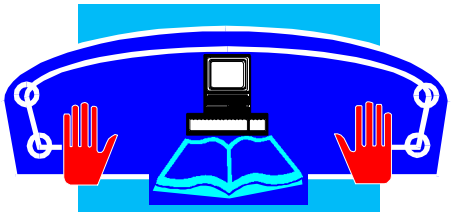

Transportation As A Constraint To The Utilization Of Marine Mammales Arctic Foods, Marine Mammals

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TRANSPORTATION AS A CONSTRAINT TO THE UTILIZATION OF MARINE MAMMALS

BY
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TRANSPORTATION AS'A CONSTRAINT TO THE UTILIZATION OF MARINE MAMMALS

by

Peter C. Thompson

This is the ninety-third Technical Report from the Freshwater Institute Winnipeg, Manitoba

Ceci est le quatre-vingt-treizième Rapport Technique de la Direction de l'Institut des eaux deuces Winnipeg, Manitoba

1976

EXECUTIVE SUMMARY

1. Marine mammals in the Northwest Territories are, in many cases, no longer being utilized for domestic purposes, rather, they are being harvested for the value of their ivory, bone and hide. Resource managers have expressed concern over the resultant waste of meat and blubber.

2. A proposal was made that the utilization of wasted marine mammal products, through inter and intra-regional trade, should be investigated.

3. The economic potential of furthering utilization is assessed by comparing freight costs to prices of potentially competing food products.

4. Transport costs are generally higher than prices paid to producers of beef, pork and fish. Where transport costs are less, it is not felt that sufficient margin exists to cover other marketing costs.

5. Transportation costs are greater than prices paid by the feed industry for raw protein materials

6. Transport costs are too high to justify inter-settlement trade in marine mammal products.

SOMMAIRE

1. Les mammifères marins des Territoires du Nerd-Quest ne sent plus souvent utilisés à des fins domestiques; on les abat plutôt pour la valeur de leur ivoire, de leurs os et de leur peau. Les gestionnaires des resources ont exprimé leur inquietude au sujet du gaspillage de viande et de graisse qui en résulte.

2. On a proposé d'étudier la possibility d'utiliser les produits perdus provenant des mammifères marins, et d'en faire le commerce à l'intérieur et à l'extérieur de la région.

3. On évalue le potentiel économique de cette utilisation en comparant les frais de transport aux prix des denrées alimentaires qui pourraient concurrence des produits.

4. Les frais de transport sent généralement plus élevés que les prix que l'on paie aux éleveurs de bovins, de procs et de poissons. Même lorsque les frais de transport sent moins élevés, on ne pense pas qu'il y ait une marge suffisante pour covrir les autres frais de commercialisation.

5. Les frais de transport sent plus élevés que les prix auxquels l'industrie des aliments de bétail achéte les produits protéagineux purs.

6. Les frais de transport sent trop élevés pour justifier le commerce des produits provenant des mammifères marins, entre les agglomerations.

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ACKNOWLEDGEMENTS

The author gratefully acknowledges the helpful suggestions and criticisms from the many people who reviewed the paper. Special thanks is expressed to Dr. D.M. Cauvin for his assistance in the planning development and editing of this paper.

FOREWORD

This report was prepared in response to a request from the Federal-Territorial, Northwest Territories Marine Mammals Working Group, which was jointly established by the Government of the Northwest Territories and Environment Canada, to review the potential for promoting utilization of marine mammal products through the expansion of both inter-settlement trade in the north and trade with major population centres in the south.

ABSTRACT

Thompson, Peter C. 1976. Transportation as a Constraint to the Utilization of Marine Mammals. Fisheries and Marine Service. Technical Report No. 651: 46 pp.

Transportation routes and tariffs (1974-1975) are assessed in detail for the Northwest Territories so that the least-cost method of transport can be established. The economic potential for utilizing marine mammal products is estimated by comparing transportation costs with prices of potentially competitive food products.

RÉSUMÉ

Thompson, Peter C. 1976. Transportation as a Constraint to the Utilization of Marine Mammals. Fisheries and Marine Service. Technical Report No. 651: 46 pp.

On étudie en détail les itinéraires et les tarifs des transports (1974-1975) clans les Territoires du Nerd-Ouest, afin de pouvoir determiner la méthode de transport la moins coûteuse. On évalue le potentiel économique de l'utilisation des produits provenant des mammifères marins en comparant les frais de transport aux prix des denrées alimentaires qui pourraient les concurrence.

INTRODUCTION

Historically, the primary use of marine mammals* by native peoples in the Northwest Territories has been for domestic purposes, i.e. to provide food, clothing and fuel. However, over the last few decades there has been a gradual change in this pattern. Economic growth and development in the north is eliminating the dependence of Arctic residents on marine mammals for subsistence. For many northern settlements, food, clothing and fuel no longer represent the principal uses of the animals; instead, the ivory, bones and hides of marine mammals have acquired a monetary value with the evolution of a wage economy, the growth of centralized communities and the development of a cottage industry producing aboriginal handicrafts for trade with southern population centres.

Today, flesh and blubber, which formerly had great domestic value are now largely discarded. This biological waste has led to a concern among resource managers that current utilization patterns represent an opportunity foregone to consume the entire animal. Consequently, an interest has been expressed in furthering the use of the available meat products through the development of inter-settlement trade and trade with southern population centres.

Product development and marketing work for marine mammal products has been extremely limited. Little information exists on whether the products have had sales success in markets for human consumption, or for pet foods, or whether the products can be sold fresh, frozen or in rendered forms. Moreover, the costs of handling, processing and transporting as well as the market prices for potential products have not been established. In light of the meager information and because there already exists a transportation system in the Northwest Territories, the assessment of transportation as a constraint to further utilization of the harvest is an important first step in evaluating the feasibility of intra and inter-regional trade.

Assuming that markets exist or can be developed for marine mammal products, the costs of transportation seem likely to be a major economic constraint to the success of further utilization. Clearly, if they are greater than the potential market price for the products, a more complete utilization of the annual harvest by eliminating or reducing the waste would not be economically feasible.

The cost of transportation is a "necessary but an insufficient condition", if a fuller utilization of the marine mammal harvest is to be made. As a "necessary condition", the potential market prices of marine mammals products must exceed their costs of transportation. As an "insufficient condition" the potential market price should provide a sufficient margin over the cost of transportation to cover other operating and fixed costs of the marketing system including a reasonable rate of return on invested capital.

While the determination of all costs is important in any investment decision, this study will generally disregard costs other than transportation costs. The cost of transportation will provide a "bench mark" - a minimum cost which must be met if inter-settlement trade and trade with southern Canada is to be possible. If transportation costs are less than the market price for marine mammal products as estimated by the prices of alternative foods or other products, then an evaluation of other cost components must be considered.

