highway is essentially a defence measure to serve the Northwest-Staging (Air) Route, the airports should accelerate development in and north of the Peace River region.

VI. SETTLEMENT.

(1.) Population in Region D has increased from 9,038 in 1931 to 14,113 in 1941, due in part to mining and forest activities. The early settlers raised farm products to meet the demands of the placer-miners and to-day the lode-miners afford a similar market. Stock-raising still requires an outside market with transportation facilities. In addition to such towns as Lillooet, Williams Lake, and Quesnel, and the mining towns in the Bridge River and Barkerville districts, there are agricultural communities scattered throughout the region.

(2.) The following census population figures show the growth of the Peace River country:

	1921.	1931.	1941.
Alberta—adjacent to British Columbia, bounded by the Clear Hills, Smoky and Wapiti Rivers	12,181	27,196	30,349
British Columbia (Region B) east of Rocky Mountain Trench	.....	6,685	7,929

It is probable that lack of transportation facilities has impeded the growth of Region B in British Columbia. Up to 1912 there were a few ranchers and some part-time trappers. Settlers moved in via Lesser Slave Lake and the Edson Trail. The main early influx came after the railway was completed to Spirit River. The farm population is about three-quarters of the total. The remainder is engaged in lumbering and urban pursuits associated with agriculture.

VII. SERVICES.

(1.) Health services are provided by the Provincial Government with hospitals in the principal towns. In 1941–42 there were over thirty schools, sixty teachers, and 1,000 pupils in Region D. There is a telegraph-line along the Cariboo Highway and telephone communication to the principal centres. Lillooet, Williams Lake, Quesnel, and the mining towns have electric power plants and water services.

There are Government agencies and administrative offices at Lillooet, Clinton, and Quesnel with a sub-agency at Williams Lake. The importance of mining is shown by the number of recording offices distributed throughout the region. Forest Rangers are stationed at strategic points and there is a District Agriculturist at Williams Lake.

(2.) An outstanding British Columbia Government service is the Peace River Health Unit, with a staff of medical officer, nurses, and inspector. Public hospitals are at Pouce Coupe, Dawson Creek, and Fort St. John. In British Columbia Region B there are over sixty schools, seventy-five teachers, and 1,400 pupils. The Dominion Government utilizing the Alaska Highway route maintains telegraph services. Postal service and outside telephone and telegraph lines are provided by the Northern Alberta Railways. The principal towns have water services and Dawson Creek a sewerage system.

Pouce Coupe is the principal British Columbia administrative centre east of the Rockies and being remote from Victoria all the offices are important. They include a Government Agent, Provincial Police, Court Registrar, Agriculturist, and Forest Ranger. Dawson Creek and Fort St. John also have certain Government sub-offices.

VIII. TOURISTS.

(1.) The tourist and recreational attractions of Howe Sound, Garibaldi Park, and the Pacific Great Eastern route are increasing in popularity. There is road access

to mountain and lake regions where the unsettled country may be considered an asset to the sportsman. The headwaters in and surrounding Region D afford park and reserve sites for the conservation of natural resources in conjunction with the tourist industry.

(2.) There is a safe and attractive water route north of Prince George from Summit Lake to Finlay Forks, then up the Finlay or down the Peace. The Rockies and the Western Plateau are accessible from the Trench via numerous watercourses. The new Pine Pass Highway will be a scenic route along McLeod Lake and through the mountains to connect with the Alaska Highway and Alberta roads. In the foothill country around Moberly Lake hunting and tourist attractions are being developed.

IX. INDUSTRY.

(1.) In Region D gold has been a source of wealth since the 1850's but now stock-raising is the principal industry. The lode mines in Bridge River and Barkerville districts contribute to the prosperity of Lillooet and Quesnel. Forest production is the chief source of employment from Squamish to Pemberton. Portable sawmills and the cutting of railway-ties, pulp-wood, and pit-props are becoming important industries along the railway.

Williams Lake is the principal distributing centre for the Cariboo and Chilcotin country. There are tourist resorts served by the railway from Garibaldi Park to Clinton, from there on many of the former road-houses and ranches have developed into auto camps and hunting-lodges.

(2.) Lack of transportation has delayed development in Region B, especially west of the Rockies. In the area tributary to the Trench trapping and some prospecting are the main pursuits. Considerable exploratory work has been done on the Ingenika silver-lead-zinc property, but work was discontinued on account of high access costs. Placer-gold has been the principal mining attraction.

In the Peace River country east of the Rockies agriculture is the main industry, employing about 60 per cent. of the working population. Grain elevators, flour-mills, and creameries afford employment.

A small quantity of high-grade coal is being mined in Pine and Peace valleys for local domestic and railway use. Sawmills are distributed to supply local demands; forest products are exported from the Alberta Peace River district.

X. TERRITORIES.

(1.) In Region D the drainage-basins tributary to the Pacific Great Eastern may be considered of greater extent than usual when reviewed from a strictly railway traffic view-point. Natural resources, such as forested watersheds, wild life, and tourist attractions should also be studied as they assume economic importance. Live stock is now being driven 100 miles; Barkerville lode mines are working 62 miles from Quesnel; and there are drivable streams which may be improved to take out forest products from farther away.

(2.) An important phase in the transportation problem is the possible extension into the north country. Northern expansion includes the north-eastern Omineca Mining Division, petroleum possibilities, forest and grazing lands adjacent to the Alaska Highway, and the areas suitable for settlement in the Fort Nelson, Hay River, and Lower Peace country.

North-eastern British Columbia and north-western Alberta contain fertile lands capable of supporting agricultural settlements. The acreage suitable for settlement in the Peace River country has been estimated at between 15,000,000 and 20,000,000 acres, the bulk being north and west of the Peace. The Yukon and MacKenzie River drainage-basins, with pioneered air and water routes, will play an important part in northern development.

AGRICULTURE.

Agricultural methods are improving, due in large measure to Government assistance and guidance; lands once expensive to clear are now opening for settlement through the assisted use of modern machinery. Soil surveys are being made and

marginal lands improved by fertilizing and cultivation. Breeding and care are increasing the weight and quality of live stock; grain at reduced prices is provided to finish feeder range cattle.

Although not adapted to prairie type farm production, the Interior of British Columbia offers certain attractions such as fertile soil, park country, inland waters, freedom from dust-storms and blizzards.

(1.) The prevailing high altitude and dry climate make stock-raising the primary agricultural pursuit for the district from Lillooet to Quesnel. Certain areas such as in the Lillooet, Beaver, and Horsefly River valleys and from Quesnel to Prince George are working into mixed farming without the aid of irrigation. The acreage table on Map 3 is based upon the 1929 Resources Survey and the 1934 Provincial Government reports. Grazing land suitable for stock range comprise open, park, and woodland country. Lands suitable for settlement include areas, as far as soil, clearing, and topography are concerned, that should produce reasonable crops under dry-farming conditions. Potential irrigation areas are regarded as range until developed, so settlement acreage figures are conservative.

Although divided into zones the figures being estimated should be considered in the aggregate rather than in detail. Zones 1, 2, and 4 with total acreage of 245,000 cultivable and 3,600,000 range lands are centrally served by the railway. Zone 3 with 20,000 acres cultivable and 3,000,000 acres range will produce mainly live stock, which is already being driven to railway stockyards.

The commercial capacity of the grazing area is limited to production of forage and winter feed. On basis of 1929 survey figures, by utilizing 2,000,000 acres of open, park, or poplar grazing lands and by cutting fodder from the cultivable and hay lands a round figure of 100,000 head of stock is now possible. This figure may be increased with range improvement, irrigation, and further utilization of jack-pine areas.

Generally the settlement acreage should be worked in conjunction with stock-raising, but there are potentially productive bottom and bench lands which, with further use of irrigation and dry farming, will be valuable for mixed farming, vegetable and even fruit growing. Increased population from forest and mining industries and improved outside markets have already increased acreage under cultivation.

The Dominion Bureau of Statistics in their reports on freight carried by the Pacific Great Eastern in the years 1935 to 1944 gives the following figures:—

Products.	Five-year Average in Tons. 1935–39.	1940–44.
Animal products (tons)	6,334	7,325
Including cattle	6,101	6,908
Agricultural products (tons)	4,558	7,092
Including potatoes	946	1,878

Dominion census returns show the following in Region D between Pemberton and Woodpecker:—

	1931.	1941.
Occupied land (acres)	539,500	684,000
Improved land (acres)	66,700	76,300
Horses and cattle	50,000	80,000
Sheep and swine	30,000	13,800

(2.) The bulk of the 600,000 acres of settlement land west of the Rockies comprises alluvial tracts from McLeod Lake to near Fort Grahame (*see* Map 3). The upper valleys contain open textured soils, improving toward the fine silt and clay lands in the Finlay Forks district. Due to short growing season crops may not always ripen until the country is opened up. Unlike the grain lands in eastern Region B this valley country is better adapted to mixed farming with some stock range. The settler may receive part income from forest production. With potential water-power, industries should develop affording employment and local markets. Much of the land has to be cleared, so little immediate outgoing tonnage will be available from farm products.

