

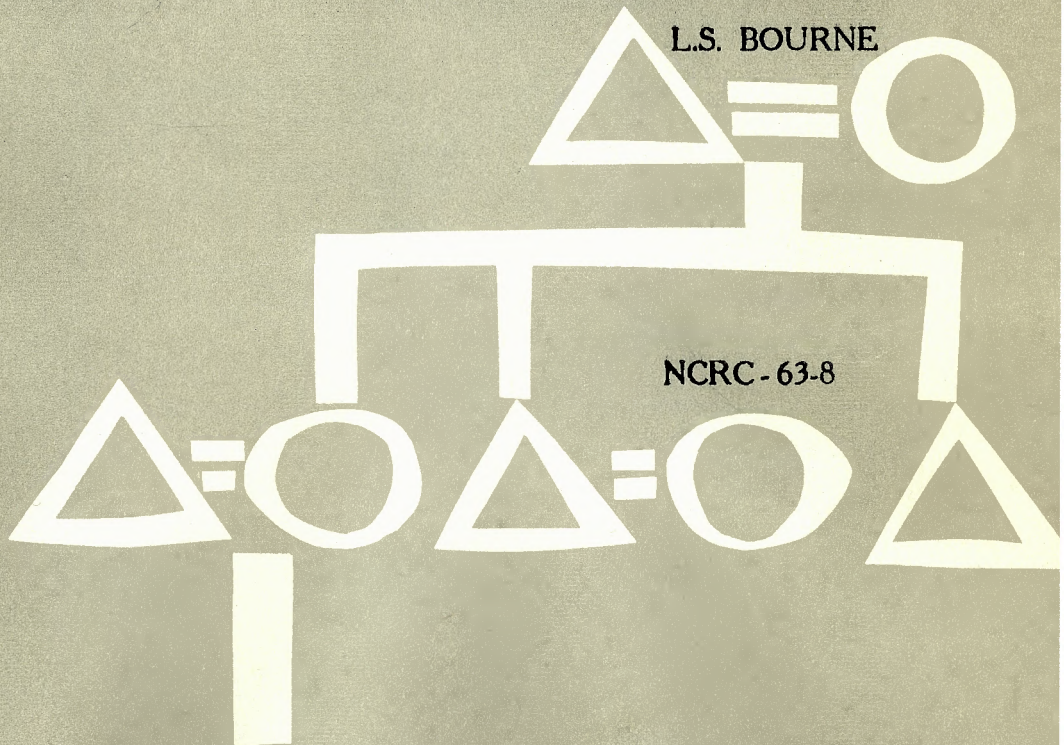
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YELLOWKNIFE, N.W.T.

A STUDY OF ITS URBAN AND REGIONAL ECONOMY

L.S. BOURNE

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YELLOWKNIFE, N.W.T.

A study of its urban and regional economy.

by

L.S. Bourne



This report was originally submitted as a thesis at the University of Alberta, and is being reproduced in its present form as a contribution to our knowledge of the North. The opinions expressed, however, are those of the author and not necessarily those of the Department.

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Ottawa, Ontario, Canada.

September, 1963.

PREFACE

Among its other functions, the Northern Co-ordination and Research Centre publishes, or aids in the publication of, reports, papers, books and theses on northern Canada and northern development which merit publication, but for which financial support is not available. Mr. Bourne's thesis, which was originally submitted as an M.A. thesis in Geography to the Faculty of Graduate Studies at the University of Alberta in April, 1963, contains a great deal of detailed information on the town of Yellowknife. Accordingly, the Centre is publishing this thesis to make it more widely available to all interested in the settlement and its development.

ABSTRACT

This study is concerned primarily with the economy of the community of Yellowknife, N.W.T., and its service region to the north and east. It represents an attempt to study, in detail, the economy of a northern settlement and to provide an outline of an approach which could be applied in other northern areas.

Yellowknife is essentially a gold mining community which has, in recent years, developed into one of the most important service centers in northern Canada because of its strategic location, modern transportation facilities and urban amenities. Its service region to the north is defined as a functional region delimited by the extent of charter airline service from Yellowknife.

It was found that despite the growth of regionally oriented functions, Yellowknife remains a specialized community dependent on the unstable economy of gold mining. The community has received a substantial amount of government subsidy throughout its existence, but this does not seem to have been based on any assumption that Yellowknife will be a permanent settlement.

The basic hypothesis here is that northern mining communities such as Yellowknife, because they are rare, expensive, and contain the service functions for large areas, should be planned as permanent almost from the beginning. For the Yellowknife area, it is suggested that Yellowknife is the logical location for a permanent regional center, defined on the basis of a regional settlement plan and co-ordinated with a service area consisting of non-permanent, temporary mining camps. These camps, with Discovery and Taurcanis as examples, should allow for

the physical mobility demanded by the mining industry.

Similarly, the approach holds in other northern areas where the economic base consists almost entirely of mineral resources. The settlement pattern, with modifications, would be most economical and beneficial were it based on a master plan of resource and community development. The responsibility for initiating such regional planning measures and subsidized permanency rests with the government of Canada.

ACKNOWLEDGEMENTS

In most studies concerned with northern areas the researcher is handicapped by an almost complete absence of published statistics and an unwillingness on the part of the government to release data in areas where only a limited number of private endeavours are involved. It is in the overcoming of this limitation that I feel especially indebted to the people of Yellowknife for their willing and generous support. Among these, a few should receive a special note of thanks: R.B. Angus, W.R.A. Barager, J. Buck, R.J. Cathro, W. Holinski, E.R. Horton, J.W. McKay, J.H. Parker, M.K. Pickard, J.R. Smith, and P. Templeton.

The author would also like to thank Mr. R.J. MacNaught of the Dominion Bureau of Statistics, Ottawa, without whom the employment statistics of Yellowknife for 1951 would have been impossible to obtain.

In addition, I am particularly grateful for the interest and constructive criticisms of submitted material by my supervisor Professor R.W. Longley and by Professors B. Fullerton and A.H. Laycock.

I would also like to thank the Directorate of the Boreal Institute who provided me with a travel grant to cover the expenses of a return trip to Yellowknife for a week in January.

Lastly, the successful completion of this thesis as such, was made possible by the assistance of Miss Sharon Kerpan in typing portions of the rough draft, of Mr. Jack Chesterman with maps, photographs and multilithing, and by the skill and perseverance of Miss Joan MacLeod in typing the final format.

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CHAPTER I

INTRODUCTION

The community of Yellowknife is located at latitude 62°28' North and longitude 114°27' West, on the west side of Yellowknife Bay. Its situation on the North Arm of Great Slave Lake is some 600 air miles north of Edmonton, the nearest larger service center. Considerable distances also separate Yellowknife from centers of a similar size north of Edmonton. It is over 400 miles by air from Yellowknife to Peace River town, 700 miles to Inuvik, 700 miles to Churchill, 200 miles to Fort Smith and 120 miles to Hay River. By road, the distance from Yellowknife to Hay River is 250 miles, to Peace River is 650 miles and to Edmonton is 975 miles.

Yellowknife is essentially a gold mining town, which by virtue of its transportation facilities and urban amenities has become the government center and supply base for a large part of the Northwest Territories. Despite this trend toward economic diversification, the urban economy remains dependent on the basic mining industry and the industries derived from it.

The Yellowknife region is a functional region defined on the basis of charter airline service. These airlines are the means of supply, communication, and transportation, and thus of regional interaction and interrelation. Within this service region, a core area can also be considered as a formal region which is uniform in its economy of gold mining and historically of uranium mining. Also, this service region is largely contained within government administrative regions, such as those of the

Department of Northern Affairs and National Resources, which have headquarters in Yellowknife.

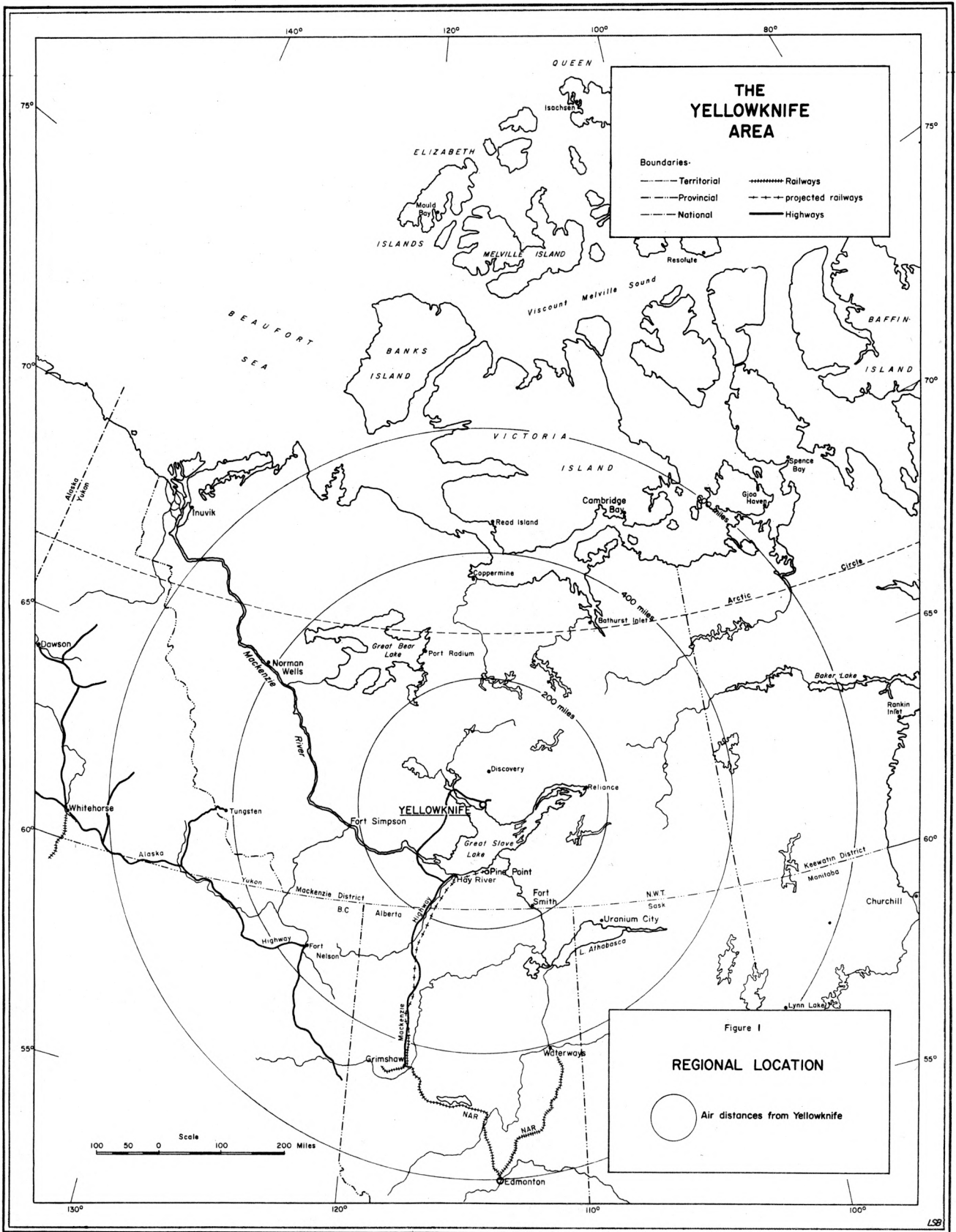
The Yellowknife area differs from the region in that its areal extent is quite vague. In general, the "area" is a comprehensive term which refers to that portion of the Mackenzie District lying north and east of Great Slave Lake. It is bordered on the east by the Keewatin District, on the west by a line through the center of Great Bear Lake and on the north by the Arctic Ocean.

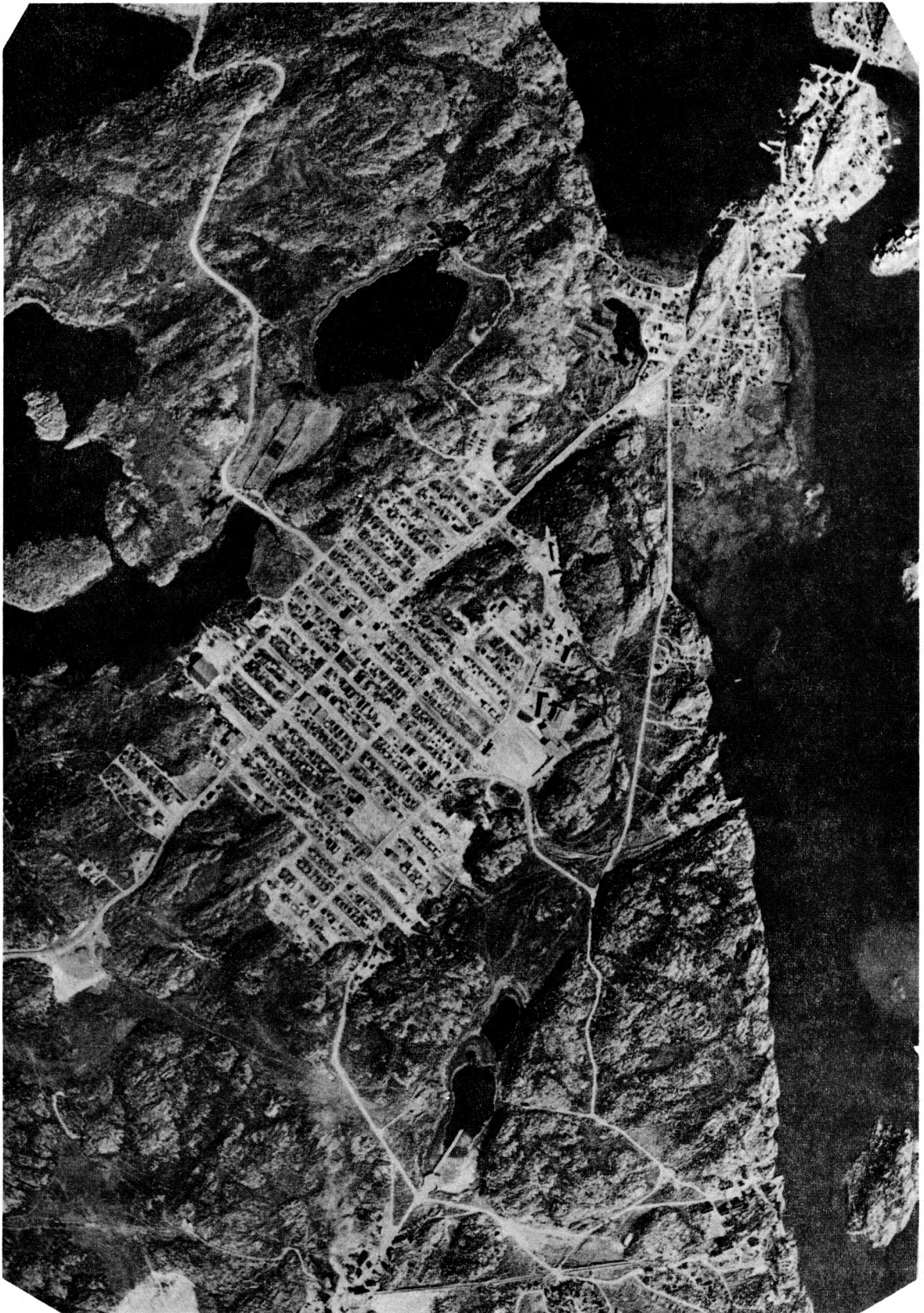
In this study, the discussion of the regional economy is concerned primarily with mining activity. As most of this activity has taken place in the area between Great Slave Lake and the Arctic coast the term "area" is more appropriate in relation to this discussion. On the other hand, the phrase "the Yellowknife Region", which includes settlements along the coast from Read Island to Spence Bay is employed primarily with reference to service functions and transportation facilities.

1. Statement of the Problem and Objectives

Most of the geographical literature available on northern areas is concerned with the native population and the primary industries of hunting, fishing, and trapping, and has a marked sociological and historical emphasis. Within the Northwest Territories little is known about the basic economies of modern settlements and the economic forces acting on these settlements. Also, there have been few studies made of the problems involved in establishing new communities based on mineral exploration in relation to northern areas.

If the human and capital resources necessary to promote economic growth are to be attracted to northern areas, the problem of creating





1. Air view of the settlement of Yellowknife. The Old Town is located on the peninsula in the northeast and the New Town is in the center of the photograph. The mine of the Consolidated Mining and Smelting Company is in the extreme south, with the mine townsite situated on the shore of Yellowknife Bay to the east. The Giant Yellowknife mining complex lies just north of the photograph area.

comfortable and interesting living conditions in permanent communities is paramount. The planning necessary to achieve such conditions must be based on a thorough knowledge and understanding of existing conditions. This should include, of course, an understanding of the economic characteristics of mining as the basis for community growth and community stability. An analysis of Yellowknife and its economic base could assist in achieving this understanding and could also provide a basis for future research techniques.

Yellowknife is well suited as a basis for such analysis for several reasons. It is the largest urban center in the Northwest Territories and is the only one, with the exception of Hay River, which is not totally dependent on government subsidies and employment. In addition, as a mining community it represents the type of urban growth most likely to take place in northern Canada, and as a regional center it offers an example of the degree of diversification that may occur within specialized economies.

Generally, the basic purpose of this thesis is to analyze the urban and regional economy of Yellowknife. An attempt will be made to test techniques of analysis and to provide by example, a method of approach which could, with some adaptations, be applied to other settlements in the northern areas of Canada. Using this approach, certain conclusions are reached which may clarify the problems of the role of the government in the economy of northern settlements, of community planning for permanency, stability and interesting living conditions, and the long term outlook for towns such as Yellowknife which are based on the exploitation of a non-renewable resource.

This study will also focus in more detail on certain specific aspects of the economic character of the North in an attempt to ascertain their importance in future economic development. The two most important

aspects are the transportation and tourist industries. As the North is usually defined on the basis of a lack of adequate transportation facilities, this aspect is of overriding importance in conditioning economic growth and community development. The tourist industry, although still in its infancy, does hold considerable promise for northern development.

Among the techniques to be tested are those involved in general studies of urban geography. Most of the approaches used were found to be wanting when applied to "pioneer" northern areas such as Yellowknife. Limitations were found in the concept of the urban economic base and in the techniques employed to delimit the service areas of urban centers. The adaptations of these techniques for application to northern areas reflects the conditions peculiar to these areas and to Yellowknife specifically. They should, nevertheless, be equally suited for application to other settlements in isolated northern locations.

2. The Approach

The analytical framework which serves as a basis for this study includes a systematic description of the physical features and natural resources of the Yellowknife area, and the historical development of its economic character. The physical features especially, are discussed in greater detail than might be expected because of the overriding importance of the environment in orienting the growth of the local economy.

To attain insight into the economy of Yellowknife it is necessary to examine it in its constituent parts. To achieve this, some means of economic or functional classification must be used. The two methods employed here entail a straight forward breakdown of employment by industrial type, and an analysis of the taxation structure and sources

of community revenue. The discussion of employment also includes a detailed basic-nonbasic breakdown to augment the conclusions drawn from the general analysis. Although the two approaches of employment and taxation are not directly comparable, taken together they do provide a reasonably accurate impression of the relative importance of each sector of the economy. As the largest and most significant of these sectors, the gold mining industry warrants an exhaustive analysis relative to the other sectors.

An integral portion of any research on northern settlements includes an investigation of the apparent degree of economic and social permanency and stability. As in most other areas, permanency depends on the relative amount of occupational diversification. In Yellowknife, permanency has been increasing slowly with the diversity of employment provided by the expansion of such regional functions as transportation and government. Another method of determining permanency is to examine the trends in labour turnover rates, percentage of married employees, public and private investment, and the attitudes of the local residents.

The next chapter attempts to summarize previous considerations and to indicate the importance of Yellowknife within the Northwest Territories and thus its position as a regional center. An essential basis for this analysis involves selecting various indices by which to compare Yellowknife with the Northwest Territories and Mackenzie District. Also, in the delimitation of the Yellowknife service region, the criteria chosen must reflect the unusual functional character of northern supply centers.

In the conclusions, an evaluation of the resource base of Yellowknife, and the Yellowknife area, is included to indicate the probable economic structure of the community in the future. Also, the problems involved in economic and community development in the North are discussed

in general terms. Employing the results of this analysis as a point of reference, the conclusions are projected to northern Canada as a whole. Throughout the long list of conclusions the emphasis rests on the need for government incentives and direction of economic development within a master plan of regional resource and community development.

3. Basic Considerations

a) The North. The term "North", because of its convenience and widespread usage, will appear in the following text several times. In light of the confusion which surrounds the actual area implied by the term, it should be defined explicitly in reference to this study. The most widely used delimitation, despite its lack of validity as a geographical region, is that of the 60°N parallel of latitude. On a more general scale, the area referred to encompasses all areas of Canada north of generally continuous settlement and adequate transportation facilities. In this thesis, both definitions will be employed and can be distinguished by the particular point of view implied. In reference to political and statistical material, the area implied is, of course, that of the Northwest Territories' boundary or the 60°N parallel. On the other hand, pertaining to discussions of general conditions such as permafrost and transportation, the North refers to those areas north of the developed area of Canada.

b) Northern Development. One of the basic assumptions of this study is that northern development per se is desirable, and will take place in the future at least to the extent that it has in the past. As unnecessary as this assumption seems to be, there are people who contend that development of our northern areas should come only when and where it is an econ-

omical proposition for private enterprise. It is felt here that such an attitude is unreasonable from an economic and planning point of view. If northern development is left solely to the private developer its growth will be extremely slow, expensive and unco-ordinated, and the North will fall further behind relative to the growth of the rest of the nation. In the long run, all Canada will lose if the North is left undeveloped. Despite the criticisms levelled against it, northern development will most likely continue simply as a result of political pressure from all sides. The problem, then, is to control and direct this development into the proper areas at the proper time.

c) The Urban Economic Base. Studies of the economies of urban areas have become increasingly concerned with the distinction between basic and nonbasic or local and regional functions. This may or may not be the most revealing approach for the average community, but for Yellowknife it is not. Yellowknife has developed apart from a complex of interrelated urban centers and a relatively homogeneous rural population. It is an isolated center whose service area consists of small outposts of civilization separated by enormous traffic deserts. This factor of isolation has produced an unusual structure in the urban economy and yet, like settlements of a similar size, it has a high percentage of basic employment. The standard basic-nonbasic ratio would then not provide an accurate indication of Yellowknife's unusual economic structure.

Consequently, the emphasis in this study will lie on the economy as a whole, distinguishing the relative importance of each functional category within the economy. This approach reveals more clearly the dependence of Yellowknife on certain activities than does a basic-nonbasic distinction. The latter is included, but only as a supplement to the

general economic survey.

d) The Size Factor and the Lack of a Basis for Comparison. A critical factor in this study is the size of Yellowknife itself. As the number of gainfully employed amounts to less than 1,400 and the total population to less than 3,300, there is considerable danger involved in statistical analyses, especially those employing percentage changes. Also, with a community the size of Yellowknife it is difficult to find a valid comparative basis for explaining the hypothesis that Yellowknife's economic and social character is unique. Employment statistics are not published in Canada for towns of under 10,000 population, or for mining areas or groups of mining towns. As a result, the comparisons employed must be selective, and are intended to show only a phase or aspect of Yellowknife's uniqueness. Taken together, it is hoped that the three comparisons employed will provide an overall indication as proof of this hypothesis.

CHAPTER II
THE LIMITING PHYSICAL ENVIRONMENT

In northern Canada the environment places severe restrictions on the development of any economic activity. Consequently, any study in the economic geography of the North must consider as of primary importance the physical characteristics shaping this development. In addition, an analysis of the potentialities of the area must have as its basis a description of the physical resource base. From this point of view, then, the physical aspects of the Yellowknife area will be discussed as a whole, but the emphasis will rest on the economic significance rather than on total interrelation of these features.

1. Physiography, Drainage and Permafrost

Most of the mainland portion of the Northwest Territories east of a line through Fort Smith, Great Slave and Great Bear Lakes is included within the distinctive Canadian Shield physiographic province. In general, the Shield is an ancient peneplain of comparatively low relief with an irregular, hummocky surface underlain by rocks of Precambrian age. In the Yellowknife area relief varies from 200 feet near the North Arm of Great Slave Lake to 500 feet along the East Arm and 1,000 feet near Great Bear Lake.

The effects of glaciation are apparent everywhere. In addition to the abrasion and scouring of rock outcroppings, the widespread distribution of glacial drift dammed drainage channels and completely altered the existing patterns. This confusion of drainage resulted in the

innumerable lakes, turbulent streams, and muskeg areas which cover much of the Shield. In most areas this overburden is shallow, although there are exceptions where drilling has indicated a depth of 400 feet or more.¹ Glacial deposition, then, has been significant in producing at least some of the area's peneplaned appearance by reducing relief and offsetting the effect of scouring on slopes.

The topography of the Yellowknife area is typical of the Shield. From the highest elevation the country appears strongly lineated with rocky hills and ridges rising abruptly 50 to 150 feet above intervening drift-filled depressions. It has been estimated that rock outcrops occupy nearly fifty per cent of the land area around Yellowknife.² The two principal topographic features in the immediate area are the West Bay Fault and the Baker Creek valley to the east, both most prominent on the property of Giant Yellowknife Mines.³ Drilling in the valley of Baker Creek has revealed a depositional stratification consisting of several feet of gravels and sands overlain by thinly stratified lacustrine clays. Above the Fault in the townsite area, the most significant glacial deposit is sand, representing outwash reworked by the waters of Great Slave Lake. These are found in places at elevations up to 240 feet above the present level of the lake.⁴

¹ Canada, Dept. of Mines and Technical Surveys, Geology and Economic Minerals of Canada, Economic Geology Series No. 1, Ottawa, 1957, p. 21.

² C.S. Lord, Mineral Industry of the Mackenzie District, N.W.T., Geol. Survey Memoir 261, Dept. of Mines and Technical Surveys, Ottawa, 1951, p. 4.

³ J.D. Bateman, "Permafrost at Giant Yellowknife", Trans. Roy. Soc. Canada, 3rd Series, Vol. 43, Sec. 4, 1949, p. 7.

⁴ R.W. Boyle, The Geology, Geochemistry and Origin of the Gold Deposits of the Yellowknife District, Geol. Survey Memoir 310, Dept. of Mines and Technical Surveys, Ottawa, 1961, p. 4.

Yellowknife is located within the area of permanently frozen ground. This soil condition, known as permafrost,⁵ is the result of the long winters and consequent low mean annual temperatures of the North. Generally, it is most prominent beneath deep overburden and its depth, in some areas down to 280 feet, is directly related to the thickness of the overburden.⁶

Some surface thawing of frozen ground does take place depending on the locality and the insulating effect of the covering material. This active layer varies in depth from one to two feet in wooded and muskeg areas to four or five feet in cultivated or broken land. The economic significance of this layer depends on the nature of the material. As R.F. Leggett points out, in areas of dry or well drained sand or gravel, permafrost is not of any major significance. When, however, the ground consists of fine-grained water-logged soil, complications arise with modern building designs and construction.⁷

In summary, the terrain of the Yellowknife area presents severe restrictions on practically all types of land use. The predominance of rock outcrops limits the areas suitable for agriculture, forestry and the construction of roads, buildings and airfields. It is difficult to find a reasonable expanse of flat land for the location of a town-site. In the Yellowknife area, the glacial sand plains south of Frame

⁵ Defined as any soil or bedrock in which the temperature has been continuously below 32°F for a period of many years (C.S. Lord and R.F. Leggett).

⁶ Bateman, op. cit., p. 11.

⁷ R.F. Leggett, "An Engineering Assessment," The Canadian North-West: Its Potentialities, a Symposium presented to the Roy. Soc. Canada, 1958, F.H. Underhill (ed.), University of Toronto Press, Toronto, 1958, p. 18.



2. Air view looking southwest from Jolliffe Island toward the New Town. Note the peneplaned appearance of the Precambrian Shield in this area, the predominance of rock outcroppings and the lack of a continuous vegetative cover.
(Courtesy W.C. Wonders)



3. View of the site of the Old Town looking northeast from the New Town. Note the large rock outcrop around which the Old Town is located. The buildings in the distant left are on Latham Island and the oil storage tanks on the right are on Jolliffe Island.

and Long Lakes, now occupied by the New Town and the airport respectively, are among the most suitable construction sites in the Shield portion of the Mackenzie District.

Although the phenomenon of permafrost has been widely recognized for years, it was only during the extensive construction in World War II that the magnitude of the problem was first revealed.⁸ When the thermal balance of the soil is disturbed, the solid permafrost at times assumes the consistency of soup, and the results are often disastrous. This characteristic has affected most northern construction, and has necessitated careful selection of sites and maintenance of the thermal regime of the soil.

On the other hand, the surface configuration has certain characteristics which have facilitated resource development. The disarranged drainage system has provided the area with a considerable number of sites suitable for the production of hydro-electric power. In the past, these sites, despite their limited size and distribution, have been more than sufficient for the development that has taken place. Secondly, the large areas of exposed bedrock have facilitated rapid, yet thorough, prospecting for ore-bearing structures throughout the area.

2. Geology and Economic Minerals

All consolidated rocks within the area are of Precambrian age. The oldest known types are the Archaean volcanic flows and sediments,

⁸ R.F. Leggett and H.B. Dickens, Building in Northern Canada, Technical Paper No. 62, Div. of Building Research, National Research Council, Ottawa, 1959, p. 8.

to which the general term "Yellowknife group" has been applied (Fig. 2).⁹ The basal member of the group consists of massive and pillowed greenstones derived from andesitic and basaltic flows. These, in turn, are overlain by a great thickness of sedimentary strata consisting of greywacke, argillite, quartz and slate.

Numerous dykes and sills intrude the rocks of the Yellowknife group, especially the basal volcanic flows. The earliest of these intrusions are sills, varying in composition from diorite to gabbro, which appear to have been injected along sedimentary horizons between flows. These vary from a few feet to several hundred feet in thickness and from a few hundred feet to several miles in length. These flows and sills have, in turn, been cut by a series of intrusives known as early diabase dykes. In some areas these dykes compose as much as 20 to 30 per cent of the exposed rock.¹⁰ In addition, the group has also been intruded by three large bodies of granitic rocks within the immediate area of Yellowknife Bay altering sedimentary rocks to knotted quartz, mica schists and hornfels.

The whole area has been greatly faulted. These faults have been classified into two broad groups which Campbell¹¹ refers to as pre-mineral and post-mineral faults and Henderson refers to as pre-diabase

⁹ J.F. Henderson, "Structural Control of Ore Deposits in the Canadian Shield Between Great Slave and Great Bear Lakes, N.W.T.", Structural Geology of Canadian Ore Deposits, a Symposium, Cdn. Inst. Min. Met., Montreal, 1948, p. 238.

¹⁰ N. Campbell, "Regional Structural Features of the Yellowknife Area," Western Miner and Oil Review, Vol. 20, No. 11, Nov. 1947, p. 63.

¹¹ N. Campbell, "The West Bay Fault," Structural Geology of Canadian Ore Deposits, a Symposium, Cdn. Inst. Min. Met., Montreal, 1948, p. 247.

and post-diabase.¹² Along the early or pre-diabase faults, conveniently referred to as shear-zone types, chlorite schist or chlorite-sericite schist has developed in widely varying widths. The post-diabase faults are clear-cut narrow fractures along which little schist has been formed. The relatively small amount of mineralization associated with these faults includes quartz, pyrite and chalcopryite, but no commercially significant amounts of gold.

Most of the known gold deposits in this portion of the Shield are in the Yellowknife-Beaulieu River area, the Indin Lake area, and the Courageous-Mackay Lake area.¹³ These gold deposits occur along the early shear-zone faults in the volcanic and sedimentary rocks of the Yellowknife series. They are usually divided in two groups: (a) the well defined quartz veins introduced along narrow shear-zones in the greenstone, such as occur on the Negus and Rycon properties, and (b) large masses of highly mineralized sericite schist and vein quartz that occur along shear zones much wider than the first type. Examples of these large ore bodies, attaining widths up to 300 feet or more, are found on the Giant and Con properties. The ore bodies themselves are developed in sericite zones within the wide chloritic shear zones, and an ore shoot may make up as much as 90 per cent of the width of the shear zone. The two large gold ore bodies, the Giant and Con systems, generally considered to be one and the same displaced more than three miles by the West Bay Fault,¹⁴

¹² J.F. Henderson and I.C. Brown, The Yellowknife Greenstone Belt, Geol. Survey Paper 52-28, Dept. of Mines and Technical Surveys, Ottawa, 1952, p. 30.

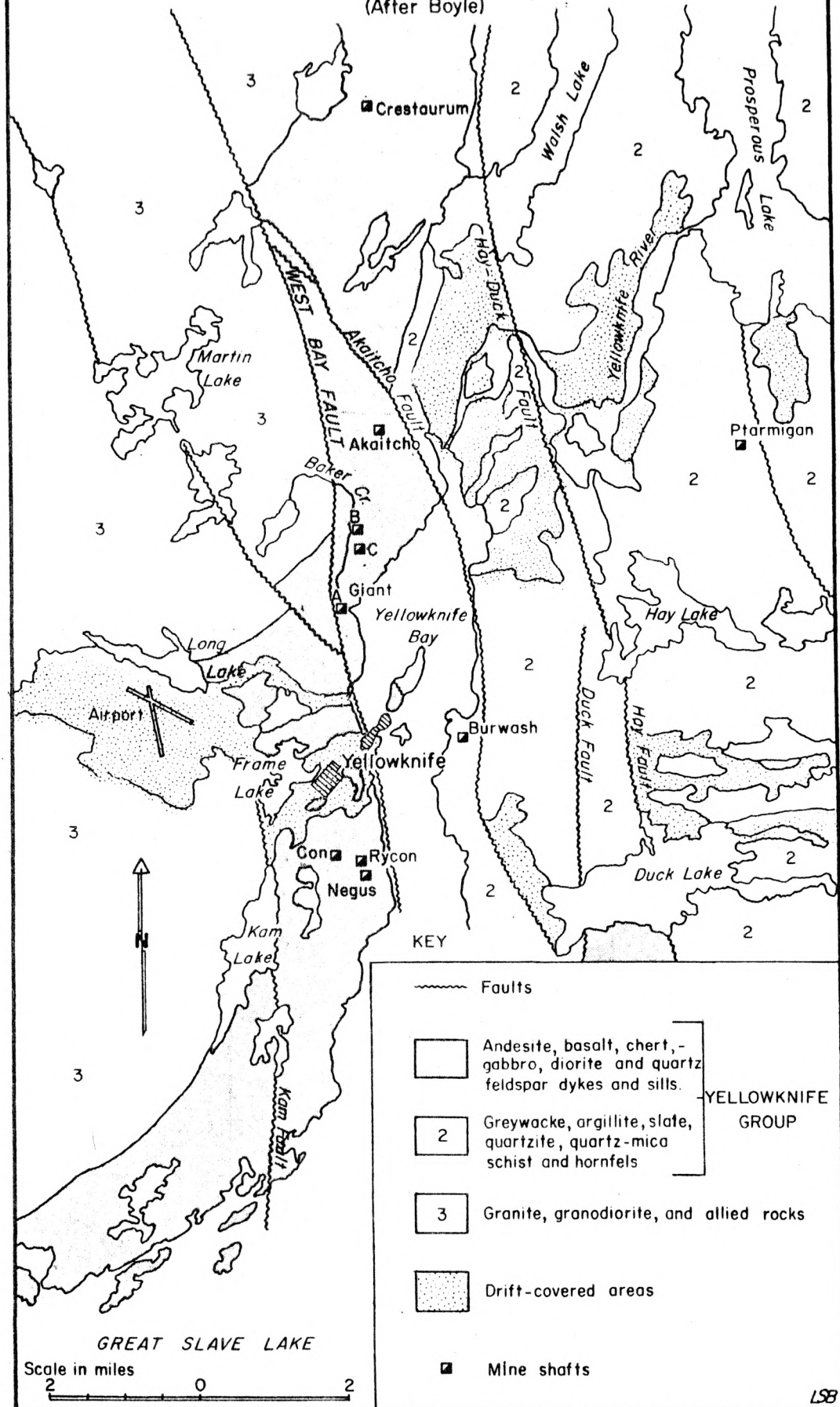
¹³ J.F. Henderson, op. cit., p. 241.

¹⁴ Ibid., p. 242.