Given the premise that transportation is a major constraint to the development of northern Canada, the objectives of this study are (1) to investigate various modes and costs of transportation available, (2) to estimate the least-cost method of moving goods within the Northwest Territories and to major transport centres outside the Northwest Territories, and (3) to estimate the economic feasibility of transporting marine mammal flesh and blubber to market.

The least-cost method of transportation may not necessarily be the most efficient or appropriate transportation method. The speed and scheduling of transportation, the requirements for storage and handling facilities and potential losses through quality deterioration need to be weighed against the least-cost method. Consequently, the costs of air freight may be compared to the least-cost transportation alternatives.

Transportation alternatives and costs for 32 communities in the Northwest Territories and northern and southern distribution centres were investigated. Table 1.1. and Figure 1.1 list and indicate the geographical locations of these

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*whales, seals, narwhal, walrus

TABLE 1.1. MARINE MAMMAL HARVESTING COMMUNITIES AND DISTRIBUTION CENTRES

Communities Harvesting Marine Mammals	Settlement Populations	Estimated Marine Mammal Harvests[4]						
		Ringed Seal	Bearded Seal	Harp Seal	Walrus	Narwhal	Beluga Whale	Total
Aklavik	761	50				-	56	106
Arctic Bay	311	1,000	20	25	4	101	3	1,153
Baker Lake	860					-		
Belcher Islands (Sanikiluaq Harbour)	272	2,295	27		8	-	8	2,338
Broughton Island	390	3,847		5		-		3,852
Cambridge Bay	809	300				-		300
Cape Dorset	690	1,976	188	15	35	-	12	2,226
Chesterfield Inlet	294					-		
Clyde River	357	2,204	35			37		2,276
Coppermine	727	4,700	4			-		4,704
Coral Harbour	404	2,213	44	31	103	-	35	2,426
Eskimo Point	681	* 353				-	32	385
Frobisher Bay	2,360	* 245				-		245
Gjoa Haven	370	1,500	** 35			-		1,535
Grise Fjord	100	450	15	60	10	15		550
Hall Beach	315	3,600			30	40	10	3,680
Holman Island	241	8,000				-		8,000
Igloolik***	611	***			***	***	***	***
Lake Harbour	260	* 850				-		850
Mackenzie Delta (Inuvik)	4,150					-	170	170
Pangnirtung	906	6,310	30	580	4	-	18	6,942
Paulatuk	112	* 141				-		141
Pelly Bay	245	500	50			-		550
Pond Inlet	550	2,000	25	25	3	200	5	2,258
Port Burwell	121					-		
Rankin Inlet	645					-		
Repulse Bay	276	1,500	69		6	1	27	1,603
Resolute Bay	209	220	6		3	4	42	275
Sachs Harbour	143	322	13			-		335
Spence Bay	406	300				-		300
Tuktoyaktuk	585	20				-	121	141
Whale Cove	243		297			-	3	300
Northern Distribution Centres								
Churchill*	1,612					-		
Frobisher Bay	2,360					-		
Hay River	3,500					-		
Resolute Bay	209					-		
Yellowknife	6,819					-		
Southern Distribution Centres	Metro[3] Populations							
Edmonton	495,702					-		
Montreal	2,743,208					-		
Winnipeg	540,262					-		
Total		44,896	853	741	206	398	542	47,641
Total Weight (1,000 lbs.)		6,734	172	222	309	1,194	1,355	9,986

* Includes Ringed, Bearded, Harp, Harbour and/or Ranger Seals
** Includes ten Harbour Seal
*** Harvests for Hall Beach and Igloolik aggregated

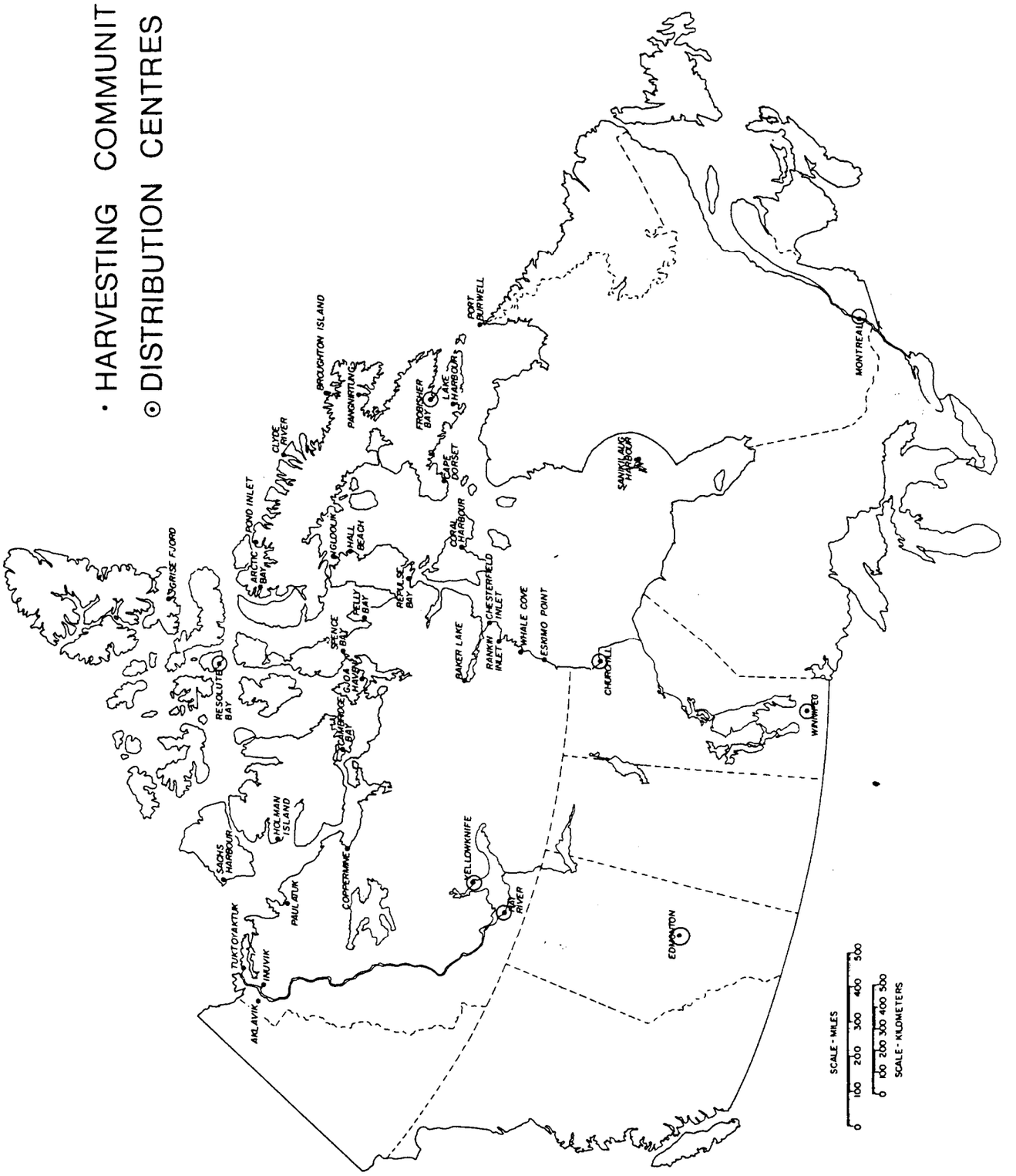

Figure 1.1 Marine Mammal Harvesting Communities and Distribution Centres

communities and centres. It should be noted that Frobisher Bay and Resolute Bay are both harvesting communities and distribution centres. Inuvik and Cambridge Bay are similar and could be regarded as distribution centres, but for simplicity, they have been regarded only as harvesting communities.