East of the foothills, on the undulating park country and prairie lands, climatic and soil conditions are favourable to agriculture. The broken country in the main

valleys and bordering on the settlement areas contain pasturage and hay meadows. About three-quarters of the arable lands requires light clearing, the remainder being open, park, or burned over.

The acreage suitable for settlement in Alberta adjacent to the Provincial boundary and west of the Smoky River (*see* Map 3) is based upon the Joint Report of 1925. Of the total 7,100,000 acres almost one-half was estimated to be first- or second-class lands.

SUMMARY.

	Acres.
Zone 1—North of Peace River to Berwyn	1,650,000
Zone 2—South of Peace River to Smoky and Wapiti Rivers	1,750,000

The following is taken from Dominion census reports covering the above-mentioned area in Alberta as a guide to possible agricultural development in British Columbia Peace River country when transportation is available:—

	1921.	1931.	1941.
Occupied land (acres)	880,000	1,804,000	2,067,000
Improved land (acres)	244,000	674,000	951,000
Field crops (acres)	139,000	468,000	685,000
Field crops (dollars)	1,926,000	3,727,000	6,828,000
Live stock (dollars)	4,083,000	3,447,000	4,228,000
Number of horses and cattle	58,000	59,000	76,000
Number of sheep and swine	18,000	44,000	79,000

There remains a large area lacking railway transportation west of Spirit River and Hines Creek where, according to Alberta soil survey reports, the prairie, first- and second-class soils are estimated at 72 per cent. of the area instead of 48 per cent. as used in the 1925 report. There has been a progressive increase in the acreage of improved land relative to occupied land.

Estimates based on 1930 survey reports on land suitable for settlement in Region B, British Columbia:—

	Acres.
Public lands, open and light clearing	887,000
Alienated and homesteads filed over two years (one-third former Dominion Block area)	283,000
	1,170,000
North and west of Block	430,000
South of Block	400,000
McLeod Lake, Parsnip and Finlay valleys	600,000
Total	2,600,000

SUMMARY.

	Acres.
Zone 3—South of Peace River	850,000
Zone 4—North and South of Finlay Forks	600,000
Zone 5—North of Peace River	1,150,000
Total	2,600,000

Grazing areas in and surrounding the region are of value due to abundance of winter and finishing feed. The map table does not include grass and park lands tributary to the Alaska Highway as far as Fort Nelson district where feeder range stock can be finished with grain feeds from Region B.

The Northern Alberta Railway was extended to Dawson Creek in 1930. Even with access only to the south-east corner of the former Dominion Block the following census figures indicate certain progress:—

	1931.	1941.
Field crops (acres)	50,000	117,000
Field crops (dollars)	628,000	1,148,000
Horses and cattle	11,000	21,000
All live stock (dollars)	636,000	1,050,000

This summary report is prepared mainly as a guide in estimating future tonnage and traffic. For a comprehensive study refer to Resources Survey, 1929–30 report.

FORESTS.

A Forest Map 4 has been prepared to indicate the areas favourable to the production of merchantable timber, which along with Map 3 showing agricultural areas gives an impression of lands better suited to the growing of forest crops. The logging trend is toward the exploitation of marginal timber with lighter portable equipment. Truck-logging continues to expand as operators harvest less accessible timber, reserving better and more accessible stands for future utilization. The reconstruction, 1946 on, should sustain a continuous market.

Part-time workers in forestry and agriculture are now developing a combination of mixed farming, ranching, and wood-lots with additional employment in harvesting forest products. A cellulose pulp-mill is possible in the Prince George district; land could then be worked along with a sustained forest yield and some additional portions opened for settlement north and south of Prince George.

On the map all figures are based on 1937 Provincial Government reports, excepting the Peace River Country compiled in 1930. Tabulations should be revised for depletion due to forest fires since 1930, especially in the former Dominion Block.

(1.) In Region D there are 1,847,000 acres carrying merchantable timber, 7,771,000 acres immature or reproduction, and 1,688,000 acres of productive forest land not satisfactorily stocked. This 9½ million acres of reproduction, logged or burned, may in time be utilized as indicated above.

The map table shows that the Squamish-Lillooet (Area 1), Horsefly-Quesnel (Area 6), and Quesnel-Prince George (Area 7) carry the bulk of the volume of merchantable timber. Area 1 contains Coast type timber being logged in conjunction with the railway. Bonaparte and Bridge River valleys are accessible via truck haul. With some improvement logs can be driven down the Fraser to the town of Quesnel. In the Quesnel Lake and other watercourse areas stream-beds are such that rail and truck logging will be considered first, but stream improvements would introduce river-driving.

Of the 14 billion board-feet reported in Region D (allowance should be made for defective timber, especially in the Quesnel Lake area) the bulk of the present growing stock may in time be termed accessible. The Pacific Great Eastern Railway is located on the east side of the Fraser where comparatively moist climatic conditions are more favourable to forest-growth.

New equipment and improvement in transportation and logging methods now make a large percentage physically accessible. Distributed throughout Region D there are possibilities for pulp-wood, railway-ties, pit-props, and other products. Lodgepole pine stands as a predominant growth are well placed with regards to grazing and part-time farmer activities. For lode-mining there is an unlimited supply of mine-timber.

Increased utilization is indicated in that pulp-wood is now being rail-hauled to augment Coast forest supplies along Howe Sound. The increased forest products' tonnage is illustrated from railway reports according to the Dominion Bureau of Statistics.

	Average Tonnage, 1935–39.	Average Tonnage, 1940–44.
Total forest products	14,999	52,701
Including—		
Logs, posts, poles, pit-props	5,306	18,797
Cordwood	840	6,145
Ties	2,173	7,593
Pulp-wood (1944 tonnage 18,016)	------	6,915
Lumber	5,989	12,687

The trend toward the portable sawmill is shown from Forest Branch, 1944, reports. There are seventeen small mills with an annual cut of 15,000 M.B.M. working south of Pemberton. From there to Quesnel on both sides of the Fraser sixteen

mills have a cut of 4,600 M.B.M. In 1944 over 4,000 acres were logged for commercial purposes.

(2.) In Region B attention is again drawn to forest-fire depletion. However, burned-over lands on the plains generally reproduce in deciduous growth and become suitable for settlement. A sufficient amount of accessible timber remains to meet local demands.

Of the 1,845,000 acres estimated to carry merchantable timber about one-half the acreage and volume is located in drainage areas 4 and 5 tributary to the Parsnip and Peace basins, where climate and topography indicate that commercial forest production should be continued. A study of both forest and agriculture maps indicates that excluding agricultural lands the coniferous immature and other sites—e.g., reproduction, burned and logged—should be conserved in view of water-supply, wild life, improved utilization and future yield of forest products. The lower valleys of the Parsnip and Finlay Rivers afford settlement opportunities for the part-time farmer and woodsman.

Development of metallic and coal mines will require continuous supply of construction and building material, mine-timber, and pit-props. Peeler stock, including spruce and cottonwood, growing on bottom-lands and slopes of all main valleys compares favourably with the better growing sites of the upper Fraser Valley.

Outside of the plains' area there are several tracts of timber in drainage-basins which may be made drivable, such as tributaries to and including the Parsnip, Finlay, Peace, and Pine Rivers. Only minor stream improvements would be required to collect pulp-bolts, pit-props, and railway-ties at such concentration points as McLeod Lake, mouth of Pack River, Finlay Forks, head of Rocky Mountain Canyon, and junction of Murray and Pine Rivers; when required, river-driving could be improved to include sawlogs.

A market for pulp-wood should follow construction of the proposed 200-ton mill at Giscome until development warrants a plant at Finlay Forks or head of Rocky Mountain Canyon where power, coal, and limestone can be made available.

In 1944 there were five commercial and nine farmer sawmills in the region; over 3,000 M.B.M. were exported, two-thirds to the Prairies and one-third to Ontario and the United States. It may be that lumber on the plains should be reserved for local needs, but forest production in and west of the Rockies could join shipments with exporting mills around Prince George.

The above is intended to be an outline. For a detailed study refer to the 1929–30 and 1937 reports. Government policy—e.g., forest protection, sustained yield, forest surveys, and planned management—will no doubt be influenced by the Sloan Report, 1946.

MINERALS.

The Resources Survey, 1929–30, Report along with recent publications on geology and mineral resources should be studied in this connection. The following summary is non-technical, being abridged from Provincial publications; reference to physical geology is made under these five divisions.

(1.) The Coast Mountains are made up largely of granite and related igneous rocks carrying mineral deposits. (2.) The Interior Plateau broadens to include the central part of the Province reaching northward to the Rocky Mountain Trench. (3.) In the Cariboo Mountains are a few bodies of igneous rocks intruded into ancient sedimentaries. The Cariboo has produced much placer gold and lode is now important. (4.) The Cassiar-Omineca Mountains have rocks of many types and ages intruded by one large and a number of smaller granitic batholiths. (5.) The Rocky Mountains are largely made up of folded and faulted sedimentary rocks from Precambrian to Cretaceous (coal) in age; there are few surface-exposed igneous rocks.