FIGURE 2

GEOLOGY of the YELLOWKNIFE BAY AREA

(After Boyle)



- KEY
- ~~~~~ Faults
 - Andesite, basalt, chert, -gabbro, diorite and quartz feldspar dykes and sills.
 - 2 Greywacke, argillite, slate, quartzite, quartz-mica schist and hornfels
 - 3 Granite, granodiorite, and allied rocks
 - Drift-covered areas
 - Mine shafts
- YELLOWKNIFE GROUP

are the most important commercial mineral deposits in the whole area. In addition to gold, the Yellowknife area has significant deposits of uranium, as well as lithium, molybdenum, tantalum-columbite, tin, tungsten, mica and silver.¹⁵ Some of these have been mined and all have undergone extensive investigation at one time or another.

The presence of these ore-bearing structures near Yellowknife Bay is the only reason a settlement of any significance exists in the area today. Also, it is reasonable to conclude that the area contains considerably more wealth in mineral resources than is presently being exploited.

3. Climatic Conditions

The climate of the Yellowknife area, although exaggerated by popular misconception, does place a definite restriction on development. In general, the climate is subarctic with long cold winters, brief, warm to hot summers and light precipitation. The major features of climatic control at this northern latitude include the extreme length of the night in winter and the day in summer; and, in the area north and east of Great Slave Lake, the degree of continentality.

The most outstanding feature of the climate of this area is the enormous temperature range from summer to winter and from year to year.¹⁶ The long winters are intensely cold, -15°F in January, while the summers are warm, averaging 61°F in July, but short. Mean monthly temperatures

¹⁵ For a comprehensive description of the complex mineralization history of the Yellowknife district the reader is referred to R.W. Boyle, The Geology, Geochemistry, and Origin of the Gold Deposits of the Yellowknife District, Geol. Survey Memoir 310, Dept. of Mines and Technical Surveys, Ottawa, 1961, 178 pp.

¹⁶ W.G. Kendrew and B.W. Currie, The Climate of Central Canada, Man., Sask., Alta., and the Districts of Mackenzie and Keewatin, Met. Branch, Dept. of Transport, Ottawa, 1955, p. 19.

are below 32°F for seven months of the year at Yellowknife, from October to April. The range of temperature extremes between winter and summer are even more profound. Although such occurrences are infrequent, winter minimum temperatures may fall below -60°F and summer maxima may rise above 90°F (Table I).¹⁷

TABLE I - CLIMATIC SUMMARY FOR YELLOWKNIFE, N.W.T.

Mean Daily	Air Temperature						Precipitation			
	Mean of Daily		Mean of Monthly		Absolute Extreme		Rain	Snow	Total	
	Maxi- mum	Mini- mum	Maxi- mum	Mini- mum	Highest Re- corded	Lowest Re- corded	Mean Amount	Mean Amount	Mean Amount	
°F	°F	°F	°F	°F	°F	°F	in.	in.	in.	
Jan.	-14.7	-6.5	-22.9	17	-48	37	-60	0	5.4	0.54
Feb.	-14.2	-5.3	-23.1	15	-48	43	-60	0	4.6	0.46
Mar.	1.4	11.4	-8.6	33	-38	42	-47	T	3.9	0.39
Apr.	17.3	28.1	6.5	52	-20	60	-38	0.10	2.6	0.36
May	38.9	47.8	30.0	66	17	79	-4	0.52	0.7	0.59
June	53.3	62.1	44.5	77	34	85	28	0.73	T	0.73
July	60.9	69.5	52.3	81	42	86	33	1.15	T	1.15
Aug.	56.7	64.5	48.9	79	38	86	34	1.02	0	1.02
Sept.	44.9	51.1	38.7	67	24	79	18	0.90	0.2	0.92
Oct.	31.0	36.1	25.9	54	7	65	-9	0.58	4.1	0.99
Nov.	7.2	13.8	0.6	34	-27	46	-43	T	6.9	0.69
Dec.	-12.9	-5.2	-20.6	17	-42	37	-55	T	6.1	0.61
Year	22.5	30.6	14.4	83	-51	86	-60	5.00	34.5	8.45

Altitude above M.S.L. 682 feet

T = trace

Source: Canada, Dept. of Transport, Climate of Canada, Ottawa, 1960, p. 73

In contrast to the Mackenzie Valley, the area north and northeast of Great Slave Lake exhibits a significant temperature gradient, especially in summer. For example, the temperature difference in July between the Great Slave Lake area and the Mackenzie Delta is less than five degrees. In contrast, the decrease in temperature for a similar distance from Yellowknife northward to the Arctic coast is nearly fifteen degrees. This sharp

¹⁷ Canada, Dept. of Transport, Met. Branch, The Climate of Canada, Ottawa, 1960, p. 25.

decrease of temperature northward is a product of the great distance from the moderating influence of any open water. In the extreme northeast, Arctic conditions of both climate and vegetation prevail much farther south than in the western Mackenzie District.

As in most of the Northwest Territories, precipitation in the Yellowknife area is light, mostly frontal in origin and with a slight summer maximum.¹⁸ The mean annual precipitation is only 8.5 inches, of which about forty per cent or 3.5 inches falls in the form of snow, and the total varies greatly from year to year. During the three months of summer, June, July and August, precipitation totals less than three inches.

Most areas within the Mackenzie District have a frost-free period of between 44 and 92 days.¹⁹ At Yellowknife, this period is 113 days, illustrating the significant moderating influence of Great Slave Lake. Variations in this frost-free period are considerable, especially in the occurrence of first fall frosts. These have occurred as early as September 2 and as late as October 3.

What, then, are the economic effects of these climatic characteristics on Yellowknife and the mining area to the north? In general, it should be emphasized that climate is essentially a cost factor and not an absolute barrier to economic development. The obvious effect of the long winters is to increase the cost of heating substantially. This was effectively pointed out by Robertson,²⁰ who compared the annual total of

¹⁸ Kendrew and Currie, op. cit., p. 85.

¹⁹ Canada, Dept. of Transport, Climatic Summaries for Selected Meteorological Stations in Canada, Vol. III, Frost Data, Ottawa, 1956, p. 24.

²⁰ R.G. Robertson, The Northwest Territories, Its Economic Prospects, a Brief to the Royal Commission on Canada's Economic Prospects, Edmonton, Nov. 22, 1955, p. 18.

"degree-days"²¹ of heating requirements at Yellowknife with that of several other centers (Table II). His statistics indicate that the actual increase

TABLE II - COMPARISON OF TEMPERATURES AND HEATING REQUIREMENTS AT SELECTED CENTERS

Settlement	Average Daily Temperature Nov.-Mar. °F	Average Temp. June, July, August °F	Annual Average Degree Days of heating
Yellowknife	-8	57	15,600
Edmonton	16	60	10,300
Saskatoon	10	62	10,800
Winnipeg	9	64	11,000
Sudbury	18	64	9,500
Chibougamau	8	58	12,400

Source: Robertson, op. cit., p. 18.

in heating costs at Yellowknife in comparison to southern centers such as Edmonton, Saskatoon and Sudbury, ranges from 40% to 50%.^{22 23} Although this is not the major cost increment for northern operations, it certainly will be one of the most permanent.

The very low total precipitation, and its extreme seasonal and annual variations, has been influential in shaping the area's development. Considering that there are seldom more than three inches of rain available for plant growth during the short growing season, there is little likelihood of locally produced foodstuffs reducing the cost of

²¹ There are as many "degree-days" as there are Fahrenheit degrees difference between 65° and the mean temperature for any day below 65°. The basic point of 65° is considered to be the temperature below which heating is required.

²² Robertson, op. cit., p. 18.

²³ A. Dubnie, Some Economic Factors Affecting Northern Mineral Development in Canada, Mineral Information Bulletin MR 38, Dept. of Mines and Technical Surveys, Ottawa, 1959, p. 42.

living.²⁴ In addition, the meager precipitation places definite restrictions on settlement sites because of the necessity of locating near sizeable rivers or lakes for an adequate water supply. This is a more severe limitation than in areas further south.

In conclusion, climatic conditions do not prohibit mining or construction activities, nor commercial or transportation operations, but the resulting cost increment is of the utmost significance.²⁵ The low mean annual temperature maintains a condition of permanently frozen ground, reduces the rate of vegetative growth and prohibits water transportation for seven or eight months of the year. Also, there is the sociological effect of the cold, dark winters which is reflected in the high labour costs and the extreme rate of labour turnover.

4. Soils, Vegetation and Wildlife

The natural resources of soils and vegetation in the Yellowknife area, from a commercial point of view, are of extremely poor quality. From the previous discussion of terrain and climatic conditions, the limitations placed on the development of soils and vegetation are quite evident. As a result, only a general account will be given in this section.

Undoubtedly, geology is the dominant factor in retarding soil-forming processes in the Shield with its great expanse of rugged, resistant

²⁴ W.C. Wonders, "Assessment by a Geographer," The Canadian North-West: Its Potentialities, a Symposium presented to the Roy. Soc. Canada, 1958, F.H. Underhill (ed.), University of Toronto Press, Toronto, 1959, p. 31.

²⁵ For a general analysis of the role of climate and other geographical factors in the exploration and development of mineral resources see N.J.G. Pounds, "Geographical Factors in the Exploration of Minerals," London Essays in Geography, L.D. Stamp and S.W. Wooldridge (eds.), Longmans, Green and Co., London, 1951, pp. 241-243; and A.M. Bateman, "Geographical Factors in the Utilization of Mineral Deposits," Outside Readings in Geography, F.E. Dohrs, L.M. Sommers, and D.R. Petterson (eds.), T. Crowell Co., New York, 1958, pp. 437-447.

crystalline rock.²⁶ Other effects include those of topography and the permanently frozen subsoils in retarding adequate drainage throughout the area. Also, the short summer season and light precipitation have limited the chemical reactions necessary for soil development. In total-ity, these factors have produced soils which can be classified generally as azonal and intrazonal depending on the drainage conditions present.

The soil parent materials in this area, as in most of the Canadian Shield, are essentially of glacial origin.²⁷ For the most part, they consist of unconsolidated glacial till, well drained glacio-fluvial sands and gravels, and glacio-lacustrine sands, silts and clays, all of comparatively recent origin. It should be noted that almost all of the good soils in the Mackenzie District have developed on alluvial terraces, of which there are none in the Yellowknife area.

The significance of this discussion is to illustrate the absence of a local agricultural potential and the necessity of importing almost all required foodstuffs. Some agricultural commodities, especially vegetables, are grown outside or in greenhouses in Yellowknife,²⁸ but this practice has been declining because the cost of importing foodstuffs has steadily decreased.

The soils encountered in the Shield are also of fundamental im-

²⁶ W. Dickson, "Northern Agriculture," The New Northwest, C.A. Dawson (ed.), University of Toronto Press, Toronto, 1947, p. 162.

²⁷ R.F. Leggett and W.J. Eden, Soil Problems in Mining on the Precambrian Shield, Technical Paper No. 108, Div. of Building Research, National Research Council, Ottawa, Nov. 1960, p. 3.

²⁸ In 1941, J.L. Robinson estimated that there were four large gardens in Yellowknife totalling 5 to 10 acres, while today there is only one covering less than one half acre. See J.L. Robinson, "Land Use Possibilities in the Mackenzie District," Cdn. Geogr. Journal, Vol. 31, No. 1, July 1945, p. 32.

portance to any mining development program. This is especially true in areas where peat accumulation has produced a phenomenon known as "muskeg"; and where deposits of varved clay liquefy very easily into the "mud" that often hampers mining operations. R.F. Leggett, in his study, "Soil Problems in Mining on the Precambrian Shield,"²⁹ suggests that soil is generally regarded as an impediment to exploration and development work and can, in some cases, be the overriding factor in determining the economic feasibility of a mining property.

These thin, immature soils, together with inadequate drainage and unfavourable climatic conditions, are the major reasons limiting the size and density of vegetative growth in the Yellowknife area. More specifically, the predominance of lakes, swamps and rugged outcrops has regulated forest growth to a few scattered areas within sheltered depressions.

In general, Yellowknife and the surrounding mining area fall within the Northern Transition category of the northern forest region.³⁰ This area is considered to be a transition zone between the heavily forested Mackenzie Lowland and the treeless "barren lands" lying about 150 miles north and northeast of Great Slave Lake. For the most part, this area supports a sparse stunted growth of black spruce, white spruce, birch and tamarack. Among these the white spruce is probably the most common species,³¹ and certainly the most important commercially.

Roughly corresponding to the southern limit of Arctic climatic conditions, the treeless tundra zone extends far to the south of that in

²⁹ In his study Leggett includes a detailed chart explaining how each of his soil or material types presents difficulties in road construction, shaft sinking, deep open excavations and building foundations.

³⁰ W.C. Bethune, Canada's Western Northland, Dept. of Mines and Resources, Lands, Parks and Forests Branch, Ottawa, 1937, p. 143.

³¹ F.H. Kitto, The Northwest Territories 1930, Dept. of the Interior, N.W.T. and Yukon Branch, Ottawa, 1930, p. 14.

any other area of the Mackenzie District. The absence of timber in this area has been of considerable significance in reference to the costs of mining activity, and is likely to be as important in the future.

Although the forests of any area are usually evaluated in connection with its natural resources, in this case the forests do not constitute a major resource in the commercial sense. Their usefulness is entirely local in that they afford a small supply of lumber, fuel and materials for general mining purposes. Lastly, although no longer a major resource, the forests do provide a protective habitat for fur-bearing animals and thus a means of livelihood for a large percentage of the native population in the area.

To complete the picture of the area's resource base some mention should be made of the wildlife possibilities. The physical characteristics of the Northwest Territories are such that its wildlife can never be described as abundant. Although there are several types of big game animals in the area, the most important in Yellowknife's economy are the fur bearers. Among these, the fox, ermine, muskrat, beaver, marten, mink and bear are the most widely trapped.³² The waters of Great Slave Lake and its tributaries are reasonably well stocked with several species of fresh water fish. Commercially, the white fish is the most outstanding fish, followed by lake trout, inconnu, pike and bluefish. The potential for both of these renewable industries, especially the fur trade, is extremely limited.

In summary, this analysis reveals that the environmental characteristics of the area have been extremely important in conditioning the historical growth and the present patterns of Yellowknife's economy. The two most obvious conclusions that can be made are: firstly, that the gold-bearing geological structures around Yellowknife Bay, when discovered in

³² Canada, Dept. of Resources and Development, Industries of the Northwest Territories, Ottawa, 1953, p. 14.

1935, provided the first and only real stimulus to settlement, and, secondly, that the resource base of the area, and thus its potentialities, must be assessed almost entirely on the basis of its mineral resources.

CHAPTER III

GROWTH OF MINING AND SETTLEMENT PATTERNS

1. Initial Mining Activity and the Gold Rush

Although Yellowknife¹ is scarcely more than 25 years old, the geographic knowledge of the area and of the presence of gold dates back to the era of the Klondike rush. Prospectors on their way to the Yukon over the Mackenzie River route explored for minerals near the mouth of the Yellowknife River, and in 1898 submitted several samples to the Geological Survey for assay. Even though the samples contained considerable quantities of gold and silver the attraction of the Klondike was greater. Only sporadic prospecting and development work took place in the early portion of this century, and these efforts failed to disclose any mineral deposits of importance.

The first outstanding event connected with the mineral industry of Yellowknife actually occurred outside the area under discussion; yet it was of profound significance in stimulating prospecting activities and in reducing the costs of subsequent mining operations.² This event was the discovery of oil in 1914 at Norman Wells on the Mackenzie River north of Fort Norman. Although drilling began in 1920 and oil was discovered in commercial quantity, there was little demand until the mining developments began on Great Bear and Great Slave Lakes in the 1930s.

As this portion of the Shield became more thoroughly prospected,

¹ The name "Yellowknife" is derived from that applied to the Indians in the vicinity of Great Slave Lake by Samuel Hearne in 1771 when he noticed that they used weapons and implements of native copper.

² E.L. Bruce, "Mineral Industry of the North-West," The New North-West, C.A. Dawson (ed.), University of Toronto Press, Toronto, 1947, p. 113.

Great Slave and Great Bear Lakes became the centers of activity in the late 1920s.³ These efforts met with little success until the discovery of silver and pitchblende at LaBine Point on Great Bear Lake in 1930. By 1932 development work was underway, and in 1933 the Eldorado Mine (Port Radium) went into production as the first metal mine in the Northwest Territories. This discovery inaugurated the widespread exploration activity that brought the mines of the Yellowknife area into production.

The first staking in the Yellowknife Bay area began in 1933 after the results of a mapping program by the Geological Survey were published. The Yellowknife camp, however, is commonly considered to date from 1934 when the United States raised the price of gold from \$20.67 to \$35.00 an ounce,⁴ and when the Rich claims were staked on the east side of Yellowknife Bay. In the following year, the first actual discovery of visible gold was made by a party of the Geological Survey under Dr. Jolliffe on the west side of Yellowknife Bay, and the rush to stake began.^{5 6}

The claims of the Consolidated Mining and Smelting Company were promptly staked in 1935, followed by the adjacent Negus claims in 1936. At the same time, several other claims were staked in the immediate area and exploration activities spread northward towards Gordon Lake where the Camlaren property was staked in 1936 and the Ptarmigan property in

³ C.S. Lord, Mineral Industry of District of Mackenzie, N.W.T., Geol. Survey Memoir 261, Dept. of Mines and Technical Surveys, Ottawa, 1951, p. 14.

⁴ Ontario, Report of the Committee on Inquiry into the Economics of the Gold Mining Industry, Gold Mining in Ontario, Queens Printer, Toronto, 1955, p. 5.

⁵ C. Camsell, "Yellowknife Mining District," Cdn. Geogr. Journal, Vol. 18, No. 6, June, 1939, p. 312.

⁶ For a detailed description of the mining history of the Yellowknife Area see Appendix A, which lists all present and past producers and any property on which active underground development work has taken place. The criterion for underground development is the sinking of a prospect shaft to a depth of over 35 feet.

1938. In the latter year, the first gold brick in the Northwest Territories was poured at the Con* mine in September and in the succeeding February gold was recovered at the Negus mine. The Ptarmigan and Rycon mines became producers in 1939, followed by Thompson-Lundmark in 1940 and Ruth in 1941 (Fig. 3).⁷

Thus, during the early years of World War II, Yellowknife was an established mining camp with six producing mines and several others undergoing active exploration. This prosperity was short-lived, however, as the shortages of labour, materials and markets resulting from the war effort gradually forced the mines to close down. Until 1942 the industry was able to withstand these difficulties, but then it declined slowly until 1944 and 1945 when all gold production in the Yellowknife area ceased (Appendix A).

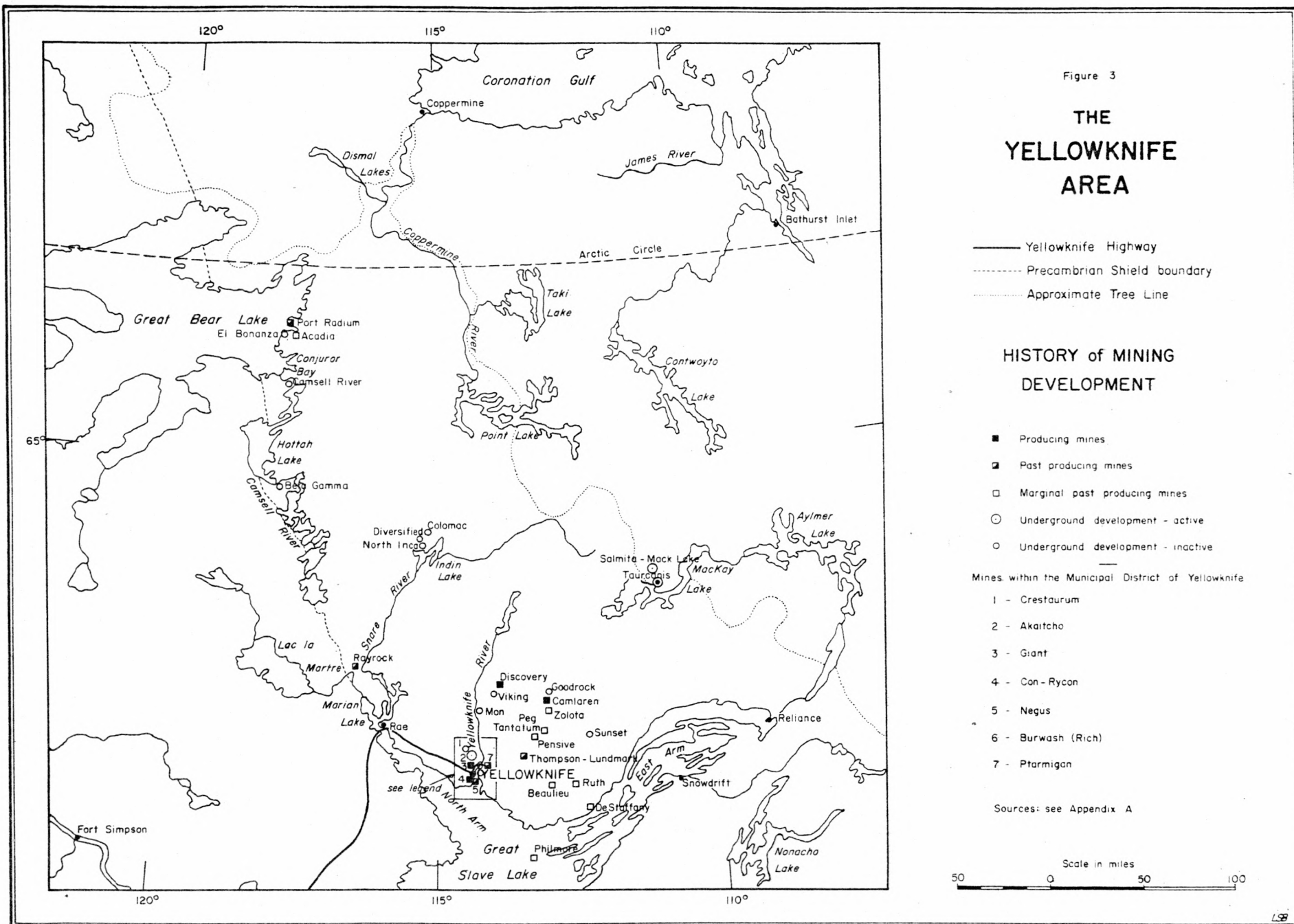
As might be expected, during this period the town suffered a similar setback and its population declined considerably. The decline, however, was remarkably brief, for in 1944 as the last mines closed, a new exploration boom began which was to initiate the post-war expansion period and to establish the present patterns of both mining and settlement.

2. Post-War Expansion

Towards the end of World War II, there was a substantial amount of risk capital available for mining exploration and the Canadian dollar was at a discount in terms of United States currency. Although the restrictions

* Throughout this paper the term 'Con' will be used to describe the mine and townsite of the Consolidated Mining and Smelting Company. In reference to mining, 'Con-Rycon' is used interchangeably with Con as Rycon is the adjoining property from which much of Con's ore is obtained.

⁷ K.J. Christie, Known Mineralized Areas and Mining Development, Yukon and N.W.T., typed manuscript, Resources Division, Dept. of Northern Affairs, Ottawa, July 1960, p. 21.



of labour and materials continued to limit production, Yellowknife found itself in the midst of its second staking rush in a decade. In January of 1944 Frobisher Exploration embarked on an extensive diamond drilling program on their Giant property. The spectacular results suggested an ore deposit far exceeding in size and grade any known in the Northwest Territories and initiated an unprecedented rush to stake, restake and prospect throughout the Yellowknife area.⁸ In 1945 alone a total of 8,851 mineral claims were staked in the Yellowknife Mining District,⁹ the greatest number of claims that has ever been recorded in any one year (Fig. 4). In that year, over 200 mining companies were incorporated to hold or develop properties in the district. With Yellowknife as a base of supply, exploration activities extended far to the north and northeast especially into the Mackay-Courageous and Indin Lake areas. Prospect shafts were sunk on widespread showings throughout the district,¹⁰ until 1948 when the boom subsided.

As the war limitations of labour and equipment gradually declined, production was resumed at several of the pre-war mines. In July, 1945, the Negus mine began milling, followed by Con in 1946 and Thompson-Lundmark in 1947. In addition, Giant, Beaulieu, Akaitcho, and Crestaurum were nearing the production stage and Discovery, Viking, Sunset, Diversified, and North Inca all showed strong promise of becoming producers. By 1948 a number of factors, including the ten per cent reduction in the sale price of Canadian gold and the general rise in operational costs,

⁸ Ibid., p. 16.

⁹ Pers. comm., T.A. Russell, Chief Mining Recorder, Dept. of Northern Affairs, Ottawa, Sept. 12, 1962.

¹⁰ For a detailed description of the activity at all of these properties see The Western Miner and Oil Review, "Yellowknife Number," Vol. 20, No. 11, Nov. 1947, 178 pp.

brought an end to the post-war mining boom.¹¹ The developments resulting from this boom did, however, establish the pattern of mining activity which has existed to the present day (Fig. 3). Out of the previous list of mines nearing the production stage only two actually commenced full scale production. As can be seen in the accompanying chart (Appendix A), several others began milling but in a short term, sporadic, and often rather dubious manner.

The most outstanding development by far was the initiation of milling at Giant Yellowknife Mines in May 1948 and the pouring of the first gold brick in June. From the beginning, this mine was expected to be the largest in the area and the prime economic support of the community. Other significant developments in 1948 included the opening of the Snare River power plant in October and the commencement of mining operations at Discovery.¹² It is significant that this property, owned by Consolidated Discovery Yellowknife Mines, has been the only post-war development to attain production. The second, Taurcanis Mines, where development work began in 1957, is only now reaching the production stage (Chapter V).

The decade of the 1950s in the Yellowknife area was one of sporadic but important periods of intensive exploration for uranium ores, and one of consolidation in the gold mining industry. Developments on marginal properties such as Beaulieu had ceased completely by 1948, while Thompson-

¹¹ F.H. Stephens, "Yellowknife, 1947," Western Miner and Oil Review, Vol. 20, No. 11, Nov. 1947, pp. 55-58.

¹² Although scheduled for production in 1948 Consolidated Discovery was forced, because of market and financial conditions, to prolong the development period until 1950. These conditions are discussed thoroughly by T.D. Anderson in "Farthest North Gold Mine Solves Operating Problems," Western Miner and Oil Review, (Part I), Vol. 25, No. 2, Feb. 1952, pp. 39-44.

Number of Claims

10,000

8,000

6,000

4,000

2,000

0

1945

1950

1955

1960

1962

Total Acreage (in 000's)

1,000

800

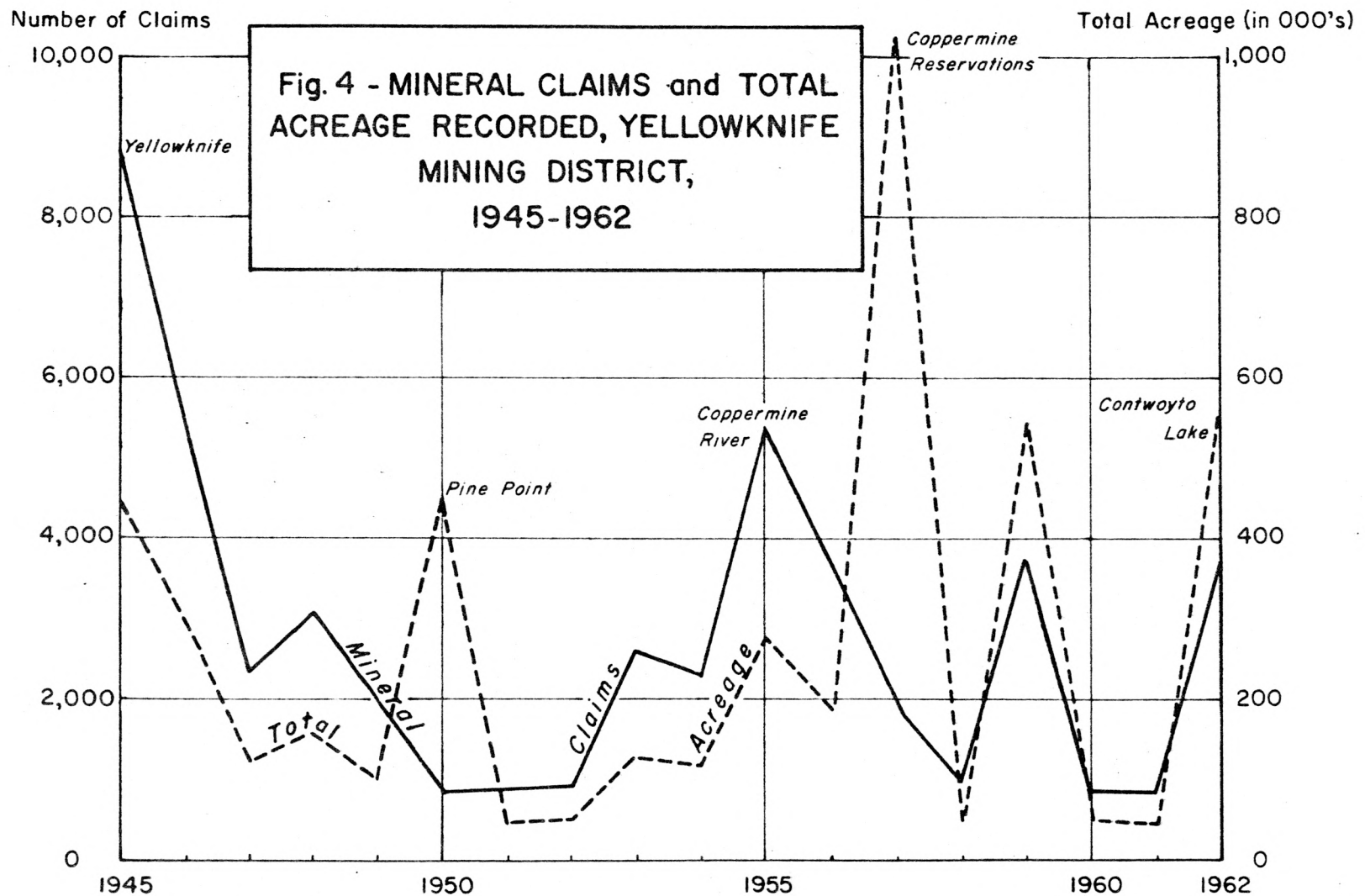
600

400

200

0

**Fig. 4 - MINERAL CLAIMS and TOTAL
ACREAGE RECORDED, YELLOWKNIFE
MINING DISTRICT,
1945-1962**



Sources: Mining Recorders, Dept. of Northern Affairs, Ottawa and Yellowknife.

Lundmark ceased operations in 1949 and Negus followed in 1952. From that date to the present, the three producing mines, Con, Giant, and Discovery, have remained the only gold producers in the Yellowknife area, and, in fact, in the whole Northwest Territories. The renewed interest in uranium in the early 1950s, which reached its greatest expression in the Beaverlodge uranium camp north of Lake Athabasca,¹³ resulted in concentrated exploration activity in the Marian-Camsell River area between Great Slave and Great Bear Lakes. The only result of this activity was the development, by Rayrock Mines Ltd., of a high grade uranium ore deposit north of Marian Lake (Fig. 3), which began producing in the fall of 1957. In 1956, three large reservation areas,¹⁴ were taken up and explored by Pickle Crow Gold Mines, Canadian Nickel and Kennarctic Exploration. These areas, totalling nearly 1,620 square miles, were among the largest ever advertised in the Northwest Territories. After exploratory trenching and diamond drilling on sulphide, copper and copper-zinc showings with little success these reservations were surrendered.

The latter part of the decade witnessed a contraction in the mining industry of the Yellowknife area. Rayrock's rather short history came to a sudden and unexpected end in 1959 followed, one year later, by the Eldorado mine at Port Radium on Great Bear Lake. The latter mine had operated continuously from 1944 when it was acquired by the Crown-owned Eldorado Mining and Refining organization. With the closing of these mines, the mining economy of the Yellowknife area was, for the first time, totally dependent on its three producing gold mines.

¹³ A.H. Lang and R.J.W. Douglas, "Minerals and Fuels," The Canadian Northwest: Its Potentialities, F.H. Underhill (ed.), University of Toronto Press, Toronto, 1959, p. 50.

¹⁴ Coppermine Mountains, Coppermine River and James River Reservations (Christie, op. cit., pp. 14, 15).

3. Settlement Form and Functional Growth

The form and functional character of any human settlement within a particular cultural area are conditioned by a combination of three basic factors; location, topography, and economy. As the economic support of a community, mining, because of the nature of the conditions under which it is established and developed, produces a settlement usually unique in its form. As Griffith Taylor points out, "Perhaps of all towns, those which are built in response to mineral deposits are created with the least regard for environmental advantages."¹⁵ Also, as the community must be located near the mineral deposit being exploited, and as areas suitable to the occurrence of metallic minerals are not usually suited to agriculture, mining towns appear in remote areas apart from dense settlement.

Before Yellowknife existed, there were only a few small trading posts scattered from Great Slave to Great Bear Lake. Out of a total of six posts which existed at one time or another,¹⁶ only three are of any significance today. These are the large Indian settlement at Rae fifty miles northwest of Yellowknife, Reliance on the eastern extremity of the East Arm, and Fort Providence,¹⁷ located near the present Indian village across the bay from Yellowknife.

Not unlike most mining towns, Yellowknife grew in its initial boom stage in 1937 as a collection of shacks and tents on the rocky peninsula which juts out into Yellowknife Bay, and on neighbouring Latham

¹⁵ G. Taylor, Urban Geography, Methuen and Co., London, 1949, p. 301.

¹⁶ For a list of these posts see M.J. and J.L. Robinson, "Exploration and Settlement of the Mackenzie District, N.W.T.," (Part I), Cdn. Geogr. Journal, Vol. 32, No. 6, June, 1946, p. 253.

¹⁷ This fort should not be confused with the present Fort Providence which lies on the Mackenzie River near the western end of Great Slave Lake.

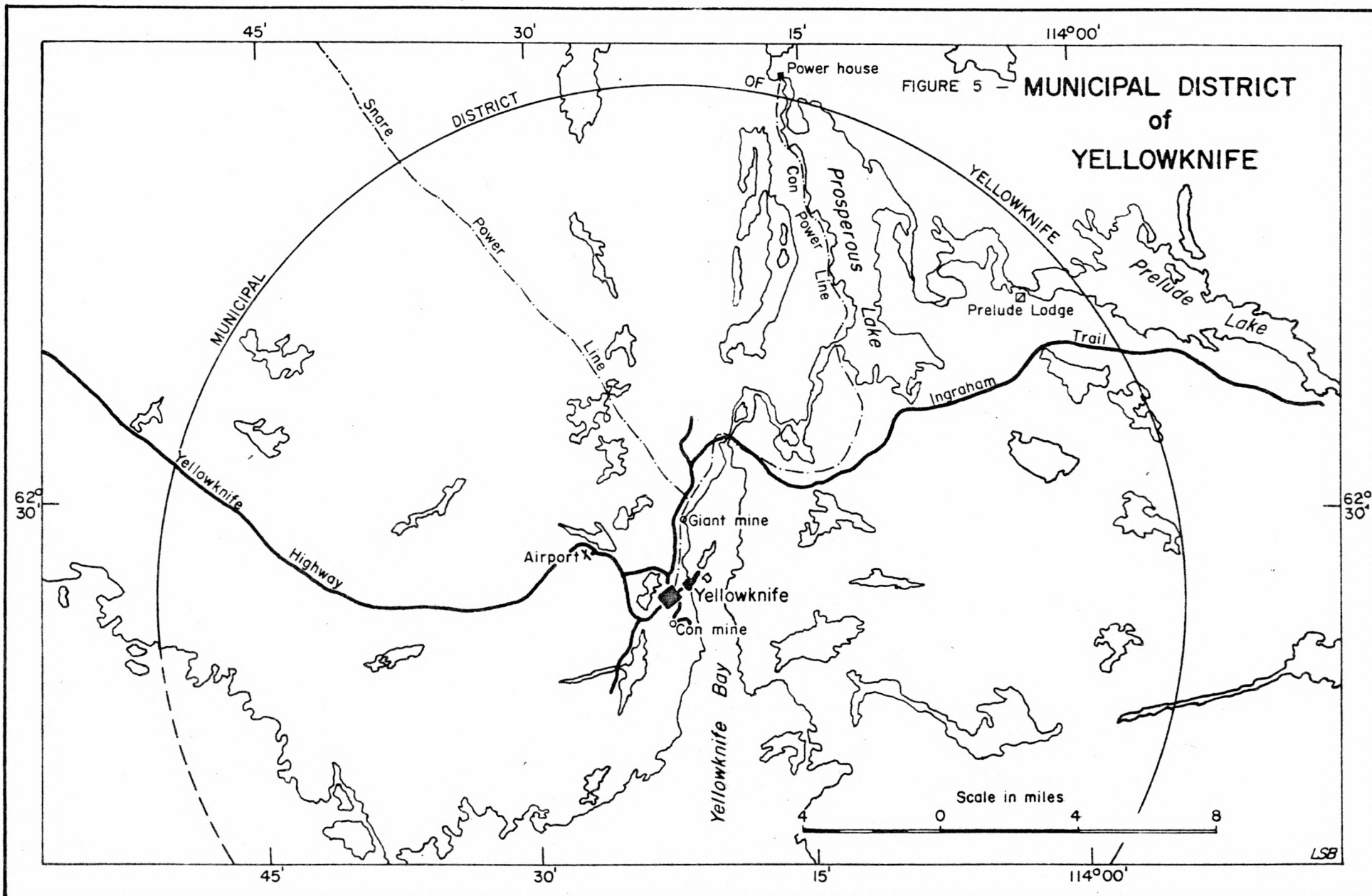


FIGURE 5 - MUNICIPAL DISTRICT of YELLOWKNIFE

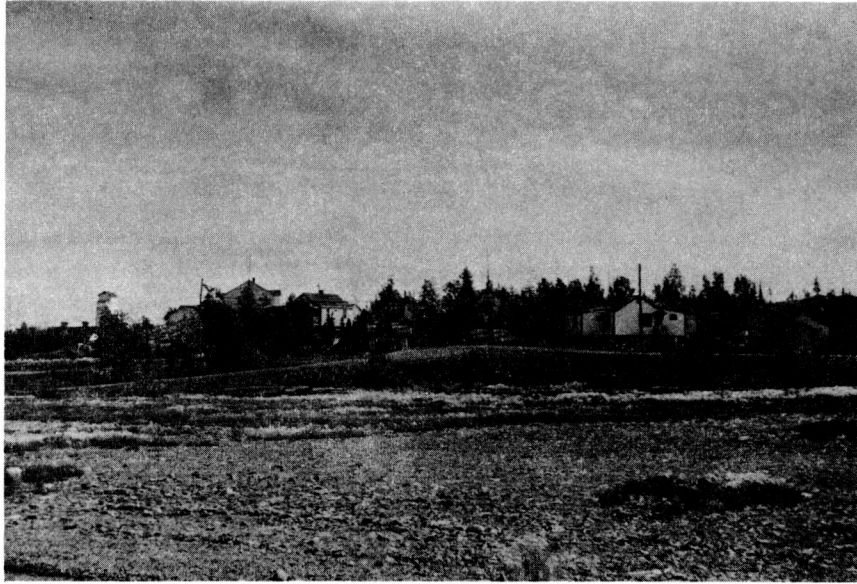
LSB

and Jolliffe Islands (Fig. 6). This area, now referred to as the Old Town, formed the original nucleus of Yellowknife. Here were concentrated the docks, storage tanks, stores, hotels, banks and offices where virtually all the settlement's business was transacted. It was a water-oriented location attesting to the vital importance of barge and float plane transportation in the local economy.