The 1973 marine mammal harvest of 28 communities has been estimated between 46,900 and 47,600 animals, the gross harvested weight of which was approximately ten million pounds.[5] Table 1.1 summarizes the harvest and weights for each of the communities. Marine mammals harvested include the bearded, harp, ranger, ringed and harbour seals; the walrus, the narwhal, and the beluga whale. The ringed seal is the principal species taken. Gross weights recorded in Table 1.1 do not represent net weight available for human and animal consumption, which has been estimated at 50%. Details with respect to edible and inedible products are recorded in Appendix A.

Section 2 (Transportation Modes) examines the transportation routes and tariff rates between communities and distribution centres. Section 3 (Transportation Alternatives) compares the transportation alternatives to estimate the least-cost methods of moving goods. Section 4 (Feasibility of Transporting Marine Mammal Products) compares the estimated transportation costs with producer prices of competing food products.

TRANSPORTATION MODES

BACKGROUND

The Northwest Territories is undoubtedly one of the most sparsely populated regions in Canada. The population of the 32 study communities in 1973 was 19,600.[6] Nearly 47 percent or 9,085 people are located at: Baker Lake, Cambridge Bay, Frobisher Bay, Inuvik and Pangnirtung. The remaining communities all have populations of less than 800.

The economic base of the communities and the Territories in general, is relatively limited. Only 13 manufacturing establishments were recorded in the Northwest Territories in 1973.[7] At the primary level of production, mining is the predominant industry, but fishing and trapping are also of importance, particularly to the study communities. Usually, each community has two or three trading organizations, either a Hudson's Bay Company store, a registered co-operative or a hunters' and trappers' association. In addition, some other industries are (1) construction, (2) transportation, communications and other utilities, (3) trade, (4) community, business and personal service industries, and (5) government services.

Figure 2.1 shows the general transportation network from southern Canada, north. Air and water transportation are available in nearly all the study communities, while there are no highway or railroad services to any of the communities. Road and rail transportation represent alternative modes of transportation only to the extent that it is feasible to transfer cargos from water and air terminals at northern distribution centres.

General rather than specific commodity tariffs have been examined in the study because of the uncertain form and state in which marine mammal products might be marketed and transported. General and specific rates differ because of factors such as perishability, bulk, and ease of storage and transportation. Usually, general commodities require no special handling.[8] As a result, general rates may underestimate specific costs for marine mammal products, particularly if refrigeration is needed, although favorable back-haul* rates and discounts on

*back-haul: the return movement of a transportation vehicle from the

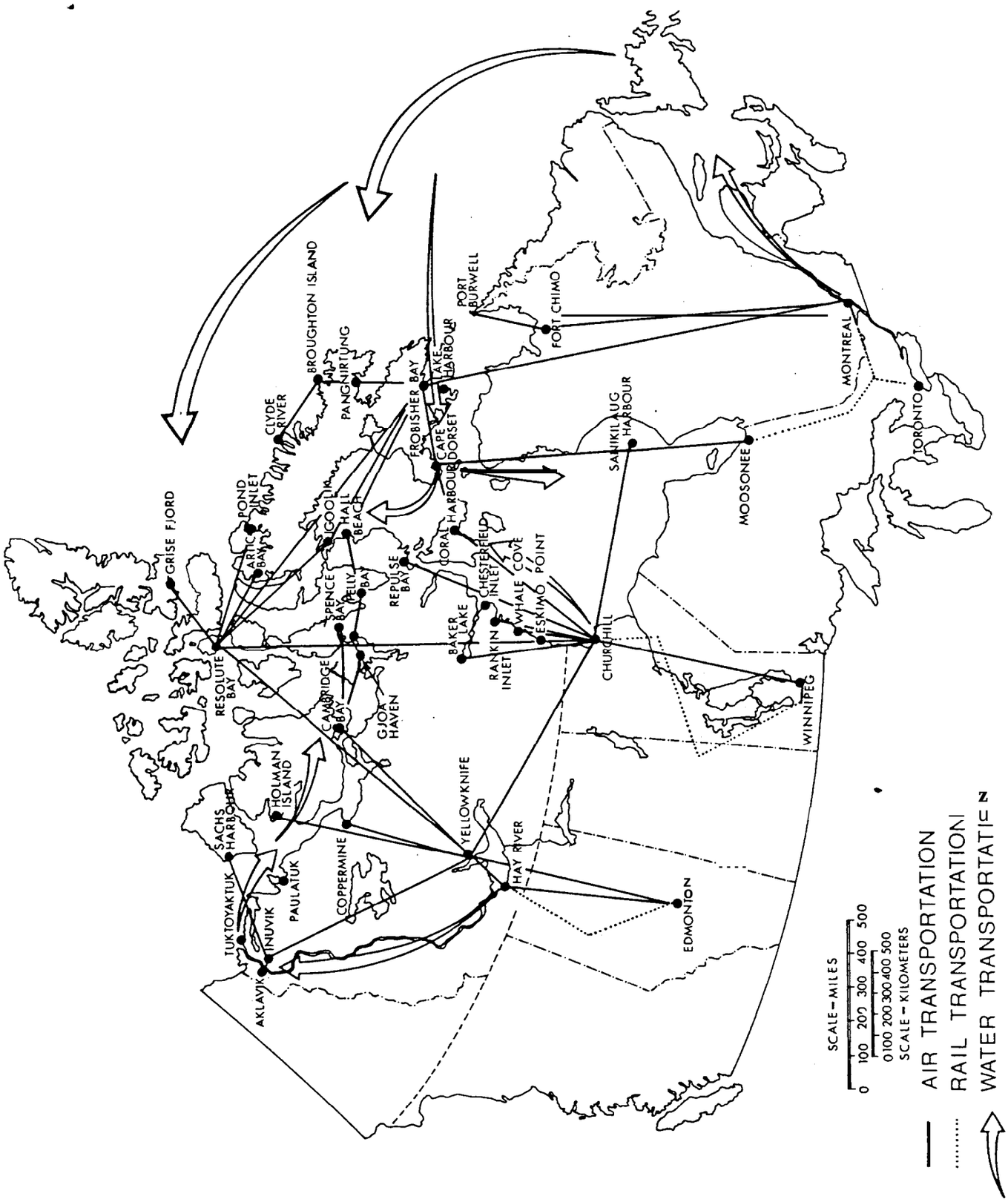

Figure 2.1 The General Transportation Network in the Northwest Territories

large volume shipments may compensate for the increased cost.