The great Northern Interior is of primary importance as prospecting ground. Favourable geological conditions including the contacts of the Cassiar batholith and related intrusives afford mineral possibilities. Region B lacks the transportation advantage of Region D where there are several producing mines. Following is a summary of metal producers and prospects.

Bralorne and Pioneer continue to lead the Province with Island Mountain and Cariboo Quartz in third place as lode-gold producers. Gold placers are worked mainly in Cariboo, Quesnel, Omineca, and Dease Lake districts.

The South-eastern Interior of the Province still supplies the bulk of silver-lead-zinc ores. Development-work on the Ferguson deposit, on Ingenika River, with promise of ore at depth, was discontinued pending improved transportation. There are other potential base-metal deposits in the Omineca Mining division.

Pinchi Lake Mine is the mercury producer (three years' production, 1,725,000 lb.); prospecting along the northward mercury belt shows two other prospects. Tungsten is distributed generally as scheelite, Red Rose Mine near Hazelton has recovered 175,000 lb. in one year. This mineral is also found in Bridge River and the Cariboo.

Stibnite (antimony) occurs north of Bridge River and near Fort St. James. Magnesite deposits are known between Quesnel and Ashcroft; hydromagnesite is in shallow lake deposits of the Interior Plateau. Molybdenite with indications of more valuable metal deposits has been found south of the Boss Mountain batholith in the Cariboo, and west of the Parsnip River where surface prospecting may be difficult due to drift cover.

The possibility of an iron industry in British Columbia attracts attention especially in conjunction with coking-coal in Vancouver Island and abundant water for power along the Coast. Valuable coking-coal would be utilized and thus provide an additional market for high-grade semi-anthracite from the Peace River. Magnetite deposits are known to be on the West Coast. It is not impossible that sedimentary iron ores may be found in the Northern Interior. Bog-iron is found in small quantities in the Taseko Valley and north of Hudson Hope.

The foregoing is outlined in some detail as one metallic mineral prospect may lead to another; there are large areas with little or no prospecting done and apparently favourable geological conditions. In most areas non-metallics may be said to exist in commercial quantities.

In and adjoining Region D the non-metallics include large and pure deposits of diatomite in the vicinity of Quesnel; of the eight occurrences three have 27,000 tons in sight. Pure limestone is centrally located suitable for commercial purposes. Marl and cement-making raw materials are commercially accessible. Sand and gravel are well distributed for construction and highway purposes. Stoneware and brick-clay and lignite coal are present near Quesnel.

The chief mineral resource of Region B is the coal found in two principal areas—Canyon-Butler and Carbon-Pine River. It is estimated that 1,000,000 tons could be mined annually for several hundred years. Seams up to 8 feet thick are exposed in the Canyon. The Carbon field may be drilled this year to make tonnage estimates and to locate higher grade coal with depth. Samples indicate an average heat value of 14,700 B.T.U.'s with a high of 15,130 with low ash, sulphur, and moisture content. Shipments of about 8,000 tons for railway locomotive use have proven these coals superior to Canmore and Bankhead.

Mining conditions and local accessibility, especially in the Peace, are favourable and mining costs should not exceed those obtaining in the Alberta foothills. When tested for domestic use, Peace-Carbon coal burns with a short blue flame, hot fire, little smoke, and minimum of ash. There is no deterioration under shipment and storage; being a hard coal and mainly non-coking it should increase in market value with pulverizing, grading, or processing to meet modern exacting requirements. A minimum weight of wasteful ash and moisture means low transportation costs for the useful heat-producing content.

East of the Rockies low bituminous coal is widely distributed, but the Peace-Pine coals are preferred even at higher prices. Certain formations underlying and parallel to the foothills area are similar to those forming oil reservoirs in other proven oilfields. These promising structures are in the vicinity of Moberly Lake, Hudson Hope, Table Mountain, and Kiskatinaw River. Analysis of coal in these localities lead to the conclusion that, if present, the oil will be high grade. Evidently the test wells driven to date are of insufficient depth. Natural gas has been found but commercial quantities have yet to be proven.

There are large deposits of limestone and sandstone suitable for building purposes. Sand and gravel are fairly well distributed in country tributary to the Pine and along the banks of the Peace. Raw materials for cement-making are plentiful.

Mining is one of the major industries in British Columbia; the following mining divisions in and adjacent to the regions, from 1900 to 1944, produced the following value of precious and base metals:—

	Precious.	Base.
Cariboo	$57,900,000	----------
Omineca	2,861,000	$1,939,000
Peace River	93,000	----------
Quesnel	12,900,000	----------
Clinton	994,000	6,000
Lillooet	62,297,000	3,000

In 1939 there was an average of 1,139 men working in mine and mill from the shipping mines employing an average of ten or more men. These are from eight mines in Region D.

The mineral chart 5 shows a concise reference to some of the prospects and producers of Regions B and D.

WATER.

Physical Map 2 with form lines and altitudes, indicates that large areas are hilly and mountainous. In the high country there is generally more precipitation, especially snow, than on the plains. The flat watersheds on the plateau retain moisture in muskeg and forest-cover to equalize run-off and maintain water-supply for power, hydraulicking, fluming, conveying, irrigation, stock, and domestic use.

Water is essential to plant and animal life; this is realized in the semi-arid parts of the Interior. Conservation of watersheds, forests, wild life, and recreational activities should be mainly under Government administration as forest reserves, public parks, and game reserves.

There are two main river systems (1) Fraser in Region D and (2) Peace in Region B.

(1.) The watersheds in and tributary to Region D are generally forest covered. The main valley from Prince George to Quesnel is broad and navigation is possible as far south as Soda Creek where the deep valley trough is pronounced. Development of power in the Fraser may not be readily undertaken due to high construction costs and wide range in discharge. The salmon-spawning tributaries also have to be safeguarded.

For power purposes the Fraser, Nechako, Quesnel, and Bridge Rivers will be important in connection with forest and mining industries. There are also other main tributaries available for power, placer-mining, irrigation, and, with improvements, river-driving. At present only the small streams are diverted for irrigation purposes.

According to 1930 reports the estimated minimum continuous power in Region D is 285,000 potential horse-power (not including final maximum at Bridge River). These figures include twenty-one possible power-sites of 500 horse-power or over.

The British Columbia Electric initial development at Bridge River now serves the gold-mines. The total final development with net operating head of 1,130 feet is estimated at 350,000 continuous horse-power. Principal market will be at Vancouver, 130 miles distant. Transmission-lines are already cleared. The Nechako River has been investigated and 40,000 horse-power reported to be available for a pulp-mill in the vicinity of Prince George. The Quesnel district with its forest resources will require power. The Fraser at Cottonwood Canyon (minimum 17,000 horse-power) is the nearest power-site to Quesnel town but heavy construction costs indicate that the Quesnel River and Lake system is preferable with a possible total development of 28,000 horse-power (minimum).

The cultivable areas in Region D are largely within the Interior Dry Belt. Precipitation varies from less than 10 inches in the deep valleys of the Fraser and Chilcotin to over 20 inches on the eastern plateau; generally the most arid country is west of the Fraser from Lillooet to Quesnel. Based upon 1929 report, a round figure estimate of 20,000 acres cultivated under irrigation may be quoted, with about the same additional acreage which can be irrigated at reasonable cost.

When water cannot be economically obtained, dry farming is practised except within certain areas—e.g., Lac la Hache and San Jose River require all water available. Benches along the west bank of the Fraser south of Quesnel contain large areas of fertile arable lands, but the number of irrigation licences in operation indicate that the improved lands are irrigated to as great an extent as the individual farmer can afford under present market conditions. In the Lillooet district south of Pavilion many of the benches are highly productive and yield excellent fruit-crops, but these lands require irrigation and warrant efficient systems including pipes and flumes to increase the use of irrigation-water.

(2.) The watersheds west of the 121st meridian are mountainous and forest covered. The Parsnip, Finlay, and Peace are navigable with shallow-draught boats. From Finlay Forks the Peace flows through the Rocky Mountain range and eastern foothills to the Canyon, the drop from the head of the Canyon is 215 feet in 20 miles. From Hudson Hope to the Provincial boundary the river is from 700 to 800 feet below the pronounced break in the plateau. Average size of the Peace River at mean water-level is 1,700 feet and 10 feet deep. Run-off records at Peace River town show a range of from 6,350 to 374,480 cubic feet per second.

South of the Peace, the Pine and Kiskatinaw Rivers and, north, the Halfway and Beatton Rivers are the chief tributaries. Moberly, Charlie, and Cecil are the principal lakes; they are small but have been used for plane landings.