Paralleling and somewhat duplicating this development was the growth of an extensive townsite on the property of Consolidated Mining and Smelting two miles south. As the only area which provided adequate housing and community services, Con slowly developed as a self-contained unit. Shortly after, a similar but much smaller campsite began to take shape on the adjacent Negus property. It is significant to note that when Burns and Company decided to build a large cold storage plant in the area it was located, not in the Old Town, but at Con. In addition, during the first ten years of the settlement's existence all hospital facilities were provided by the sixteen-bed hospital at the Con mine.¹⁸ Therefore, until the post-war period, Yellowknife did not have a single urban nucleus. Instead, it consisted of a waterfront collection of transportation facilities, mining offices and expeditors, and two mining camps,¹⁹ one of which was of sufficient size to contain many of the area's public services.

¹⁸ Western Miner and Oil Review, "Yellowknife's Pioneer Operator," Yellowknife Number, Vol. 20, No. 11, Nov. 1947, p. 80.

¹⁹ A distinction should be made here between a mining community, settlement or town and a mining camp or campsite. Throughout this study the former group of terms will apply only to settlements in which there is a variety of community services, an elementary differentiation into zones of residential and business use, and an organized street pattern. On the other hand, a mining camp has a connotation of being temporary, an unorganized collection of residences, mine and service buildings.



4. The largest residential zone outside of the Old and New Towns is on the Con property. Shown here are a few of the single-family residences on the property.




5. The residential area at the Giant mine is smaller, more compact and more recent than the one at Con. All but one of the single-family houses are contained in this view. The large white building left of center is the residence for single staff employees.

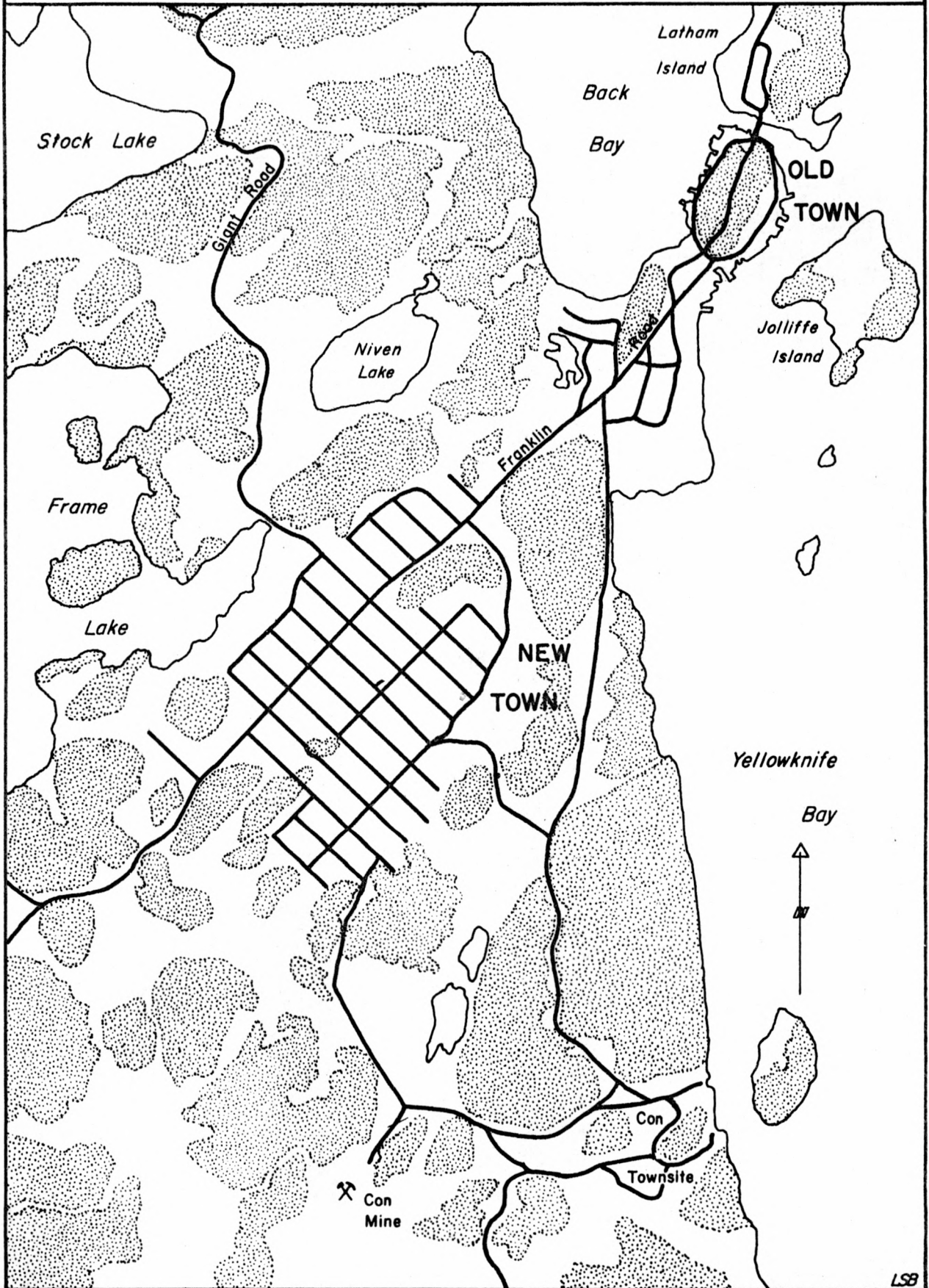
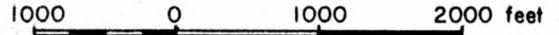
FIGURE 6

YELLOWKNIFE

SETTLEMENT FORM and PHYSICAL CONTROLS

 Areas of bedrock outcroppings

1000 0 1000 2000 feet



By 1945 Yellowknife and the surrounding prospecting area contained over 3,000 persons.²⁰ With this new growth and the increasing awareness that Yellowknife was becoming a permanent settlement, it was generally agreed that the site conditions and the rather primitive state of buildings and services of the Old Town were totally inadequate. There was little room for future expansion, water and sewer facilities would be difficult to install, and the implementation of proper town planning measures was virtually impossible.²¹

As a result, the Federal Government decided to establish an entirely new townsite where water and sewer facilities could be placed underground, where zoning regulations and building controls could be enforced and where expansion was possible in all directions. In 1945, the grid street pattern for the new town was surveyed on a sandy plain about one and one-half miles inland from the old site. By 1947 the new residential and commercial nucleus of Yellowknife began to take shape.

The functional growth of Yellowknife following the creation of the New Town and the end of the boom period, involved a general expansion of both community and regional services (Table III), and a physical movement from the Old Town to the New. The Old Town, despite this loss of functions, has maintained an important commercial position especially in those functions which are regionally oriented and those utilizing the waterfront location.²² Even today all of the charter airline and water transportation

²⁰ J.L. and M.J. Robinson, "Exploration and Settlement of Mackenzie District, N.W.T.," (Part II), Cdn. Geogr. Journal, Vol. 33, No. 1, July 1946, p. 49.

²¹ News of the North, Yellowknife: Past, Present, Future, issued for the Sixth Commonwealth Congress of Mining and Metallurgy, Yellowknife, Sept. 14 and 15, 1957, Yellowknife, p. 4.

²² Several small retail concerns have remained in the Old Town, partially for social reasons, to serve the local population. The most significant movement was that of the Hudson's Bay Company from the heart of the Old Town to the New in 1953.

TABLE III - THE TRENDS IN COMMUNITY AND REGIONAL
FUNCTIONS IN YELLOWKNIFE, 1946-1962

Functions	Number of Establishments		
	1946	1956	1962
Community			
Bakeries	2	1	1
Banks	3	2	1
Barbers	1	n.a.	3
Barristers	3	2	4
Beauty Salons	0	2	2
Cafes	7	5	3
Churches	4	3	6
Clothing and Shoes	2	2	2
Construction and Electrical Contractors	4	n.a.	5
Dentists	1	1	1
Doctors	2	2	3
Drug Stores	2	n.a.	2
General Stores	4	6	4
Hardware	4	4	5
Hotels	1	3	3
Insurance	3	3	3
Plumbers	1	n.a.	2
Publishers	1	n.a.	1
Real Estate	0	2	3
Service Stations	1	2	3
Regional			
Charter Airlines	2	2	6
Mining Offices	16	6	6 ^a
Mining Services ^b	13	4	6
Trucking Companies (Bus)	1	2	4
Water Transportation Companies	2	1	0

^a INCO, Salmita-Mack Lake, Giant, Consolidated Mining and Smelting, Discovery and Akaitcho.

^b Includes expeditors, diamond drillers, consulting engineers, and exploration and supply agents.

n.a. = not available

companies, and most of the mining companies and expeditors, have their offices located here.

The New Town, despite its surprisingly slow growth in the early years, has become the center for most community services in the area (Fig. 7). It contains the main business section, the government offices and residences, the better homes and almost all of Yellowknife's new construction. One of the most important factors in this development has been the emergence, especially since 1954, of the Federal Government as a major component of its economic base. The establishment of several government offices, most of which are oriented toward regional administration, has brought a small degree of diversification to the community, and has provided an important stimulus towards its development as a regional center.

The most recent stimulus to Yellowknife's economic growth has been the completion, in 1960, of a road connection with Hay River and the "outside". The most important effects include its contribution to the feeling of community permanency and the overall reduction in the operational costs of all economic activities.²³ Also, the speed and economy of utilizing this northernmost road terminus in conjunction with the charter airlines has, in no small way, been responsible for the current attraction of Yellowknife as a base of supply. This attraction has been reflected in the growth of mining services and charter airlines between 1956 and 1962 (Table III).

In conclusion, the rather unique settlement patterns are essentially a result of Yellowknife's location and gold mining economy, and the historical sequence of events. The contrasts between the New Town and the Old,

²³ J.W. McKay, Truck Transportation to Yellowknife - The Economic Effect on Inventories, a paper presented at the Tenth Annual Alberta and Northwest Mining Meeting, Edmonton, Feb. 23, 1962, 14 pp.

however, must be attributed to the difference between planned and unplanned settlements. This distinction, as A.E. Smailes²⁴ emphasizes, is fundamental in explaining the sort of dichotomy that exists in the present day settlement of Yellowknife.

4. Settlement Evaluation

In general, Yellowknife is a reasonably well developed community despite its location, economy and historical development. Although it has avoided much of the fringe development characteristics of non-company mining towns, most of the Old Town consists of substandard housing. This area is a liability to the community and yet its attractive site and colourful history could be of considerable significance in the tourist trade. Certainly, the reconstruction of this area is the most pressing problem in community redevelopment.

The New Town, on the other hand, is quite similar to communities in the south and is adequately supplied with the modern amenities of urban life. According to the original plan, it was designed to serve as the center for an increasing number of mines in the immediate area. This consolidation of facilities in a central, planned and serviced community was intended to increase the feeling of permanency and to provide, through the large population and the economic diversity, a higher standard of community services.

The importance of this type of community development has been thoroughly analyzed by V.J. Parker²⁵ in his approach to new towns based

²⁴ A.E. Smailes, The Geography of Towns, Hutchinson & Co., London, 1953, p. 103.

²⁵ V.J. Parker, The Planned Non-Permanent Community: An Approach to the Development of New Towns Based on Mining Activity, unpublished M.Sc. thesis, Community and Regional Planning, University of British Columbia, April 1960, p. 62.

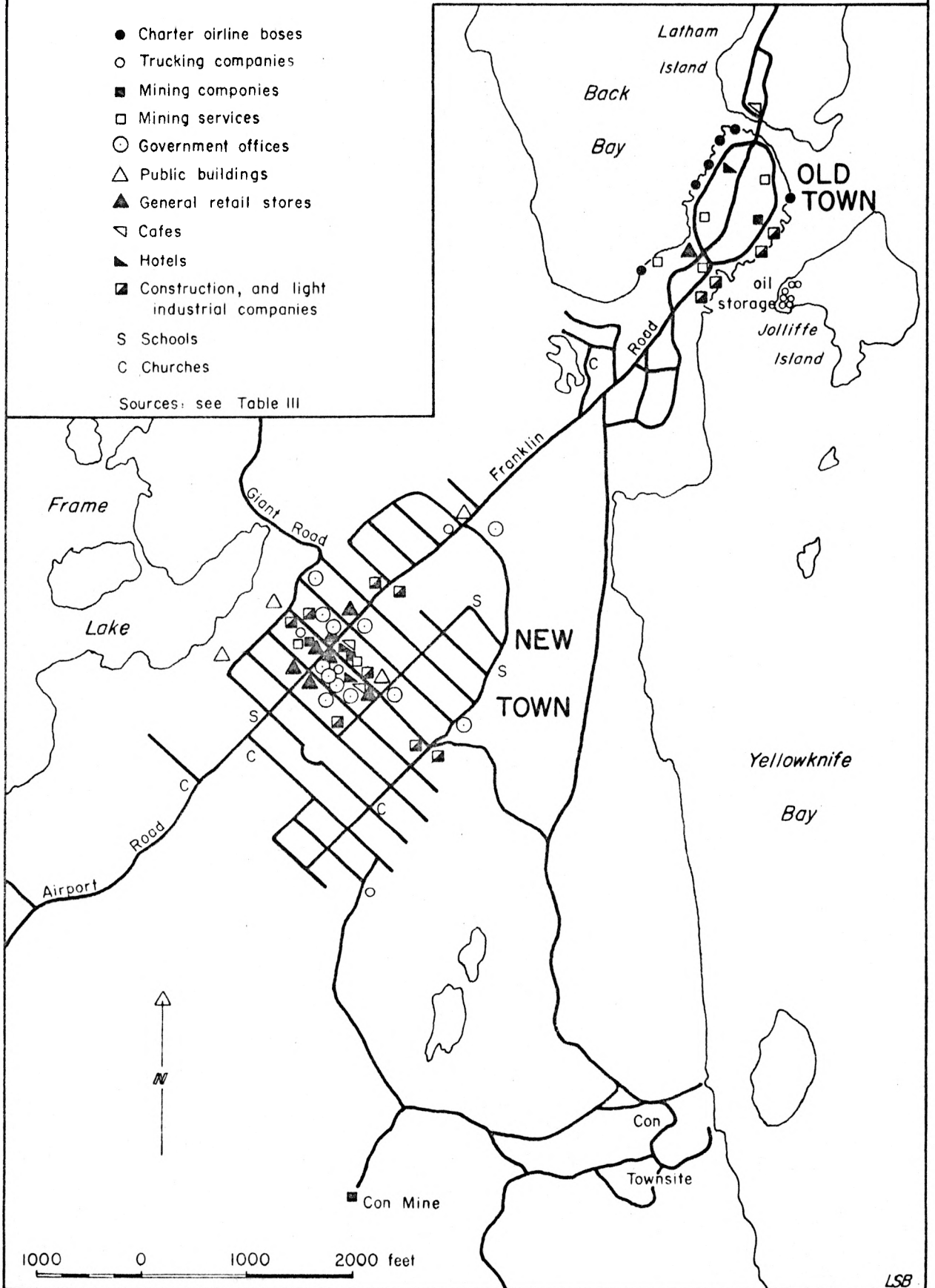
FIGURE 7

YELLOWKNIFE

LOCATION of SELECTED URBAN FUNCTIONS

- Charter airline bases
- Trucking companies
- Mining companies
- Mining services
- Government offices
- △ Public buildings
- ▲ General retail stores
- ▽ Cafes
- ▲ Hotels
- Construction, and light industrial companies
- S Schools
- C Churches

Sources: see Table III



on mining, by the Queen's University²⁶ study of single-enterprise communities, and by I.M. Robinson's research on Canada's new industrial towns.²⁷ Parker and Robinson emphasize the importance of creating such a multi-enterprise mining center,²⁸ in maintaining a permanent community based on regional development. The Queen's study, because of its socio-economic nature, also stresses the necessity of securing the support of the companies involved in persuading their employees to move into such a community. In Yellowknife this was of considerable importance because the growth of Giant, now the largest employer, paralleled that of the New Town in 1947, and it was possible to co-ordinate their community planning programs.²⁹

From an overall point of view, there was little doubt of the necessity for a new town at Yellowknife. Nevertheless, considerable criticism has been directed toward the conceptual basis for its design. As is usually the case, planning concepts and principles which have proven applicable to more southerly communities are applied to northern settlements with little, if any, understanding of the environmental conditions involved.

²⁶ Queen's University, Institute of Local Government, Single-Enterprise Communities in Canada, a report to C.M.H.C., Ottawa, 1953, pp. 23-26.

²⁷ I.M. Robinson, New Industrial Towns on Canada's Resource Frontier, Research Paper No. 73, University of Chicago, Chicago, 1962, pp. 118-121.

This is the most recent and undoubtedly the most comprehensive survey and evaluation of Canadian new towns built since World War II. As representative case studies for a more detailed analysis he selected Kitimat, Elliot Lake, Drayton Valley and Schefferville. Although Yellowknife is not discussed, many of the basic considerations concerning community planning are applicable.

²⁸ Parker's use of "multi-enterprise", referring to more than one mining operation, should not be confused with the same term used in the Queen's University study. This study employs the term only in relation to communities where one or more activities along with mining constitute the economic base.

²⁹ The result of these efforts is that over 85% of the married employees at Giant, as well as 60% at Con, now live in the New Town. See J. Fried, Yellowknife, a sociological study, unpublished manuscript, Northern Co-ordination and Research Centre, Dept. of Northern Affairs, Ottawa, 1962, p. 14.

There is no valid reason, other than simplicity, for a grid street pattern. As Langlois³⁰ has pointed out for other northern settlements, the design should have consisted of curved streets, varying in width according to function and molded to the landscape. Residential densities could have been increased considerably to avoid long walking distances during the severe six-month subarctic winter,³¹ to decrease the cost of providing adequate services, and to provide more of a community "town-feeling".

On the other hand, it is hardly surprising that the New Town of Yellowknife resembles a "suburb in the wilderness" and lacks a regional character or distinctiveness. The town was created in the rush that followed World War II and there was little desire or inclination to investigate conditions pertinent to its establishment. There is little indication of reference to past experiences with new town construction or of consultation with local residents concerning modifications of the plan.³² A possible explanation for this phenomenon, in addition to simplicity, is the conscious effort on the part of the town planners to create new towns as similar as possible to southern suburbs to reduce the feeling of being apart or isolated from civilization.

³⁰ See Claude Langlois, "Our Mining Towns: A Failure," Community Planning Review, Vol. 7, No. 1, March 1957, p. 53. He suggests neighbourhood units of 1,000 population with a density of 40 persons per acre for subarctic settlements. In contrast, average densities in Yellowknife's New Town are less than 15 persons per acre.

³¹ A review of recent new towns in Canada and the successful use of low density neighbourhood units at Kitimat and Elliot Lake is included in S.D. Lash, "Planning of Recent New Towns in Canada," Engineering Journal, Vol. 41, March 1958, pp. 43-53, 58. It must be remembered that residential construction in Yellowknife, in contrast to these new towns, was almost entirely private and therefore difficult to co-ordinate.

³² J.M. McMeekan, "The History of Yellowknife 1945-1946," The Yellowknife Blade, May 8, 1962, p. 8.

Yellowknife's Commercial Core



6. Yellowknife's wide main street, Franklin Road, is quite similar to that of any other small town. The new Federal building is on the right and the Yellowknife Hotel is on the extreme left.



7. Yellowknife's second business area is located on the south side of 50th Street east of Franklin Road. The largest business and focal point is the Gold Range Hotel, shown in the center of the above view.

5. Population Characteristics

As previously mentioned, there are four well defined and physically separated zones of settlement in Yellowknife. Each of these zones, the Con Mine, Giant Mine, New Town, and Old Town, is a specialized functional unit, especially as a focus of residency.³³ The largest zones within the Municipal District are the New and Old Towns, which contain sixty and twenty per cent of the total population, respectively.³⁴ As for the mine townsites, Con has the largest population, comprising over ten per cent of the total population (Table IV).

TABLE IV - ESTIMATED POPULATION OF THE MUNICIPAL DISTRICT OF YELLOWKNIFE, BY SETTLEMENT UNITS, 1962

Settlement Unit	Population	Per Cent of Total
New Town	1,900*	59
Old Town	650*	20
Con Mine	340	10
Giant Mine	260	8
Indian Village	100	3
Total	3,250	100

*Estimated from taxation and election lists.

Sources: Pers. comm., Staff of Giant and Con mines, and the Yellowknife Indian Agent.

The actual population growth of Yellowknife, because of the lack of statistics and its extreme seasonal and annual fluctuations, is virtually impossible to trace accurately. The following table (Table V),

³³ In actual fact there is a fifth zone, the Yellowknife Indian Village. However, its role in the development of past and present patterns of both settlement and economy is small enough to justify its exclusion from this general discussion. (Fried, *op. cit.*, p. 13)

³⁴ The Municipal District of Yellowknife covers 272 square miles, the outside boundary being delimited by a circle with a radius of fifteen miles (Fig. 5).

TABLE V - ESTIMATED POPULATION GROWTH OF THE MUNICIPAL DISTRICT OF YELLOWKNIFE, 1939-1961

Year	1939	1941	1945	1951	1956	1961
Population	1,000	1,410	3,000	2,724	3,100	3,245
Per cent change	-	41	113	-8	14	5

compiled from a variety of sources, reveals the fluctuating trends prior to 1951 and the relative stability thereafter. The latest period of expansion was between 1951 and 1956 corresponding to the increase in government facilities. Between 1956 and 1961 the rate of increase declined to less than one per cent per year.³⁵

As a framework for the analysis of employment to follow (Chapter IV), it would be valuable to comment briefly on the demographic distinctiveness of mining settlements in general. Professor M.G.A. Wilson measured this uniqueness by comparing the characteristics of mining towns with those of 420 other settlements in Australia.³⁶ He found, as did Nelson,³⁷ that the classic mining community is traditionally masculine both in the labour force and the total population (Appendix B), that despite the small number of children the population is youthful, and that there is inevitably a large foreign-born element.

³⁵ The population given in the 1961 census is considered by many to be considerably lower than the actual. A settlement survey by the Department of Northern Affairs indicated a population of 3,427 (see Northern Co-ordination and Research Centre, Settlement Survey, 1961, Ottawa, 1962, p. 1), while other estimates range as high as 3,600 or 3,800. The discrepancy seems to lie in tabulating the transient section of the population which appears largely excluded from the government census.

³⁶ M.G.A. Wilson, "Some Population Characteristics of Australian Mining Communities," T.E.S.G., 53, No. 5, May 1962, pp. 125-132.

He studied twenty-nine mining settlements varying in size from 1,200 to 31,500 which he classified by employing Chauncy Harris' criterion of at least 15 per cent of the labour force engaged in mining.

³⁷ J.H. Nelson, "Some Characteristics of the Population of Cities in Similar Service Classifications," Economic Geography, Vol. 35, No. 2, April 1957, p. 171.

Despite the lack of statistics, certain parallels can be drawn between Yellowknife and the typical mining community. Beneath its stable and diversified appearance, Yellowknife is still a mining town with a youthful transient population, a high rate of labour turnover, and a large percentage of foreign born. In 1951 males comprised 89 per cent of the labour force and out of a total population of 2,724, 52.8 per cent or 1,438 persons were classified as employed.³⁸ By 1962 the percentage of males had decreased considerably and the labour force had declined, both in absolute and relative terms, to 41.5 per cent of the total population.

Yellowknife's foreign-born population, especially in mining, is considerable. At the Giant mine, for example, the number of non-Canadian workers in 1962 amounted to over 48 per cent of the total staff and almost 62 per cent of the underground workers. This characteristic, essentially a product of the labour shortage during the uranium rush in the early 1950s, adds diversity to Yellowknife's social character and partially explains the recent trend to stability.³⁹

The transient nature of a large proportion of the population, both Indian and white, is reflected in the high rate of labour turnover (Chapter VII). Although it has decreased considerably in recent years, labour instability continues to be much greater than in more southerly areas. This factor of transience cannot be statistically evaluated in the employment study to follow, and thus greatly reduces the accuracy of the conclusions.

³⁸ Pers. comm., R.J. MacNaught, Census Division, Dominion Bureau of Statistics, Ottawa, September 1962.

³⁹ One of the major reasons for the greater social stability is that many of the immigrants, especially the Germans and Italians who were brought in between 1953 and 1958, have remained as permanent residents. In contrast, the percentage of Canadian arrivals staying as permanent residents is considered to be much smaller.

CHAPTER IV

THE URBAN AND REGIONAL ECONOMY

There is considerable confusion surrounding the terminology employed in studies of the economic basis of urban areas. What is termed the urban economy in current literature, is regarded here as the sum total of productive activity within an urban area and that part of the surrounding area dependent to a marked degree on its facilities and services. Included within this broad general survey, and based on the recognition of a dichotomy of urban economic functions, is an analysis of the economic base of the community. This approach distinguishes those activities of a community which produce goods and services for areas outside the city boundary from those producing for local consumption. A second approach for determining the degree of economic dependence or specialization within the community involves the use of taxation sources for community expenditures. Using these criteria as a basic framework, it is possible to estimate various degrees of dependence on certain sectors of the economy and to estimate the direction future urban growth will take.

1. The General Area Economy

"The principal industries of the Northwest Territories are mineral production, fur trapping and commercial fisheries. Among these the mineral industry is paramount; in recent years it has accounted for no less than ninety per cent of the combined value of production." (R.G. Robertson)¹

Excluding minerals, the natural resources of the Yellowknife area do not contribute significantly to the modern economy of the community. The resources of forest, soil, fish, and wildlife growth, and potential

¹ R.G. Robertson, "Huge Mineral Potential Assured in the Northwest Territories," Western Miner and Oil Review, Vol. 31, No. 10, Oct. 1958, p. 120.

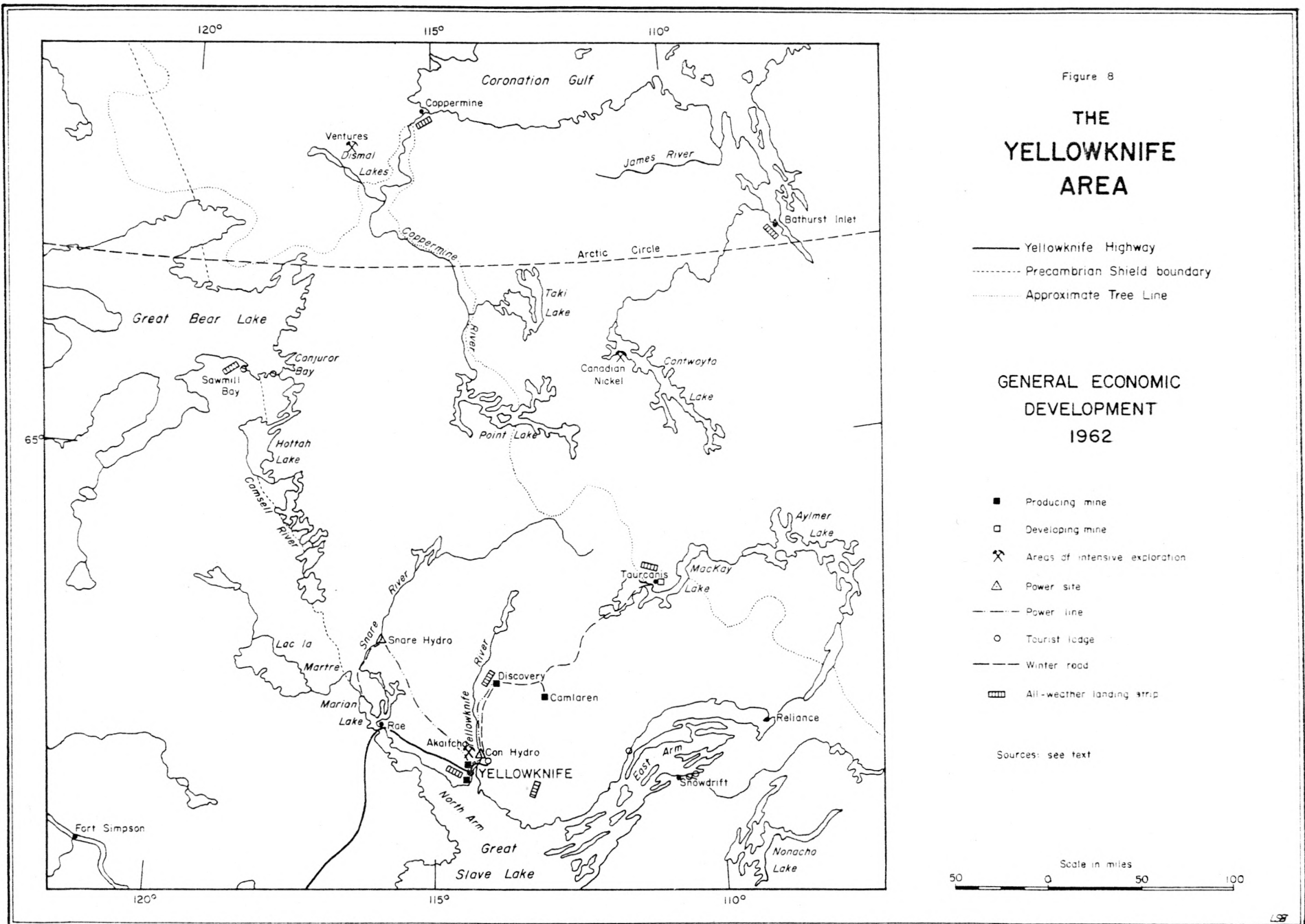
hydro-electric power are either extremely limited or remain largely undeveloped. In light of these conditions, and the detailed description of the resource base included in Chapter II, these factors need be dealt with here only in a very superficial manner.

In the area north of Great Slave Lake, as in most of the Northwest Territories, fur was the earliest resource exploited. Historically, it provided the main source of income for the native peoples as well as the first stimulus for permanent settlement. In recent years, because of instability in both supply and demand, fur trapping has declined rather drastically as a source of income. Nevertheless, it does provide a livelihood for large numbers of the native population at the settlements of Rae, Snowdrift, Reliance, Lac la Martre (Fig. 8), as well as the Yellowknife Indian Village and the Old Town. In the long run, however, it is anticipated that depressed prices, rising costs and fluctuating supply will further reduce its value as a source of income for the natives.²

A much more recent development, dating from 1945, is the growth of commercial fishing on Great Slave Lake. The value of the catch rose quite steadily from 1945 until 1954 when it levelled off at approximately \$1.4 million annually. The present Department of Fisheries quota for the lake of 12.0 million pounds has never been reached, and appears to be the maximum that can be expected. Despite this limited potential, Yellowknife could benefit as a supply and processing center for the activity within the North Arm. At present, the fishing industry in this area is completely serviced out of Hay River in spite of the proximity of Yellowknife and its supply facilities.

Another aspect of the fishing industry, namely sport fishing, has

² W.C. Wonders, "Economic Change in the Mackenzie Valley Area," Cdn. Geogr. Journal, Vol. 58, No. 4, Oct. 1961, p. 140.



been the prime attraction responsible for the rapid expansion of the tourist industry in recent years. This growth has been reflected in the increasing highway traffic into Yellowknife since 1960 and in the growth of exclusive fishing lodges on Great Slave and Great Bear Lakes (Fig. 8).³ To supplement the excellent fishing grounds, however, the area has little to offer the prospective tourist other than its northern location and tours of the producing gold mines. Although the present contribution to the urban and regional economy is almost negligible, the outlook for the industry is encouraging and rapid expansion is expected (Chapter VI).

Among the remaining industries utilizing the area's resources, only the timber industry is economically significant, and even this significance is indirect. The scattered stunted growth around Yellowknife Bay and the outlying mines has been useful in reducing the costs of initial development by providing a local source of rough mine timber. Recently, the importance of this supply in the immediate area has been reduced because of numerous fires and general depletion. Outside of this area, new isolated developments may utilize local sources to their advantage for several years.

To complete this discussion of the area's non-mining economy some mention is necessary of those activities which developed directly as a result of the growth in mining. Probably the most important is that of the hydro-electric power industry. The suitable sites in the area, although rather small and dispersed, have a combined potential which is quite substantial.⁴ A report of a survey carried out in 1946 lists four rivers,

³ During 1962 there were five such lodges in operation, three on the East Arm of Great Slave Lake: Great Slave, Frontier Fishing Tours and Snow-drift Lodges; and two on Great Bear Lake: Great Bear and Conjuror Bay Lodges. A sixth was scheduled for completion in 1962 on Prelude Lake just east of Yellowknife.

⁴ D.B. Turner, "The Resources Future," The Canadian Northwest: Its Potentialities, a Symposium presented to the Roy. Soc. of Canada, 1958, F.H. Underhill (ed.), University of Toronto Press, Toronto, 1958, p. 86.

the Snare, Emile, Yellowknife and Beaulieu, each as having several sites within an economic distance of Yellowknife which are physically suitable for development.⁵ At present, only two sites are being utilized to serve the mines and settlements at Yellowknife and Discovery. The largest is the Northern Canada Power Commission plant (18,000 hp.) at Big Spruce Lake on the Snare River. The second is the smaller unit (4,700 hp.) owned by the Consolidated Mining and Smelting Company at Bluefish Lake fifteen miles north of Yellowknife. In the past these sites have proven more than sufficient for the development that has taken place. On the other hand, the power is costly, but this is more a reflection of the small demand rather than the lack of supply.

Transportation also plays a significant role in Yellowknife's economy both directly and indirectly. The modern facilities which accompanied the growth of the large mining camp on Yellowknife Bay in turn attracted other activities which provided services to the region. The largest and most important functional activity to take advantage of Yellowknife's strategic transportation facilities has been the government. Together, the growth of transportation and government functions has, in recent years, provided the basis for Yellowknife's economic expansion and increasing diversification.

2. The Urban Economy

There is little doubt that gold mining dominates the economy of the Yellowknife area. The community itself was founded on the mining industry and continues to depend on it for its existence. Recently, the trend has been toward greater diversification throughout the economic structure and especially within the transport and government industries. In this section, an attempt is made to define statistically the dominance of mining

⁵ B.A. Monkman, "Water Resources of the Yellowknife Area," Western Miner and Oil Review, Vol. 19, No. 6, June 1946, p. 53.

as the basic industry and the importance of the expanding sectors of the economy.

The standard economic base analysis is the most widely used approach to the study of urban economies. To facilitate such a study some form of aggregation of data is essential. Among the types employed,⁶ listing the relative numbers of persons employed in each industrial category within the urban area is the traditional, and most straight forward method of approach. Both F. Stuart Chapin⁷ and John Alexander,⁸ for example, argue that while offering certain advantages in data availability, this method poses numerous problems as a means of measurement. It does not afford an accurate distinction between basic and service activity, nor does it recognize certain variables such as worker productivity, personal income and historical considerations, which may obscure underlying trends in the economy.

On the other hand, J.W. Webb⁹ recognized the deficiencies of the approach, but stressed that statistics for small urban centers were just not available to permit the use of other measures, and could not be reduced to a common denominator even if they were. Howard Nelson¹⁰ used employment

⁶ For a list of the various types of aggregation used see C.M. Tiebout, "The Urban Economic Base Reconsidered," Land Economics, Vol. 32, No. 1, Feb. 1956, p. 95.

⁷ F.S. Chapin, Urban Land Use Planning, Harper and Bros., New York, 1957, p. 111.

⁸ J.W. Alexander, "The Basic-Nonbasic Concept of Urban Economic Functions," Economic Geography, Vol. 30, No. 3, July 1954, p. 246.

⁹ J.W. Webb, "Basic Concepts in the Analysis of Small Urban Centers in Minnesota," A.A.A.G., Vol. 29, No. 1, March 1959, p. 59.

¹⁰ H.J. Nelson, "A Service Classification of American Cities," Economic Geography, Vol. 31, No. 3, July 1945, p. 189.

as the basis for his functional classification of American cities because he found that it was the only measure which was easily comparable from industry to industry and from year to year.

It is not the purpose of this analysis to weigh the advantages and disadvantages of employment as a framework for the study of urban economies. It will suffice to say here that despite its disadvantages it is the most practical approach for the purposes of this particular study. In addition to the lack of statistics, it would be difficult to justify the necessity of a detailed analysis of input versus output or local versus regional consumption considering Yellowknife's size, location and economy. As a result, the emphasis in this study will rest primarily on the relative numbers employed in each functional category rather than on a basic-nonbasic distinction.

As a highly specialized mining community situated in northern Canada, and as one in which the government plays a highly significant role, Yellowknife offers numerous difficulties to a conventional urban study. Firstly, Yellowknife has developed apart from an integrated urban complex and thus, upon maturity, contains an unusual range of services for a community its size. Also, Yellowknife's population characteristics, including high labour turnover rates, large seasonal fluctuations and extensive "moon-lighting",¹¹ injects variables into, and reduces the validity of any statistical generalization.