AIR TRANSPORTATION

Air is the primary mode of year-round transportation throughout the Territories. There are nine commercial air carriers serving 31 of the 32 study communities with scheduled services. Paulatuk, the exception, can be reached only by charter service.

Each of the nine carriers is licensed by the Air Transport Committee of the Canadian Transport Commission (C.T.C.) to provide one of three specified levels of scheduled service to each community named on the air carrier licence. These classes of domestic service are defined by the C.T.C.[9]

Two marine mammal harvesting communities, Inuvik and Frobisher Bay and three northern distribution centres - Yellowknife, Hay River and Churchill receive Class 1 scheduled air services. This class of service is the same as those which are provided between the major cities in southern Canada.

Class 2 flights are similar to Class 1 flights with carriers following published schedules and service patterns. While most Class 2 flights are almost daily in frequency, there are striking exceptions. For example, Cape Dorset, listed on a Class 2 licence issued to Austin Airways Limited, is served only at monthly intervals from Moosonee, Ontario.

The majority of harvesting communities are served by commercial airlines with Class 3 licences. These flights can be irregular in frequency. In some cases, the carriers only go into settlements when traffic conditions warrant the service. Examples of communities with this type of service include Pelly Bay and Coral Harbour for Nordair service to Frobisher Bay. In other cases, Class 3 services are similar to Class 2 services where carriers adhere to published schedules and patterns.

The nine licensed air carriers serving the study communities are listed along with settlements served and tariff rates in Appendix B.

Figure 2.1 shows the general air transportation system in the Northwest Territories. Edmonton, Winnipeg and Montreal are the principal southern centres serving the north. These centres correspond to the primary air bases of the three major airlines serving the Territories Pacific Western Airlines at Edmonton, Transair Limited at Winnipeg, and Nordair Limited at Montreal. Each carrier operates within a fairly well defined region of the north with little overlap into adjacent areas. In addition to these three air regions, a fourth region centred at Resolute Bay receives air services from all three southern distribution centres.

In each of the four regions there is a northern distribution centre which serves the surrounding settlements. Frobisher Bay is the northern centre for air transportation originating from Montreal. Study communities served from Frobisher Bay are listed in Appendix B, Figure B.1. Nordair operates from Montreal and Frobisher Bay to all outlying communities with the exception of Port Burwell which is served from Fort Chimo, Quebec by St. Felicien Air Services Limited. The other three regions, the Winnipeg-Churchill region, the Edmonton-Yellowknife-Hay River Region and the Resolute Bay region are similarly described in Appendix B.

Transportation costs for goods classed as general commodities are recorded in Tables 2.1, 2.2, 2.3 and 2.4. The recorded costs represent "back-haul" tariffs from north to south, which in some cases are less than tariffs in the opposite direction.

Tables 2.1 to 2.4 have been compiled by summing the tariff rates of all air carriers in the north. For example, for the Frobisher Bay region (Table 2.1) goods transported from Pangnirtung to Montreal are handled initially by Nordair to Frobisher Bay at a cost of $22.00 per hundredweight. At Frobisher Bay goods are transferred to another Nordair aircraft and flown to Montreal at a cost of $39.00/cwt. Total cost between Pangnirtung and Montreal then equals $61.00/cwt.

In certain cases, several connections must be made to fly from a northern community to a southern centre. Further, there may be more than one possible route to follow. Tables 2.1 to 2.4 record only the least-cost routes between places. While such routing is least expensive, it may not be the most direct or convenient route.

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direction of its principal haul. (Webster's Third International New World Dictionary, G. & C. Merriam Co., Springfield, Mass., 1966)

Table 2.1 Air Transportation Costs - Frobisher Bay Region, 1974[10]
(all values expressed in dollars per 100 pounds)

	Frobisher Bay	Lake Harbour	Pangnirtung	Clyde River	Coral Harbour	Hall Beach	Igloolik	Pelly Bay	Resolute Bay
Frobisher Bay		19.00	22.00	46.00	42.00	43.00	46.00	62.00	41.00
Lake Harbour	19.00		41.00	65.00	61.00	62.00	65.00	81.00	60.00
Pangnirtung	22.00	41.00		42.00	64.00	65.00	68.00	84.00	63.00
Clyde River	46.00	65.00	41.00		88.00	89.00	92.00	108.00	87.00
Coral Harbour	42.00	61.00	64.00	88.00		35.00	45.00	57.00	83.00
Hall Beach	43.00	62.00	65.00	85.00	35.00		10.00	22.00	82.00
Igloolik	46.00	65.00	68.00	88.00	45.00	10.00		32.00	72.00
Pelly Bay	62.00	81.00	84.00	108.00	57.00	22.00	32.00		86.00
Resolute Bay	41.00	60.00	63.00	87,00	83.00	82.00	72.00	81.00	
Broughton Island	31.00	48.00	14.00	28.00	73.00	74.00	77.00	93.00	72.00
Cape Dorset	27.00	46.00	49.00	73.00	26.00	70.00	73.00	81.00	68.00
Port Burwell	123.00	142.00	145.00	169.00	165.00	166.00	169.00	185.00	164.00

Table 2.2 Air Transportation Costs - Churchill Region, 1974[11]
(all values expressed in dollars per 100 pounds)