The only power possibility of importance in Region B is at the head of Rocky Mountain Canyon. Practically the entire fall can be utilized by the construction of a dam 100 feet high at the head and two 80 feet high lower down the Canyon. The upper dam will form a reservoir 50 miles long to augment the lowest discharge of 4,500 cubic feet per second. The total minimum continuous power is estimated at 153,000 horse-power, 210,000 for eight months or 283,000 for six months in the year. With adjacent coal-measures and limestone deposits, tributary forest products and potential mining country to the west there should be a use for this power.

In the agricultural settlements east of the Rockies there is sufficient moisture to produce crops by careful farming methods. The domestic water-supply situation is generally favourable; less than one-fifth of the settlement area may be stated to suffer from a possible water shortage. Ground water supplies may be expected at the contact of sandstone and shale formations. Shallow reservoirs are often used for stock water where streams or springs are not available.

Introductory reference is made to wild life and recreation. Tourist attraction and outdoor activities have a wide range from the Interior Dry Belt to the lake and mountain regions. Game in season is still obtainable; hunting parties augment the earnings of trappers and ranchers by engaging guides and pack-trains. Beaver culture is desirable as a conservation agency and provides a habitat for the muskrat; these two animals furnish valuable furs in quantity.

APPENDIX B.

RESOURCES AND POTENTIAL TONNAGE.

The potential resources may be interpreted in terms of railway tonnage and traffic. The foregoing sections (1–14) are abridged herewith under two regions:—

D. The present Pacific Great Eastern territory.

B. The future possible Pacific Great Eastern territory.

REGION D.

AGRICULTURE.

The railway on the eastern side of the plateau to where it joins the widening valley of the Fraser at Soda Creek serves a larger area of cultivable and mixed farming

country than a low gradient route would in the river valley. The railway location serves a local rather than a main line purpose.

The principal agricultural industry of stock-raising, with a grazing area of over 6,000,000 acres, is limited by the available natural and cultivated forage for winter feed. Of the 265,000 acres estimated to be under irrigation or cultivable by dry farming the bulk is tributary to the railway.

According to census returns, from Pemberton to Woodpecker, there were:—

	1931.	1941.
Improved lands (acres)	66,700	76,300
Horses and cattle (number)	50,000	80,000

Based on the 1941 figure for improved acreage, the 265,000 potential crop or hay acreage, plus assisted grain importations, should contribute to feed and finish over four times the 1941 stock population. This will be an increase in freight carried over the amounts shown in annual average P.G.E. railway tonnages:—

	1935–39.	1940–44.
Animal products (tons)	6,300	7,300
Agricultural products	4,500	7,100

The estimate of acreage suitable for crops is conservative because potential irrigation areas are excluded and listed as range land until developed; by reclamation, irrigation, and intensive cultivation of arable lands and range improvement an estimate of, say, 60,000 tons of outgoing agricultural products may be anticipated.

Forests.

Forest resources can be protected and managed to produce a continuous harvest. The Forest Map shows that the railway runs through the better forest lands; in certain areas the climate is conducive to forest-growth. A large part of the 9,000,000 acres immature and not satisfactorily restocked may in time be stocked with some useful forest products.

Forest products' railway traffic compares more than favourably with agricultural according to average annual tonnage returns as follows:—

	1935–39.	1940–44.
Total forest products	15,000	52,700
Including—		
Lumber	6,000	12,700
Logs, posts, poles, props, and ties	8,300	32,500
Pulp-wood (1944 tonnage 18,000)	----------	7,000

This increase is mainly due to war-effort demands, with the possible exception of pulpwood rail-hauled to augment supply for Howe Sound mills. Thirty-three sawmills are operating Squamish–Quesnel; the latter is a shipping-point for peeler logs.

The bulk of the 14 billion board-feet of merchantable timber can be made physically accessible by rail, truck, or river-driving. The logging trend is towards exploitation of marginal timber, reserving better and more accessible stands. Improved methods tend to make a large volume accessible; increased utilization is possible through pulp, props, and ties.

Lode-mining requires a continuous supply for construction and timbering. The light-weight Interior woods find an outside market for such purposes as building, packaging, and pulp.

The reconstruction period offers a sustained market especially for ocean-borne traffic to which Region D is accessible. An annual increase comparable with the above tonnage table may be optimistic; with proper protection and management, these potential forest resources may supply a continuous future demand. Based on an annual cut of 2 per cent. of 80 per cent. of the reported merchantable timber, over 330,000 tons of outbound freight traffic should ultimately accrue from forest products.

Minerals.

The mineral chart gives an impression of some of the prospects and producing properties. There still remains territory to be prospected in ground favourable to

mineral occurences. New uses for unimportant minerals and demand for gold is stimulating interest in commercially marginal properties.

Some formations of the Coast range and the Cariboo Mountains, in and tributary to Region D, are productive of lode-gold in quantity. Placer-gold is well distributed; in the Cariboo conditions for large accumulations are still excellent. Transportation now permits heavy equipment to make many properties profitable.

According to Department of Mines 1900–44 reports, mining divisions in and tributary to the region have produced over $134,000,000 mainly in gold and only $9,000 in base metals. Bridge River district leads and Barkerville takes third place in Provincial gold production. In 1939 there were eight mines working over 1,100 men in mine and mill; prospecting and placer-mining will give further employment.

Other metallic ores are known to be present. Non-metallics are well distributed, especially diatomite in commercial quality and quantity.

Apart from the annual average of 6,000 tons gold concentrates outbound, mineral freight is now small. Pending discovery of base metals and utilization of non-metallics the principal source of railway revenue will be incoming mining machinery, building materials, and commercial supplies.

Region D's population increase of over 5,000, from 1931 to 1941, is mainly due to mining activity. Considerable passenger, express, and class freight originates from the mines.

WATER.

Although generally considered to be in a dry belt there are certain areas in Region D which do not require irrigation, and are well watered with lakes and streams.

In the semi-arid districts irrigation now is mainly limited to inexpensive projects and assisted flooding of hay lands. When larger scale projects are needed water can be diverted to irrigate cultivable lands.

Potential water-power is distributed over twenty-one sites, each of over 500 horse-power. A minimum estimate indicates 285,000 continuous horse-power, not including the Bridge River final development of 350,000. The following sites may be regarded as important in connection with forest and mining industries: Bridge River, under construction, now supplying local mines; Nechako, potential 40,000 for possible pulp-mill; Quesnel, three sites, 28,000 to develop forest and mining; Fraser River, 27,000 minimum; Chilcotin, 13,000; and Westroad, 11,000 continuous horse-power.

REGION B.

AGRICULTURE.

Agriculture in the valleys west of the Rockies will be secondary to and connected with other industries, especially forest production. The former Dominion Block with its tributary country is adapted to grain-farming and mixed farming.

Map table 3 includes an estimate of grazing lands. The following is acreage suitable for settlement in Region B, British Columbia:—

	Acres.
Former Dominion Block (one-third of total area)	1,170,000
North and west of Block	430,000
South of Block	400,000
North and south of Finlay Forks	600,000

To forecast a tonnage estimate, an adjoining 7,000,000 acres in Alberta, as far east as Smoky River, are considered tributary. On the basis of the 1925 report 48 per cent. or 3.4 million acres are reported suitable for settlement; later soil surveys estimate as high as 72 per cent. Although certain areas in Region B, Alberta west of Spirit River and Hines Creek, are not served by railway, settlement has progressed according to the following census figures:—

	1920–21.	1930–31.	1940–41.
Improved lands (acres)	244,000	674,000	951,000
Wheat (tons)	13,000	215,000	307,000
Oats (tons)	37,000	85,000	125,000
Horses and cattle	58,000	59,000	76,000
Sheep and swine	18,000	44,000	79,000

The railway reached Dawson Creek in 1930. According to 1941 census Region B in British Columbia contained 167,000 acres improved land, raised 1,640,000 bushels of wheat, 1,055,000 bushels of oats, and 21,000 horses and cattle.

Region B has been divided into five zones, with the following acreage suitable for settlement:—

	Acres.
Alberta.	
Zone 1. North of Peace River to Berwyn	1,650,000
Zone 2. South of Peace to Smoky and Wapiti	1,750,000
British Columbia.	
Zone 3. South of Peace River	850,000
Zone 4. North and south of Finlay Forks	600,000
Zone 5. North of Peace River	1,150,000
Total acreage	6,000,000

A forecast of future agricultural development and production may be based upon the progress made in Alberta. To estimate railway tonnage, regardless of crop yields, the more conservative figures of the 1925 report, 0.22 ton per acre, will be used:—

	Tons.
Outgoing stock and grain	1,100,000
Outgoing other by-products (15 per cent. of above)	200,000
Incoming agricultural traffic (5 per cent. of both)	65,000
Total tonnage	1,365,000

Forests.

The estimates shown on Map 4 based upon 1929–30 reports should be revised to allow for depletion due to forest fires. Of the total 14 billion board-feet merchantable timber in Region B, British Columbia, 2 billion east of Pine, Murray, and Beatton Rivers may be excluded from potential export figures as burned, logged, or remain for local market. The remaining 1.8 billion in the Block may be discounted 50 per cent. for the same reason. One billion board-feet in the upper Pine watershed may be river-driven, but in general the forest products west of the Rockies can be more economically developed first.