Another problem is that of measuring the contribution of outlying mining camps such as Discovery and Taurcanis to the economy of Yellowknife. Except for the matter of size difference, their relationship with the community is different from that of Giant and Con only because of the

¹¹ Defined as the practice of holding two or more jobs, a common feature of all northern settlements.

distance between them.¹² Although this distance renders trips less frequent, such camps are, nonetheless, dependent on the retail and personal service functions of Yellowknife. The basis for ascertaining their significance to the economy must then lie with their direct contributions. Employees at Discovery and Taurcanis do not usually own or rent homes in Yellowknife nor do the companies pay sufficient taxes to assist in maintaining the community. For these reasons, the employment at Discovery and Taurcanis cannot be directly equated to local employment and is thus excluded from the urban statistics.

a) Trends in the Employment Structure

The following table (Table VI) summarizes the employment structures in Yellowknife for 1951 and 1962. The statistics are listed in the standard industrial categories,¹³ and for each category the numerical and percentage changes between 1951 and 1962 were calculated.

The first and most obvious change revealed by these statistics is the decline in the total number of persons employed. Despite a population increase of nearly twenty per cent, the labour force shrank by 5.9 per cent from 1,438 persons in 1951 to 1,354 persons in 1962. This stagnant employment picture can be attributed to the decline in the labour force of the mines. The number employed in mining actually declined by 218 persons or by nearly 27 per cent during this period. Most of this

¹² Discovery is located sixty miles north of Yellowknife and Taurcanis 150 miles northeast. Both are connected to Yellowknife by a winter road and by regular air service, but not by an all-weather road.

¹³ In this study all employment figures are given by industry rather than by occupation. Employment by occupation is usually considered to be more revealing of the social structure of a community than the economic structure. For comparative purposes, the occupational breakdown for both Yellowknife and Timmins, Ontario, are included in Appendix C.

TABLE VI - PROPORTION OF THE LABOUR FORCE IN STANDARD INDUSTRIAL CATEGORIES,* YELLOWKNIFE, 1951 and 1962

Industrial Category	1951		1962		Change 1951-62	
	No.	Per Cent	No.	Per Cent	No.	Per Cent
Agriculture	3	0.2	2	0.1	-1	-33
Forestry, Fishing, Trapping and Logging	17	1.2	21	1.5	+4	+24
Manufacturing and Construction	105	7.3	90	6.7	-15	-14
Mining	813	56.5	595	43.9	-218	-27
Transportation and Communications	94	6.5	107	7.9	+13	+14
Retail and Wholesale	65	4.6	96	7.1	+31	+48
Public Utilities	8	0.6	6	0.6	-2	-25
Finance, Insurance and Real Estate	19	1.3	20	1.5	+1	+5
Service	304	21.1	417	30.7	+113	+37
(Community)	(41)	(2.8)	(32)	(2.2)	(-9)	(-6)
(Government)	(147)	(10.2)	(215)	(15.9)	(+68)	(+22)
(Recreation and Business)	(18)	(1.3)	(26)	(1.9)	(+8)	(+6)
(Personal)	(98)	(6.8)	(144)	(10.7)	(+46)	(+15)
Not Stated	10	0.7	-	-	-	-
Totals	1,438	100.0	1,354	100.0	-84	-6
Total population	2,724		3,245		+521	+19.8
Per cent of total population in labour force		52.8		41.5		-11.3

* Dominion Bureau of Statistics, Standard Industrial Classification Manual, Ottawa, 1960.

Sources: 1951 statistics from R.J. MacNaught, Census Division, Dominion Bureau of Statistics, Ottawa, Sept. 1962.

1962 statistics obtained from a field survey carried out by the author during July and August of 1962.

reduction resulted from the closing of the Negus mine in 1953, which previously employed about 150 persons. The remainder of the decline in mining stems from the gradually shrinking labour forces at both Con and Giant. This decline in employment has been partially offset by an increase of 113 persons in the service industries, especially the government.

The expanding population, which appears to be in contrast to the decline in employment, is primarily a result of an increase in the number of married employees. This is illustrated by the fact that the number employed as a percentage of the total population declined from nearly 53 per cent in 1951 to less than 42 per cent in 1962. At Giant and Con, for example, the percentage of married employees increased from 40 and 50 per cent, respectively, in 1956, to 56 and 58 per cent in 1962.¹⁴

On the regional scale, the decline of mining employment is even more striking. Table VII lists the numbers employed at each mine in the townsite area and in the region to the north and east.¹⁵ Between 1951 and 1962 the number of persons employed in mining in the region fell from 305 to 194. The greatest decline came after 1956 when the Rayrock and Port Radium mines ceased operations and approximately 345 persons were released.

In the urban economy the relative decline of mining employment would suggest a moderate shift toward secondary activity. On closer investigation, it is obvious that most of this shift has been into categories which are largely derivative of the continuing effect of mining and which

¹⁴ Pers. comm., A.T. Rivett, Giant Yellowknife Mines Ltd., and J.H. Winter, Consolidated Mining and Smelting Co., Yellowknife, June 1962.

¹⁵ The totals for mining in Table VII will not agree with those in Table VI, as the latter includes only those engaged directly in mining and its related fields, whereas Table VII lists the total on the payroll of each company whether they are in mining or not.

TABLE VII - TOTAL LABOUR FORCE EMPLOYED BY MINING COMPANIES;
YELLOWKNIFE TOWN AND REGION, 1947 to 1962

Company		1947	1951	1956	1962
Town	Con	300	295	250	227
	Giant	228	415	399	346
	Negus	133	150	-	-
	Totals	661	860	649	573
Region	Discovery	40	90	109	139
	Taurcanis	-	-	-	55
	Rayrock	-	-	145	-
	Eldorado	100	215	200	-
	Thompson-Lundmark	58	-	-	-
	DeStaffany	6	-	-	-
	Beaulieu	50	-	-	-
	Sunset	21	-	-	-
	Viking	10	-	-	-
	Peg Tantulum	9	-	-	-
	Acadia	20	-	-	-
	Akaitcho	25	-	-	-
	North Inca	23	-	-	-
	Diversified	26	-	-	-
Totals	388	305	454	194	

Note: This table includes only those employees at the producing and development mines listed in Appendix A which were operational in the above years.

Sources: C.S. Lord, Mineral Industry of the District of Mackenzie, N.W.T., Geol. Survey Memoir 261, Dept. of Mines and Technical Surveys, Ottawa, 1951, 336 pp.

Annual Reports of Consolidated Discovery Yellowknife Mines, Giant Yellowknife Mines, Akaitcho Yellowknife Mines, Eldorado Mining and Refining, Rayrock Mines and the Alberta and Northwest Chamber of Mines.

The 1962 statistics were obtained by personal interview with the companies involved during July and August of 1962.

are, essentially, unproductive.¹⁶ Among these, the most significant expansions occurred in the service and retail categories. Employment in

¹⁶ W. Lougheed and Associates stress this point in their study of gold mining communities in Canada. See W. Lougheed and Associates, The Gold Mining Community, a study prepared for the Industrial Commission of Timmins, Timmins, 1958, p. 50.

service industries increased between 1951 and 1962 by over 37 per cent from 304 to 417 persons. The number of civil servants showed the largest numerical and percentage gains, accounting for 68 out of the total increase of 113 in the service group, and registering a 22 per cent increase over 1951. The total of 215 government employees in 1962 represents 16 per cent of the gainfully employed population of Yellowknife, as compared to 10 per cent in 1951. The number engaged in personal services also increased substantially during this period. By 1962 there were 144 persons in this category, an increase of some 46 persons or 15 per cent over 1951.

Among the remaining groups the retail and wholesale group showed the largest gain, increasing by nearly 48 per cent from 65 to 96 employees and from five to seven per cent of the total labour force. Transportation and communication facilities, reflecting the growth of charter airline and government services,¹⁷ increased their employment by nearly 14 per cent during this period.

Other than mining, the only significant decline in employment took place in manufacturing and construction. This decline should probably be attributed to a reduction in the number of labourers and general construction workers, both Indian and white. On the other hand a part of it may also be due to the problem of classifying marginal workers, especially native labourers. Some of those listed under construction, for example, may appear in the 1962 statistics under forestry, fishing and trapping or under transportation and communications, without an actual change in occupation.

¹⁷ The Canadian Broadcasting Corporation, Canadian National Telecommunications and the Post Office.

b) Present Employment Structure in Comparison

The employment breakdown for 1962 (Table VI) indicates that the largest employment groups in Yellowknife are in mining, government, personal services, and transportation and communications. The most significant of these continues to be the mining industry. In 1962 almost 44 per cent of the labour force was directly engaged in mining and its related industries. In the total population (Table VIII) mining provides a livelihood for approx-

TABLE VIII - ESTIMATED PROPORTION OF TOTAL YELLOWKNIFE POPULATION DIRECTLY SUPPORTED BY MAJOR SECTORS OF THE ECONOMY, 1962

Sector	Numbers*	Per Cent of Population
Mining	1,200	37
Retail Business ^a	900	28
Government ^b	700	21
Transportation	150	5
Marginal Indians and Whites	300	9
Totals	3,250	100

* Estimated by employing the criterion of 41.5 per cent of the total population being in the labour force, and where possible, the married-single ratio.

^a Includes all aspects of retail and service industries excluding transportation.

^b Includes all government employees and their families, not only those listed in Table V (see text).

imately 1,200 persons compared to the 900 persons dependent on all types of retail activity, the second largest group. These figures do not, however, reveal the true degree of dependence on the mining industry as most of the community's retail businesses exist largely to serve the mining population. Although these businesses are slowly developing a small degree of independence they can still be considered, indirectly, as part of the mining industry.

The only major functional group in Yellowknife which is not a direct derivative of the continuing effect of mining is the government. This category, including both the Territorial and Federal governments, contains some 215 persons and accounts for nearly sixteen per cent of the labour force. As civil servants within the categories of construction, transportation and communication, and public utilities are not included, these figures tend to underestimate the importance of the government as an economic entity. An estimate of the number of persons involved would raise the government payroll to between 265 and 275, accounting for nearly twenty per cent of the total labour force.

Surprisingly, the personal services group accounts for nearly eleven per cent of the labour force and is the third largest category. This most certainly reflects the large variety of personal services in Yellowknife relative to that of other community services or businesses. The fourth industrial category, transportation and communication, employs 107 persons or 7.9 per cent of the labour force. Within this total, some 85 persons are engaged in transportation alone, of which over one-third are concentrated in activities related to air transportation. These qualifications indicate the dependence of Yellowknife and the surrounding area on aircraft and the importance of regional functions in the economy.

Among the remaining functional groups only the retail and wholesale category warrants further discussion. In 1962 only 96 persons, or some seven per cent of the labour force, were employed in retail and wholesale businesses. Although this is the most rapidly expanding functional sector of the economy, the relatively small numbers employed demonstrate the low level of development of such concerns in Yellowknife.

In order to supplement such quantitative statements concerning

Yellowknife's functional character, some basis for comparative analysis should be included. About the only statistics available which are even remotely comparable are those for small urban centers in Minnesota with populations between 2,500 and 10,000.¹⁸ This comparison (Table IX),

TABLE IX - COMPARISON OF THE FUNCTIONAL CHARACTER OF YELLOWKNIFE WITH THAT OF SMALL URBAN CENTERS IN MINNESOTA*, BY INDUSTRIAL CATEGORIES

Category	Per Cent Employed	
	Minnesota	Yellowknife
Agriculture and other primary industries	3.3	1.6
Mining	3.4	43.9
Manufacturing and Construction	22.5	6.7
Transportation and Communication	10.6	8.5
Retail and Wholesale	28.1	7.1
Finance, Insurance and Real Estate	2.7	1.5
Service	29.3	30.7
(Public Administration)	(4.8)	(18.1)
(Business and Professional Services)	(18.2)	(1.9)
(Personal Services)	(6.3)	(10.7)

* J.W. Webb, "Basic Concepts in the Analysis of Small Urban Centers in Minnesota," A.A.A.G., Vol. 49, No. 1, March 1959, p. 61.

Note: The functional categories in Table VI have been modified here to those used in Webb's study. Public utilities are included in transportation and communications, and community and government services are combined under public administration.

although involving a large number of variables, does emphasize Yellowknife's unusual occupational stratification in relation to urban centers within a developed urban complex. Assuming the Minnesota figures represent somewhat of an average for communities of a similar size, and excluding the obvious concentrations in mining and government, the personal services group is the only one in which Yellowknife appears to be above average.

¹⁸ Webb, op. cit., p. 61.

This is essentially the result of the community's isolation from larger urban centers. Most centers of a similar size are unable to provide a wide range of personal services because of the competitive proximity of larger centers. The distance from Yellowknife to the nearest larger service center, Edmonton, is sufficient to render a variety of such services as hotels, laundries and barbers, economically feasible. On the other hand, business and professional services are not so strongly affected by distance. Therefore, there is little need to provide these services in Yellowknife when this can be done more effectively, and more profitably, from outside.

The comparison with small Minnesota towns also demonstrates that Yellowknife is deficient in the categories of retail and wholesale trade, and manufacturing and construction. In Minnesota, employment in retail and wholesale trade is nearly four times what it is in Yellowknife. Although this is not altogether unexpected, it does reveal the extent to which Yellowknife is dependent on outside service centers, and the absence of a developed retail trade or service area. Its trade area lies primarily within the boundaries of the Municipal District. Although it does provide goods and services to a large area the volume is not sufficient to be reflected in the employment structure.

The differences in manufacturing and construction are even more pronounced. Almost all of the ninety persons listed in this category in Yellowknife are engaged in construction rather than manufacturing, and a large percentage of these would be seasonal native labourers. As economic conditions dictate, there is virtually no manufacturing industry in Yellowknife.

A second attempt to place Yellowknife's employment structure within proper perspective is by comparison with older, larger and more diversified

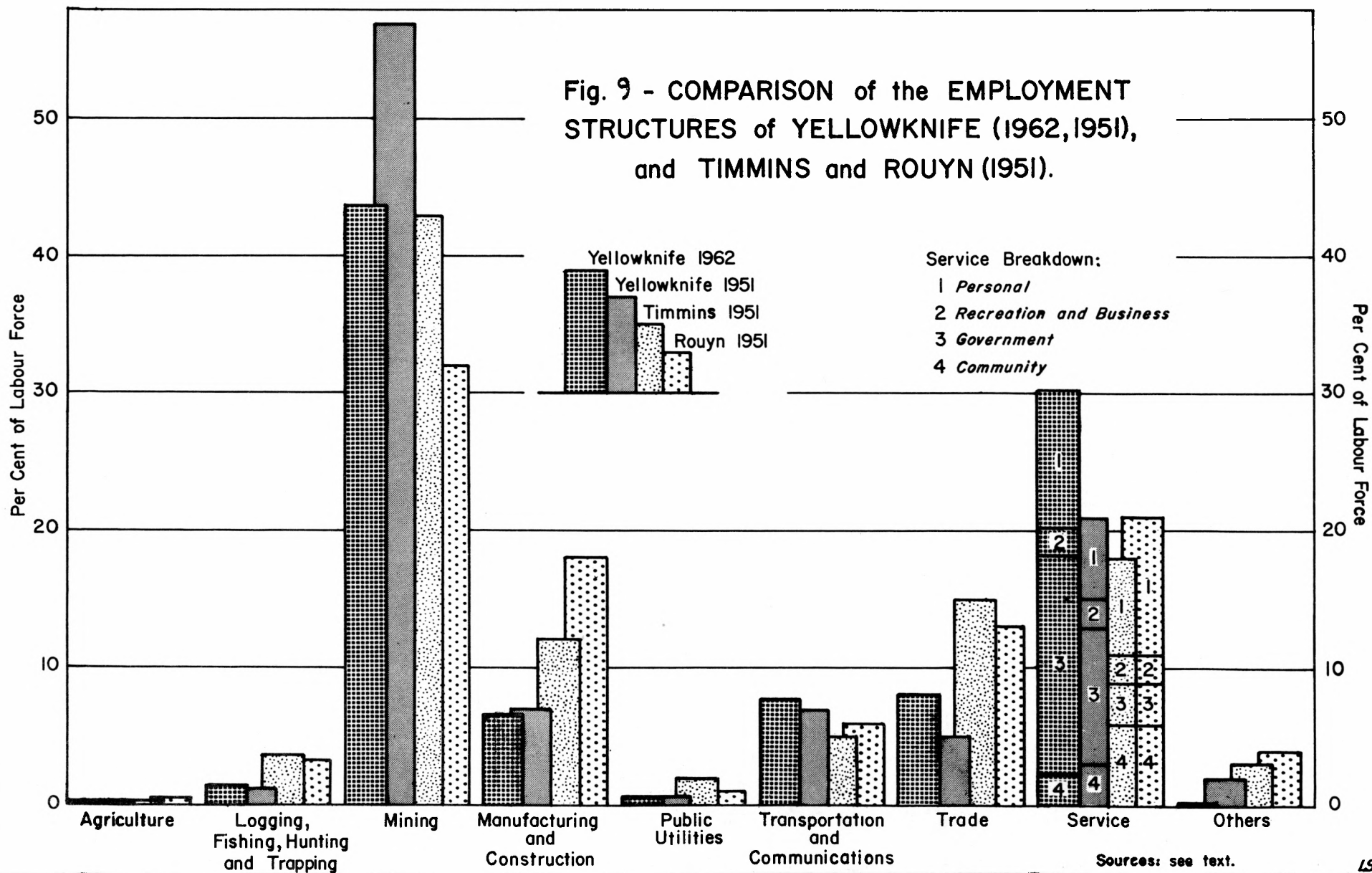
gold mining communities. The only two such centers in Canada for which statistics are available are Timmins, Ontario and Rouyn, Quebec.¹⁹ A comparison of the employment structures of these three centers for 1951 (Fig. 9 and Appendix C), reveals similar differences, except for mining, to those found between Yellowknife and Minnesota towns. Yellowknife is lacking in manufacturing and retail trade, and is above average in transportation and service industries. The lack of diversification in Yellowknife's economy is demonstrated by the relatively high percentage that is employed in the mining industry.

The employment figures for Yellowknife in 1962 are included on the same illustration to show that Yellowknife is drawing more in line with older centers in terms of its employment structure. The exception to this, of course, is the increase in the number and percentage of government employees. Nevertheless, the comparison does emphasize the decline in mining employment and the increase in retail and wholesale trade. It is recognized that Timmins and Rouyn also changed in a similar direction between 1951 and 1962, but it is anticipated that the changes were not of the same order of magnitude as in Yellowknife.

A third attempt at comparison is included in Appendix D. In this table Yellowknife's employment structure is compared to that of three mining communities in northern Sweden. Although these three centers are dependent on minerals other than gold, and are largely government-operated, the comparison does emphasize the significant similarities and differences between Yellowknife and other mining towns. As expected,

¹⁹ Timmins was established in 1911 and had a population of 28,000 in 1951. Rouyn, which is usually classified as a gold-copper mining center, was founded in 1923 and had a population of 14,000 in 1951. Both centers are located in the northern area of eastern Canada, the former in Ontario, the latter in Quebec.

Fig. 9 - COMPARISON of the EMPLOYMENT STRUCTURES of YELLOWKNIFE (1962, 1951), and TIMMINS and ROUYN (1951).



Sources: see text.

the greatest difference appears in the service category as a result of Yellowknife's government function.

c) Basic and Nonbasic Employment

In a comparative sense a standard basic-nonbasic employment analysis of Yellowknife would be virtually meaningless. If the previous figures for small towns in Minnesota were used as the nonbasic minimum requirements in each functional category, the results of Yellowknife's unusual location, as well as its development as a regional center, would be obscured. For example, in comparison with Minnesota, Yellowknife's transportation employment would seem about average for its size and thus would be classified as nonbasic. This would obscure the importance of air transport facilities which largely serve the region and are thus basic.

What can be done here is to make an empirical distinction between employment in industries which serve the region and those which serve the local population, omitting the minimum or average requirements.²⁰ The actual method employed was to obtain the actual or estimated percentage of goods or services in each particular industry in Yellowknife directed outside the community. This was then applied to the number of persons employed in each industry to indicate the regional or basic employment (Table X).

The results of this rather detailed and subjective approach reveal that approximately 873 persons are employed in regional or basic activities in contrast to 481 in local or nonbasic activities. This is a ratio of

²⁰For a discussion of the minimum employment percentages necessary in each industrial category to support a community of 2,500 to 3,000, and to illustrate the unsuitability of the method for this study see E.L. Ullman and M.F. Dacey, "The Minimum Requirements Approach to the Urban Economic Base," in Proceedings of the IGU Symposium in Urban Geography, Ser. B., No. 24, Lund Studies in Geography, Department of Geography, University of Lund, Gleerup Publishers Ltd., Lund, Sweden, 1962, pp. 121-143.

TABLE X - ESTIMATED BASIC AND NONBASIC
EMPLOYMENT IN YELLOWKNIFE, 1962

Industrial Category	Total Em- ployment	Nonbasic Employment	Basic Em- ployment	Per Cent of Total Basic
Agriculture	2	2	-	-
Forestry, Fishing, Trapping and Logging	21	21	-	-
Manufacturing and Con- struction	90	55	35	4
Mining	595	-	595	68
Transportation and Communications	107	52	55	6
Retail and Wholesale	96	80	16	2
Public Utilities	6	6	-	-
Finance, Insurance and Real Estate	20	20	-	-
Service	417	245	172	20
(Community)	(32)	(32)	(-)	(-)
(Government)	(215)	(103)	(112)	(13)
(Recreation and Business)	(26)	(16)	(10)	(1)
(Personal)	(144)	(94)	(50)	(6)
Totals	1,354	481	873	100

Note: These figures were obtained by calculating for each business or service industry the percentage of sales or time consumed by areas outside the Municipal District of Yellowknife. These figures were then applied to the employment totals for that business or service to obtain basic and nonbasic totals. In most cases, the percentages were obtained directly from the business or service; however, for smaller concerns it was often necessary to make a reasoned estimate.

approximately 100 to 55 in favour of regionally oriented functions, which is not unusual for a community of Yellowknife's size.²¹ What is unusual about it is the composition of the basic or regional serving category. In

²¹ The correlation between city population and the basic-nonbasic ratio is essentially a matter of economies of scale. The larger the city, the larger the relative number of basic services that can be provided. See C.T. Stewart, "Economics Base Dynamics," Land Economics, Vol. 25, No. 4, Nov. 1959, pp. 327-336.

contrast to most small communities where manufacturing, trade, and service industries comprise the largest basic endeavours, 81 per cent of Yellowknife's basic employment is within the mining and government categories. The structure of basic employment differs still further in that the next largest components are transportation and personal services, each with six per cent. The fact that only two per cent of the basic employees are in retail activities adds further proof to the previous conclusion that Yellowknife lacks a developed retail or service area. The service area, as outlined in Chapter VII, is large but is lacking in population and purchasing power. As a result, its effects are felt in administration and transportation rather than in retail trade.

3. The Taxation Base and the Degree of Specialization

A second method of determining the actual degree to which a community depends on certain functional groups is through its taxation base. This is especially revealing in the Canadian North where government grants, loans and subsidies are given to all communities to help meet municipal costs. As these financial aids contribute in no small way to Yellowknife's economic livelihood, and are not reflected in employment statistics, the role of the government must be considerably greater than that indicated in the previous section.

As in most areas, municipalities in the North are seldom able to meet their operational costs. In northern gold mining communities the situation is even worse. Most of these are characterized by lower than average private investment which reduces the amount of property available for taxation purposes. Also, as the number of families increases there is a corresponding increase in the demand for community services, without a similar expansion in the economy. The natural result of these conditions

is that the Federal and Territorial governments have been forced to contribute in order to balance Yellowknife's budget. Since 1955 this assistance has varied annually from a low of \$99,000 to a high of over \$145,000 and represents the basis for the recent expansion of community services (see Appendix F).

In terms of direct taxation the community received an estimated \$160,000, or 51 per cent of its total revenues of \$315,000, from the mining companies (Table XI).²² As an indication of the degree of dependence

TABLE XI - TAXES LEVIED ON MINING PROPERTIES AS A PROPORTION OF TOTAL YELLOWKNIFE MUNICIPAL TAXATION (\$315,000), 1962

Company	Taxes (\$)	Per Cent of Total Taxation
Giant Yellowknife	109,000	34.6
Consolidated Mining and Smelting	44,000	14.0
Akaiicho Yellowknife	2,500	1.3
Ptarmigan	1,400	0.4
Consolidated Discovery	950	0.3
Others	1,200	0.4
Totals	159,050	51.0

Sources: (Tables XI and XII) Compiled from the taxation records of the Secretary-Treasurer, Municipal District of Yellowknife, and from the Interdepartmental Committee on Federal-Territorial Financial Relations, Report on the North-West Territories, 1962, Dept. of Northern Affairs, Ottawa, 1962, p. 66.

this is considerably higher than that indicated by the employment percentage in mining. As might be expected, the largest source was Giant Yellowknife Mines. Their contribution of \$109,000 represented nearly 35 per cent of

²² Unless otherwise stated, all taxation figures were compiled from the records of John Buck, Secretary-Treasurer, Municipal District of Yellowknife, during July and August of 1962.

the total, while their labour force of 346 persons represented only 26 per cent of the total labour force.²³ In contrast, Con's taxes made up only 14 per cent of the total tax revenues and yet it employed nearly 18 per cent. Consequently, the employment figures would seem to underestimate Giant's role in supporting the community and overestimate Con's.

To examine the role of the government as a financial entity in Yellowknife's economic base it is necessary to include all sources of community revenue in addition to direct taxation. Out of a total estimated revenue of \$417,000 in 1962, the municipality received 45 per cent from the Federal and Territorial governments (Table XII).²⁴ The Territorial govern-

TABLE XII - SOURCES OF REVENUE FOR THE MUNICIPAL DISTRICT
OF YELLOWKNIFE, BY MAJOR CATEGORIES, 1962
(Total Revenue \$417,000)

Category	Form	Amount (\$)	Per Cent of Total
Mines	Direct taxation	159,050	37.2
Federal gov't	Grants	60,000	14.4
Territorial gov't	Grants	126,500	30.4
Totals		345,550	82.0

ment's grants, totalling \$126,000, are the most important to the community and constitute over 30 per cent of the total revenue received. Combining these percentages with those of the mines, it was found that the two largest components of Yellowknife's economic base provide 82 per cent of the municipality's revenue. This figure is significantly higher than the

²³ Pers. comm., A.T. Rivett, Personnel Officer, Giant Yellowknife Mines Ltd., June 1962.

²⁴ The total revenue of \$417,000 includes taxes levied and government grants. However, as the tax total includes \$200,000 in school taxes which are collected by the municipality, but are not immediately passed on to the government, the grants and taxes cannot be added together to total \$417,000.

64 per cent of the labour force they employ.

It would seem, then, that the most accurate representation of the degree of specialization within Yellowknife's economic base must lie somewhere in between these figures. Unfortunately, it is not possible to weigh the variables to obtain an average degree of specialization. All that can be said is that the functions of mining and government in Yellowknife comprise nearly three-quarters of the total urban economic functions. Between the two, mining remains dominant; however, the importance of the government as illustrated by the sources of community revenue, is increasing rapidly.

In assessing the dependence of Yellowknife on mining and government activities these two approaches, employment and taxation, are lacking in that they do not provide a measure of indirect dependence. Although this cannot be measured exactly an approximation would be revealing.

Using employment as a measure of personal income,²⁵ the mines must provide 44 per cent of Yellowknife's total income, and the government 20 per cent. The retail establishments (including transportation, see Table VIII), employing 27 per cent of the labour force, must derive 44 and 20 per cent of their income from the mining and government employees, respectively. Thus, in income equivalent, the mines serve as a source for 12 out of the 27 per cent retail income, and the government five per cent. Totalling these percentages (44, 20, 12, and 5), it is found that the mines and the government provide 81 per cent of the community's personal income. If the marginal whites and Indians are excluded the percentages

²⁵ The assumption here is that employment can be equated to personal income. In most cases this is not true; however, in Yellowknife the higher wage scales in mining and government are somewhat balanced by "moonlighting" among other labour groups, so the assumption has some validity.

rise to 60 and 27 per cent respectively, for a total approximate degree of income dependence of 87 per cent (Table XIII).

TABLE XIII - SUMMARY, DEGREE OF SPECIALIZATION IN CONTRIBUTIONS TO COMMUNITY MAINTENANCE, YELLOWKNIFE, 1962

	Per Cent Employed	Per Cent Basic Employment	Per Cent Revenue	Per Cent Personal Income	
Mining	44	68	37	56 ^a	60 ^b
(Giant)	(26)	(40)	(26)		
(Con)	(18)	(28)	(11)		
Government	20*	13	45**	25	27
(Federal)	(19)	(12)	(14)		
(Territorial)	(1)	(1)	(30)		
Total Contribution	64	81	82	81	87

* Estimated, see text

** Rounded total of 14.4 and 30.4

^a Including marginal whites and Indians in the total population

^b Excluding marginal whites and Indians from the total population

The summary of these various indications of specialization in Table XIII illustrates that Yellowknife is indeed a highly specialized and highly subsidized community. Gold mining remains dominant in the economy of both Yellowknife and the Yellowknife area. It is the raison d'etre of Yellowknife; directly it provides the greatest employment and consequently the fundamental source of personal income; and it is potentially the most dynamic aspect of the economy. The rapidly increasing role of the government in the economy has been shown to nearly equal that of the mining industry in certain categories. Also, it is apparent that no other economic activity provides employment, income or revenue, independent of mining or government, at a sufficient level to support the community either now or in the immediate future.

CHAPTER V
THE GOLD MINING INDUSTRY