	Churchill	Eskimo Point	Rankin Inlet	Baker Lake	Chesterfield Inlet	Coral Harbour	Repulse Bay	Whale Cove	Hall Beach	Sanikilauq Harbour	Resolute Bay	Yellowknife	Hay River	Frobisher Bay	Montreal	Edmonton	Winnipeg
Churchill		1[illegible].00	33.00	43.00	44.00	56.00	81.00	31.00	83.00	77.00	34.00	21.00	28.00	70.00	31.00	27.00	15.00
Eskimo Point	18.00		19.00	35.00	26.00	56.00	69.00	13.[illegible]	82.[illegible]	95.00	56.[illegible]	44.0[illegible]	51.[illegible]	8[illegible].[illegible]	49.[illegible]	45.[illegible]	33.[illegible]
Rankin Inlet	33.00	19.00		22.00	[illegible].[illegible]	4[illegible].[illegible]	57.[illegible]	8.[illegible]	73.[illegible]	110.00	71.[illegible]	5[illegible].[illegible]	66.[illegible]	82.[illegible]	64.[illegible]	6[illegible].[illegible]	48.[illegible]
Baker Lake	43.[illegible]	35.[illegible]	22.[illegible]		24.[illegible]	53.[illegible]	72.[illegible]	25.[illegible]	7[illegible].[illegible]	12[illegible].[illegible]	81.[illegible]	69.[illegible]	[illegible]6.[illegible]	[illegible]5.[illegible]	74.[illegible]	70.[illegible]	5[illegible].[illegible]
Chesterfield Inlet	44.[illegible]	26.[illegible]	[illegible].[illegible]	24.[illegible]		41.00	60.[illegible]	15.[illegible]	6[illegible].[illegible]	121.[illegible]	82.[illegible]	70.[illegible]	[illegible]7.[illegible]	[illegible]3.00	75.00	71.[illegible]	59.[illegible]
Coral Harbour	56.00	56.00	40.00	53.00	41.00		26.00	46.00	35.00	133.00	94.00	82.00	89.00	42.00	81.00	83.00	71.00
Repulse Bay	81.00	69.00	57.00	72.00	60.00	26.00		59.00	29.00	159.00	19.[illegible]	1[illegible].[illegible]	114.[illegible]	68.[illegible]	107.[illegible]	1[illegible].[illegible]	[illegible]3.[illegible]
Whale Cove	31.00	13.00	8.[illegible]	25.[illegible]	15.[illegible]	46.[illegible]	5[illegible].[illegible]		8[illegible].[illegible]	1[illegible].[illegible]	69.[illegible]	57.00	64.00	8[illegible].[illegible]	62.[illegible]	58.[illegible]	46.[illegible]
Hall Beach	83.[illegible]	82.[illegible]	73.[illegible]	7[illegible].[illegible]	68.[illegible]	35.[illegible]	2[illegible].[illegible]	8[illegible].[illegible]		160.[illegible]	[illegible]2.[illegible]	7[illegible].[illegible]	86.00	43.[illegible]	81.[illegible]	85.[illegible]	[illegible]3.00
Sanikilauq Harbour	77.[illegible]	95.[illegible]	11[illegible].[illegible]	12[illegible].[illegible]	121.[illegible]	133.[illegible]	15[illegible].[illegible]	1[illegible].[illegible]	160.00		111.[illegible]	98.[illegible]	105.[illegible]	147.[illegible]	1[illegible].[illegible]	104.[illegible]	[illegible]2.[illegible]
Resolute Bay	22.00	40.00	55.00	65.00	66.00	78.00	103.00	53.00	82.00	99.00		18.00	21.00	41.00	44.00	28.00	22.00
Yellowknife	21.00	44.00	59.00	69.00	70.00	82.00	107.00	57.00	85.00	98.00	29.00		7.00	70.00	33.00	10.00	22.00

Table 2.3 Air Transportation Costs - Yellowknife-Hay River Region, 1974[12]
(all values expressed in dollars per 100 pounds)

Yellowlnife		63.00	53.00	51.00	42.00	25.00	16.00	52.00	37.00
Pelly Bay	57.00		23.00	28.00	84.00	73.00	47.00	97.00	94.00
Spence Bay	47.00	23.00		17.00	74.00	63.00	37.00	87.00	74.00
Gjoa Haven	45.00	28.00	17.00		72.00	61.00	35.00	85.00	82.00
Holman I a land	38.00	84.00	74.00	72.00		15.00	37.00	13.00	30.00
Coppermine	23.00	73.00	63.00	61.00	15.00		26.00	28.00	45.00
Cambridge Bay	10.00	47.00	37.00	35.00	37.00	26.00		50.00	47.00
Sachs Harbour	41.00	94.00	84.00	82.00	10.00	25.00	47.00		36.00
Tuktoyaktuk	24.00	87.00	77.00	75.00	27.00	42.00	40.00	17.00	
Aklavik	21.00	84.00	74.00	72.00	46.00	46.00	37.00	36.00	21.00
Inuvik	14.00	77.00	67.00	65.00	39.00	39.00	30.00	29.00	14.00
Hay River	7.00	68.00	58.00	56.00	49.00	32.00	21.00	52.00	37.00

Table 2.'4 Air Transportation Costs - Resolute Bay Region, 1974[13]
(all values expressed in dollars per 100 pounds)

	Resolute Bay	Pond Inlet	Igloolik	Arctic Bay	Grise Fiord	Yellowknife	Hay River	Frobisher Bay	Churchill	Montreal	Edmonton	Winnipeg
Resolute Bay		**56.00**	**72.00**	34.00	37.00	18.00	21.00	41.00	22.00	44.00	28.00	22.00
Pond Inlet	**56.00**		38.00	24.00	43.00	74.00	77.00	87.00	78.00	100.00	84.00	78 00
Igloolik	**72.00**	**38.00**		41.00	109.00	89.00	93.00	46.00	94.00	85.00	95.00	94 00
Arctic Bay	**34.00**	24.00	41,00		37.00	52.00	55.00	75.00	56.00	78.00	62.00	56.00
Grise Fjord	37.00	43.00	109.00	37.00		55.00	58.00	**78.00**	59.00	81.00	65.00	59.00

WATER TRANSPORTATION

Water transportation is of considerable importance in the north, particularly for the movement of heavy and bulky cargos. Thirty-one of the thirty-two study communities, Pelly Bay being the exception, have water transportation.

Northern water operations are constrained by a short open water season. The shipping season throughout the Arctic usually extends through the months of July, August and September, most communities having two month seasons either during July and August or during August and September, depending on particular ice conditions.

Another constraint to northern water transport is vessel insurance, the cost of which reflects the hazards of northern navigation. Rates are high not only for early or late season sailings, but also during the declared navigation season. It is not surprising, therefore, that most communities have only one sea lift a year.[14]

The general water transportation pattern is illustrated in Figure 2.1. There are three regions, of which the Yellowknife-Hay River and the Churchill regions correspond with the air transport regions. The third or eastern and high Arctic region operating out of Montreal combines the Resolute Bay and Frobisher Bay air regions.

Water transport is provided along the Mackenzie River system and along the Western Arctic coast by the Crown-owned Northern Transportation Co. Ltd. (N.T.C.L.). The season commences in mid-June and terminates by mid-September. Freight rates for general commodities, including loading and unloading charges are summarized in Table 2.5.

In addition to the N.T.C.L. , there are four privately owned carriers licensed to operate on the Mackenzie system by the C.T.C. The se companies are Kaps Transport Limited of Edmonton; Steeper Brothers Marine Transport Limited of Dawson Creek, B.C.; Cooper Barging Services Limited of Fort Nelson, B.C. , and Linberg Transportation Limited of Fort Simpson, N.W.T.[15]

In 1975 the N.T.C.L. initiated a barge service operating from Churchill to communities situated on the west coast of Hudson Bay which replaced a Ministry of Transport charter service. At the present time, direct lateral transfers of cargo between settlements on the Bay are not possible. Transfers would have to be made by back-hauling cargos to Churchill and then reshipping them. This would involve, at the minimum, double the one way freight charge.[16] Much the same arrangement exists for settlements served by the N.T.C.L.'s Mackenzie system.

The communities in the eastern and high Arctic are presently served by the Ministry of Transport, which charters ocean tankers to "sea lift" fuel supplies. Although the tankers are used primarily to serve petroleum, they have a limited capacity to carry dry cargo. At present, these tankers have no refrigeration capacity.