It may be assumed that 1 billion board-feet will be inaccessible for some time to come. With feasible stream improvements raw materials can be driven to concentration points in the main valleys. The chief manufacturing sites will be at Finlay Forks and the head of Rocky Mountain Canyon. Potential water-power, coal, and limestone, are available between these sites.

The upper Parsnip contains a stand of Douglas fir. The bulk of the merchantable timber—spruce 70 per cent., pine and balsam 29 per cent.—may be considered of small diameter compared with Coast standards, but the size permits small outfits and farmer-woodsmen year-round cutting and logging with light equipment. A percentage of immature can be utilized for pulp-wood and mine-props, leaving sufficient restocking for a continuous harvest.

The lightweight Interior woods are already in demand in the east and south, and should also find an ocean-borne market being shipped via Prince George. Assuming 10 billion board-feet as physically accessible and the volume of all timber products expressed in saw-timber, but not including immature and reproduction, a 2-per-cent. annual cut will produce 300,000 tons of railway traffic.

Minerals.

West of the Rocky Mountain Trench the Northern Interior contains favourable conditions for mineral occurences, especially in the contacts of the Cassiar batholith and related intrusives. Considerable work was done on the Ingenika silver-lead-zinc property. Some of the prospects are shown on mineral chart 5. Properties developed

in the Omineca Mining Division from 1900–44 produced $2.8 million in precious and $1.9 million in base metals, the latter mainly due to access from Canadian National Railway.

In and east of the Rockies some non-metallics are found in quantity. The foothill country contains promising petroleum structures similar to those forming oil reservoirs in proven fields. Coal of quality and in quantity is present in the Pine and Peace valleys. In the latter there are two areas, the Rocky Mountain Canyon and Carbon river, both described under section 13.

Coal in quantity is already mined in British Columbia and in Alberta, so the Peace coals would be of little interest for some time to come were it not for their high quality chemically and physically. With indicated large tonnage deposits, low mining costs, small moisture and ash content; utilization and market estimates used are justified.

The following considerations support this view: A dependable coal-supply is evident; the coal can be easily beneficiated. Vancouver Island coal-supply is diminishing (it should be reserved for coking purposes), declining rate of new oil-producing fields and the fact that Peace River coal may be used instead of coke in the carbon and chemical industries. There is in British Columbia a coal market now supplied by Alberta coal. Steamships and locomotives could use this coal. The above is an outline only, which would indicate that a special investigation of these coal deposits is justified.

It would be to the advantage of the British Columbia Government to see that the production and marketing of the Peace coals are realized, especially in view of its railway problem. Development of the present market may justify a supply of 1,000 tons daily; energetic and efficient production and marketing should double this estimate to a 2,000-ton train a day or 750,000 tons annually.

WATER.

In Region B the Rocky Mountain Trench is drained by the Peace River flowing through the mountain pass. Inland waterways show low gradients available for transportation systems.

Irrigation is not required, but careful farming methods are essential to reap advantage of early summer rains. Domestic water-supply is generally available from wells and small reservoirs.

The following rivers have potential water-power sites which may be utilized in forest and mining industries: McLeod, 500; Nation, 650; Murray, 700; Pine, 1,400 minimum continuous horse-power.

The 1930 survey undertook investigations and stream measurements to estimate the potential hydro-electric power at Rocky Mountain Canyon where 153,000 minimum continuous horse-power can be developed at an estimated cost of $130 per horse-power. Two hundred and eighty-three thousand horse-power was estimated for six months in the year, nearly three times the amount used in all British Columbia pulp and paper industry in 1944.

With raw materials collected by rail and water this power should aid in developing industrial communities. Incoming passenger and freight traffic can thus be anticipated beyond the usual accruing from agricultural settlements. Vancouver and adjoining manufacturing centres can supply much of the incoming needs; these centres (with ocean shipping) require the outgoing semi-processed materials. The natural north and south railway route with lateral extensions will ultimately afford this desirable exchange of commodities.

MISCELLANEOUS.

The 1925 report suggested 5 per cent. of outgoing agricultural traffic (or 65,000 incoming farm requirement tonnage) mainly of eastern origin. Certain factors such as improved standards of living, new agricultural methods and requirements (to be supplied by south-western British Columbia manufacturers and world shipping) will increase incoming rail traffic. The distance from Pacific manufacturing and shipping centres to the Peace River country discourages through truck transportation.

According to the 1941 census, Region B in Alberta had a total population of 30,000, depending mainly upon 1,000,000 acres of improved land. Of the total 6,000,000 cultivable acres in Region B it is safe to assume the improvement of 4,000,000 acres with an anticipated agricultural and allied industrial population of, say, 90,000.

In the East Kootenay country, with forests similar to Region D, the 1944 sawlog production of 93,000 M.B.M. employed 1,500 men in woods and mills. With possible stability of the forest industry and improved communities with family accommodation the potential annual harvest of 200,000 M.B.M. in Region B should support, say 7,500 people.

Judging from the population in the Crowsnest coal towns a coal industry in Peace River may ultimately support a population of 5,000. Other mining pursuits may not be estimated until properties are fairly well advanced, but the power and coal possibilities should augment the supply of raw with semi-processed materials. Judging from pulp and paper towns in British Columbia, industrial communities should account for a population of 5,000.

Development of the northern territories beyond railway extensions will create distributing and forwarding centres. Having regard to the factors outlined above the population of Region B may develop into, say, 100,000.

Region D 1935–39 annual manufacturing and miscellaneous freight averaged 22,000 tons, the bulk being incoming tonnage. The 1941 population was 14,000. On the basis of the above figures the potential manufactured and miscellaneous tonnage accruing to Region B may be estimated at 150,000 tons, which would include the 65,000 mentioned in the introduction to this section.

APPENDIX C.

REGIONAL CHARACTERISTICS.

INTRODUCTION.

Appendices A and B dealt with the potential resources in areas from which tonnage might accrue to a railway extension to tap the known main resources, and included Region B, Peace River Country, and Region D, Pacific Great Eastern region south of Prince George.

The following is a concise outline of the characteristics and resources of Region A, Northern British Columbia, and Region C, Canadian National Railway Belt. From these regions no railway tonnage has been estimated nor included in the general report. The present purpose is to complete the study of Northern British Columbia and to exhibit the vast area in the north capable of future development.

HISTORY.

Fort St. James and Fort Fraser originated as trading-posts about 1805. Robert Campbell went up the Stikine River and established a post at Dease Lake in 1838. Five years later he continued north-east through the upper Liard Valley and on to the Yukon River. In 1865 the Western Union Telegraph Company commenced to build a line to the Bering Straits; this venture was followed by an influx of placer-miners in the north country and later by settlers in the Nechako Valley. The Trail of '98 was an attempt at an overland route to the Yukon gold-rush.

In 1860 four placer-miners left the Cariboo and crossed the Rockies through the Yellowhead Pass. Two years afterwards about two hundred men travelled across the country from Eastern Canada and reached Tête Jaune Cache by the same route. Over fifty years later the Grand Trunk Pacific Railway (present Canadian National) completed its line through the Yellowhead Pass. The seaport of Prince Rupert handled material during railway-construction.

As a defence measure the Cariboo Highway was extended into Prince Rupert during World War II. The Alaska Highway from Dawson Creek to Fairbanks was also constructed primarily to serve a series of airports. The Haines cut-off from the Alaska Highway was constructed to relieve ocean-borne war traffic on the Yukon and White Pass route.

PHYSICAL.

The Resources Maps show that Region A includes all of Northern British Columbia roughly north of Stewart–Sifton Pass–Sikianni Chief River. The total area is about 100,000 square miles, over one-quarter of the entire Province. The divide between Arctic and Pacific waters is near Dease Lake. The main drainage is toward the Liard River; the Stikine is the principal access from the Pacific. Streams form networks with small lake expansions, except in the north-west corner where Atlin, Tagish, and Teslin Lakes form a pronounced lake region. The Physical Map shows a high broken country west of a line from Fort St. John to Fort Nelson. East of these points most of the country is below 3,000 feet altitude.

Region C extends across the central part of the Province and is roughly bisected by the Canadian National Railway Prince Rupert line. Practically all drainage is finally toward the Pacific; the principal river systems are the Nass, Skeena, Nechako, and Fraser. The central plateau of medium altitude contains large lake areas, including Babine, Stuart, Takla, Burns, and Francois Lakes. The Fraser River rises near the Provincial boundary, flows north-west through the Trench, broadens into a wide valley where joined by the Salmon and Nechako Rivers in the Prince George district, and finally turns to follow due south through Region D.

CLIMATE.