As the largest functional component in the economy of Yellowknife, gold mining warrants a certain degree of emphasis in this study. This is especially true in light of the unique characteristics of mining, both as an industry and as the economic base of a community. To explain the significance of these features to Yellowknife, gold mining will be discussed in terms of the changing patterns and costs of production, the problems of subsidy and the price of gold, and the intensity and orientation of exploration activity.

1. General Characteristics

The mining industry as a whole differs from other industries in two basic aspects. Firstly, it is an extractive industry based on the exploitation of non-renewable resources which have a finite size, grade, and value, and thus a limited economic life. Secondly, the uncertainty involved in both reserves and markets is much greater than in most other industries.

A study of gold mining necessitates a third basic consideration. In the years following World War II, the industry has suffered a marked decline in operating profits resulting from the pressure of rising costs against a fixed market price for its product. On the international markets, the price of gold has remained unchanged at U.S. \$35.00 an ounce since 1934. This has narrowed the spread between costs and price much more quickly than usually occurs in the physical process of exhausting

a mine.¹

The situation became so critical in the early post-war years that the government was forced to initiate a program of subsidies to producing gold mines. Despite its temporary nature, prevailing conditions have necessitated the continuance of the program through to the present.

The effects of this profit squeeze have been apparent throughout the post-war mining development of the Yellowknife area. During the last two years of the War the favourable conditions existing in the international gold market and the ten per cent discount on the Canadian dollar induced several companies in the area to proceed with development of low-tonnage, marginal properties. None of these companies were able to absorb the rising post-war costs, the removal of the discount on the dollar, and the disappearance of risk capital, and by 1948 all were forced to cease operations (Appendix A).

For the three producing mines, exploiting large high-grade² ore bodies, the diminishing profit margin resulted in an extensive drive to absorb costs by reducing the labour force through mechanization. Also, as operational costs have risen steadily, ore which was at one time recoverable becomes waste, and the life expectancy of the mines is shortened.

From an investment point of view gold mining has not been at all attractive for risk capital in recent years. Since 1950, present pro-

¹ Ontario, Committee of Inquiry into the Economics of the Gold Mining Industry, Gold Mining in Ontario, Queen's Printer, Toronto, 1955, p. 16.

² The grade of an ore body refers to the average amount of gold contained in one ton of ore. In the Yellowknife area, high-grade ore is generally considered to average at least 0.5 ounces of gold per ton and usually closer to 0.75 ounces, such as that mined at Giant.

ducers have spent very little on exploring for gold.³ With the exception of the current interest in the Contwoyto Lake area, there has not been an extensive exploration program even in the proven mineralized zone around Yellowknife.

On the other hand, gold mining does have certain important economic advantages. As an occupation, gold mining offers steady employment throughout the year without the usual seasonal variations so pronounced in the North. This guaranteed annual wage has proven quite attractive to employees, especially the heads of families. Another feature, besides the high mineral value of the gold ore, is the transportation advantage inherent in the production of a low bulk commodity.⁴ This explains the fact that in the Yellowknife area, and the Mackenzie District as a whole, the only minerals produced, gold and uranium, are of this type.

It would appear, then, that the gold mining industry leaves much to be desired in terms of stability and progress as the economic support of a community. It is a sick industry, not threatened by depletion of its ore reserves but rather by the elimination of profits, and a community based on it can hardly be healthy either socially or economically. The situation is effectively summarized by William Lougheed and Associates in their study of gold mining communities for the Industrial Commission of Timmins.

"One-industry towns always pose special problems of stability and progress. One-mineral towns are, in addition, built on a wasting economic foundation. On top

³ W.K. Buck and B.F. Burke, The Canadian Mineral Industry in 1960, Preliminary Review, Mineral Resources Division, Dept. of Mines and Technical Surveys, Ottawa, 1962, p. 89.

⁴ W.K. Buck, "The Place of the Mineral Industry in the Economy of the Yukon and N.W.T.," Proceedings, Second National Northern Development Conference, Edmonton, Sept. 13-15, 1961, pp. 27-52.

of all this, gold mining communities are saddled with the added uncertainties of gold."⁵

Although this was written with specific reference to the extreme conditions existing in Ontario and Quebec and contains no reference to Yellowknife, the conclusions are still applicable in a modified form. Certainly, the situation of gold in the international markets has hindered expansion and prohibited the exploitation of several marginal ore deposits, and yet conditions remain relatively prosperous. This is essentially the result of the youthfulness of the Yellowknife camp, the size and grade of the ore deposits under exploitation, and the extremely high mill heads⁶ which the three mines have been able to maintain.

2. Production Characteristics

The production of gold at Yellowknife has risen quite steadily since the end of World War II (Table XIV). Between 1946 and 1956 the value of gold produced increased from \$0.9 million to \$12.2 million, then declined during 1957 and 1958 when Giant's production dropped. Since 1959, production has levelled off at approximately 400,000 ounces annually, worth \$14.0 million. In 1961, Con, Giant and Discovery produced 402,580 ounces of gold together valued at \$14.3 million from a combined daily milling rate of nearly 1,700 tons and a yearly total of over 614,000 tons (Figs. 10 and 11).

During 1961, Giant continued to be the largest producing mine in the Northwest Territories, and the fourth largest in Canada. The mill

⁵ W. Lougheed and Associates, The Gold Mining Community, a study prepared for the Industrial Commission of Timmins, Timmins, 1958, p.6.

⁶ Mill head refers to the average amount of gold contained in one ton of ore after milling and is expressed in both dollars and ounces. It differs from the grade of ore in that grade usually refers to richness of the ore prior to milling and as some gold is not recoverable the mill head will be lower than the grade.

TABLE XIV - YELLOWKNIFE GOLD PRODUCTION, 1961

Mine	Daily Milling Tonnage	Gold Produced (oz.)	Grade (oz/ton)	Mill Heads (\$)	Total Value (\$)	Per Cent of Value
Giant	1,004	238,966	0.78	27.83	8,507,473	59.6
Con/Rycon	530	106,165	0.57	21.44	3,455,033	24.2
Discovery	151	64,484	1.18	41.78	2,034,929	16.2
Totals	1,685	409,615	0.67	-	14,267,435	100.0

Sources: Compiled from the following publications and personal interviews:

Annual Reports of Giant Yellowknife Mines, Consolidated Discovery Mines, and the Alberta and Northwest Chamber of Mines.

Canada, Dept. of Northern Affairs, Resources Division, Mining in the North, 1961, Ottawa, 1962.

Pers. comm., Staff of the Con mine, Yellowknife.

Letter received from F. Beinder, Publications Secretary, Consolidated Mining and Smelting Company, Trail, Sept. 7, 1962.

treated an average of 1,004 tons daily, from which 238,966 ounces of gold and 30,892 ounces of silver valued at \$8.5 million, were recovered.⁷ The Con-Rycon mine produced an estimated 106,165 ounces of gold from 530 tons a day,⁸ while Discovery recovered 64,484 ounces of gold and 6,788 ounces of silver worth \$2.3 million from 150 tons of ore a day.⁹

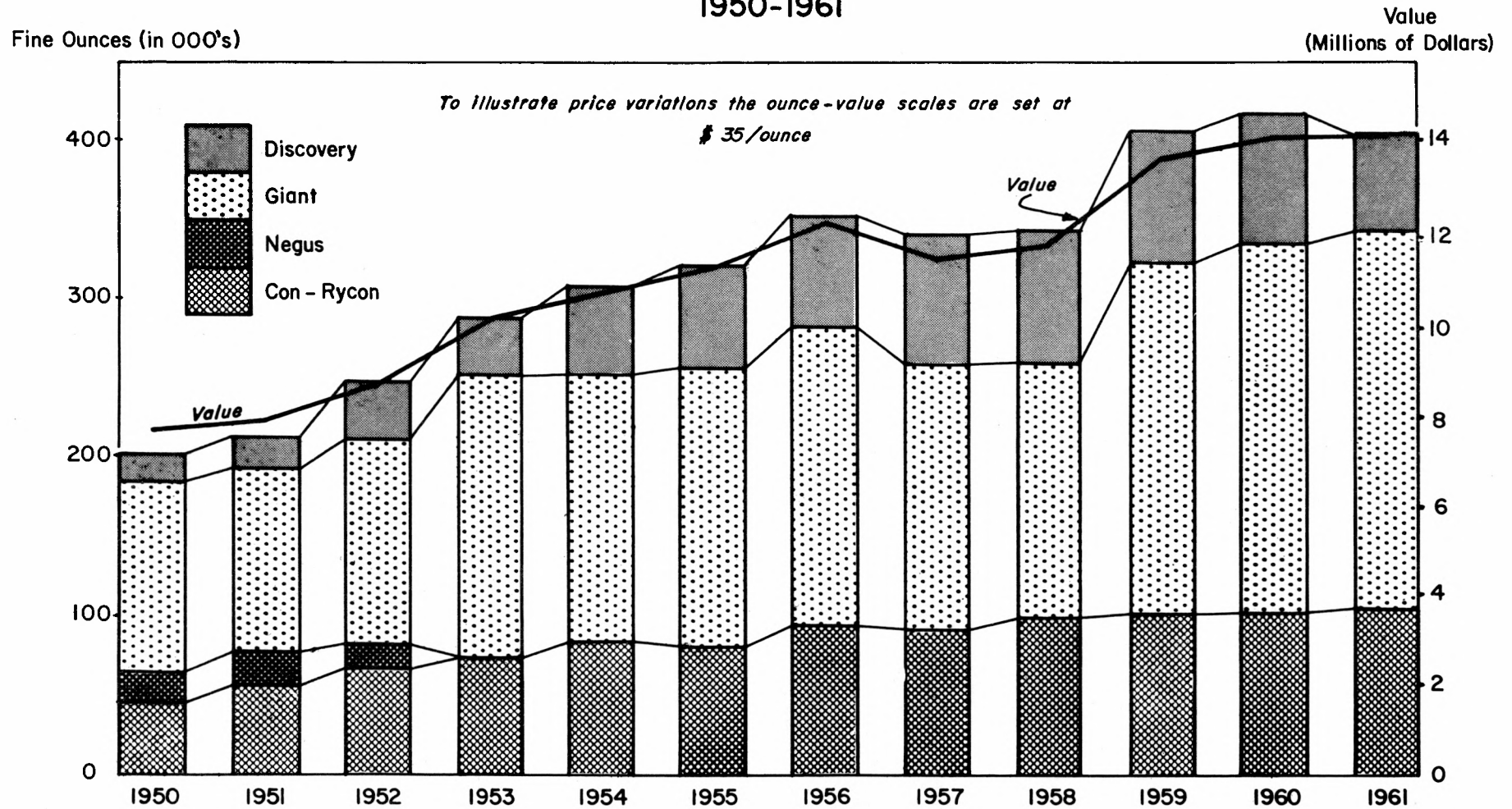
At all three mines the average grade of ore mined (Fig. 12) has always been considerably higher than that of gold mines in Ontario and Quebec. Discovery, despite a marked decline from 1960, remained the highest grade gold mine in Canada as its mill heads averaged well over an ounce per ton. Throughout Giant's production history, mill heads have been maintained at slightly over three-quarters of an ounce per ton,

⁷ Giant Yellowknife Mines Ltd., Annual Report 1961, Toronto, March 1962.

⁸ Canada, Dept. of Northern Affairs, Resources Division, Mining in the North 1961, Ottawa, 1962, p. 12.

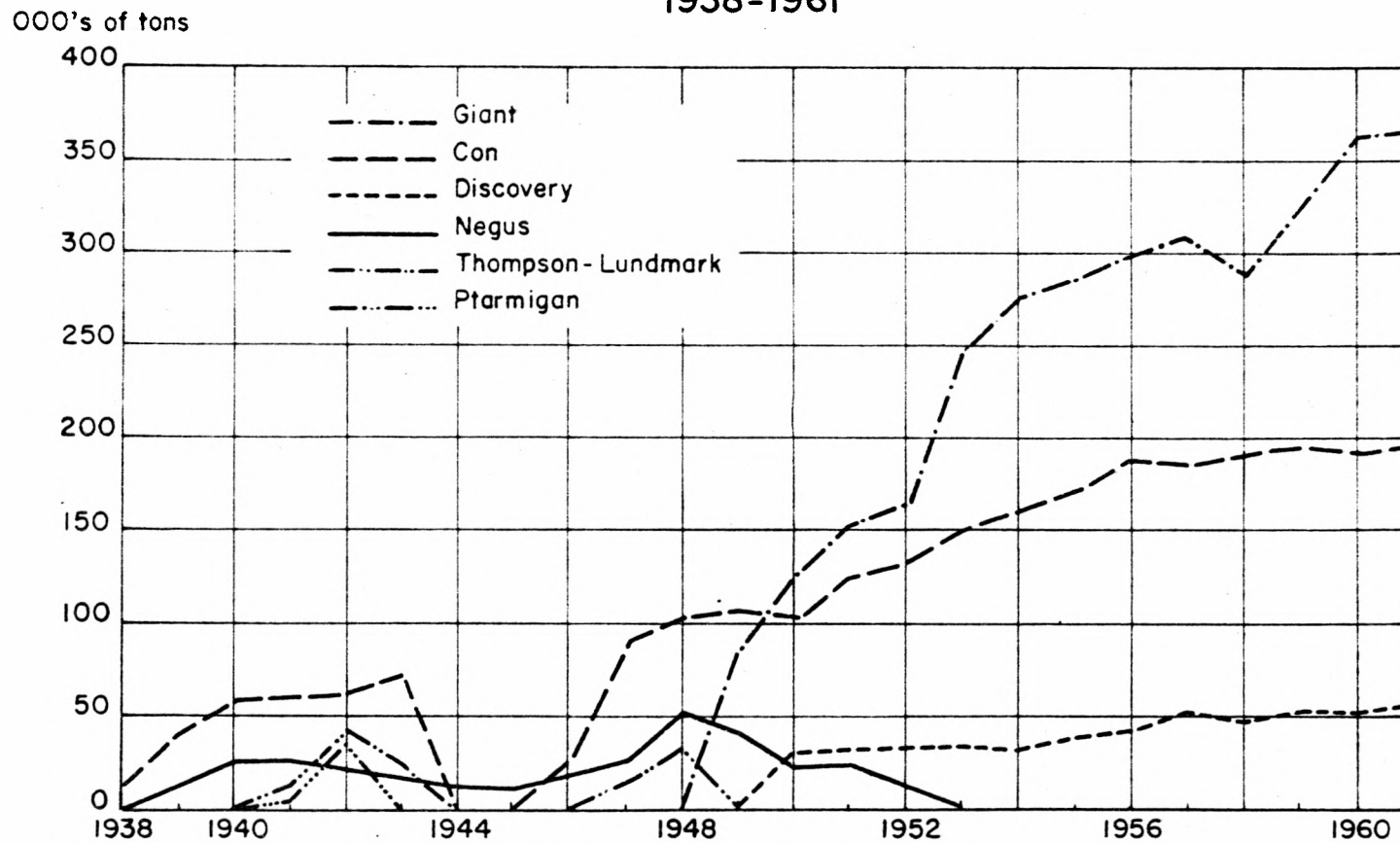
⁹ Consolidated Discovery Yellowknife Mines Ltd., Annual Report 1961, Toronto, March 1962.

Fig.10- VOLUME and VALUE of GOLD PRODUCTION from
YELLOWKNIFE AREA MINES
1950-1961



Sources: see text.

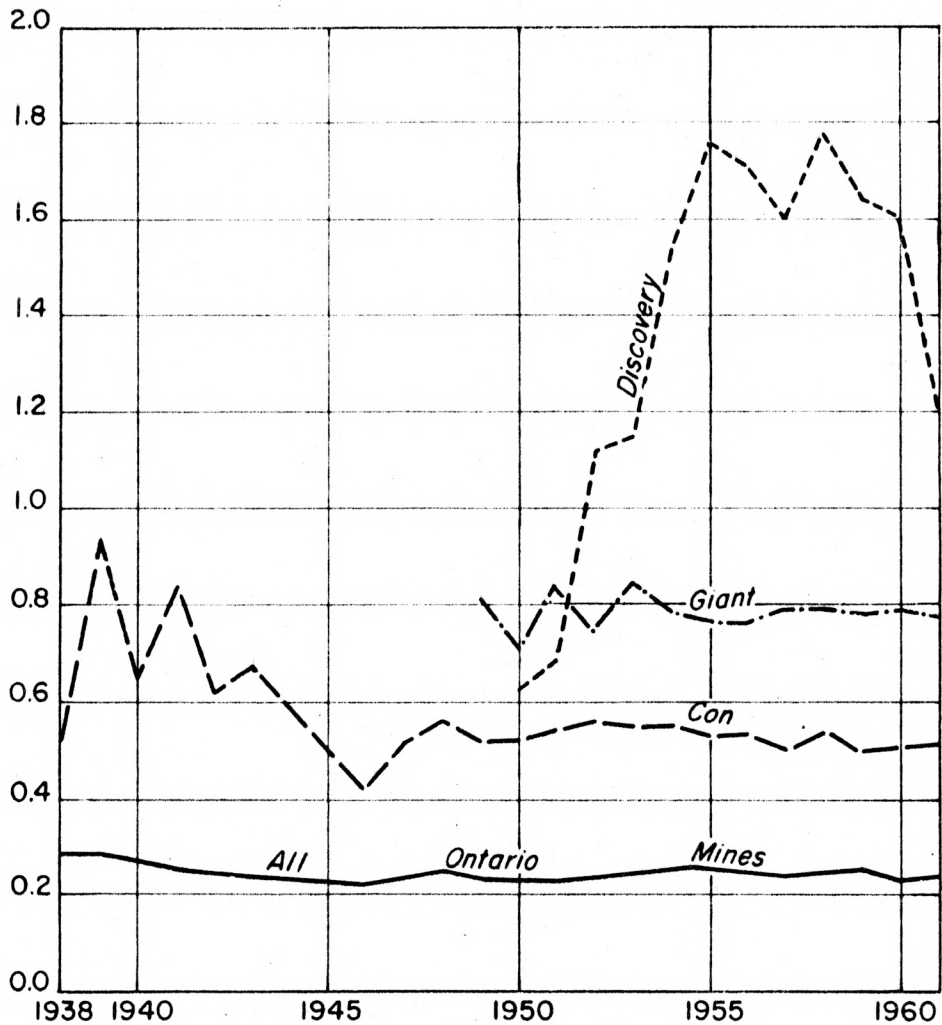
Fig. II - YEARLY MILLING TOTALS,
YELLOWKNIFE AREA GOLD MINES,
1938-1961



Sources: same as fig. I, and the Annual Reports of the Alberta and Northwest Chamber of Mines.

Fig.12 - AVERAGE GRADE OF ORE MINED,
YELLOWKNIFE AND ONTARIO MINES,
1938-1961

Ounces of
gold per ton



Sources: Annual Reports; Giant and Discovery Mines.

Pers. comm., Con staff.

Ontario Committee of Inquiry, "Gold Mining in Ontario", 1955, p.19.

while Con's ore have averaged nearly 0.6 ounces.

For 1962, preliminary figures indicate a further production decline for the industry as a whole with production estimated at less than 392,000 ounces.¹⁰ In spite of this decline, detailed statistics released by Giant reveal an increased milling rate of 1,030 tons per day and, with gold at \$37.10, a fifteen per cent increase in the value of production.¹¹

One of the most important factors in Giant's current growth is the improvement in gold recovery. This has always been a problem because Giant's ore is refractory and extremely difficult to treat by the methods ordinarily used in Canadian gold mining. A substantial part of the gold has so far proved non-recoverable. Constant research has increased the recovery rate in recent years from 68.95 per cent in 1958 to 82.24 per cent in 1961.¹² and 88.9 per cent in 1962.¹³

3. Cost Increments for Northern Operation

The problems involved in mining in the Canadian north are varied and difficult to assess from an economic point of view. It is apparent, however, that all companies in the North bear the burden of additional costs or "cost increments" in comparison with companies operating in more southerly parts of Canada.

A recent survey by Amil Dubnie, "Some Economic Factors Affecting Northern Mineral Development in Canada,"¹⁴ summarizes the additional

¹⁰ Edmonton Journal, March 4, 1963.

¹¹ Northern Miner, August 2, 1962.

¹² Financial Post, April 7, 1962

¹³ Northern Miner, August 16, 1962. In contrast, the Discovery mine, for example, recovers 98.9 per cent of the gold in its ore.

¹⁴ A. Dubnie, Some Economic Factors Affecting Northern Mineral Development in Canada, Mineral Information Bulletin MR 38, Dept. of Mines and Technical Surveys, Ottawa, 1959, p. 52.

costs of operation for Giant and Discovery (Table XV). During 1958, before

TABLE XV - ESTIMATED COST INCREMENTS FOR OPERATING
IN YELLOWKNIFE COMPARED TO EDMONTON,* 1958

	Cost Per Ton Mined (\$)	
	Giant	Discovery
Transportation	1.75	2.75
Power	1.00	1.00
Labour	0.90	1.00
Heating	0.28	0.40
Interest on Capital Investment	1.00	1.20
Cost of Carrying Inventories	0.32	0.50
Totals	\$5.25	\$6.85

*No allowance has been made for the location of Edmonton which is still 2,000 miles from the major markets in Canada.

Sources: Compiled and modified from A. Dubnie, Some Economic Factors Affecting Northern Mineral Development in Canada, Mineral Information Bulletin, Dept. of Mines and Technical Surveys, Ottawa, 1959, 52 pp., and T.D. Anderson, "Farthest North Gold Mine Solves Operating Problems," (Part I), Western Miner and Oil Review, Vol. 25, No.2, Feb. 1952, pp. 39-44, and the Annual Reports of Consolidated Discovery Yellowknife Mines and Giant Yellowknife Mines Ltd.

the highway went into Yellowknife and the winter road into Discovery, the cost increment for Giant amounted to \$5.25, and for Discovery \$6.85, on every ton of ore milled. This accounts for nearly 40 per cent of the \$13.39 operational costs at Giant and 18 per cent of the \$41 per ton costs at Discovery.¹⁵

Although these costs appear in every operational category, trans-

¹⁵ The wide difference in operational costs between Giant and Discovery is partially the result of smaller ore bodies and deeper operations at Discovery. The difference is not as significant when considering that the mill heads at Discovery in 1958 averaged \$62.39 per ton compared to \$26 74 at Giant.

portation is generally considered to be the main factor. A measure of this increment can be illustrated by reference to the Discovery mine. This is the only mine in northern Canada which has no land or water access and must rely on air service over a portion of its supply route. The degree of dependence has been reduced significantly by the construction in 1960 of a winter road from Yellowknife. Most heavy freight is now hauled by truck over this road to the mine in the winter, reducing costs by almost one-half.¹⁶

The average rates paid by this company for a ton of freight in 1958 originating in Edmonton were about \$85.00. On a per-ton-mined basis this amounted to an increment of \$2.20, and if the costs of handling and warehousing in Yellowknife are included the increment rises to \$2.75 per ton. For an operation still further north, such as Taurcanis, Dubnie estimates the cost increment at over \$4.00 a ton.¹⁷

In comparison, during 1961, a 15 per cent increase in production and a 10 per cent reduction in freight, coupled with lower trucking rates and handling charges, reduced the increment to \$1.52 a ton. A similar reduction occurred at Giant during this period. Again, the same factors of reduced freight totals, lower rates and increased production dropped the transportation increment on every ton of ore mined from \$1.75 to only \$0.67 (Table XVI).¹⁸

In addition to transportation, significant cost increments occur in the costs of power, labour, heating, carrying large inventories and

¹⁶ Pers. comm., Staff of Consolidated Discovery Yellowknife Mines Ltd., Yellowknife, July 3, 1962.

¹⁷ Dubnie, op. cit., p. 29.

¹⁸ Pers. comm., J.W. McKay, Giant Yellowknife Mines Ltd., Yellowknife, January 16, 1963.

TABLE XVI - ESTIMATED TOTAL COST INCREMENT FOR
GIANT YELLOWKNIFE MINES, 1961

	Cost Per Ton Milled (\$)
Transportation	0.67
Power	0.70
Labour	0.67
Heating	0.20
Interest on Capital Investment	0.74
Cost of Carrying Inventories	0.14
Totals	3.12

Source: Compiled from the records of J.W. McKay, Purchasing Agent, and M.K. Pickard, General Manager, Giant Yellowknife Mines Ltd., January 14 and 15, 1963.

interest on capital investment. As the only figures available for such a calculation in 1961, these increments can be illustrated by reference to Giant Yellowknife Mines. Of the four categories, heating and inventories are the least significant, but are the least likely to decrease in the future. Labour costs have always been a problem in northern areas. Although wages remain slightly higher than in more southerly areas (Table XVII), most of the increment lies in the provision of fringe benefits such as room, board, recreation and transportation. The capital investment, and the resulting interest, necessary for the construction of northern plants are considerably higher than in the south and amount to \$0.74 per ton. The costs of power, representing an increment of \$0.70 per ton, are about fifty per cent higher than in Edmonton.¹⁹ All of these categories reflect marked reductions from those of 1958 (Table XV), as a result of greater efficiency, an overall three per cent decline in

¹⁹ Pers. comm., M.K. Pickard, General Manager, Giant Yellowknife Mines Ltd., Yellowknife, January 15, 1963.

TABLE XVII - COMPARISON OF AVERAGE HOURLY WAGE
RATES AT GIANT YELLOWKNIFE AND OTHER
LARGE CANADIAN GOLD MINES, 1962

Mine	Location	Hourly Rate \$
Giant	Yellowknife	1.92
Bralorne Pioneer	S.W. B.C.	1.86
Kerr Addison	N. Ontario	1.66
Madsen Red Lake	N.W. Ontario	1.63
Hollinger	N. Ontario	1.54
McIntyre	N. Ontario	1.53

Source: J.R. Smith, General Superintendent,
Giant Yellowknife Mines Ltd., June 11, 1962.

operational costs (from \$13.39 to \$12.97 a ton), and an increase in production of nearly 27 per cent.

Despite the marked decline during this period, the total cost increment at Giant of \$3.12 per ton still represents a significant deterrent to any mineral development in the area. In relation to mines in Ontario rather than to Edmonton, the increment would be somewhat higher because of the proximity of these mines to the major Canadian markets and sources of supply. In addition, major cost reductions in the future such as occurred between 1958 and 1961, are generally considered to be unlikely. The most exact representation of the additional costs incurred for operation in Yellowknife as compared to Edmonton would seem to be around \$3.00 for every ton milled. This amounts to about one-quarter of the total operational costs of the mine.

4. Subsidies and the Price of Gold

As previously stated, the gold mining industry has been depressed by the pressure of rising costs against a fixed market price. To help

meet these external pressures and to avoid depopulation of gold mining communities, the Federal government began to pay "cost-aid" to the industry in 1948.

These subsidies are paid under the Emergency Gold Mining Assistance Act (EGMAA), and are based on a "rate of assistance" paid for each "assistance ounce".²⁰ The rate of assistance has varied considerably since 1948 as a result of government policy. The present rate, as outlined in 1955, is determined by taking two-thirds of the amount by which the cost per ounce of gold produced from a mine exceeded \$26.50 with a maximum of \$12.33 per ounce.²¹ The number of assistance ounces amounts to two-thirds of the total gold produced and sold to the Royal Mint. An amendment to the act in 1958 raised the assistance payable by adding twenty-five per cent to the amount obtained by multiplying the rate and the number of assistance ounces.²²

Nearly all present and past producing mines in the Yellowknife area have received considerable benefit from this emergency program. The actual amount received has varied because of rising production and changes in the rate of assistance (Table XVIII). The total payments to Yellowknife mines rose from approximately \$900,000 in 1948 to a maximum

²⁰ Canada, Dept. of Mines and Technical Surveys, Report on the Administration of the Emergency Gold Mining Assistance Act, year ending March 31, 1961, Ottawa, 1961, p. 7.

²¹ It should also be noted here that whereas assistance is paid on the basis of operational costs per ounce of gold, the figures quoted previously in this thesis refer to the standard operational costs per ton of ore mined. For example, the operational costs for Giant in 1961 amounted to \$12.97 per ton of ore mined, but per ounce mined the costs were \$16.52. At Discovery for the same year, operational costs were estimated at about \$29.58 per ton and \$25.08 per ounce of gold.

²² For the full regulations of the act see, Canada, Dept. of Mines and Technical Surveys, Emergency Gold Mining Assistance Act and Regulations, Office Consolidation, Ottawa, 1961, 42 pp.

TABLE XVIII - TOTAL EGMAA ASSISTANCE RECEIVED BY
MINES IN THE YELLOWKNIFE AREA, 1948-1961

Year	Assistance in 000's of dollars						Yearly Totals
	Negus	Rycon**	Thompson	Giant	Con	Discovery	
1948	142	24	207	339	208	-	920
1949	122	26	12	452	307	-	969
1950	131	5	-	218	220	178	752
1951	124	-	-	421	283	99	927
1952	66	-	-	585	295	65	1,011
1953	-	8	-	867	347	185	1,407
1954	-	9	-	1,071	243	81	1,404
1955	-	2	-	282	33	0	317
1956	-	11	-	0	0	0	11
1957	-	-	-	240	0	0	240
1958	-	-	-	436	0	0	436
1959	-	-	-	0	39	0	43*
1960	-	-	-	0	0	0	0
1961	-	-	-	0	0	0	0
Mine Totals	585	85	219	4,911	1,975	608	8,386
Per Cent of Total	7.0	1.0	2.6	58.5	23.6	7.3	100.0*

* Includes Ruth Mines Ltd., which produced for a short period during 1959 and received \$4,000 in assistance.

** Production from the Rycon portion of the Con mine was treated separately until 1957.

Note: Thompson ceased production in 1949 and Negus in 1952.

Source: Compiled from the Report on the Administration of the Emergency Gold Mining Assistance Act, 1961.

of \$1.4 million in 1953 and 1954 when the minimum rate was lowered from \$22.00 to \$18.00 per ton. In 1955, the rate was raised to its present level of \$26.50 and assistance to the three producing mines in Yellowknife declined sharply until 1960 when all assistance to them ended. At this time, all three mines had operational costs below \$26.50 per ounce and were thus ineligible. This is quite striking in view of the fact that there are only nine other gold mines in Canada with comparable operational costs below \$35.00 an ounce.

It is difficult to assess exactly what the effects of the assistance program have been. In contrast to Ontario, where it has meant the difference between meeting expenses and operating at a loss, the emergency aid has not greatly influenced the overall mining economy of Yellowknife. For the three producing mines, all of which seem to have made a profit during the period,²⁴ the value of the assistance would seem to be in expanding production and increasing the margin of profit. This would be true especially of mines such as Giant and Discovery, who were in the early stages of production when the aid program was established. The rate was calculated using one of the earlier years as a base when production totals were lower per unit and operational costs considerably higher.²⁵

Subsidization, however, is only a temporary solution to the most pressing problem in gold mining today, the fixed price of gold. The price which any Canadian mine receives depends upon the United States price and the value of the Canadian dollar on the markets for foreign exchange. As previously mentioned, the American price of \$35.00 an ounce, which dominates the world market, has remained unchanged since 1934 while the costs of mining the gold have increased substantially.

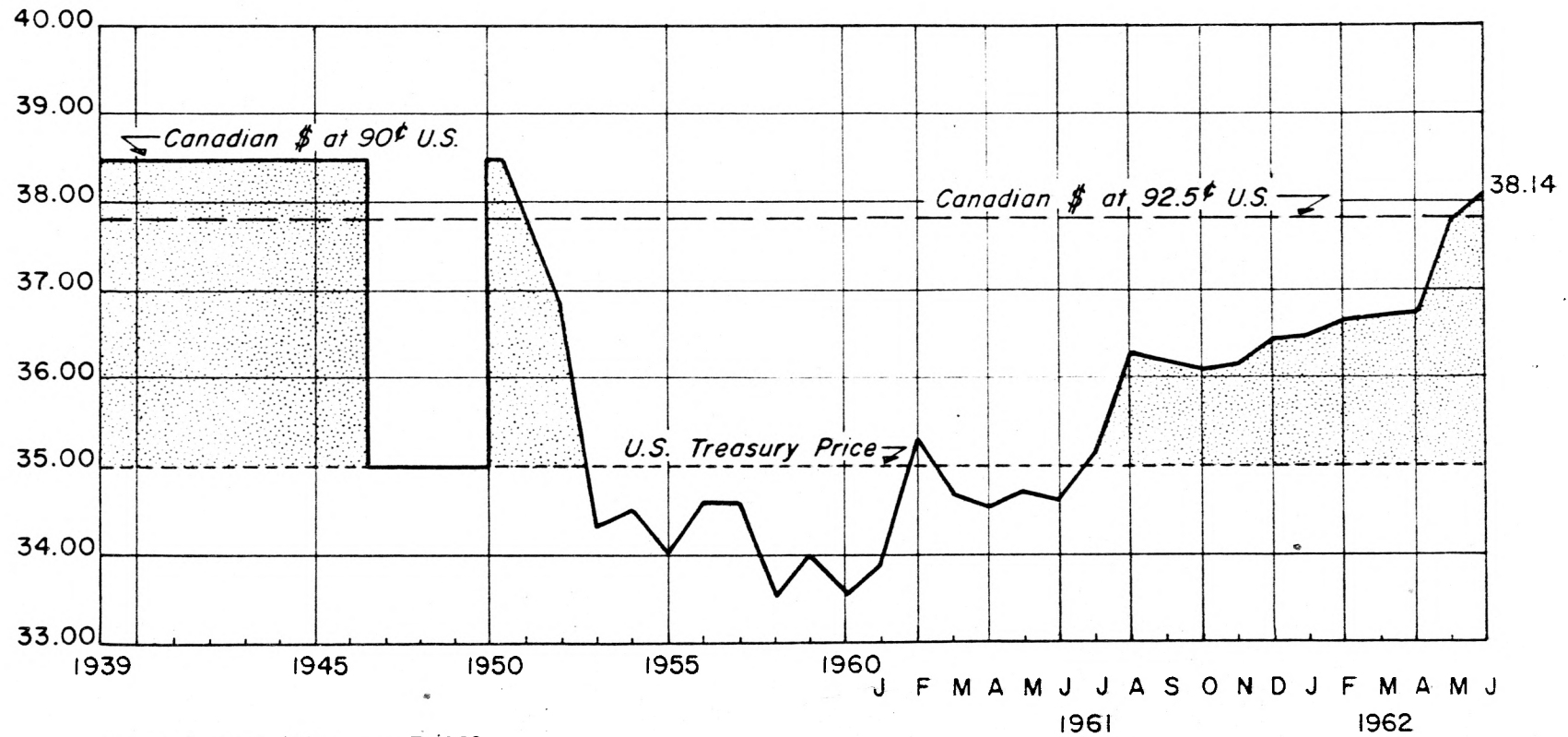
Quite apart from this problem, the price of gold in Canadian funds rose steadily throughout the latter half of 1961 and all of 1962 following the discount of the dollar in terms of American funds. With the dollar at the fixed rate of 92.5 cents in U.S. funds, the price of gold in Canada amounts to roughly \$37.80 per ounce, but has gone as high as \$38.14. As is illustrated in the following graph (Fig. 13), this high is almost \$1.60 an ounce more than at the first of the year and a full

²⁴ Only Giant and Discovery have actually published such figures.

²⁵ Pers. comm., M.K. Pickard, General Manager, Giant Yellowknife Mines Ltd., Yellowknife, January 15, 1963.

Fig.13 - VARIATIONS OF THE CANADIAN
PRICE OF GOLD,
1939-1962

Price per ounce
(dollars)



Source: Northern Miner, June 7, 1962.

12 per cent higher than 1958's average value of \$33.57.²⁶ This has, at least, given temporary relief to the mines in the battle against the profit squeeze and has permitted a slight relaxation in the standard of ore mined.

The only real stimulus must of necessity come from the United States. The arguments for and against an increase in the price of gold are, of course, rampant throughout the industry and need not be discussed here.²⁷ The effects of a price increase, if it should come, will depend, of course, on the size of the increase. Estimates indicate that a 25 to 50 per cent rise would encourage widespread exploration and development work and would lengthen the life expectancy of producing mines by 10 to 25 per cent depending on their ore characteristics. At Giant, for example, costs dictate that the minimum grade of ore or cut-off point for mining is 0.4 ounces per ton. With a substantial price increase this could be lowered to 0.2 or 0.3 ounces while still permitting economic operation. Some inactive properties in the area might become economically feasible for development, but the chances of this happening in a large number of cases is very small. For the community of Yellowknife itself, it is thus obvious that the difference between stagnation and prosperity, and between a life expectancy of ten or twenty more years for producing mines such as Giant, rests to a large extent with the decision of the U.S. government on the future price of gold.

5. Reserves, Exploration and Life Expectancy

Although statistics on ore reserves are difficult to obtain and even more difficult to assess, certain generalizations can be made regarding

²⁶ Northern Miner, June 7, 1962.

²⁷ See the articles on the gold issue in the Toronto Globe and Mail, Friday, July 13, 1962, and the Financial Post, June 16, 1962.

the future of Yellowknife's mines. Giant's production is in no immediate danger as reserves at the beginning of 1962 were quoted at 2,560,000 tons grading 0.79 ounces of gold per ton.²⁸ These reserves, sufficient for seven or eight years' production at the current rate of 366,500 tons a year, have been maintained at the same level since 1958. As the property is quite large and far from fully explored, this period probably will be extended at least to twelve or fifteen years.

Con and Discovery, on the other hand, have much less favourable outlooks. Reserves at Discovery had declined by the end of 1961 to 85,000 tons grading 0.82 ounces per ton with milling at a peak of 55,000 tons annually.²⁹ To bolster its sagging "lifeline", Discovery reached an agreement with Camlaren Mines, owners of a small property forty miles east of Discovery, to mine and stockpile Camlaren ore during the summer of 1962.³⁰ This was then trucked over a winter road to the Discovery mill during the winter of 1962-63.³¹ This solution, however, represents only a short term answer and unless substantial new reserves are found the mine will close in the matter of a few years.

The reserves at the Con-Rycon mine were estimated in April of 1962 at 187,200 tons grading 0.72 ounces per ton.³² Recent reports indicate that new reserves are still being found below the 3,100-foot level and encouraging mineralized ground has been encountered at even greater

²⁸ Northern Miner, June 14, 1962.

²⁹ Financial Post, April 7, 1962.

³⁰ Financial Post, June 16, 1962.

³¹ Mackenzie Press, Hay River, January 11, 1963.

³² Financial Post, Survey of Mines 1963, 37th Annual Edition, Toronto, Nov. 1962, p. 266.

depth.³³ Nevertheless, considering that the mine has been in operation nearly twenty-five years, that it is mining at an expensive depth, and that it has less than one year's reserves outlined, it appears to be near exhaustion. When the mine does close down almost one-quarter of the employment positions in the community will disappear with it.

Other developments likely in the near future include the opening of production at the Taurcanis mine 150 miles northeast of Yellowknife, and the mining of the adjacent Akaitcho Yellowknife Mines property by Giant (Fig. 8). The Taurcanis development, certainly the more significant of the two, has been under active exploration since 1957 by Consolidated Discovery. In January 1963 it was announced that the management was going ahead with production plans and hoped to be operational in March of 1964 at 120 tons a day.³⁴ Positive ore reserves of 110,000 tons grading 0.93 ounces per ton have been outlined.

The most important event connected with exploration in the Yellowknife area in recent years has been the discovery of gold at Contwoyto Lake, 250 miles north of Yellowknife (Fig. 8). The discovery was made in 1960 as a result of aerial prospecting by geologists of Canadian Nickel, the exploration subsidiary of the International Nickel Company (INCO). During the 1961 field season information of the strike leaked out and touched off the largest staking rush in the Northwest Territories in more than a decade (Fig. 4). Interest in the discovery reached fever proportions in 1962 as extensive airborne and ground geophysical and geological surveys were initiated by a host of companies, including

³³ W.R.A. Baragar, Mineral Industry of Mackenzie and Part of District of Keewatin, 1961. Geol. Survey Paper 62-1, Dept. of Mines and Technical Surveys, Ottawa, 1962, p. 17.

³⁴ News of the North, Yellowknife, January 10, 1963.

Falconbridge, Giant and Conwest Exploration (Con).³⁵ By the end of 1962, 1,884 claims had been staked in the area,³⁶ and with INCO's 675 square miles of prospecting permits the total area under investigation reached 1,000 square miles. Other companies have reported promising gold showings on their properties, but it will probably be a year before the results of drilling, assays, mapping and planning by any company will provide a detailed outline of the area's possibilities.

One thing is certain. If a mine develops in this area, costs are bound to be high and the grade of ore necessary for economic operation would have to be at least 0.75 ounces per ton, as mined at Giant. Without adequate power resources and inexpensive land or water transportation, the operational costs would be enormous. In the previous discussion of cost increments, the additional transportation costs resulting from supply and resupply of a mining camp over 150 miles north of Yellowknife were estimated at over \$4.00 a ton mined. Similar increases would occur in all other operational categories.

From an overall standpoint, the developments at Taurcanis and Con-twoyto indicate that future mining developments in the area north of Great Slave Lake will involve relatively small isolated producers serviced entirely by air and winter road from Yellowknife. In relation to Yellowknife's economy, the one hundred or so residents expected at Taurcanis will provide a source of income similar to that of Discovery at present, and Rayrock and Port Radium in the past. Yellowknife cannot survive on this supply function alone but it is here that the greatest possibility for expansion of its present economy seems to lie.