Chartered carriers in the Arctic are reluctant to undertake lateral or back-hauls of cargos from northern communities. Poor loading and unloading facilities, tight sailing schedules and previous difficulties with moving goods on back-hauls have been cited as factors contributing to this problem.[12] As a result, tariffs to the south are not generally available. As an indication of sea lift costs, however, it is understood from the Canadian Coast Guard that costs from Frobisher Bay, and Resolute Bay to Montreal during 1974 were $6.25/cwt and $40.00/cwt, respectively.[18] In order to ship cargos by water from other eastern and high Arctic settlements cargos would need to be moved to either Frobisher Bay or Resolute Bay.

RAIL TRANSPORTATION

Only one rail line extends within the boundaries of the Northwest Territories. The Great" Slave Lake Railway, a subsidiary of Canadian National Railways, provides rail service from Edmonton to Hay River, and presents a potential transfer link between air and water transportation. Two other railways may provide similar potential. The C.N.R.'s Hudson Bay route connects Churchill to Winnipeg and the Ontario Northland Railway and the C.N.R. link Moosonee, Ontario to Toronto and Montreal via North Bay, Ontario. Rail routes are illustrated in Figure 2.1.

Railways are large volume carrier systems, and tariff schedules are based on carload volumes, such that carloads cost substantially less than partial loads. A minimum carload would approximate 30,000 pounds. Unless minimum weight requirements are met, car pooling arrangements would be required to obtain a savings in transportation costs. The use of rail transport, in conjunction with

Table 2.5 Water Transportation Costs, 1974-75[19]
(Values expressed in dollars per 100 pounds)

Between	and	General Commodity Rate
Hay River:		
	Aklavik	$2.85
	Inuvik	2.85
	Tuktoyaktuk	3.18
	Sachs Harbour	4.65
	Holman Island	6.57
	Paulatuk	5.81
	Coppermine	6.57
	Cambridge Bay	7.10
	Gjoa Haven	8.67
	Spence Bay	8.67
Churchill		
	Eskimo Point	8.25
	Whale Cove	8.25
	Rankin Inlet	8.25
	Baker Lake	8.25
	Chesterfield Inlet	8.25
	Coral Harbour	8.25

other modes would necessitate planning and scheduling of product shipments from many communities.

General commodity tariffs for each of the three railways are summarized in Table 2.6 and additional information is presented in Appendix C. The existing rail linkages to the Territories generally serve the same southern centres as does the air carrier system. The Great Slave Lake Railway and the C.N.R.'s Hudson Bay Railway are feasible transport links. The Ontario Northland route, however, does not appear to be as useful because of the poor air link into Moosonee. The Frobisher region would likely be better served through C.N.R. from Churchill.

HIGHWAY TRANSPORTATION

The highway system of the Northwest Territories, although extremely limited, is of great importance. The Mackenzie Highway runs north from Edmonton to Fort Simpson, with branches to Hay River and Yellowknife. This road is a prime mover of consumer goods and could easily be utilized to back-haul marine mammal products by transferring them from air or water carriers at Hay River or Yellowknife.

Highway general commodity tariffs between Yellowknife, Hay River and Edmonton are summarized in Table 2.7. These rates apply to maximum trailer loads and include loading and unloading charges, but not refrigeration charges.

Table 2.6 Rail Transportation Costs, 1974[20]
(Values expressed in dollars per 100 pounds)

	Northern rail terminus to southern rail terminus			
Weight Class lbs. 1000 lbs.	Hay River Edmonton	Churchill Winnipeg	Moosonee Toronto	Moosonee Montreal
30 to 40	1.77	2.05	1.79	2.04
40 to 50	1.64	1.93	1.57	1.79
50 to 60	1.64	1.86	1.57	1.79
60 to 70	1.56	1.81	1.46	1.65
70 to 80	1.56	1.78	1.46	1.65
80 to 100	1.49	1.76	1.40	1.57
100 to 200	1.45	1.76	1.40	1.57
120 and up	1.43	1.76	1.40	1.57

Table 2.7 Highway Transportation Costs, 1974[21]
(Values expressed in dollars per 100 pounds

	Cargo Destination		
Origin	Hay River	Yellowknife	Edmonton
Hay River		$1.16	$2'.00
Yellowknife	$1.00		$3.00

TRANSPORTATION ALTERNATIVES

Transportation between the 32 marine mammal harvesting communities is confined, primarily, to air transportation . Other transport alternatives, however, do exist between northern communities and southern centres. Such alternatives consist of combinations of air, water, rail and/or road. Generally each combination will have a different cost and a time differential. Thus considerations of a particular alternative will depend on the trade off between cost and time, and such factors as product form and perishability.

This section examines the transportation alternatives of Holman Island, Arctic Bay, Pangnirtung and Eskimo Point, each representing one of the four transportation regions. Also least-cost transportation alternatives from all harvesting communities are compared to the cost of air transportation.

HOLMAN ISLAND

Holman Island is situated on the western coast of Victoria Island on Amundsen Gulf and is in the transportation region centred at Yellowknife-Hay River. The harvest of marine mammals during 1973 was estimated at more than 8,000 animals (Table 1.1) which represents a potential of 600,000 pounds of product for human and animal consumption.

Holman Island is accessible to Edmonton by air through Yellowknife. Transportation by water is by barge between Hay River and Tuktoyaktuk and by ocean-going vessel between Tuktoyaktuk and Holman Island. Air and water transportation can be linked to road and rail at Hay River and road at Yellowknife. These alternatives are illustrated in Figure 3.1.

The water and rail and water and road transportation combination to Edmonton are by far the least expensive methods at $8.34/cwt and $8.57/cwt, respectively. The cost of moving the 1973 harvest of marine mammal meat products to Edmonton by water and rail would have been approximately $49,400. This compares to a cost of $288,000 for direct air shipments at $48.00/cwt. The least-cost alternative is probably the most favorable transportation method.

ARCTIC BAY

Arctic Bay is located on the Borden Peninsula of Baffin Island on Admiralty Inlet and is in the Resolute Bay region. The 1973 marine mammal harvest was estimated at 1,153 animals (Table 1,1) which represents approximately 224,000 pounds of meat products.

Arctic Bay is accessible to Edmonton, Winnipeg and Montreal by air through Resolute Bay and by water at Resolute Bay to Montreal. Air transportation can be linked with rail at Hay River and Churchill and with road at Hay River and Yellowknife. These alternatives are illustrated in Figure 3.2.

The highest transportation costs are incurred in shipments to Montreal. Direct air costs are $78.00/cwt and the air and water combination costs are $74.00/cwt. The difference between these two alternatives appears to be insignificant in terms of shipping perishable products. The lowest costs are to Edmonton. The alternatives of air transportation to Yellowknife, road to Hay River and rail to Edmonton, and air to Yellowknife and road to Edmonton cost $54.77/cwt and $55.00/cwt. The cost of direct air to Edmonton is $62.00/cwt. Air transport to Winnipeg at $56.00/cwt is very favorable in comparison to least-cost transportation to Edmonton. Shipping the 1973 harvest to Winnipeg by air would cost $125,400. while the cost of shipping it by the least-cost method to Edmonton would amount to nearly $123,000. Air and rail transportation to Winnipeg at $58.05/cwt is more expensive than direct air to Winnipeg.