East of the Coast Range the climate of Region A is not generally influenced by physical features; summers are warm and generally dry, and winters are long and cold but bearable on account of the low humidity. Published reports are limited to the following stations:—

Station.	Altitude.	Precipitation.		Temperature.	
		Annual.	Summer.	Annual.	Summer.
	Feet.	Inches.	Inches.	Degrees.	Degrees.
Atlin	2,240	11	4	32	53
Watson Lake	2,216	15	7	28	53
Fort Nelson	1,200	14	7	30	57

At Fort Nelson from May 1st to September 30th the average daylight between sunrise and sunset is 16 hours; early summer rains yield a quick luxuriant growth. Average depth of snow in the Rocky Mountain Trench is from 18 inches in the lower levels to 4 feet at Sifton Pass. Where the Liard River joins the Mackenzie River the latter opens six weeks earlier each spring than Great Slave Lake.

Region C has variations in climate due in part to geographical conditions such as coastal, mountainous, Interior plateau, and upper Fraser "Trench" areas. Returns from the following stations are representative:—

Station.	Altitude.	Precipitation.		Temperature.	
		Annual.	Summer.	Annual.	Summer.
	Feet.	Inches.	Inches.	Degrees.	Degrees.
Prince Rupert	170	95	22	46	55
Terrace	200	47	8	44	58
Hazelton	1,150	19	7	40	55
Vanderhoof	2,100	13	6	35	54
Prince George	1,870	21	8	39	55
McBride	2,400	20	7	40	55
Barkerville	4,200	38	14	35	52

Forest Map 4 shows that forest-cover is general throughout the region with more abundant growth in the Coast area and in the Prince George-McBride district. In the areas suitable for settlement irrigation is not practised; the average humidity is higher than that prevailing in the Interior Dry Belt.

RESOURCES.

With the exception of the country traversed by the Alaska Highway, the Stikine–Dease water route, and the White Pass route, Region A and its natural resources require further investigation. Results of limited reconnaissance surveys are shown on Maps 3 and 4. The appreciable agricultural lands suitable for settlement will be found along or east of the Alaska Highway. In the eastern part of Region A forest-growth is distributed over the plateau; elsewhere merchantable timber is confined to the valleys. Average estimated yield per acre is 8 M.F.B.M. There is a constant seasonal fire-hazard due to the dry climate and the lack of forest protection. Except for trapping and hunting, outdoor attractions do not compare with other regions. Because of expensive access, high valued minerals (especially placer gold) have been the primary attraction. Along the eastern part of the Alaska Highway the discovery of petroleum, natural gas, and coal may be anticipated. From present information mineral possibilities are of primary importance in Region A. The principal water-power sites are at the canyons of the Liard and Stikine Rivers.

The central plateau traversed by the Canadian National Railway contains nearly all the agricultural lands in Region C. Activity in forest products has assisted the settlers with part-time work. Lumbering, especially in the Coast area and east of Prince George, is the principal industry. Gold-mining is increasing with a return of labour. Certain war minerals such as mercury and tungsten, although produced in quantity, are not now in demand. According to a 1935 Dominion geological report there were over 200 mining prospects and former producers in the Portland Canal area. The commercial possibilities of the Groundhog coalfields have yet to be proven. Telkwa coal was used during the war. There are potential water-power sites in the Nass, Skeena, and Nechako River basins.

TRANSPORT.

Early access to Region A was by river route and trail along the Stikine–Dease waterways into the mining country; this route afterwards was used in connection with airport construction at Watson Lake. The Yukon and White Pass Railway from Skagway to Whitehorse serves the Atlin Lake district and Yukon country. The Haines cut-off road joins the main Alaska Highway 100 miles north-west of Whitehorse. Construction of the telegraph-line north of Hazelton and the Trail of '98 through Sifton Pass afforded interior pioneer routes. The Fort Nelson country was reached by Indian trails from the south. The Alaska military highway served amongst others the following airports: Fort St. John (M-50), Fort Nelson (M-317), Watson Lake (M-670), Whitehorse (M-974), and Fairbanks (M-1582)—all mileage from Dawson Creek. Principal airports (shown on Transportation Map 1) should in time be used to develop Region A.

Access from the Pacific to the western part of Region C is possible by the many inlets and rivers, notably Portland Canal and Skeena River, leading to the Interior mining country. Advantage was taken of the Interior lake and river systems by early traders and settlers. Historical reference has been made to exploratory trips from the north and east toward the Fraser River. A series of watercourses from Yellowhead Pass to the Pacific bisect the Province; these waterways were followed by the Grand Trunk Pacific in a northern transcontinental line to Prince Rupert. The following are important points *en route* with mileage from Jasper, Red Pass Junction, 530 miles to Vancouver (M-44), McBride (M-107), Prince George (M-253), Endako (M-368), Smithers (M-493), Hazelton (M-543), Pacific (M-600), and Prince Rupert (M-720). First- and third-class trains operate daily in and out of Prince Rupert. The Cariboo Highway, from Prince George to Hazelton (310 miles), now extends 190 miles farther to Prince Rupert. There is a road from Vanderhoof through Fort St. James to Manson

Creek. East of Prince George a highway is under construction along the Fraser to Jasper; this will be connected with the North Thompson Highway from Kamloops.

SETTLEMENT.

According to the 1941 census the population of Region A was 1,887 people, of which about 1,200 were Indians. There is little settlement as the term is generally understood; mining, fur-trading, and freighting are the main industries. Definite census returns are difficult due to seasonal placer-mining activities.

There are trading centres at Fort Nelson, Lower Post, McDame Creek, Dease Lake, and Telegraph Creek; Atlin is the chief distributing-point for the north-west corner of Region A. During airport and highway construction population increased at such centres as Fort Nelson, Smith River, Watson Lake, Teslin Lake, and Telegraph Creek.

East and north of the Rockies the average climate compares favourably with that of the Interior along the Canadian National Railway. Gardens thrive and game is abundant. There are settlement possibilities in such districts as Fort Nelson and Lower Post.

In 1941 there was a total population of 30,700 in Region C. Census returns were made according to the following subdivisions:—

Portland Canal-Nass (including Premier, Stewart, 450)	2,353
Skeena-Coast (including Prince Rupert 6,700, Terrace 350)	10,554
Skeena-Bulkley (including Hazelton, Smithers, 350)	4,862
Upper Nechako-Lake Region (including Burns Lake 220, Vanderhoof 350)	4,981
Nechako-Fraser-Parsnip (including Prince George 2,000)	5,253
Fraser-Canoe (including McBride 240)	2,713
Total	30,716

Of the gainfully employed approximately 10 per cent. were in agriculture, 25 per cent. other primary, 10 per cent. services, 7 per cent. manufacturing, and 5 per cent. transportation. The main population centres are situated along the railways and highways. In the great areas beyond these facilities there are comparatively few miners, prospectors, and trappers. Prince Rupert is the headquarters for the Canadian North Pacific fishing fleets; cold-storage plants, shipyards, and railway terminal work are the main sources of employment.

MISCELLANEOUS.

There are Provincial Government agencies at Telegraph Creek and Atlin and ten Mining Recording offices distributed through Region A. Canadian customs offices are at Premier, Boundary, and White Pass. Anyox, Watson Lake, and Fort Nelson have hospitals.

Lack of tourist facilities preclude recreational traffic on the Alaska Highway. Muncho Lake with its fishing and big-game country and the hot springs in Toad River valley afford a promising site for a Provincial park. The Vancouver–Rupert–Skagway inside passage trip is a first-class tourist attraction leading to the lake areas in Zone 4 and the Yukon country beyond.

Region C is provided with Government Agencies at Prince Rupert, Fort Fraser, and Prince George, and twenty Mining Recording offices at various points convenient to the prospector. There are District Forester headquarters at Prince Rupert and Prince George, and Agriculturalists at Smithers and Prince George. Seven hospitals are in operation between Rupert and McBride.

Prince George is becoming a travel centre as highways are improved and extended. The triangle (water and rail) trip Vancouver–Rupert–Jasper was a tourist feature before the war. Region C offers a satisfactory habitat for a wide variety of wild life. The Vanderhoof-Fort Fraser agency, even though a farming district, issued 100 trappers' licences. Big-game and sports fishing augment the tourist industry.

AGRICULTURE.

Region A is divided into four zones shown on map 3:—

1. Lower Liard and Hay Rivers.
2. Upper Liard River.
3. Stikine-Iskut River.
4. Atlin-Teslin Lakes.

Apart from production for local markets little cultivation can be expected in Zones 3 and 4. There are about 20,000 acres around Teslin Lake with fair soil but subject to summer drought. The flats of Tagish and Little Atlin Lakes would have to be reclaimed to be utilized. In Zones 3 and 4 certain areas of alpine and lowland range are sketched on the Agricultural Map. At Telegraph Creek, the Nahlin River, and upper Skeena River horses are kept on the open range all winter.

Results of soil surveys in Zones 1 and 2 undertaken by the Dominion Government in 1943 are summarized as follows:—

Fort Nelson district—500,000 acres of arable land with heavy clearing.
Liard River terraces—17,000 acres of arable land with heavy clearing.