³⁵ For a complete list of the companies involved and their exploration programs see the articles in the Northern Miner, August 2, 1962.

³⁶ Pers. comm., J.D. Dines, Mining Recorder, Dept. of Northern Affairs, Yellowknife, January 15, 1963.

DIVERSIFICATION OF THE URBAN ECONOMY

CHAPTER VI

Of all towns, mining towns are the most susceptible to high degrees of economic specialization. They tend to be monofunctional and are lacking the occupational diversity found in most other settlements. In general, their size and location are not conducive to diversification except at the local service level.

The critical result of this functional specialization is vulner-

ability to changing economic conditions. It is widely recognized that

one-industry towns are less stable than those in which there is a variety

of economic functions. Thus, the solution to the problem of the instab-

ility of mining communities must lie with diversification of the local

economy.

In gold mining towns, diversification is usually slower and more

difficult than in other mining communities. Even in more southerly areas

than Yellowknife, efforts to attract new industries have been unsuccessful,

and the long term outlook is not encouraging. The Loughheed study, for

example, concludes that "It does not even appear certain that over a long

period of time opportunities for economic diversification will improve

without the intervention of senior government agencies."¹

In northern communities diversification has usually taken the

form of increased regional functions. Kitimat and Schefferville,² for

example, have broadened their economic base through expansion as regional

1

W. Loughheed and Associates, The Gold Mining Community, a study prepared for the Industrial Commission of Timmins, Timmins, 1958, p. 6.

2

See I.M. Robinson, New Industrial Towns on Canada's Resource Frontier, Research Paper No. 73, Dept. of Geography, University of Chicago, Chicago, 1962, p. 93.

service centers for areas further north. Although it is questionable as to what degree this functional growth will stabilize such communities, it appears at present to be the only solution. In reference to these conditions Parker concludes, "The concept of regional centers, then, is one of permanent settlement."³

The analysis of employment and taxation structures in Yellowknife included in Chapter IV indicates the highly specialized nature of the local economy. Recently, there has been a moderate shift toward diversification as the result of an increase in government and transportation functions. Despite the fact that these functions are largely derivatives of the continuing effect of mining, it is on such growth that resistance to the forces of ore depletion and external market changes will be based.⁴

1. Government Functions

The importance of the government in Yellowknife's economy is usually underestimated. It is a highly subsidized community which receives considerable assistance from both the Federal and Territorial governments. This assistance appears in the form of building construction and property taxes, employment, outright grants, grants in lieu of taxes, subsidized community services and cost-aid to the mining industry.

The reasons why Yellowknife has received such a large amount of government functions and financial assistance are essentially two-fold. Its attraction as a regional center for administrative functions is

³ V.J. Parker, The Planned Non-Permanent Community: An Approach to the Development of New Towns Based on Mining Activity, unpublished M.Sc. thesis, Community and Regional Planning, University of British Columbia, April 1960, p. 59.

⁴ For a discussion of the difficulties and advantages of diversifying urban economies see R.U. Ratcliff, Urban Land Economics, McGraw-Hill, New York, 1945, pp. 43-46.

largely the result of its strategic northern location and the availability of a well developed transportation system. Direct financial assistance has been necessary because the demand for community services has consistently surpassed the ability of the municipality to raise capital through taxation. To avoid community depopulation and low-standard construction, the government has been forced to contribute substantially to maintain and expand community services.⁵

The effects of this increasing assistance have been quite profound. This is not to imply that community existence depends on this assistance, but rather that the present functional character and level of community services is, in large part, the result of the economic stimulus provided by this assistance. In terms of employment, the increasing number of civil servants has almost completely compensated for the decline in mining employment, and is the basic reason why the community has not declined accordingly.

In the future, the role of the government in the employment structure of Yellowknife is not expected to increase significantly. In fact, its importance may even decline.⁶ Yellowknife no longer has the chance of becoming the capital of the new Mackenzie Territory, and could even lose some of its present functions if the advantage of transportation is removed. For example, the Department of Public Works is now in the process of shifting its regional headquarters from Yellowknife to Hay River, which is slowly emerging as the transportation center of the Mackenzie Valley. On the other hand, the rate of financial assistance will continue to expand as the needs of the community expand and become

⁵ At the outset, the government completely planned, constructed and financed the water and sewage systems in the New Town and then donated them outright to the municipality.

⁶ Pers. comm., P. Templeton, Regional Administrator, Dept. of Northern Affairs, Yellowknife, July 9, 1962.

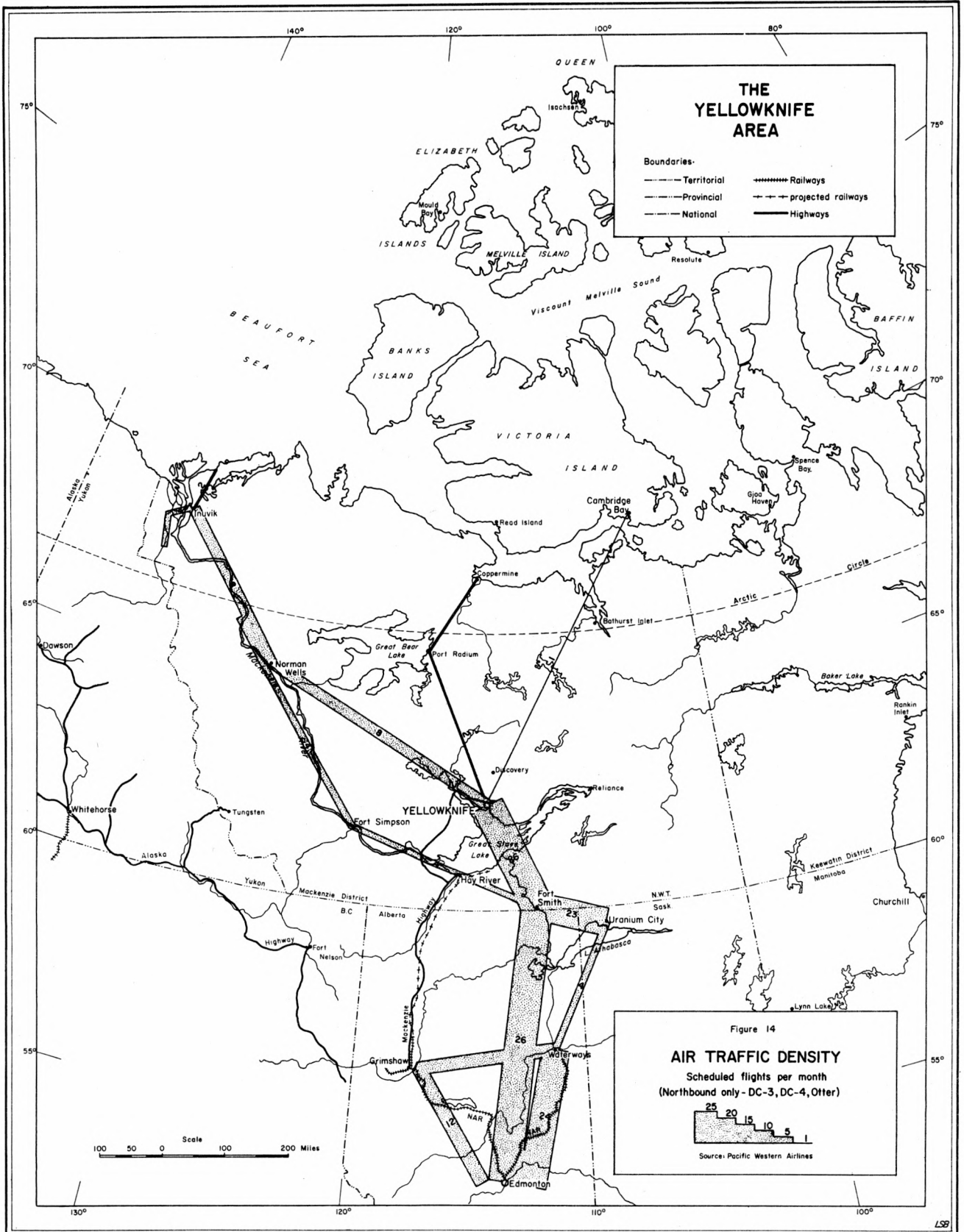
more urbanized.

2. Transportation

Changes in transportation facilities and the costs of transport may bring about shifts or modifications in the economy of any community. In Chapter V it was estimated that transportation constitutes one of the major cost increments for operation in northern Canada and specifically in Yellowknife. Therefore, any major alteration in the existing system will have considerable effect on other activities within the urban economy.

In the Yellowknife area, as in all of northern Canada by definition, inadequate transportation facilities have hindered economic development. In spite of these conditions, the gold mining camp at Yellowknife developed because of the richness of the deposits and the negligible costs of shipping the product to market.

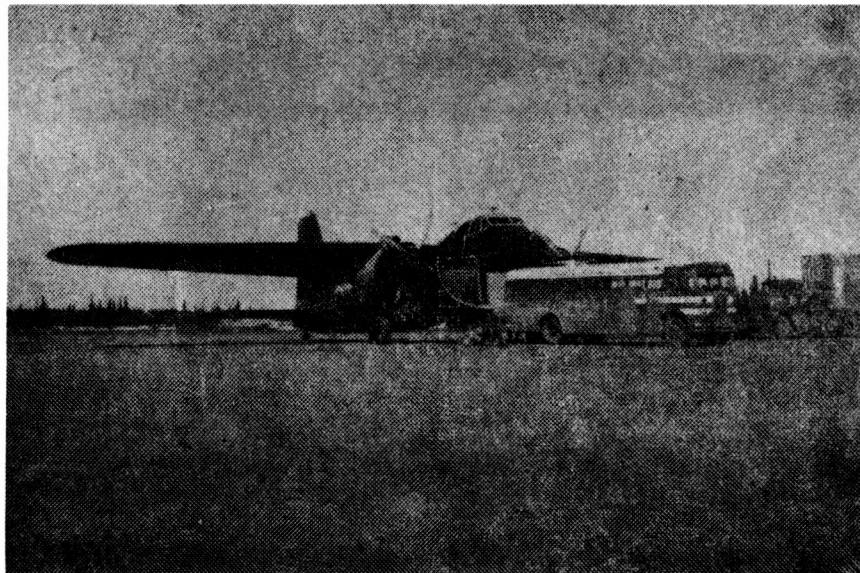
In relation to the major transportation arteries of the Mackenzie District, Yellowknife is strategically located for road and air transport, but not for water. It is situated on one of the most important air and road routes in northwestern Canada. The greatest air traffic density in the Mackenzie District is on the route from Edmonton to Fort Smith and Yellowknife (Fig. 14) and Yellowknife is the present terminus of the only highway in the Northwest Territories. On the other hand, its location is limiting in that it is somewhat isolated on the north shore of Great Slave Lake from the main flow of activity along the Mackenzie River. This is the basic reason why Yellowknife has not become a center for water transport and why it will not be a major focal point in the developing highway system of the Northwest Territories. It will, however, remain strategically located for all movements north and northeast of Great Slave Lake.



Transportation



8. The center of float plane activity in Yellowknife is in the Old Town, along Back Bay. Shown here is the dock area of Wardair, the largest of the charter airlines.



9. Three of the most recent additions to the transportation picture in Yellowknife are shown here. Freight is being unloaded from a "bruck" and a large diesel truck into Wardair's Bristol freighter. (Courtesy of the Mackenzie Press)

The specific transport facilities available in the Yellowknife area have undergone considerable alteration since 1956, and especially since 1960. These changes, including a road connection to the "outside", have produced considerable shifts in the existing economy and means of transport, and explain the recent trend to greater community stability and regional service.

As a basis for perspective on the discussion to follow, Table XIX

TABLE XIX - AVERAGE FREIGHT RATES TO
AND FROM YELLOWKNIFE, BY TYPE, 1962

Route and Means of Transport	\$ per 100 lbs., northbound
Edmonton to Yellowknife:	
rail and barge: Edmonton to Waterways	1.05
Waterways to Yellowknife	1.75
	2.80
air freight	15.00
air express	30.00
bus (express)	8.25
truck	4.00
Yellowknife to Taurcanis:	
air freight (Bristol freighter)	5.60
truck (winter only)	2.30

Note: Charter airline rates are not included because they vary considerably and bear no relation to the amount of freight carried.

Sources: Compiled from A. Dubnie, Transportation of Minerals in Northern Canada, Mineral Information Bulletin MR 50, Dept. of Mines and Technical Surveys, Ottawa, 1961, 20 pp.; W.R.A. Barager, Mineral Industry of the District of Mackenzie and Part of the District of Keewatin, 1961, Geol. Survey Paper 62-1, Ottawa, 1962, p. 2; and the Annual Reports of Consolidated Discovery Yellowknife Mines, Giant Yellowknife Mines, and the Alberta and Northwest Chamber of Mines.

lists the various freight rates in effect during 1962 for transport to and from Yellowknife. Taking the difference in speed of service by water, road and air into consideration, this table points out the advantages of

moving freight north by truck as opposed to the use of planes or barges.

a) Air Transportation

The importance of air transport in the founding and development of Yellowknife, as in all of northern Canada, can hardly be overestimated. The small single-engine aircraft, equipped with floats or skis for landing on the innumerable lakes and rivers of the area, made possible the effective exploration of much of this region. Even today, the aircraft provides the lifeline for many mining camps and settlements which otherwise would be totally isolated.⁷

Throughout the Yellowknife area air transportation has been hindered by the lack of adequate landing and terminal facilities. The situation was remedied somewhat by defense construction during World War II which resulted in a legacy of fine airports along the Mackenzie River, including Yellowknife.⁸ Away from the larger settlements in the valley, however, the situation still remains critical. Recently, the government has attempted to alleviate the problem by assisting in the construction of all-weather landing strips at several smaller settlements and mining camps.⁹ The presence of these facilities has been largely responsible for the increasing use of wheeled aircraft in northern resupply, replacing the more expensive light aircraft and the more time-consuming tractor trains.

⁷ Precambrian, "Air Transportation," (special issue), Vol. 34, No. 12, Dec.-Jan. 1961, p. 9.

⁸ The airport at Yellowknife is more than adequate to meet existing demands, and is adequately equipped with navigational aids and room for future expansion. The terminal buildings, on the other hand, are totally inadequate for handling either freight or passengers.

⁹ For example, see C. Mamen, "Discovery Airstrip," Cdn. Mining Journal, Vol. 80, No. 10, Oct. 1959, p. 109.

Air service in the Yellowknife area, as elsewhere, is of two types: scheduled and charter service. Scheduled air service is provided by one company, Pacific Western Airlines. This company operates daily flights from Edmonton to Fort Smith, Uranium City, and Yellowknife, as well as less frequent connections to most other settlements in the Mackenzie District as far north as Inuvik and Cambridge Bay (Fig. 14).

Charter airlines operate on a much more flexible system and it is virtually impossible to trace any overall pattern of routes. Fairly continuous service is maintained from Yellowknife to Discovery, Taurcanis, Contwoyto Lake, Great Bear Lake and the East Arm, but otherwise the system is highly variable. The actual number of aircraft involved is almost as flexible as the routes flown. During the summer of 1962 there were an average of 21 aircraft, mostly of the Otter, Beaver and Cessna variety, operating from bases in Yellowknife's Old Town.

In relation to the urban economy, the charter airlines are the most important. In 1962, they provided employment for some twenty people on a year-round basis as well as considerable income to private business in Yellowknife. Employing only 13 persons, and contributing far less to retail business, the scheduled airlines play a secondary role in the local economy. In terms of freight and passenger traffic the charter airlines are also the more important of the two despite the difference in distances involved. A comparison between Tables XX and XXI reveals that while traffic on scheduled routes has declined markedly in recent years, the charter airlines have at least held their own.

Current developments worthy of note include the use of larger aircraft such as the DC-6 on scheduled routes and the Bristol freighter¹⁰

¹⁰ News of the North, Yellowknife, April 19, 1962.

TABLE XX - SCHEDULED TRANSPORT STATISTICS
FOR YELLOWKNIFE, 1959-1962

Year	Incoming		Outgoing		Totals	
	Passen- gers	Freight (tons)	Passen- gers	Freight (tons)	Passen- gers	Freight (tons)
1959 (July-Dec.)	2,649	217	2,869	36	5,518	253
1960	3,419	377	3,725	74	7,144	451
1961	3,080	81	3,310	38	6,390	119
1962*	2,800	80	2,600	32	5,400	112

* Estimated

Source: Letters received from J.M. Robins, General Superintendent, Pacific Western Airlines, Edmonton, July 17, 1962 and February 15, 1963.

TABLE XXI - CHARTER TRANSPORT STATISTICS
FOR YELLOWKNIFE, 1960 and 1961

	1960	1961
Passengers carried from Yellowknife Charter Bases (no.)	15,792	13,013
Freight carried from Yellowknife Charter Bases (lbs.)	7,612,830	6,622,249
(tons)	3,806	3,311
Hours flown by charter aircraft: by aircraft groups,		
Group A	847	903
Group B	6,279	6,207
Group C	2,125	1,113
Totals	9,291	8,223

Note: Group A aircraft includes DC-3, C-46, PBY Canso, etc.
Group B aircraft includes DHC Beaver and Otter, Norseman, etc.

Group C aircraft includes Cessna 180 and smaller aircraft.

Source: Pers. comm., K.W. Studnicki-Gizbert, Air Transport Board, Ottawa, Sept. 12, 1962.

on charter flights. The main function of the Bristol has been to transport heavy equipment to areas not served by winter road and truck transport. In doing so it has replaced the slow, but less expensive tractor trains. The increase in costs involved is offset by reductions in allied costs such as handling and storage, and in time consumed.

In all, the scheduled and charter airlines in Yellowknife make a relatively small direct contribution to the economy, but indirectly through service provided to the region and the mining and retail concerns in Yellowknife, the effects are considerable. In the future, the small plane will continue as the means of supply for isolated camps and settlements and will serve as the basis for exploration activity in the region. As overall costs decline, the larger aircraft will become increasingly economical as a means of bulk transport on northern supply routes.

b) Roads and Winter Roads

By far the greatest alteration in the commodity flow in and out of Yellowknife resulted from the completion of the highway to the "outside" in 1960. Previously, Yellowknife was an isolated community dependent on slow, seasonal water carriers and tractor trains, and fast, but expensive, aircraft.

Overland hauling from the railhead at Grimshaw to Yellowknife began shortly after the camp opened in the late 1930s. Using tractor trains¹¹ and rugged winter roads, freight was brought to Hay River and then across the ice of Great Slave Lake to Yellowknife. In the fall of 1948, the Mackenzie Highway was completed from Grimshaw to Hay River,

¹¹ Tractor trains consist of interlocked sleds pulled by caterpillar tractors. They have the advantage of being capable of travelling almost anywhere, but their average speed is little more than one mile per hour.

but there was still no regular service to Yellowknife.¹² Freight had to be transported across the lake by barge during the summer or by tractor train during the winter. During freeze-up and break-up periods all freight had to be flown across the lake.

In the winter of 1956 a new 250-mile winter road was completed through the bush around the western end of Great Slave Lake. In February, the first trucks loaded with freight drove into Yellowknife. By the end of the winter, trucks had hauled in nearly 800 tons of freight. As the road was extended to include Rayrock and Snare Hydro, the tonnage increased rapidly, reaching a peak of 3,448 tons in 1959.

In the following year the \$12 million highway was completed from Mile 28 of the Mackenzie Highway near Hay River to Yellowknife, a distance of 280 miles. It was constructed as a first class highway sufficient for modern load requirements,¹³ but not as an all-weather road. The mile-wide crossing of the Mackenzie River near Fort Providence must be crossed by ferry in summer and ice bridge in winter. During the freeze-up and break-up periods, which together may be as much as three months, the crossing is impassable. The Federal government surveyed the possibility of a bridge and concluded that in light of present and foreseeable traffic the huge expenditure necessary was not justified. Nevertheless, until a bridge is built the road remains incomplete and Yellowknife remains isolated for three months of the year.

Despite its limitations the road has had a profound effect on the economic and social character of Yellowknife. Many of the more

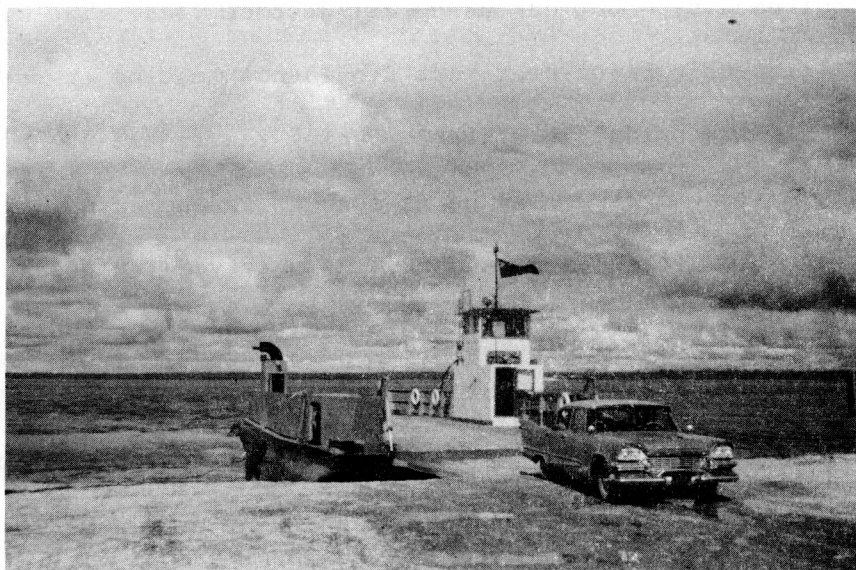
¹² J.W. McKay, "Truck Transportation to Yellowknife, the Economic Effect on Inventories," a paper presented at the Tenth Annual Alberta and Northwest Mining Meeting, Edmonton, February 23, 1962, p. 2.

¹³ Ibid., p. 4.

The Yellowknife Highway



10. Throughout most of its length the Mackenzie (Yellowknife) Highway is a first class gravel road. The portion shown here, 5 miles south of the Mackenzie River crossing, illustrates the quality of the road despite extremely damp weather and unstable building conditions.



11. The most serious limitation on the usage of the highway is the lack of a bridge across the Mackenzie River. At present, service is provided by the ferry "J.A. Berens", which operates quite efficiently and meets the required demand during the summer.

important consequences cannot be measured in terms of dollars and cents, but have been felt throughout the community. In general, the most important effect has been one of stabilization, an increasing sense of community permanency and a reduction in the feeling of isolation.

The cost of living, which is extremely high, has dropped sharply since 1960. This reduction has been reflected in nearly all retail prices, but is most pronounced in the prices of perishable foodstuffs, which were formerly brought in by air. With this cost reduction and the moral lift provided by direct vehicle accessibility, the labour turnover rate has dropped steadily. Community permanency and stability have increased as a result and have been reflected in greater residential and commercial investment.

The most significant repercussion of the road which can be evaluated statistically, is that it completely altered the existing system of commodity flow in the Yellowknife area. The drastic change from water to truck transportation can best be illustrated by reference to freight movements for Yellowknife's largest mine (Table XXII). As general freight

TABLE XXII - GIANT YELLOWKNIFE MINES, GENERAL FREIGHT RECEIPTS,
BY ORIGIN AND MEANS OF TRANSPORT, 1955-1962 (in tons)
(Fuel Oil and Lumber Excluded)

Year	Barge from Waterways	Direct Truck to Yellowknife	Truck to Hay River and Barge	Truck to Hay River and Air	Air Direct from Edmonton
1955	3,267	0	22	20	41
1956	2,536	40	50	48	35
1957	2,583	153	65	83	33
1958	2,817	314	67	60	18
1959	2,340	268	103	65	28
1960	1,236	395	149	67	20
1961	37	2,126	0	19	4
1962	15*	2,173**	0	10	4

* From Uranium City

** Includes freight carried by bus

Source: (Tables XXII and XXIII) Modified and brought up-to-date from McKay, op. cit., pp. 8, 9.

can now be loaded at Edmonton or the railhead, and trucked directly to the consumer in Yellowknife, handling charges are almost eliminated and rates are comparable to those of water transport. Previously, almost all freight was brought in by barge from Waterways and Hay River. By 1961, all but about 30 tons of the total of over 2,200 tons brought into Giant were carried by truck.

According to local sources, one of the greatest single effects of the road has been in the reduction of stores inventories at the mines and businesses in Yellowknife.¹⁴ With a rapid and dependable means of transport available for nine months of the year there is little need to carry large inventories of operating supplies. The reduction of inventories represents a considerable saving in warehousing costs as well as the freeing of capital for other purposes. At Giant, for example, the average value of stores on hand during 1962 amounted to about \$840,000, one-half the total on hand in 1955 (Table XXIII).¹⁵

TABLE XXIII - GIANT YELLOWKNIFE MINES, VALUE OF TOTAL STORES INVENTORY, 1955-1962 (in dollars)

Year	Daily Mill Tonnage	Highest Inventory Value	Lowest Inventory Value
1955	788	\$2,257,661	\$1,553,370
1956	813	2,014,348	1,425,965
1957	848	2,007,961	1,462,000
1958	792	2,098,590	1,431,622
1959	879	1,833,212	1,427,485
1960	977	1,485,367	1,217,344
1961	1,004	1,180,514	868,461
1962	1,050	952,191	725,602

Source: same as Table XXII

¹⁴ Ibid., p. 8.

¹⁵ Mine officials at Giant suggest that inventories have now become stabilized and further reductions appear unlikely.

The area to the north of Yellowknife has also benefitted from the new highway and truck transportation. Following a brief unsuccessful experiment with trucks in 1948-49 and prior to 1957, all bulk freight hauled into the Discovery mine was carried by tractor train. By 1957 the rising costs of cat train operation forced this company to switch to the Bristol freighter as a means of supply. The Bristol continued to carry all bulk freight until 1960 when heavy equipment requirements and an improved winter road persuaded the company to switch to trucks.¹⁶ The change proved to successful that trucks have continued to haul most northbound freight, replacing both the tractor train and the Bristol. As indicated in Table XXIV, trucks have also taken over the majority of resupply for the Taurcanis

TABLE XXIV - CHANGING PATTERNS OF NORTHERN RESUPPLY: FREIGHT MOVEMENTS FROM YELLOWKNIFE TO DISCOVERY AND TAURCANIS (in tons)

Year	Means of Transport				Total
	Truck	Tractor Train	Large Aircraft	Small Aircraft	
Discovery					
1954	-	1,004	40	172	1,216
1955	-	1,079	-	231	1,310
1956	-	842	27	243	1,112
1957	-	1,494	38	159	1,691
1958	-	-	971	289	1,260
1959	-	-	831	219	1,050
1960	822	-	204	223	1,249
1961	851	-	42	208	1,101
Taurcanis					
1959	-	-	1,004	45	1,049
1960	-	-	750	16	766
1961	410	-	931	15	1,356
1962	863	-	425	14	1,302

Sources: Consolidated Discovery Yellowknife Mines Ltd., Annual Report, 1961, Toronto, 1962.

Pers. comm., J.H. Parker, N.W. Byrne Ltd., Mining Engineers, Yellowknife, August 1962 and January 1963.

¹⁶ Consolidated Discovery Yellowknife Mines Ltd., Annual Report, 1960, Toronto, 1961, p. 4.

mine, which is over 150 miles from Yellowknife. During the winter of 1962 trucks were driven into the abandoned Port Radium mine on the eastern end of Great Bear Lake.¹⁷ This venture at least proved that trucks can operate efficiently over long distances and on roughly prepared winter roads.

The reasons for the switch to trucks are quite numerous. The high-powered wheeled truck has certain advantages over the cat train despite its lack of ruggedness.¹⁸ Freight can be hauled to formerly isolated locations direct from point of origin without unloading and with considerable saving of time. Trucks carry much greater cargoes and when loaded, are less expensive. Another major advantage is that trucks can be used on all-weather roads during the summer months eliminating large capital investments in equipment which is idle for eight or nine months of the year. Also, the use of trucks has been facilitated by the improvement in roads and equipment and the provision of government subsidy. Recently, the government rephrased its "tote road" assistance regulations to permit the granting of assistance for seasonal road construction.¹⁹

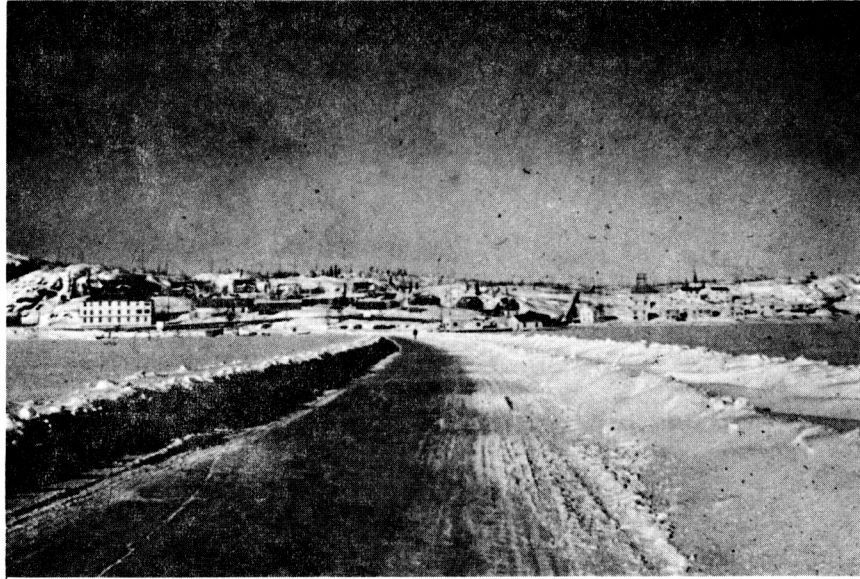
The operation of trucks on winter roads has justified the expectations of its supporters. For the time being, the increasing speed and reliability of trucks will tend to expand their usage into all but the most difficult terrain. Large aircraft such as the Bristol freighter may delay their use in the initial stages of the development of a mining

¹⁷ Pers. comm., W. Holinski, Base Manager, Byers Transport Ltd., Yellowknife, June 21, 1962.

¹⁸ For a detailed discussion of the advantages of truck transportation see W.C. Wonders, "Roads and Winter Roads in the Mackenzie Valley Area," a paper presented at the Annual Meeting, B.C. Division, Canadian Association of Geographers, Vancouver, March 24, 1962, p. 15.

¹⁹ Commissioner of the Northwest Territories, Votes and Proceedings, Twenty-Second Session, N.W.T. Council, Ottawa, January 15-25, 1962, p. 60.

Winter Roads



12. An example of a temporary winter road is the ice road on Yellowknife Bay (Back Bay) between the Old Town and the Giant camp. This very useful shortcut is in use for a full three months of each year.



13. Air view of heavy trucks, equipped with snowploughs, operating on a winter road northeast of Yellowknife. (Courtesy W.C. Wonders)

camp, for example, at Contwoyto Lake. In the long run, however, decreasing costs and heavy equipment requirements will necessitate the use of truck transportation.

c) Water Transportation

The highway also brought to an abrupt end the role of water carriers as a significant feature in the movement of general freight to and from Yellowknife. In contrast to the flexible combination of roads and winter roads, water transportation has the disadvantage of restricting development to areas immediately adjacent to the route; it is extremely slow and cumbersome, and is limited to a very short operative season.

The decline in general freight handled by water carriers to and from Yellowknife has been remarkable (Table XXV). In 1958, nearly 14,500 tons of general freight were unloaded at Yellowknife from barges of the two transportation companies, Northern and Yellowknife, of which all but less than one ton came from Waterways. The amount of general freight carried between Hay River and Yellowknife is now negligible.

As might be expected, the road has not affected the importing of bunker and diesel oil from Norman Wells and Hay River. This situation is likely to continue for some time with a gradual shift from Hay River to Norman Wells as the latter increases its capacity and the variety of oil products produced. Preliminary figures for 1962 indicate that the practice of hauling oil from Edmonton to Hay River by truck and then by barge to Yellowknife is declining rapidly. Yellowknife Transportation Company reports that this tonnage dropped from nearly 8,000 tons in 1961 to 4,500 tons in 1962.²⁰ Lumber products also have not

²⁰ Pers. comm., W. Smitten, Office Manager, Yellowknife Transportation Company Ltd., Edmonton, February 15, 1963.

TABLE XXV - ORIGIN AND TYPE OF FREIGHT LANDED AT
YELLOWKNIFE BY BARGE, 1958-1962 (in tons)

Year	Point of Origin	General	Bunker and Diesel Oil	Totals
1958	Hay River	342	8,613	8,955
	Waterways	10,151	-	10,151
	Norman Wells	-	8,812	8,812
	Totals	10,493	17,425	27,918
1959	Hay River	407	7,258	7,665
	Waterways	9,681	-	9,681
	Norman Wells	-	11,467	11,467
	Totals	10,088	18,725	28,813
1960	Hay River	191	7,766	7,957
	Waterways	5,452	-	5,452
	Norman Wells	-	9,950	9,950
	Totals	5,643	17,716	23,359
1961	Hay River	1	7,980	7,981
	Waterways	1,548	-	1,548
	Norman Wells	-	11,081	11,081
	Totals	1,549	19,061	20,610

Note: For a detailed discussion and statistical analysis of water-borne freight movements in the Yellowknife area prior to 1958, see V. Salyzyn, Transportation as a Limiting Factor in Economic Development: Mackenzie District, Canada's Northwest, unpublished M.A. thesis, Dept. of Political Economy, University of Alberta, Edmonton, 1958, 97 pp.

Source: Compiled from the records of Yellowknife Transportation Company Ltd., and Northern Transportation Company Ltd., Edmonton.

been affected to any significant extent as most are still transported by barge from Fort Smith. There is, however, a marked trend toward the use of forest products from Hay River which can be delivered directly by truck. This trend will most likely become dominant in the near future.

d) Transportation Developments

Further transportation improvements, at least in the immediate

future are not expected to influence the local economy of Yellowknife to any great extent. The two major projects under construction, the road east of Yellowknife and the railway to Great Slave Lake, will have pronounced effects but in areas other than Yellowknife. Other developments, which will only be touched on here, are those now in the experimental stage.

The only all-weather road under construction in the Yellowknife area during 1962 is the East Road or Ingraham Trail. It is a Federal government pioneer development road planned to tap the rich mineralized areas around MacKay Lake and the East Arm of Great Slave Lake. Until construction was halted by the austerity program in June of 1962, twenty miles of the road had been completed as far as Prelude Lake (Fig. 5).

The huge expenditure involved in such road construction is justified by the government on the basis of predictions of the mineral wealth in the area. The road is expected to stimulate prospecting activity in the area and thus to encourage mining development. This theory is open to considerable criticism in light of the knowledge of the area's geology and of past experiences with such pioneer roads. This knowledge would suggest that the road is uneconomic and premature, and that an inexpensive network of winter roads covering a much larger area would serve much the same purpose.²¹