The above-mentioned zones have short but intensive growing seasons with dry summers and long hours of daylight. It has been reported that grain-crops can be grown as far north as Fort Simpson (north latitude 62°).

The Fort Nelson River flats afford some sites for small farms, but for extensive cultivation clearing will be heavy and there is a danger of flooding. The Nelson plateau is a rolling upland area: the soil is a heavy, fairly stone-free clay, classed as wooded but only slightly leached. This plateau contains about one-half million acres of potential farm lands and extends 50 miles along the highway west of Muskwa River crossing. The well-drained parts are covered with heavy stands of aspen poplar, the level and less drained comprise shallow muskegs with some spruce.

Along the Racing River there are about 1,000 acres of level sandy loam with light clearing, which along with the grazing land have potential value as ranch properties. The terraces of the Liard River are fairly level with apparently good soil. Clearing will be heavy on the main area between Smith and Coal Rivers. About 215 miles beyond Muskwa there is a small arable tract near the hot springs (tropical valley). The terrace around Lower Post has fine sandy loam and is fairly level with quite light clearing.

Range and grazing lands require further exploration; present estimates include about 1.4 million acres of open grazing and wild-meadow land. From information to date areas have been sketched on Map 3; some of these extend north of the Peace River country in British Columbia and should be utilized along with grain and mixed farming north of the former Dominion Block.

Other potential farm lands are between Fort Nelson and Hay Lakes. A large tract of grass and park land, estimated at 100,000 acres, lies north of Hay Lakes. In the lower Peace and Vermilion districts exploratory surveys estimated some 2½ million acres of park land, first- and second-class soils to be agricultural lands. These areas suitable for settlement extend south to the Northern Alberta Railways, so a railway extension would not be traversing an unproductive area.

Region C throughout its main agricultural belt is already served by certain transportation facilities. Government services and assistance compare favourably with those of the older settlements in the Province. Having regard to the publications covering agricultural pursuits and the purpose of this report to review regions with insufficient transportation facilities, the following quotations and tabulations will serve to indicate the agricultural potentialities of Region C. The Canadian Department of Agriculture in 1943 reports:—

"Farming has been carried on to some extent in this area since the railway was built. However, development has been rather slow as at present there are only about 50,000 acres of cultivated land in the area. However, general agriculture is quite practical in the areas as shown by the results obtained by the better farmers and by recently established Dominion Experimental Stations located at Smithers and Prince George."

Of 1,835,000 acres soil surveyed, preliminary estimates indicate a possible 1,000,000 acres of arable land, the greater portion of which is available for settlement; 700,000 acres were classified as arable, the bulk of which is wooded, but a considerable portion could be easily cleared. All this land lies reasonably close to the railway; a fair main highway traverses the area.

The following summary was compiled from a 1934 Provincial Government report, which included an approximation of agricultural areas based upon percentages of various classes of land in surveyed areas shown by zones on Map 3.

Zone.	Acres. Arable.	Grazing.
1. McBride	19,000	25,000
2. Prince George	225,000	365,000
3. Fort Fraser	260,000	380,000
4. Fort St. James	29,000	160,000
5. Smithers	80,000	275,000
6. Terrace	85,000	.....
Totals	698,000	1,205,000

For a detailed study of the agricultural possibilities the reader is referred to the Land Utilization Survey of Nechako Valley in 1942 undertaken for the Provincial Land Settlement Board. This survey affords a guide to estimate the potential settlement value of Region C.

FORESTS.

The Provincial Forest Branch in their 1944 report outlines the results of a forest resources reconnaissance and inventory undertaken in Region A. The four zones are shown on Map 3; these have been subdivided into eight drainage areas with merchantable timber acreage and board-feet shown on Map 4.

The productive forest land is estimated at around 4 million acres or about 14 per cent. of the whole region and is generally confined to valley-bottoms. In addition to the map details by drainage areas the following is quoted by zones:—

Class.	Zone. I.	II.	III.	IV.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.
Merchantable	55,000	135,000	165,000	181,000	536,000
Immature	1,341,000	1,014,000	505,000	637,000	3,497,000
Not satisfactorily stocked	2,520,000	1,059,000	913,000	203,000	4,695,000

The more productive forest land is generally confined to Coast valleys, to westerly drainage at the northern boundary, and to the area east of the Rockies tributary to Nelson and Liard Rivers. Even with access from the Alaska Highway, which traverses some of the most productive areas, an adequate control system for other than roadside fires is not considered feasible at present.

Before construction of the Alaska Highway small sawmills supplied building and mining lumber in the Atlin Lake district. During highway-construction many portable mills cut spruce for bridge timber and camp buildings. Lumber from along the Nelson and Liard Rivers has been shipped via water route to the Mackenzie River district. Forest products' shipments may also be made via Coast waters. Local use especially for mining purposes affords the present market. When the agricultural lands in the Fort Nelson-Hay Lakes-Lower Peace districts are being settled and minerals, especially petroleum, developed the heavy stands of spruce in the Fort Nelson district will be utilized.

Of the total of 70 billion board-feet of merchantable timber reported in the four regions under review, Region C is estimated to have 38 billion. Drainage areas 1 and 2 east of Prince George carry one-third and all the Interior areas 1 to 6, inclusive, carry

about three-quarters of the merchantable timber in Region C. Forest Map 4 shows a fairly uniform distribution of forest-growth over the Interior plateau.

Region C figures quoted in Map 4 are based upon 1937 figures. In addition to the 5.2 million acres of merchantable timber, there are 4.5 million acres immature and reproduction and 4.9 million acres of other productive forest land not satisfactorily restocked. Productive forest land is estimated at 38 per cent. of the total area of Region C.

Forest products will continue to make a large contribution to the wealth of Region C. Protection, yield, and management will no doubt be influenced by the Sloan Report, 1946. Utilization, accessibility, and markets will vary from time to time. As this region already has main railway transportation these subjects are not amplified in this report.

MINERALS.

The Coast Range is made up of igneous rocks intruded as a great batholith; in places spurs of these rocks extend into the plateau. There is evidence to assume that the core of the Cassiar-Omineca system may constitute a batholith comparable to that of the Coast system. The Rocky Mountain rocks are mainly folded and faulted sediments; the Rockies recede in altitude in the northern part of Region A.

West of and including the Rockies the area is generally mountainous and covered with overburden, except above the timber-line. Only a small part of this mountain territory has been examined. Map 5 indicates some of the prospects and working properties. The following is based upon a 1944 report by the Dominion Government:—

In the Rainy Hollow area mining has been retarded by access and development costs. A small deposit of high-grade silver-copper was worked in the early 1920's. In 1928–29 extensive exploratory work was done on the Gold Cord property but indicated low and erratic gold content. Coarse gold was found in Squaw Creek and placer-workings have been carried on since 1927; this area also shows promise of lode-gold.

To date placer-mining is considered more profitable than lode prospecting in the Atlin Lake area. However, the Engineer mine was in operation for many years and shipped selected high-grade ore. Spruce and Pine Creeks produced over $12,000,000 in placer-gold up to 1939. In other camps thirty-nine producers were distributed over ten creeks in 1942. Copper-silver-gold, antimony, tungsten, hydromagnesite, and molybdenite occur but require further work to prove of commercial importance.

Dease Lake and River area is usually referred to as the Cassiar gold area. A granitic batholith is known to be 150 miles long and may extend to the headwaters of the Finlay River. About $5,000,000 in placer-gold has been produced in the Cassiar area. Rich shallow ground was worked on a tributary of McDame Creek. There is still considerable virgin ground to be prospected. In 1939 a small mill was installed where rich gold quartz was discovered near McDame Lake. Platinum, coal, asbestos, chromite, magnetite, galena, and copper are known to occur in the Dease Lake and River area.

Minerals reported adjacent to the Alaska Highway between Watson and Teslin Lakes include molybdenite, fluorite, sheelite, chalcopyrite, and tetrahedrite, but not in commercial mineral deposits.

In the upper Liard River area, the Turnagain and upper Kechika River regions, reached from Prince George, have produced some placer-gold. Prospects of gold, copper, chromium, nickel, and coal have been reported.

East of the Rockies the mineral most likely to lead to the economic development of the eastern part of Region A is oil. Geological formations indicate petroleum possibilities. When drilling for water at Fort Nelson sufficient natural gas was encountered to supply a construction camp. Sedimentary iron ores of commercial quantity may be found as some horizons of the Rocky Mountains are known to be ferruginous.

From 1900 to 1944 the production of precious and base metals in Atlin and Stikine mining divisions amounted to about $20,000,000. Prior to this Stikine produced around $4,000,000, mainly placer-gold.

The following is a concise description of the important mineral occurrences and activities in Region C:—

Portland Canal, Skeena, and Omineca mining divisions from 1900–44 produced around $190,000,000 in precious and base metals. Up to the early thirties over 22,000,000 tons of ore had been mined in the Portland Canal area: Anyox handled 90 per cent. of this ore and up to 1935 produced over 645,000,000 lb. of copper, when reserves became depleted and operations suspended. In 1939, Big Missouri and Premier gold and gold-silver mines employed 450 men; value of production was $2.4 million for the Portland Canal area.