Whether the cost of the road is justified or not, the present twenty miles is being extensively used as an access road to the fishing areas on the Yellowknife River and at Prelude Lake. The municipal campsite on Prelude Lake is now the most popular tourist center in the whole

²¹ Estimates place the cost of winter road construction at \$100 to \$200 a mile, compared to \$20,000 or \$30,000 for an all-weather road.

area and promises to be a very significant economic asset to the community in the future. As far as Yellowknife is concerned, then, the road need go no further.

The effects of the Great Slave Lake railway, presently under construction from Grimshaw to Hay River (Fig. 14), will be felt throughout the North. The impact of this railway on the economic conditions on the south shore of Great Slave Lake and on the transportation system of the Mackenzie District will be most pronounced.²²

Although there has been an enormous amount of criticism directed toward the specific route that the railway should follow, and, in fact, the need for a railway to Great Slave Lake at all, it is under construction and is planned for completion in 1966.²³ Its effects on the economy of Yellowknife will probably be very small. It will, through competition, produce a slight reduction in transportation costs for the community as a whole. On the other hand, it will place increasing emphasis on Hay River as the center of land and water transportation in the Mackenzie Valley. This most certainly will have an adverse effect on Yellowknife's attractiveness as a regional supply base. As previously mentioned, this trend has been foreshadowed by the decision of the Department of Public Works to move its regional supply office to Hay River.

Projected transportation developments could have a substantial effect on the mining industry of the Yellowknife area. Research is presently being directed toward the development of new types of vehicles

²² See Canada, Royal Commission on the Great Slave Lake Railway, Report of the Royal Commission, Vol. 1, June 1960, and Vol. 2, July 1960, Ottawa, 1960, 197 pp.

²³ At the close of construction in 1962, the railway extended about 73 miles beyond Peace River town and began carrying agricultural produce southward. (Edmonton Journal, Dec. 7, 1962)

sued to northern terrain and climatic conditions. Among these projected vehicles are all-purpose cross-country vehicles, hovercraft, vertical take-off aircraft and large turbo-prop freighters, to name just a few.²⁴ These hold enormous promise for isolated mineral developments such as could develop on the base metal deposits of Great Slave Lake's East Arm. By reducing the presently insurmountable barrier of transporting base metals to the market from northern Canada, these new means of transport will have their greatest effect. For Yellowknife itself, their repercussions will be quite insignificant except for the supply benefit derived from new developments to the north and east.

3. The Tourist Industry

The smallest sector of Yellowknife's economy to be discussed here is the embryonic tourist industry. In Yellowknife, tourism had its beginnings with the growth of exclusive fishing lodges on Great Bear and Great Slave Lakes, and with the completion of the Yellowknife Highway in 1960.

In 1961, the first full tourist season, an estimated 465 persons visited Yellowknife and contributed some \$12,000 to the local economy. In the following year the totals rose to over 1,000 persons and nearly \$30,000. In addition, the five fishing lodges accommodated about 800 fishermen during the three-month summer season.²⁵

In comparison to the tourist figures for the Northwest Territories

²⁴ See J.R.K. Main, "Transportation as a Factor in Northern Development," Resources for Tomorrow, Conference Background Papers, Vol. 1, Ottawa, July 1962, pp. 579-96.

²⁵ Yellowknife Board of Trade, "General Outline of the Board of Trade's Tourist Development Program," Jan. to Sept. 1962, unpublished report, Yellowknife, September 1962, p. 1.

two conditions are worthy of note. The number of tourists recorded at Yellowknife represented 35 per cent of the total in 1961 and 46 per cent in 1962. On the other hand, the financial outlay by tourists in Yellowknife amounted to only two per cent of the Northwest Territories total in 1961 and four per cent in 1962. This indicates that Yellowknife is probably the largest tourist attraction in the Territories and that it is attracting a much different type of tourist. The average tourist spent only \$30 during his stay in Yellowknife, while in the Northwest Territories as a whole the figure was \$400.²⁶

After only two tourist seasons it is apparent that the outlook for tourism is bright. It will continue to increase in the foreseeable future at least as much as it did between 1961 and 1962. Nevertheless its potential should not be overestimated. It will not expand enough to become a major basic industry, nor will it maintain the community should the present economic base be removed.

The reasons why the tourist industry has a limited potential are fairly straight forward. On the whole, the tourist industry seldom provides employment to large numbers of people and, in this area especially, is markedly seasonal. The attractions of the area, such as angling, touring gold mines and its northern location, are not the type which induces a second trip. Also, the northern location necessitates a long and arduous trip over at least 700 miles of gravel road through a somewhat less than scenic landscape. Another factor, although not necessarily a permanent one, is the substandard condition of accommodation along the Mackenzie Highway and the complete lack of it on the Yellowknife Highway.

²⁶ Northwest Territories Tourist Association, Report of the Third Annual Conference, Yellowknife, February 7-9, 1962.

Despite the long term limitations, the immediate outlook for the tourist industry is encouraging and rapid development is expected. The number of tourists visiting the Northwest Territories is expected to increase five-fold by 1965. Assuming a similar ratio as in the past, the tourist traffic in Yellowknife should total 5,000 persons by 1965 and represent a contribution of some \$150,000 to the local economy. This revenue will form a very significant part of the total community income in Yellowknife, and when combined with the basic industry of gold mining should augment community prosperity substantially.

CHAPTER VII

YELLOWKNIFE: A MULTIFUNCTIONAL REGIONAL CENTER

The most interesting and significant trend in the changing economy of Yellowknife has resulted from its growth into a multifunctional regional center. The significance of this trend lies in the diversification of economic functions serving both the local population and the surrounding area. It is generally agreed that with such economic diversification there is increasing stability and community permanency.

As previously mentioned, this growth has been primarily a result of the attraction of Yellowknife's transportation facilities and its strategic northern location. It is situated on a major traffic artery between Edmonton and the central northland, and has the farthest north road connection in the Northwest Territories. In addition, the regular transportation connections with southern points and the urban characteristics of Yellowknife have attracted government and service organizations simply because it is one of the best places to live in northern Canada. In contrast, Fort Smith has no road connection, Hay River does not have regular air service, and both are considerably smaller than Yellowknife.

1. Yellowknife in the Northwest Territories

The most revealing indication of Yellowknife's importance in the Northwest Territories is the degree of economic concentration within the Municipal District. As the major population cluster one would expect to find a large percentage of the total Northwest Territories' goods and services within the urban area, but in many cases the percentage is surprising.

The two basic reference points used are that Yellowknife's pop-

ulation of 3,245 represents 22 per cent of the 14,895 persons in the Mackenzie District and its labour force of 1,354 accounts for 21 per cent of the total. In contrast to these percentages, Yellowknife, for example, contains three of the seven hotels in the Mackenzie District, 34 per cent of the motor vehicles, 35 per cent of the charter airlines and 48 per cent of the telephones. In terms of industrial production, the value of gold produced by the three Yellowknife area mines amounts to 80 per cent of the total industrial production (Table XXVI and Fig. 15).

TABLE XXVI - YELLOWKNIFE GOLD PRODUCTION AS A PERCENTAGE OF TOTAL MACKENZIE DISTRICT INDUSTRIAL PRODUCTION, 1961

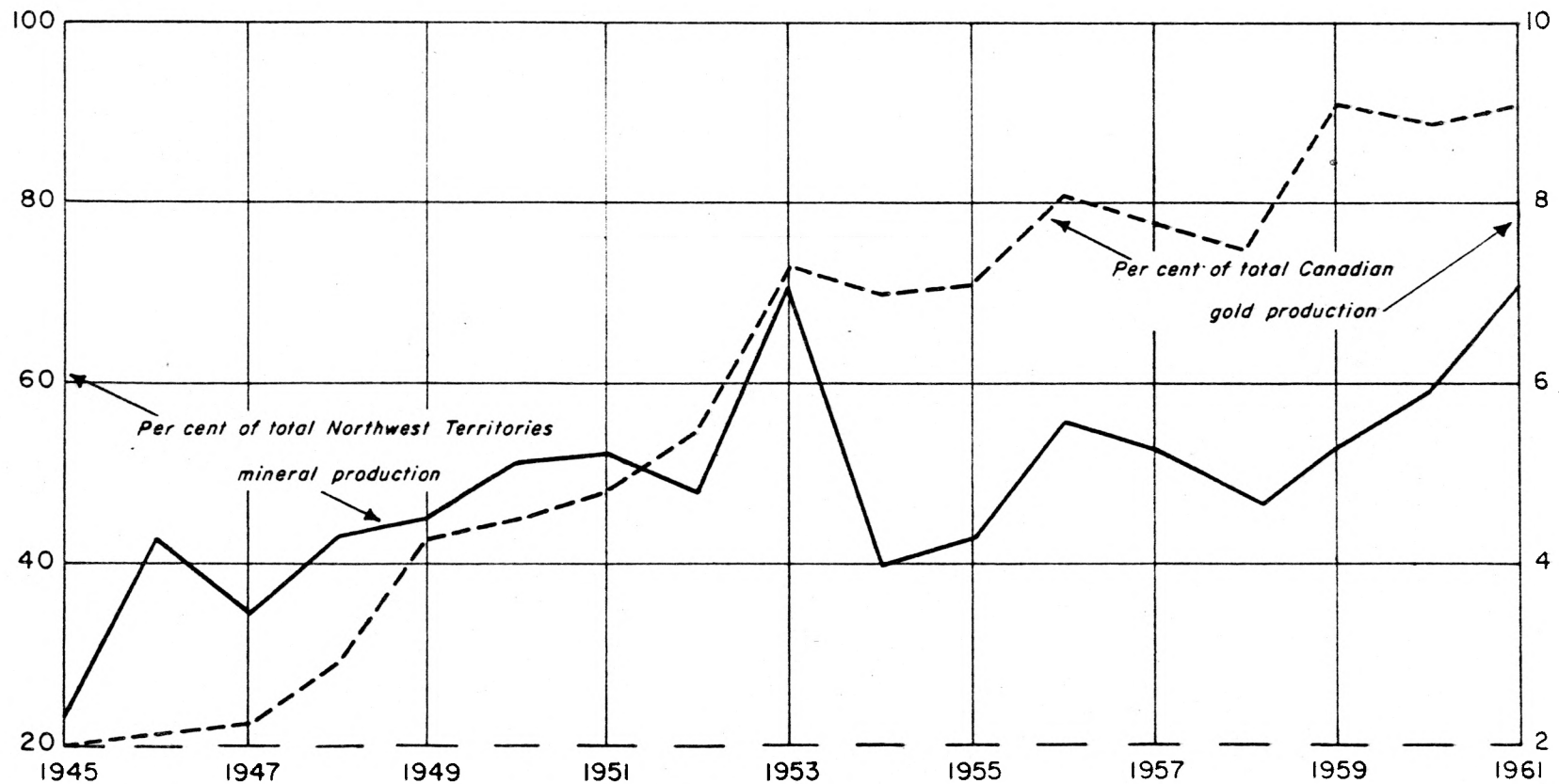
Category	Value (\$)	Per Cent of Total
Gold	14,267,000	80.0
Fish	1,484,000	8.3
Fur	1,356,000	7.6
Oil	714,000	4.0
Timber	9,000	0.1
	17,830,000	100.0

Note: This excludes other income producers such as the government and tourist activities.

Source: Municipal District of Yellowknife, Brief Proposing the Choice of Yellowknife as the Capital Site for the Mackenzie Territory, unpublished manuscript, Yellowknife, 1962, 11 pp.

Also, a large part of the remaining production, in oil and lumber for example, is sold in the Yellowknife market. The fact that gold is the only mineral produced adds still further to the economic concentration. This situation is not likely to change until full-scale production is attained at the Canada Tungsten mine in 1963 and at the Pine Point lead-zinc mine in 1966.

Fig.15 - YELLOWKNIFE GOLD PRODUCTION as a PERCENTAGE of
 TOTAL NORTHWEST TERRITORIES MINERAL PRODUCTION and
 TOTAL CANADIAN GOLD PRODUCTION, 1945-1961.



Source: Canada, Dominion Bureau of Statistics, Canadian Mineral Statistics, 1886-1961, pp.66 and 118.

Although the next section will delimit an approximate service or trade area for Yellowknife, there are numerous services centered in Yellowknife which serve all, or almost all, of the Northwest Territories and which cannot be mapped practically. These also show the economic dominance of Yellowknife within the Northwest Territories and the Mackenzie District. The following is a list of these services:

- 1) The headquarters of the N.W.T. Liquor System
- 2) The election headquarters and returning officer for the constituency of the N.W.T.
- 3) The northern offices of the N.W.T. Tourist Association
- 4) The N.W.T. Mine Rescue Station
- 5) The Resident Geologist of the Department of Mines
- 6) The Mining Recorder's and Mining Inspector's Offices
- 7) The Museum of the North
- 8) The only comprehensive vocational training school
- 9) The central station for CBC radio in the Mackenzie District, controlling unmanned stations at Hay River, Fort Smith, and more recently, Uranium City.¹

Another revealing approach, especially in relation to the delimitation of Yellowknife's service area, involves a comparative analysis of the charter airline activity on which this service function is dependent. In the following table (Table XXVII), all of the larger northern bases of non-scheduled air service west of Hudson Bay are compared in terms of hours flown and revenues earned. In both these categories, Yellowknife stands out as the largest charter base in the Northwest Territories, and similarly, in all of northern Canada. Its nearest competitors, Churchill, Lynn Lake and Uranium City, do create a very competitive marginal service area to the east and southeast of Great Slave Lake, but it is of marginal significance to Yellowknife. The limited

¹ News of the North, Yellowknife, April 5, 1962.

TABLE XXVII - INDICES OF THE RELATIVE IMPORTANCE
OF SELECTED NORTHERN CHARTER BASES, 1961
(Yellowknife = 100)

Base	Hours Flown	Charter Revenues Earned
Yellowknife	100.0	100.0
Churchill	49.3	89.3
Lynn Lake	47.3	35.4
Uranium City	35.2	22.2
Dawson	19.5	19.5
Fort Smith	18.3	13.2
Inuvik	16.4	13.3
Hay River	15.3	8.0
Whitehorse	14.7	8.2

Source: Pers. comm., K.W. Studnicki-Gizbert,
Air Transport Board, Ottawa, Sept. 12, 1962.

activity at other centers within the Northwest Territories would suggest a purely local rather than regional orientation.

This discussion provides the basis for an evaluation of the importance of Yellowknife in the Northwest Territories and the delimitation of its trade or service area. At this stage it seems worthwhile to conclude that it is the largest and most important settlement in the Northwest Territories and the service center for most of Canada's central northland. It has thus grown to the status of a major regional center with the accompanying facilities.

2. Delimitation of the Yellowknife Region or Area of Influence

The concept of the functional region has long been employed in geographic investigation. Generally, a functional region is defined as describing an area which is functionally organized and interrelated, in contrast to the static formal region defined in terms of homogeneity.

A functional region, then, expresses spatial organization through the interconnections which are functionally operative between places.² One type of functional region is the urban trade or service area, sometimes referred to as the urban sphere of influence,³ which is oriented to a nodal point or central place.⁴

On selecting indices to measure the area of influence, the particular functions of the central place must be the governing consideration. Also, these indices must provide concrete data that can be mapped on a practical scale. In most studies, researchers employ the following criteria: the area of retail sales, accessibility and traffic movements, the home addresses of high school and university students and hospital patients, and various private and public administrative areas.⁵ Most of these approaches have been devised with reference to central places within areas of reasonably uniform rural populations, and thus necessitate considerable modification for application to northern areas. Similarly, in northern Canada where the population is extremely small and is clustered in small isolated settlements and camps, the factor of economic isolation becomes more important than the size of the center.

² R. Hartshorne, Perspective on the Nature of Geography, Rand McNally, Chicago, 1959, p. 136.

³ See H.E. Bracey, "Towns as Rural Service Centres: An Index of Centrality with Specific Reference to Somerset," Transactions and Papers, 1953, Institute of British Geographers, No. 19, p. 95; and R.E. Dickenson, "The Regional Functions and Zones of Influence of Leeds and Bradford," Geography, Vol. 15, No. 89, Sept. 1930, pp. 548-57.

⁴ "A central place is defined as a cluster of central functions located at the point most accessible to a maximum profit area which the center can command." (B.J.L. Berry and H. Mayer)

⁵ See A.E. Smailes, "The Analysis and Delimitation of Urban Fields," Geography, Vol. 32, 1947, pp. 151-161.

Bengtsson,⁶ found in his study of a small Swedish town within a developed urban complex that, as in larger centers, the area of retail trade was the most important method of delimiting the urban sphere of influence. In northern Canada, this is not the case.

In addition to the factors of low population⁷ and economic isolation, the delimitation of spheres of influence in northern Canada must consider as basic the following conditions. Only two of the five largest communities, Hay River and Yellowknife, are connected by road to the "outside". Secondly, Yellowknife is the only settlement which exhibits a large number of characteristics that are at all urban in character. Thirdly, a significantly large number of functions, especially in Inuvik and Fort Smith, are sponsored and controlled by the Federal and Territorial governments. This brings in the factor of subsidized services and thus service areas dictated by control rather than competition.

The discussion in preceding chapters suggests that the two most revealing measures of the Yellowknife region or area of influence are the extent of government administration, and service provided by the charter airlines. The use of these two is justified when considering that charter airlines are the avenues of transportation and communication normally provided by roads and railways, and that administrative boundaries closely approximate economic regions organized on the basis of transportation facilities. Other units of measurement will be em-

⁶ R. Bengtsson, "The Structure of Retail Trade in a Small Swedish Town," Proceedings of the IGU Symposium in Urban Geography, Lund Studies in Geography, Ser. B, No. 24, Department of Geography, University of Lund, Lund, Sweden, 1960, p. 297.

⁷ The five major centers in the Mackenzie District, Yellowknife, Hay River, Fort Smith, Inuvik and Fort Simpson, comprising 55 per cent of the total population, contain only 8,000 people.

ployed, but only as aids in refining the boundary location.

Although the coincidence between government and economic regions is more a reflection of necessity than a step toward regional economic planning, the former regions are extremely useful in outlining the sphere of influence. For administrative purposes the Mackenzie District, with its capital at Fort Smith, is divided into three major regions, centered on Fort Smith, Inuvik, and Yellowknife. Each of these regions is, in turn, subdivided into areas centered on other settlements. Within the Yellowknife region these are the Yellowknife, Coppermine and Cambridge Bay administrative areas (Fig. 16).⁸

The nature of charter airline flying also necessitates certain qualifications as a means of regional delimitation. As elsewhere, charter aircraft in the north fly almost anywhere where there is business. In addition, as the name suggests, there is little regularity of operation, or of passengers or freight carried. As a result, the service area of any base is fluctuating and indefinite, and any delimitation of such an area must be based on a seasonal average (Fig. 17).⁹

Another consideration is the limited range of the aircraft. In most cases the single engine aircraft can travel only 600 to 700 miles without refueling. This factor tends to limit the extent of charter airline service in the north where 700 miles is about the maximum distance from one service center to the nearest large service center. Only in specific cases will planes refuel at gas caches or at settlements and

⁸ Pers. comm., P. Templeton, Regional Administrator, Dept. of Northern Affairs, Yellowknife, July 9, 1962.

⁹ Average statistics for the summer months of 1962 were obtained by personal interviews with each of the charter airlines in Yellowknife.

extend their service further out. One such case occurs along the Arctic coast where settlements such as Spence Bay and Gjoa Haven are supplied from Yellowknife after refueling or trans-shipment at Cambridge Bay.¹⁰ These settlements can thus be included in Yellowknife's service area despite the break in transportation.

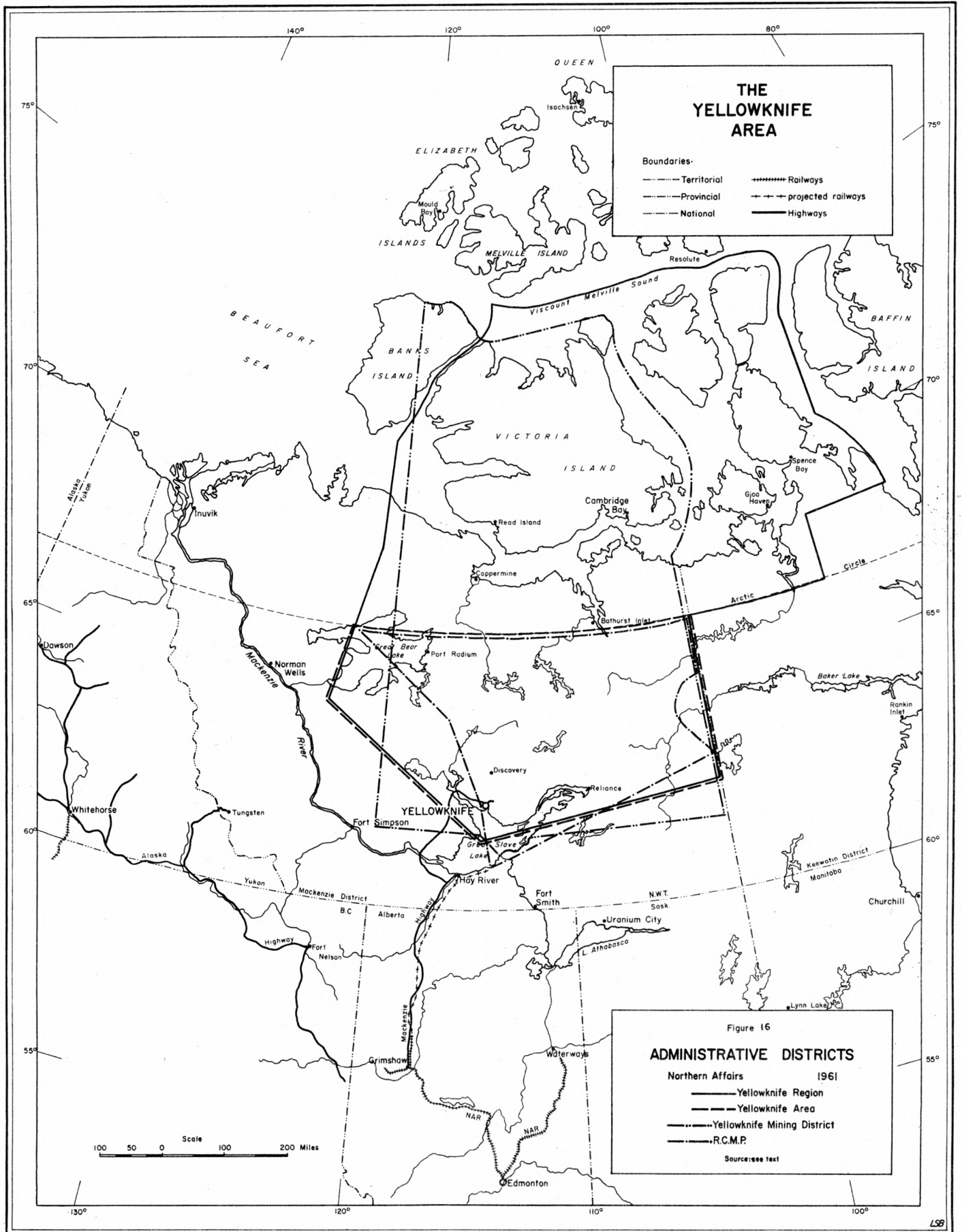
The practice of contract flying must also be considered as another variable. For example, the Polar Continental Shelf Project was, until 1962, serviced from Winnipeg through Churchill by Transair. In 1962, Wardair received the contract and supplies originating in Edmonton and Calgary are now funnelled through Yellowknife to the whole of the Queen Elizabeth Islands from Alert to Mould Bay.¹¹ Nevertheless, in light of the amount of servicing by ship from eastern Canada, and the flexibility of operation, this area could hardly be classed as anything but marginal to Yellowknife's service area. Another example within the marginal supply area is the supply and resupply of the oil drilling activity at Winter Harbour on Melville Island. This program has received supplies by ship from Montreal and by aircraft from Inuvik and Yellowknife, but during 1962 increasing use was made of Yellowknife as a base of supply.

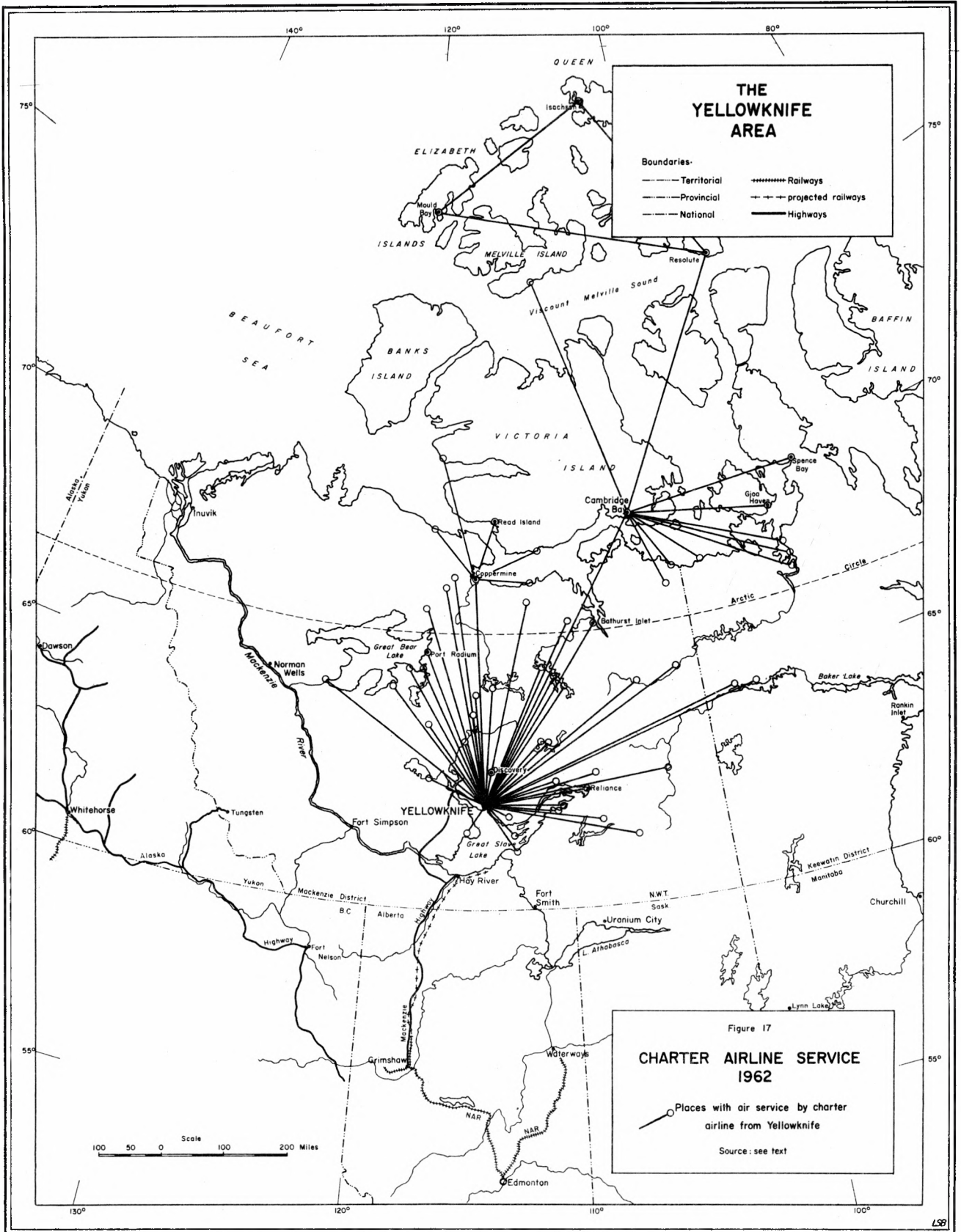
The following is a summary of the basic definitions involved in employing charter airlines and administrative regions as a means of regional delimitation:

1) Charter airlines: includes flights to those areas which were serviced from Yellowknife during 1962 no matter how infrequent the flights.

¹⁰ Pers. comm., K. Gray, Float Base Manager, Pacific Western Airlines, Yellowknife, June 23, 1962.

¹¹ Pers. comm., L. Brown, Base Manager, Wardair Canada Ltd., Yellowknife, June 30, 1962.





Within the region as outlined (Fig. 18), the supply function of Yellowknife was greater than that of any other regional center.

2) Administrative districts¹²: the political boundaries used include those of the Department of Northern Affairs with headquarters in Yellowknife, the Yellowknife Mining District, and the Royal Canadian Mounted Police area which is under the jurisdiction of the Yellowknife office.¹³

In summary, the Yellowknife service area, as a functional region, can best be described as consisting of a two-part hierarchy including primary and secondary areas, defined by the degree of service provided. A third area outside the region, but marginal to it, is included for reference purposes (Fig. 18). The first area is that nearest Yellowknife, comprising the land-locked portion of the Canadian Shield to the north. Within this zone, which is called the primary area, the settlements and camps depend entirely on the services and facilities of Yellowknife. The secondary area, in which the majority of service is provided from Yellowknife, represents the outer margin of the major service area and is intended to recognize the influence of other centers. Generally, it includes that portion of the Mackenzie District lying north of a line through the center of Great Slave Lake and east of a line through the center of Great Bear Lake. Its northward extension includes the Arctic coast and southern Queen Elizabeth Islands from Read Island and Coppermine in the west to

¹² An attempt was made to employ newspaper circulation and the home addresses of school children in Yellowknife as means of delimitation. Neither of these reveals any significant distribution pattern, and both contain a sufficient number of variables to render them virtually useless.

¹³ Pers. comm., Staff of the Dept. of Northern Affairs and the Royal Canadian Mounted Police, Yellowknife, Aug. 7, 1962.

Spence Bay and Gjoa Haven in the east.

The marginal area extends north of the secondary zone into the Queen Elizabeth Islands where no regional center dominates, but in which Yellowknife plays an important role. For the purpose of this study, the boundary of the Yellowknife service region, indicating Yellowknife's area of influence, excludes this marginal zone.

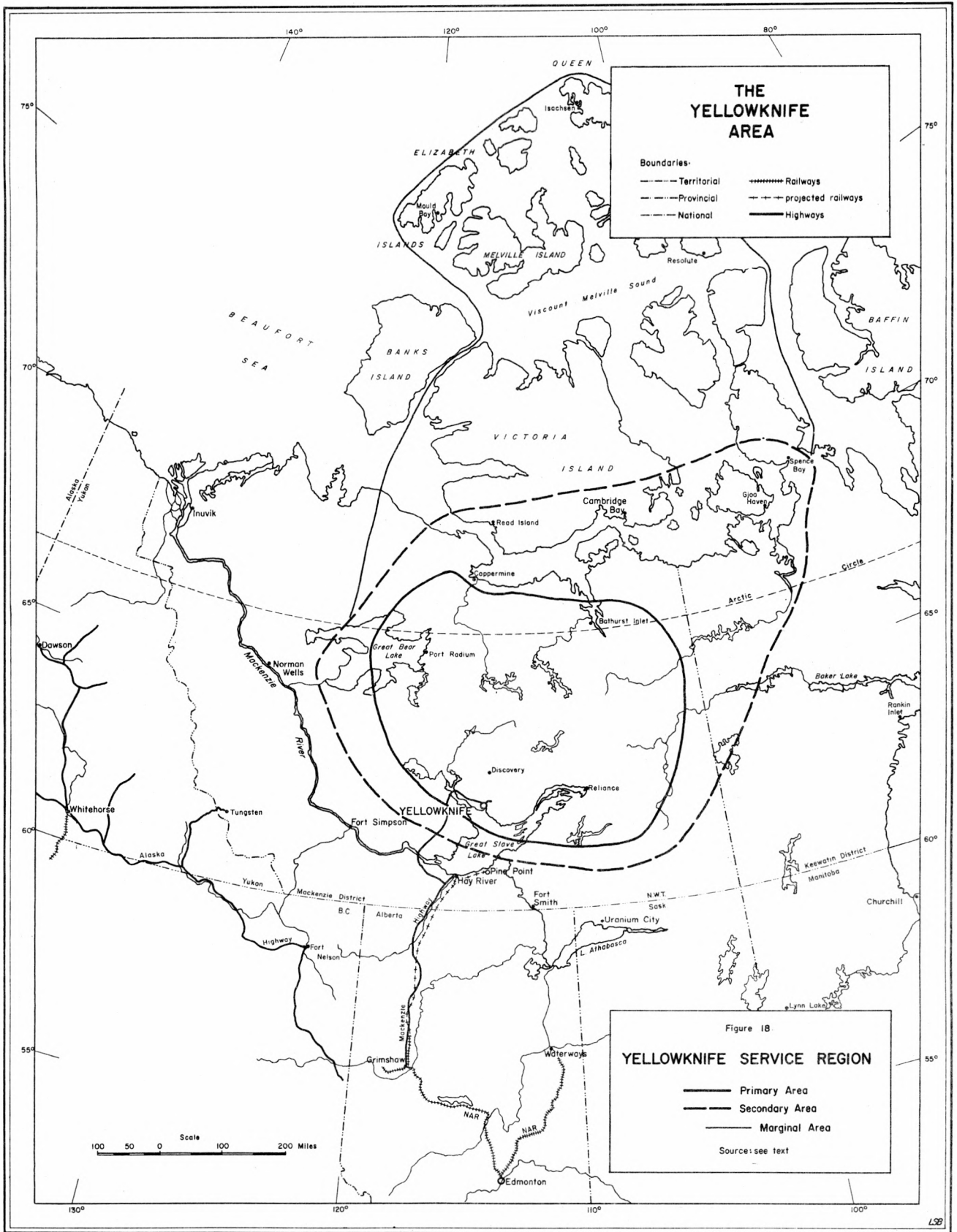
This distinction is purely an approximation on the basis of announced criteria. The regional boundaries are largely subjective, but are at least derived from a basic framework of service and administrative functions, and a personal knowledge of the area and the conditions involved. All of this must be considered in light of the fact that much of the service extended from Yellowknife is simply trans-shipment of goods and services provided from more southerly centers such as Edmonton.

3. Degree of Permanency

It is generally recognized that mining communities are established and develop under conditions which are relatively uncertain. As mining is not a self-perpetuating form of production, the communities based on its existence have a life expectancy only as great as that of the basic resource. In addition, gold mining communities are saddled by the added uncertainties of gold.

In some cases, however, the factors of assured long term production and economic diversification can result in an unusually high degree of "permanency".¹⁴ In recent years, Yellowknife has shown an increasing trend toward greater permanency in both the social and economic spheres.

¹⁴ The term "permanency" as used here refers to the degree of economic stability and assured existence, and the feeling or sense of permanency among the business and private sectors of the community.



Formerly, most residents considered it a temporary home where they made their stake and then moved south. This attitude was reflected in lower standards of community services, housing, and private investment, and in extremely high labour turnover rates.

To analyze this changing condition and to determine its economic repercussions, some quantitative methods of measurement are necessary. Professor Stone suggests several methods which are applicable to this study, such as: the number of ways of making a living, number of stores, level of public utilities, and the attitudes of business and private citizens.¹⁵ To this list could be added the rate of labour turnover, the percentage of married employees, and investment in new and existing buildings.

The labour turnover rate is an excellent indicator of business, labour and, therefore, community stability. In most northern areas the turnover rate is astonishingly high. In the small Yellowknife business community, which is somewhat comparable to business communities in more isolated centers, turnover averages around 100 per cent a year, and sometimes reaches 200 per cent. For Yellowknife itself, the most precise indication is provided by statistics from the largest employers: Giant, Con, and the Federal and Territorial governments. Discovery is also included as an example of the effects of isolation from Yellowknife.

The turnover rates at the three Yellowknife mines, summarized in the following graph (Fig. 19), have shown a striking decline since 1957.¹⁶ The rates at Giant and Con declined from over 100 per cent to

¹⁵ K.H. Stone, "Human Geographic Research in the Canadian North," Arctic, Vol. 7, No. 3-4, 1954-55, p. 330.

¹⁶ The 1955 figure is probably more representative of the earlier situation than 1956 or 1957, because the rates in these years reflect the attraction of uranium boom towns such as Uranium City and Elliot Lake.

around 40 and 30 per cent, respectively. At Discovery, the turnover has remained at about 100 per cent, indicating little change in the type of person employed or the economy of the settlement.

Although detailed statistics are not available, the turnover of government employees is estimated at between 35 and 50 per cent depending on the department concerned.¹⁷ This has not shown a significant decline in recent years as government contracts for northern service usually specify two-year postings. Considering that few stay longer, this alone produces a 50 per cent turnover regardless of conditions.

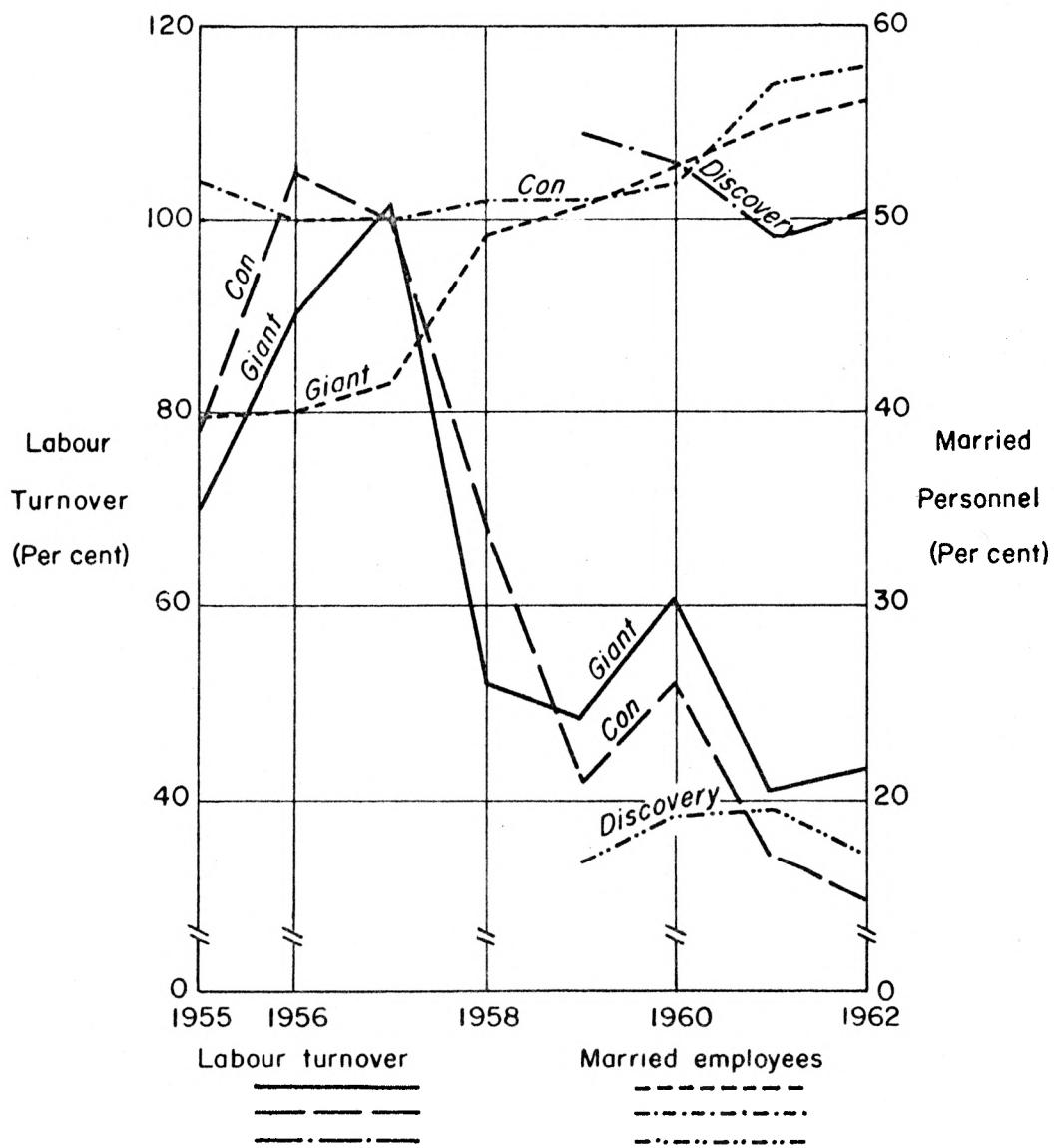
The percentage of married employees serves as a further indicator of increasing community permanency and social stability. In the early stages of development, mining camps exhibit a high degree of masculinity in the population and a correspondingly low percentage of married employees. As the camp slowly develops into a community with expanding public services the number of families increases. At Giant and Con, the percentage of the total employment in the married category increased between 1955 and 1962 from 40 and 52 per cent to 56 and 58 per cent, respectively (Fig. 19).¹⁸ On the other hand, at Discovery, the continued existence of a mining camp lacking economic diversification and an all-weather road to the outside has limited the number of married personnel to between 16 and 19 per cent of the total labour force.

The level of public and private investment has risen steadily in the last few years, and has been most noticeable in the number and value

¹⁷ Pers. comm., P. Templeton, Regional Administrator, Dept. of Northern Affairs, Yellowknife, July 9, 1962.

¹⁸ Pers. comm., A.T. Rivett, Personnel Officer, Giant Yellowknife Mines Ltd., Yellowknife, July 17, 1962.

Fig. 19 - LABOUR TURNOVER and PER CENT MARRIED, YELLOWKNIFE AREA MINES, 1955-1962



Sources: Personnel Officers; Giant, Con and Discovery.

of new housing units. The following table (Table XXVIII) summarizes the

TABLE XXVIII - ESTIMATED NUMBER, VALUE AND OWNERSHIP
OF HOUSING UNITS* IN YELLOWKNIFE, 1957 and 1962

	1957	1962	Per Cent change
New Town: Total housing units	388	438	+13
Privately owned	300	306	+ 2
Per cent privately owned	77	70	- 9
Government owned	63	98	+56
Per cent government owned	16	22	+38
Giant houses	n.a.	30	-
Con houses	n.a.	4	-
Average value all units	\$5,000	\$7,000	+40
Old Town: Total housing units	95	90	- 5
Average value all units	\$1,500	\$1,500	

* Includes detached, semi-detached and apartment dwellings

n.a. = not available

Source: Compiled from the records of J. Buck, Secretary-Treasurer, Municipal District of Yellowknife.

housing situation in Yellowknife during 1957 and 1962.¹⁹ The most striking changes in this five-year period include the 40 per cent increase in the value of housing units in the New Town and the 56 per cent increase in government-owned housing. The total dwelling units grew by 50, or approximately 10 units per year, of which one-half were constructed by the Federal and Territorial governments. If nothing else, this at least indicates expanding confidence on the part of the two governments concerning Yellowknife's permanency.

The number of private homes increased by only two per cent between

¹⁹ In 1957 Yellowknife altered its assessment standards to agree with those of Alberta. There has been no change since.

1957 and 1962 and declined, relatively, to 70 per cent of the total units in the New Town. This reflects the decrease in non-government wage earners discussed in Chapter IV, but obscures the considerable number of renovations of and additions to existing structures. In addition, several low standard, privately-owned units have been destroyed as part of the community re-development project.

New business and housing construction in 1962 further reflects optimism in Yellowknife's future. Although statistics are not available for previous years, the value of public works and building construction, estimated at over one million dollars, is considered to be the greatest since the war.²⁰ During the year, at least five major new buildings were completed and extensive renovations were made to existing structures. Housing starts totalled twelve in comparison to ten for previous years, and plans for another five were announced during the summer. The community itself, in recent years, has launched an ambitious road paving program and an equally ambitious sidewalk construction program. These programs, largely financed by the Territorial government, have greatly enhanced the beauty of the community and the general living conditions on which social stability depends.

In general, the attitude of Yellowknife's residents and especially its municipal government is one of undying optimism. They believe in the community's possibilities of permanency to a far greater degree than economic conditions would suggest to be reasonable. Despite indications that one mine is near depletion, that another has a foreseeably limited

²⁰ Edmonton Journal, Nov. 16, 1962.

production, and that when these two depart so will the government, investment continues to expand. This investment, both private and business, suggests a feeling of confidence that Yellowknife will exist for at least ten and possibly fifteen years. Taken together, most of the factors discussed in the preceding paragraphs reveal a marked trend toward increasing economic and social stability and a greater sense of permanency among all concerned.

CHAPTER VIII

CONCLUSIONS

1. The Economy of Yellowknife

In general, there are three broad conclusions which can be drawn from this discussion concerning the economy of Yellowknife. Firstly, Yellowknife continues to be dominated by the mining industry on which it was founded. The two mines within the Municipal District, and their attendant services, employ forty-four per cent of the gainfully employed population, and provide thirty-seven per cent of the general tax revenues necessary to support the community.

Secondly, the contribution of mining to the urban economy is declining absolutely and relatively. This decline is being partially offset by the rapid growth of service activities. Most of these activities should not be considered as independent, but rather as derivatives of the continuing effect of mining. Those activities which do not serve the mining industry and population of Yellowknife directly have been attracted by the level of transportation and community services which have developed with the mining industry. There has been little, if any, development of industries based on other resources.

Thirdly, the Federal and Territorial governments are becoming increasingly important as sources of employment and financial aid. Like other mining communities, government assistance in the form of grants, subsidies, and grants in lieu of taxes, has been essential in maintaining the level of community services at a time when the labour force has been declining. In Yellowknife, the two senior governments now employ twenty per cent of the total labour force and contribute forty-five per cent

of the community's total revenue. Together, government and mining, the two major components of Yellowknife's economic base, employ sixty-four per cent of the working population and are the source for eighty-two per cent of the revenues of the community.

The most striking trend within the urban economic structure, and one not accurately revealed by employment or revenue statistics, is Yellowknife's growth as a regional center. Many students of specialized communities in northern areas suggest that the expansion of regional functions provides the basis for the development of permanent mining communities. Although this approach is more reasonable for northern settlements than industrial diversification it is doubtful to what extent these service functions will develop. Yellowknife's experience suggests that expansion in the service industries creates few employment opportunities, and is essentially a derivative of the basic industry.

The economic structure of Yellowknife does not differ greatly from that of other mining, and especially gold mining, communities. The deviations from the norm that occur are largely a result of Yellowknife's youthfulness, size, and isolated location. The latter factor is of the utmost importance in explaining the lack of retail trade outlets, and the importance of transportation and government services. The changes in the economy between 1951 and 1962, illustrated by the analysis of employment, reveal that Yellowknife is drawing more in line with older communities in terms of economic diversification.

2. The Economic Future of Yellowknife

Gold mining in Yellowknife appears to have a limited economic future. Present reserves and expected underground developments suggest

a rather short life expectancy for two of the Yellowknife area mines, Con and Discovery. The outlook for Giant is more favourable, although production beyond fifteen years is deemed unlikely. Even if the price of gold were to be increased substantially, the ore characteristics in the area would not permit the lengthening of the production period by more than twenty per cent.

Among the smaller components of the economic base, few hold promise of large-scale expansion without assistance from the government. The following is a summary of what is most likely to happen in these fields if such assistance is not forthcoming.

1) Regional center: Yellowknife's role as a regional center may well increase with developments north and east of Great Slave Lake. It is improbable, however, that it will develop as the major center for the whole Mackenzie District as it is situated north of the main line of transportation and economic organization. This line, representing the basic framework for future expansion, runs north from Edmonton to Great Slave Lake and then down the Mackenzie River to the Arctic Ocean.

2) Political function: Yellowknife's importance in the administration of the Mackenzie District and the Northwest Territories will probably not expand. As recent attempts to attract the new capital of the Mackenzie Territory to Yellowknife failed, Fort Smith will remain the capital and only regional functions will continue to be carried on from Yellowknife, Hay River and Inuvik.

3) Tourism: The tourist industry will definitely provide a rapidly expanding source of income for the community, and the area as a whole. On the other hand, the marked seasonality, and low personal expenditures characteristic of the tourist industry in this area, will

limit its significance to the urban economy in the long run.

4) Fishing: On Great Slave Lake, commercial fishing holds only a limited potential and will continue to utilize Hay River as its base of supply. Increased activity in the North Arm may provide some business for Yellowknife's commercial functions, but certainly not to a significant extent.

5) Other activities: There is little possibility of any major industry or service activity locating in Yellowknife. Such activities as may come in will be extremely small and, if commercial, will be oriented toward the local market. At present, Yellowknife is being considered as the site of the Territorial Jail and as a research center for the Arctic Institute of North America, but neither of these facilities will provide large scale employment opportunities.

3. The Case for Economic Diversification

In most cases, the size and location of gold mining communities virtually eliminates the possibility of economic diversification by private investment. This is particularly applicable to isolated communities such as Yellowknife, situated in northern Canada and within the Precambrian Shield where the economic potential is almost entirely based on mineral resources.

Nevertheless, if Yellowknife is to become a permanent community immune to extreme economic fluctuations, it must diversify its economy. In the past, the growth of the government and transportation services oriented toward the Yellowknife region have provided the only basis for diversification. In addition, the future does not hold great promise of wider diversification by normal means. Therefore, the future of Yellow-

knife as a permanent community depends on continued government support and increasing subsidies to encourage diversified growth of the local economy

4. The Role of the Government

Only the Federal government can ensure a co-ordinated program of resource development in northern Canada. Privately sponsored endeavours, apart from mining, seldom allow for a sufficient profit margin to attract further capital. On the other hand, where private enterprise can operate effectively it would be most beneficial for the North if it were co-ordinated with a government-controlled master plan of regional economic development.

Within the general framework of a master plan, there are various ways by which the government could encourage and control development. For Yellowknife specifically, the following incentives would, if applied, encourage the exploitation of the resources of the area and broaden the community's economic base.

(1) Incentives to mineral exploration and development

- a) provision of greater assistance to prospectors and greater tax deductions for exploration programs
- b) increase in the periods of tax exemption for new mines and depletion allowance for producing mines
- c) assistance to mining companies in planning for long-term production and for company-town construction
- d) introduction of greater permanency or predictability in the present three-year program of cost-aid to the gold mining industry by means of a differential cost subsidy which is permanent, and which varies in scale reflecting changes in the market price of gold in Canada stemming from alterations in the exchange rate between U.S. and Canadian dollars

(2) Incentives to transportation development

- a) expansion of the winter road network with reference to new mines and areas of intensive exploration activity
- b) expansion of the all-weather road network based on definite long-term developments and in areas usually preceded by winter roads

c) increase in the subsidization of rudimentary landing strips in areas under active exploration

d) increase in the number of tourist sites and facilities along the Mackenzie and Yellowknife Highways to promote the tourist trade

(3) Community planning, construction and stabilization

a) planning of new residential areas on the basis of environmental restrictions and advantages

b) provision of measures to ensure adequate financing of new construction

c) planning of older sections of Yellowknife by means of low-cost housing and reconstruction to encourage investment and tourism

d) assistance to transportation concerns to reduce the high cost of transport, and thus the cost of living

These incentives to and controls of development in the Yellowknife area, which are largely dependent on Federal government subsidy, can be applied to most of northern Canada. Although there is no exact parallel to the situation of Yellowknife and its region, economic expansion in the North will be based on a similar economy and will show similar characteristics.

5. The Concept of Planned Permanent and Non-Permanent Communities

The benefits of planning for permanent or non-permanent mining communities have been argued for some time.¹ Essentially, such planning is an attempt to satisfy the need for mobility in community development based on mineral resources. In many mining areas, because of the volatile nature of the basic mining activity and the difficulties in achieving diversification of the economic base, permanent settlement is not possible.

¹ See V.J. Parker, The Planned Non-Permanent Community: An Approach to the Development of New Towns Based on Mining Activity, unpublished M.Sc. thesis, Community and Regional Planning, University of British Columbia, April 1960, p. 63.

In these areas planners advocate the planning of non-permanent communities.

This concept requires considerable modification for use in northern areas. Firstly, there must be a distinction between mining communities and mining camps. The latter, with Discovery, Rayrock and Taurcanis as examples, are seldom planned as permanent settlements in the first place. In these "camps" there is little semblance of community development and their existence remains solely dependent on the exploitation of the mineral deposit.

In contrast to these camps, mining "communities", such as Yellowknife, have attained some degree of economic diversification and could well be planned as permanent communities despite the uncertain future of their basic industry. The practice of abandoning mining communities creates serious local problems everywhere. In southern Canada, however, abandonment may be acceptable in most cases because developments are frequent, the service functions of an area are usually divorced from the mining activity, and the resource base is usually broad enough to attract other activities over the long run. In the North, on the other hand, such communities are infrequent, expensive, and difficult to establish and maintain. Also, they are usually major regional service centers and represent community development based on the utilization of most of the area's resource potential.

Investment in northern mining communities such as Yellowknife is another important factor in justifying their permanent existence. These communities are seldom able to meet the huge initial capital expenditures necessary, and find it impossible to borrow money on the open market for capital works programs. As a result, considerable investment by the Federal government must be made throughout the community's existence.

Private investment in northern communities is relatively low because of low returns and general uncertainty concerning future economic conditions. The difficulties of attracting any investment into northern communities are exaggerated in a mining community which has a limited economic existence. If such risk capital is to be attracted some assurance must be available that the community will continue to exist even if its mining industry should decline.

In Yellowknife, public and private investment is already large enough to render abandonment unreasonable. Yellowknife need not continue to retain its present population if mining activity were to cease, but the town should remain in existence as a center of government administration and regional supply for the expanding mining area to the north and east. The North cannot afford, at present, the duplication of such community growth and, as Yellowknife offers some strategic advantages, its long-term existence will not be completely uneconomical. There is no other center on the north shore of Great Slave Lake, nor is there likely to be one in the immediate future, which could act as the service center for the vast region to the north.

The planned permanency of Yellowknife, or any other northern community, should only be determined as part of a regional plan of settlement.² Unfortunately, it is virtually impossible to predict the location, size and value of a mineral deposit and the external market conditions affecting its development.³ Nevertheless, it is possible to prepare for such local

² I.M. Robinson, New Industrial Towns on Canada's Resource Frontier, Research Paper No. 73, Dept. of Geography, University of Chicago, Chicago, 1962, p. 126.

³ For example, see N. Watts, "Kiruna: Sweden's Northernmost Mining Town," Geogr. Magazine, Vol. 28, 1955, pp. 231-241.

occurrences within a flexible master plan of regional resource and community development. It is suggested here that in the area north of Great Slave Lake, Yellowknife should be the central point or service center planned in conjunction with small, flexible and impermanent mining camps to the north.

6. Community Planning in the North

The settlement pattern of Yellowknife reflects a combination of planned and unplanned developments. The Old Town exists as a remnant of the past and as an example of the absence of town planning controls and community services. The New Town, on the other hand, is a "model" of communities to the south and is adequately supplied with modern urban services. The residential areas at the two mines are as well planned as similar mining camps, but on the whole, have hindered the growth of the New Town by housing a large percentage of the area's population.

Although the New Town is a creation of government planning, it lacks in many respects the characteristics expected from a sound community planning program. The New Town has no distinctive regional character, and its general design does not consider environmental restrictions. The street system is based on a grid pattern which ignores topographic limitations and advantages, and residential densities are similar to those in southern cities despite the severe climate and the high cost of providing basic services.

In light of the severe environment and the difficulties of attracting labour and investment, one of the challenges of northern development may well be to create towns which are northern in character and design. These should offer to the newcomer pleasant living conditions in a setting

which reflects northern environments, economies and concepts.

7. Evaluation

As the future of northern Canada rests primarily in its mineral resources, most new settlements will be mining towns. This development in itself involves variables which are somewhat unique and certainly are highly significant, but which have been largely ignored in the literature on northern Canada.

Mining towns pose difficult problems for planners in almost all areas, but under severe northern conditions the problems are acute. Misuse of resources, unplanned exploitation, and the lack of community planning on a regional basis are extremely expensive mistakes in the North. The growth of communities such as Yellowknife, which exhibit a small degree of economic diversification, is quite rare. As a result, it is feasible to plan these centers as permanent communities within a outline of regional settlement.

If the expanding population is to be housed in relatively few new settlements, then the problem of attracting people and capital to the North depends partly on conditions within these towns. Investment, especially, is risky, expensive and extremely difficult to secure and hold under present conditions.

In conclusion, one of the greatest challenges in northern development may then be the outlining of a master plan of regional development involving planned impermanent mining camps integrated with and dependent on a few strategic regional centers. These centers, selected after careful study and evaluation of the resource potential of the area, should be planned as permanent communities, and should offer comfortable and varied

living conditions to the prospective resident in a distinctively northern setting.

The solving of these problems in the Yellowknife area, and throughout the North, will entail a considerable amount of basic research. This study of Yellowknife may provide the basis for the establishment of regional planning measures in the area north of Great Slave Lake, as well as an example of certain techniques of analysis which may, with modifications, be applied to other areas in northern Canada.

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APPENDIX A

A HISTORY OF MINING DEVELOPMENT IN THE YELLOWKNIFE AREA
(Underground Developments and Past Producers)*

Name of Mine	Year Claims Staked	Year of Initial Development	Depth of Shaft (feet)	Capacity (tons/day)	Mill		Total Ore Milled	Year Operations Ceased	Present Status	Mineral Produced
					Milling Began	Milling Ceased				
Amatcho Yellowknife	1936	1944	35	-	-	-	-	1951	Exploration	Gold
Burwash Yellowknife	1935	1935	125	-	-	-	-	1945	Inactive	Gold
Cemlaren Mines	1936	1937	380	-	-	-	-	1939	Mining	Gold
Censell River Silver	1932	1937	60	-	-	-	-	1947	Inactive	Silver
Colomac Yellowknife	1945	1945	5701	-	-	-	-	1947	Inactive	Gold
Gon/Rycon	1935	1936	3,100	500	1938	1943	2,489,918	-	Mining & Milling	Gold
Consolidated Beaulieu	1939	1946	320	90	Oct. 1946	Nov. 1947	252	1948	Inactive	Gold
Consolidated Discovery	1944	1945	4,060	150	1950	prod.	503,936	-	Mining & Milling	Gold
Cormac (Beta Gemma)	1934	1934	50	-	-	-	-	1943	Inactive	Uranium
Crestaurn Mines	1944	1945	450	-	-	-	-	1947	Inactive	Gold
DeStaffany Tantalum	1942	1946	40	5	Sept. 1947	Oct. 1947	some	1947	Inactive	Tantalum-Columbite
Beryllium	1945	1945	202	-	-	-	-	1948	Inactive	Gold
Diversified Mining Interests	1931	1934	180	small	-	-	-	1957	Inactive	Uranium
El Bonanza	1930	1932	800	100**	1933	1940	n.a.	1960	Inactive	Sodium-Uranium
Eldorado Mining and Refining	1935	1938	2,000	1,000	1948	prod.	3,463,740	-	Mining & Milling	Gold
Giant Yellowknife Mines	1938	1939	35	-	-	-	-	1943	Inactive	Gold
Goodrock Mines	1938	1932	210	25	1936	1939	12,000**	1948	Inactive	Uranium-Silver
International Uranium (Acadia)	1937	1938	60	-	-	-	-	1938	Inactive	Gold
Mon Group	1936	1937	1,940	210	1939	1944	455,000**	1952	Inactive	Gold
Negus Mines	1938	1946	186	-	-	-	-	1948	Inactive	Gold
North Inca Gold	1943	1945	50	50	Nov. 1946	Nov. 1946	940	1947	Inactive	Tantalum-Columbite
Peg Tantalum	1938	1935	525	50	May 1941	Nov. 1941	some	1947	Inactive	Gold
Philmore Yellowknife	1935	1935	525	50	Feb. 1941	Aug. 1942	20,324	1942	Inactive	Gold, Copper Tungsten
Pensive Yellowknife	1938	1938	924	100	1941	1942	34,429	1942	Inactive	Gold
Platnigan Mines	1945	1945	1,125	175	1957	1959	78,781	1960	Inactive	Uranium
Rayrock Mines	1940	1941	200	25	Aug. 1942	Aug. 1942	187	1959	Inactive	Uranium
Ruth Yellowknife	1945	1946	145	-	-	-	-	1948	Exploration	Gold
Salmits-Mack Lake	1945	1945	230	-	-	-	-	1946	Inactive	Gold
Sunset Yellowknife	1945	1945	1,265	-	-	-	-	1946	Development	Gold
Teurcanis Mines	1938	1938	930	125	1941	1943	133,969	1949	Inactive	Gold
Thompson-Lundmark	1945	1946	150	-	-	-	-	1948	Exploration	Gold
Viking Yellowknife	1946	1946	35	10	Sept. 1947	Oct. 1947	18	1948	Inactive	Gold
Zolota Yellowknife	1946	1946	35	10	Sept. 1947	Oct. 1947	18	1948	Inactive	Gold

* The minimum requirement for qualification as an underground development mine for purposes of this table is the sinking of a prospect shaft at least 35 feet.

** Estimated
1. Adit.

prod. = producing
n.a. = not available

Sources: Compiled and modified from the following publications: C.S. Lord, Mineral Industry of the District of Mackenzie, N.W.T., Geological Survey Memoir 261, Dept. of Mines and Technical Surveys, Ottawa, 1951, 336 pp.; K.J. Christie, "Economic Mineralized Areas and Mining Development, Yukon Territory and Northwest Territories," manuscript, Resources Division, Dept. of Northern Affairs, Ottawa, July 1960, 52 pp.; Financial Post, Survey of Mines 1963, 37th Annual Edition, Maclean-Hunter Publishing Co., Toronto, Nov. 1962, 312 pp.; C.S. Lord, Mineral Industry of the Northwest Territories, Geological Survey Memoir 230, Dept. of Mines and Technical Surveys, Ottawa, 1941, 135 pp.; Giant Yellowknife Mines Annual Report 1961, Toronto, 1962; Consolidated Discovery Yellowknife Mines, Annual Reports 1943-1961, Toronto, 1949-1962; Rayrock Mines, Annual Reports 1937-1961, Toronto, 1938-1962; Matitcho Yellowknife Mines, Annual Report 1951, Toronto, 1952; and Alberta and Northwest Chamber of Mines, Annual Reports, 1955-1961, Edmonton, 1956-1962.

APPENDIX B

COMPARISON OF SELECTED NORTHERN COMMUNITIES, MALES
AS PERCENTAGE OF TOTAL POPULATION, 1961

Town	Location	Total Population	Per Cent Male	Age of Town (yrs.)*
Thompson	Man.	3,449	70.9	3
Manitouwadge	Ont.	2,635	62.7	7
Gagnon	P.Q.	1,900	62.0	1
Uranium City	Sask.	3,349	61.3	8
Schefferville	P.Q.	3,178	59.2	7
Lynn Lake	Man.	2,118	57.5	10
YELLOWKNIFE	N.W.T.	3,245	56.7	23
Kitimat	B.C.	8,217	54.6	8
Red Lake	Ont.	2,419	53.6	23
Elliot Lake	Ont.	13,179	53.4	7
Whitehorse	Yukon	5,031	53.3	-
Drayton Valley	Alta.	3,854	52.9	7
Flin Flon	Man.	11,104	52.5	32
Timmins	Ont.	29,270	51.8	49
Sudbury	Ont.	80,120	51.6	65
Noranda	P.Q.	11,477	51.4	35
Trail	B.C.	11,580	51.2	61

* Estimated

Source: Census of Canada, 1961.

APPENDIX C

COMPARISON OF OCCUPATIONAL STRUCTURES* OF
YELLOWKNIFE AND TIMMINS, ONTARIO, 1951

Category	Yellowknife		Timmins	
	Number	Per Cent	Number	Per Cent
Managerial	85	5.9	731	7.4
Professional	111	7.7	737	7.5
Clerical	69	4.8	812	8.2
Agriculture	3	0.2	34	0.4
Fishing, Hunting, Trapping	10	0.7	1	0.0
Logging	4	0.3	191	1.9
Mining	474	33.0	2,892	29.4
Manufacturing, Elect. Light & Power	130	9.0	1,112	11.3
Construction	114	7.9	509	5.2
Transportation & Communication	106	7.6	736	7.5
Commercial	38	2.6	626	6.4
Financial	4	0.7	53	0.5
Service	243	16.9	809	8.2
Labourers	36	2.5	484	4.9
Others	8	0.6	123	1.2
Totals	1,438	100.0	9,850	100.0
Population		2,724		27,743
Per cent in labour force		52.8		35.4
Per cent males in labour force		89.6		82.3

* Dominion Bureau of Statistics, Occupational Classification Manual, Census of Canada, 1961, Ottawa, 1961.

Sources: Yellowknife statistics from R.J. MacNaught, Dominion Bureau of Statistics, Ottawa. Timmins statistics from Timmins Department of Industries, Economic Survey of the Town of Timmins, 1960, Toronto, 1960, p. 49.

APPENDIX D

COMPARISON OF EMPLOYMENT STRUCTURES, BY INDUSTRY,
OF YELLOWKNIFE AND SELECTED MINING
COMMUNITIES IN NORTHERN SWEDEN

Industrial Category*	Per Cent Employed			
	Yellowknife	Malmberget ¹	Boliden ²	Kiruna ³
Primary Industries	1.6	0.3	1.1	0.4
Mining	43.9	54.4	51.7	33.6
Manufacturing ⁴ and Construction	6.7	12.8	25.1	25.6
Commerce ⁵	8.6	10.2	6.6	9.7
Public Utilities	0.6	0.9	0.4	1.6
Communications ⁶	7.9	5.3	3.4	10.0
Service	30.7	16.0	11.2	18.5
Other	-	0.1	0.3	0.6
	100.0	100.0	100.0	100.0

* Industrial categories modified from Table VI to agree with those given for Swedish communities.

¹ Malmberget is an iron-mining town with a population of 9,047, located near Gallivare in northern Sweden (67°15' N)

² Boliden is a copper-sulphide mining town of 2,816 persons situated near the Gulf of Bothnia in the northeast (64°45' N)

³ Kiruna, the largest center in the iron mining area of north-central Sweden, has a population of 19,348 and is located near the Norwegian border at 67°45' N latitude.

⁴ Includes smelting of the ore.

⁵ Includes Finance, Insurance and Real Estate (Table VI)

⁶ Includes Transportation (Table VI)

Source: Statistics for Swedish communities obtained from Dr. W.C. Wonders, Uppsala University, Uppsala, Sweden, by letter, April 2, 1963.

APPENDIX E

MAJOR EMPLOYERS IN YELLOWKNIFE, 1962

Firm	No. of Employees	Classification
Giant Yellowknife Mines	346	Mining
Consolidated Mining and Smelting	227	"
Yellowknife Hotel	40	Service
Stanton Hospital	39	Government
Federal School	38	"
Hudson's Bay Company	32	Retail
Gold Range Hotel	27	Service
Department of Northern Affairs	25	Government
Public School	24	Service
Department of Public Works	20	Government
Yellowknife Laundry	20	Service
Dominion Catering	17	"
Frame and Perkins Garage	15	Transportation
Yellowknife Taxi	15	"
Pacific Western Airlines	13	"
Municipal District	13	Service
Royal Canadian Mounted Police	12	Government
Imperial Bank	12	Finance
Curry Construction	12	Manufacturing
Boyles Brothers, Diamond Drillers	10	Mining
Frenchy's Transport	10	Transportation
Department of Transport	10	Government
Canadian National Telecommunications	10	"
Department of Justice	8	"
Liquor Commission	8	"
Yellowknife Separate School	8	Service
Wardair Canada Ltd.	8	Transportation
N.W. Byrne, Mining Engineers	8	Service

Source: Field survey by the author, July and August, 1962.

APPENDIX F

TOTAL REVENUES AND EXPENDITURES FOR THE MUNICIPAL DISTRICT OF YELLOWKNIFE, 1955-1962*

Year	Expenditures			Sources			
	Community	School ^a	Total	Taxation	Fed. ^b Gov't	Terr. Gov't	Other ^c
1962	417	200	617	315	60	127	115
1961	419	184	603	297	64	145	97
1960	402	147	549	259	54	126	110
1959	408	127	535	281	48	125	81
1958	391	104	495	241	23	100	131
1957	331	112	443	252	17	141 ^d	33
1956	n.a.	102	-	276	10	47	-
1955	206	92	298	231	10	- ^e	57

*In 1962, Territorial assistance included the following grants: \$71,000 mill grant, \$18,000 for road construction, \$15,000 for sidewalk construction, \$13,000 for community welfare, \$5,000 for town planning, and \$4,500 for recreational development.

^a Represents 50 per cent of the total school costs in Yellowknife. The Municipality acts as a collector for this portion of the tax and simply passes it on to the government.

^b Grants in lieu of property taxes

^c Mill rate taxes and approximately \$20,000 in frontage tax each year.

^d This unusually high grant includes \$52,000 for the initiation of Yellowknife's road paving program.

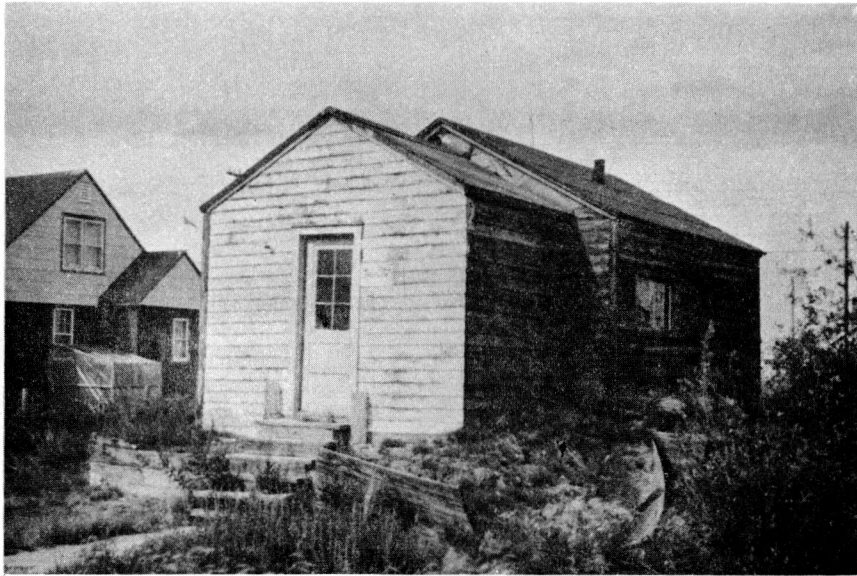
^e Grants were received from the Territorial government, but not on a standardized basis.

n.a. = not available

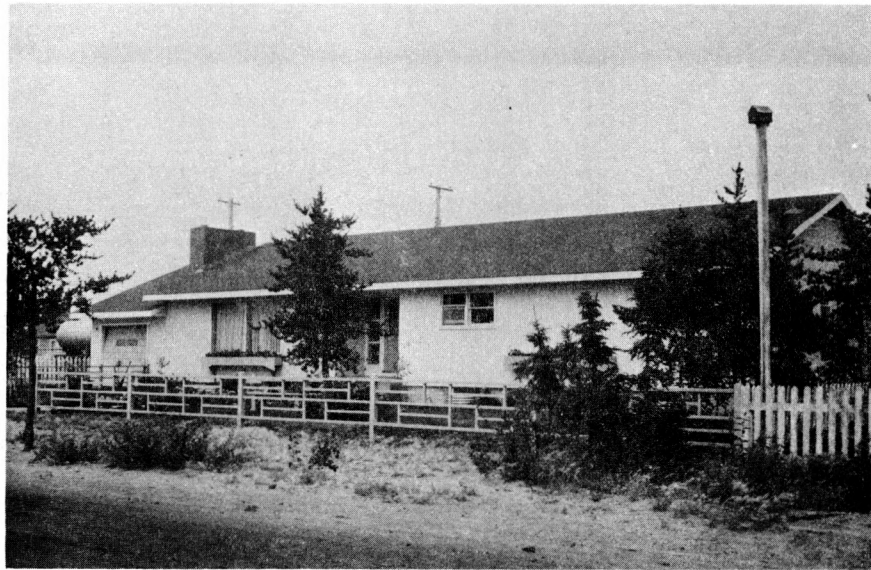
Source: John Buck, Secretary-Treasurer, Municipal District of Yellowknife, July and August of 1962 and January of 1963.

APPENDIX G

Private Housing



14. Typical of many houses in the Old Town and of the first dwellings constructed in the New Town, this shack is one of many being removed to conform to current standards in the New Town.

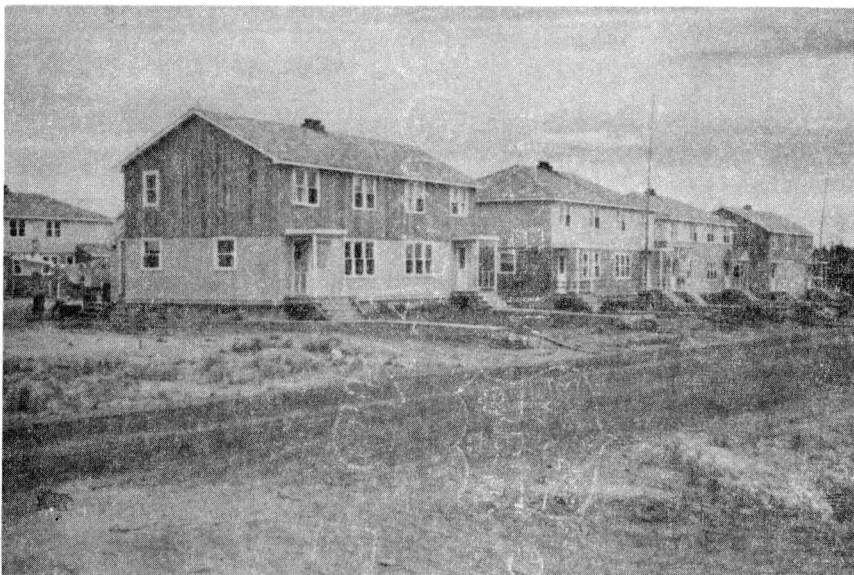


15. This home, one of the most luxurious in Yellowknife, exemplifies the trend toward more expensive and permanent types of housing units.

Government Housing



16. Older residential areas such as that of the Department of Transport shown here, usually contain single-family units and are of a somewhat more aesthetically pleasing design.

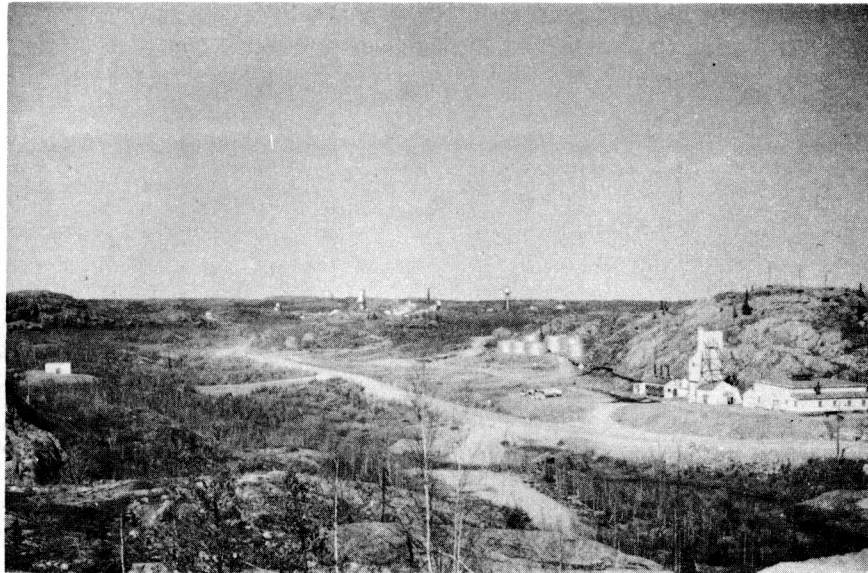


17. Recent housing construction by the Federal Government has tended toward the multi-family standardized type common throughout northern areas. They are lacking in both design and arrangement but are reasonably well furnished.

Local Mines



18. By far the most prominent features of the local landscape are the headframes and mine complexes of Giant and Con. This illustration shows the active headframe of the Con-Rycon mine.



19. This view, from atop the West Bay Fault, covers the huge mining complex of Giant Yellowknife. A - shaft headframe is located in the right foreground, C - shaft in the center and B - shaft in the background.

Regional Mines



20. Air view of the Discovery mine 60 miles northeast of Yellowknife. The mine airstrip is in the foreground. (Courtesy W.C. Wonders)



21. Air view of the Taurcanis mine located in the Barren Lands 150 miles northeast of Yellowknife. Note the float plane dock on Bulldog Lake in the foreground and the local roads; the one in the background leading to the airstrip and the one in the foreground leading to the nearby abandoned mine of Salmita-Mack Lake.