Groundhog coal was discovered about 1903. Reports, 1912–15, suggest that the coal is of superior quality, but in some areas folding is complex with minor folds and crumples, this structure is also complicated by faulting. During the war considerable coal was shipped from Telkwa mines to construction and military camps and for use other than locomotives on the Canadian National Railway.

Between Terrace and Cedarvale some development-work has been done on gold and molybdenite prospects; this area is worthy of careful examination. In the Hazelton area there are prospects of gold, silver-lead-zinc, bismuth, and antimony. Tungsten was produced in quantity during the war at Red Rose mine. Some high-grade gold-silver-copper ore has been shipped from Babine Mountain and Smithers area. In the Topley area work has shown high-grade galena ore. The Silver Queen silver-lead-zinc property was partly developed at Owen Lake. Geological reports suggest mineral occurrences near Taltapen Lake which should improve with depth.

On Stuart Lake west of Fort St. James work was done and some shipments of antimony made since 1939. Pinchi Lake, a large war producer of mercury, employed 450 men, but operations were suspended in 1944. At the north end of Takla Landing there are other mercury prospects and producers.

On Averil Creek north of Hansard scheelite is reported to be prevalent and worthy of further investigation for possible tungsten development. Results in and around Barkerville indicate gold possibilities, both lode and placer in the Cariboo Mountain area.

In general the northern half of British Columbia may be considered according to accessibility. Most of the country west of the Coast Range may be reached by Coast and river vessels, the railway belt has waterways, roads, and trails. These areas have produced important mineral properties such as Polaris Taku, Premier, and Big Missouri gold or gold-silver, Anyox copper, Red Rose tungsten, and Pinchi mercury mines. New discoveries and further development of known deposits may be anticipated.

The area east of the Coast range and north of the railway belt is in general less well known. Except for the small part served by the Northern Alberta Railways, this area depends upon river, air, and road transport. Until transportation facilities are improved only high-grade minerals (principally gold) may be considered profitable.

WATER.

The following is based upon a report of the Dominion Water and Power Bureau in 1944:—

In addition to potential power, water is essential for domestic and other industrial uses. When river and lake systems are navigable winter haul is usually practicable, especially during the pioneer period. As this Province extends transportation and development northward, the Mackenzie and Yukon River basins should increase in importance to British Columbia. In this report reference will be made to the north country beyond Regions A and B. The north Pacific region includes the following major drainage-basins:—

The Mackenzie River drains northward into the Arctic Ocean. Its tributaries include the Peace (820 miles long, with a drainage area of 119,000 square miles) and the Liard (700 miles, with 106,000 square miles). The Frances, Dease, Kechika, and Fort Nelson (200 miles, with 21,000 square miles) are the main tributaries of the Liard.

The Yukon River drains north-west into the Bering Sea (250 miles with 160,000 square miles in Canada, 1,150 miles with 200,000 square miles in Alaska). Its tributaries include the Lewes, Pelly, White, Stewart, and Porcupine Rivers.

The Fraser River basin drains southward and empties into the Pacific through the Gulf of Georgia. The main northern rivers in this system include the McGregor and Nechako (180 miles, with 18,000 square miles).

The main coastal rivers include the Taku, Nass, Stikine (310 miles, with 20,700 square miles), and Skeena (330 miles, with 21,000 square miles).

There are many large lakes and headwaters which offer possibilities for water-storage. These include three lakes in the Stuart River system and ten located in and north of Tweedsmuir Park, all draining into the Nechako; the headwaters of Nation River include four lakes; Babine Lake empties into the Babine River, a tributary of the Skeena; Morice River has two lakes with flow into the Bulkley River; Atlin, Bennett, Tagish, and Marsh Lakes have as their outlet the Lewes through Lake Laberge; Teslin Lake and River also empty into the Lewes River.

The main power-developments to date are 15,000 horse-power on the North Klondyke River and 10,000 horse-power near Prince Rupert. The following are some of the sources of undeveloped water-power:—

Fraser drainage-basin: Nechako at its Grand Canyon and Stuart Lake and River system. Total power estimated for the upper Fraser some 1.6 million horse-power at minimum flow.

Mackenzie basin: Nation River, potential 80,000 horse-power (1929 report estimated without storage); Peace River Canyon, 160,000 horse-power minimum; Grand Canyon of the Liard.

Yukon drainage-basin: Lewes and Pelly Rivers.

Skeena drainage-basin: Sustut, Babine, and Bulkley Rivers.

Nass and Bell-Irving Rivers.

Stikine drainage-basin: Stikine and two of its tributaries.

Estimated power figures are based upon limited records. Full advantage can not be taken of some sites on account of flooding adjacent railways. Evidently there is a distribution of adequate water-power for the development of mineral resources and wood-cellulose products. Potential power near deep water coastal anchorages should attract heavy power-using industries.

The coastal waters of the Pacific North-west have natural conditions conducive to profitable fishing industries. Lakes and streams are also available for fresh-water species.

With its proximity to the rich halibut banks Prince Rupert has certain advantages over southern landing ports. In 1944 the canned-salmon pack caught in the Skeena and Nass Rivers was 210,000 cases, being 20 per cent. of all British Columbia.

Interior lakes and streams offer potential commercial and sports fishing; the latter is favoured as a tourist attraction. Even the northern lakes such as Teslin do not at present warrant development of commercial fishing except to supply local needs.

The bulk of the foregoing headwater storage and potential power-sites are in British Columbia. Northward to the Arctic the land areas flatten out and river gradients and banks decrease. Yukon and Lewes Rivers have been navigated for over forty years. The Mackenzie, Liard, and Peace Rivers are navigable for great distances. Even with improved air and land travel river transport will continue to be important. Storage and regulation for power purposes should have regard to navigation aids and fish propagation.

ROUTES.

Transportation Map 1 shows northward railway extensions which may in time serve Region B and territories beyond. Physical Map 2 indicates the importance of waterways for water-borne transport, low-altitude land routes or a combination of both. Regions A, B, and C contain well-defined south–north routes and east–west passes, including the Yellowhead, Peace, and Liard.

Having regard to the progressive development of the Pacific North-west and the lower Mackenzie River basin the following routes are mentioned herewith:—

The coastal inside passage and the seasonal White Pass and Yukon route (110 miles of connecting railway) has been in operation for nearly fifty years. Steamboats operate Yukon basin waters which traverse the interior and low-altitude parts of Alaska.

A route from Fort St. James along the lake country and Driftwood River joins an alternative from Hazelton and follows up the Skeena; then a north-western extension follows the Stikine waters and Atlin Lake to Whitehorse. This route is apparently favoured by interests in the State of Washington as a connection with Alaska. New mining areas and a scenic country would be opened up.

The Rocky Mountain Trench through Sifton Pass (3,270 feet) joins the Liard valley on the northern boundary of the Province. A railway reconnaissance survey indicates probable easy gradients and direct alignment. Light construction and little precipitation suggest economical maintenance. To reach Yukon waters via Frances River another summit of 3,150 feet would have to be crossed near Finlayson Lake.

The Alaska Highway from Dawson Creek to Fort Nelson connects railhead with navigable water from Nelson to Simpson and offers a short route to the Mackenzie. This should justify the upkeep of the highway to Fort Nelson as an integral part of a natural access to the Northwest Territories and the Arctic. The rivers are adapted to seasonal navigation and winter roads. The wide valleys offer no appreciable difficulties in constructing all-season land routes as progressive development warrants. An east–west railway line if constructed north of the Peace would meet the Alaska Highway about 80 miles north of Dawson Creek.

The Peace River is navigable east of Hudson Hope. The west side of this river offers a land route north of the Hines Creek road and railway which can be extended via Hay River to Great Slave Lake. Navigation on the lake does not open as early as on the Mackenzie River at Simpson.

It is reported that three-fourths of the land and nine-tenths of the world's population are north of the equator. The north polar sea is essentially the centre of the important part of the globe. The shortest distances for flying between these populous areas are in northern latitudes. Air routes, utilizing many of the existing airports, will continue to develop the Pacific North-west and will play an important part in future world affairs.

Industrial growth, with water-power and shipping facilities, in the Vancouver and Puget Sound areas requires a source of raw material as well as markets. Development of and transportation to the northern regions of the Pacific North-west should result in a reciprocal movement of goods along natural channels—land, water, or air—and in time become a part of global trade routes.

ACKNOWLEDGMENT.

The foregoing reports in Appendices A and C are intended to be general and extensive. Acknowledgment for data and information is gratefully made to Government departments. To retain a non-technical interpretation the reports were not edited by departmental specialists. The appraisal in Appendix B includes an estimate of ultimate tonnage which may accrue from the potential resources of Regions B and D when adequate development, transportation, and markets are provided.

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