PANGNIRTUNG

Pangnirtung is located on Cumberland Sound on the eastern coast of Baffin Island and is representative of the Frobisher Bay transportation region. The marine mammal harvest during 1973 was estimated to be 6,942 animals (Table 1.1), or 588,750 pounds of meat products.

There are two transportation alternatives for moving freight to Montreal, either by air via Frobisher Bay or by air to Frobisher and then by water to Montreal. These alternatives are illustrated in Figure 3.3.

The cost of air transport to Montreal is $61.00/cwt or over $359,000. to ship the 1973 harvest while the cost of the air and water combination is $28.25/cwt or approximately $166,300. The savings by shipping through the least-cost alternative could well offset extra costs involved for storage and loss of quality.

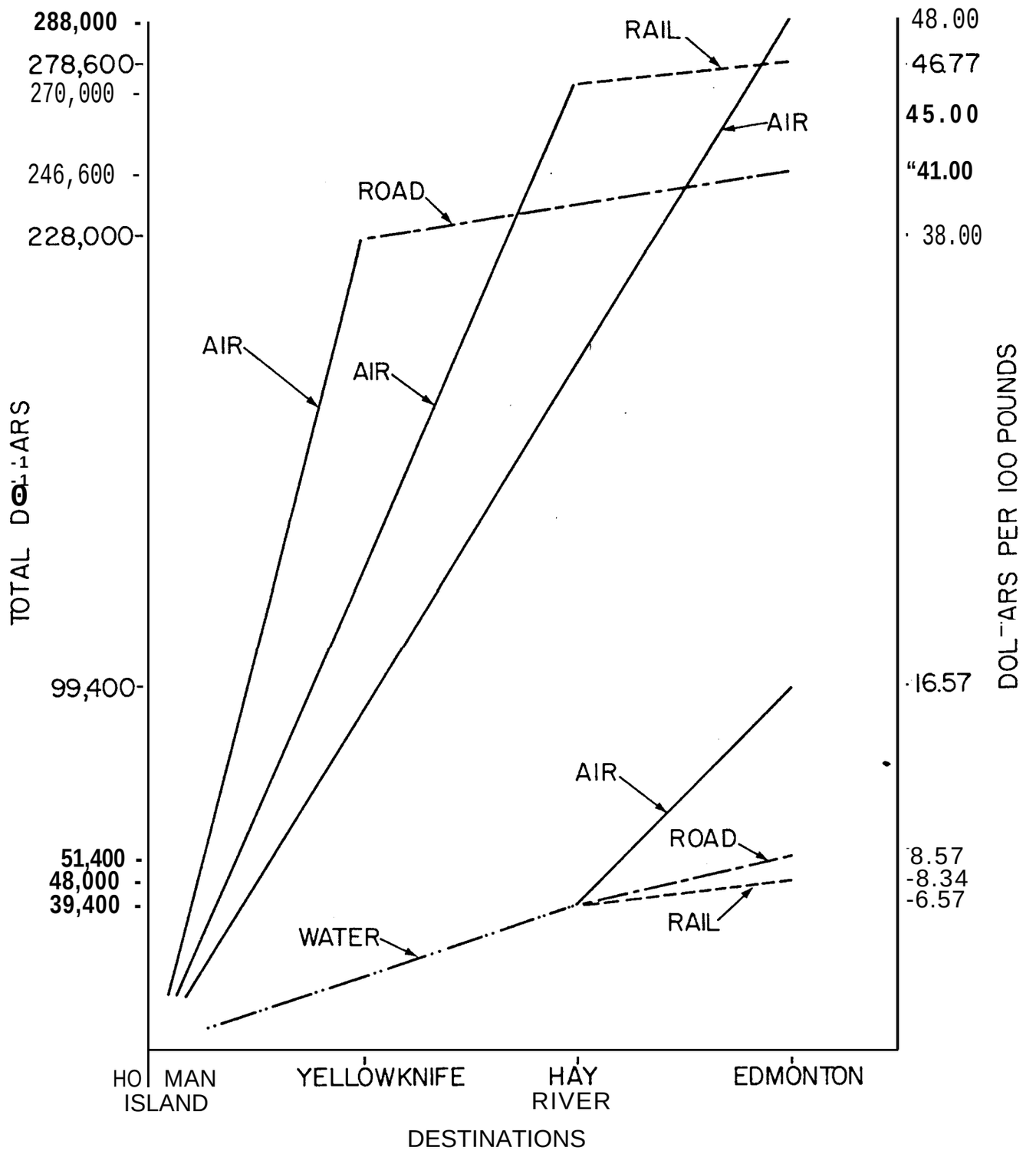


Figure 3.1 Transportation costs at Holman Island

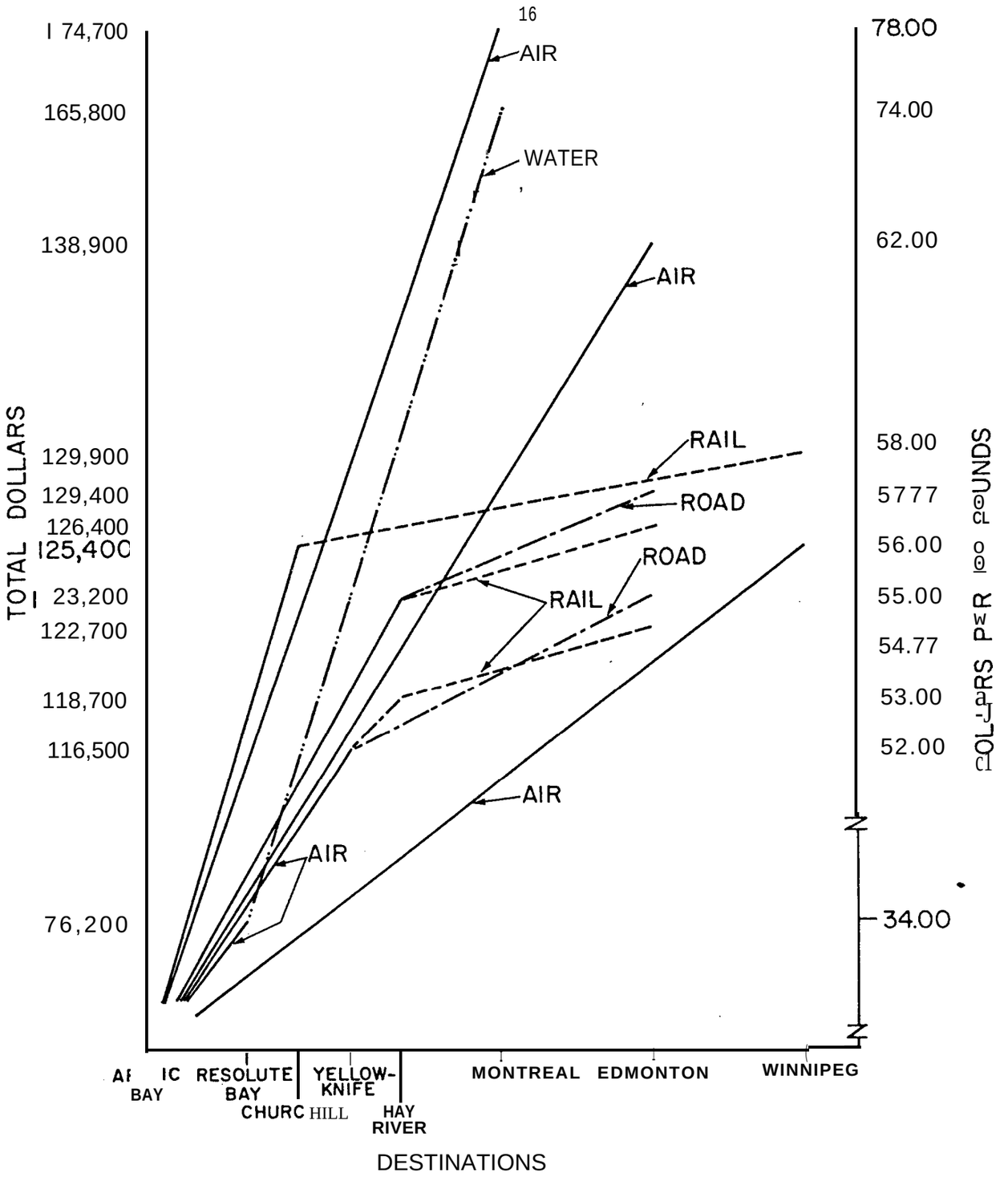


Figure 3.2 Transportation costs at Arctic Bay

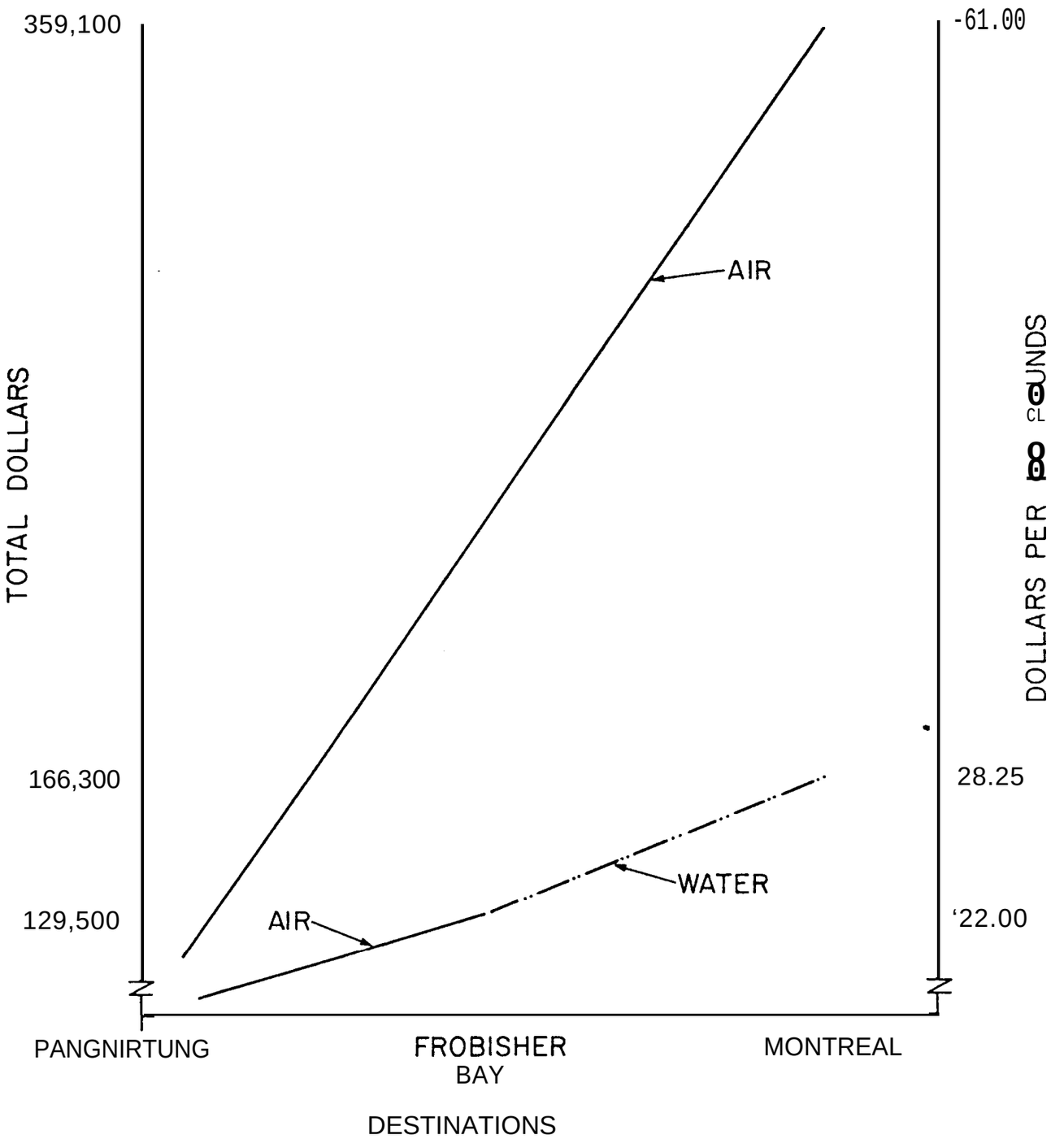


Figure 3.3 Transportation costs at **Pangnirtung**

ESKIMO POINT

Eskimo Point is located on the west shore of Hudson Bay, about 160 air miles north of Churchill. The 1973 harvest of marine mammals was estimated at 383 animals or approximately 66,475 pounds of meat products.

Transportation services at Eskimo Point include air to Churchill and Winnipeg and barge to Churchill. The Hudson Bay railway can be linked with air and water to transport goods to Winnipeg. These alternatives are illustrated in Figure 3.4.

The least-cost transportation method to Winnipeg is the combination of water to Churchill and rail to Winnipeg at $10.30 cwt. Air and rail and direct air cost $20.05/cwt and $33.00/cwt, respectively. Again the cost savings may justify the use of the least-cost method over the other alternative transportation methods.

LEAST-COST TRANSPORTATION ALTERNATIVES

Extending the preceding assessment of transportation costs Table 3.1 compares the least-cost alternative with air transportation for the 32 marine mammal harvesting communities. The data presented have been calculated by considering the transport modes available to each community and selecting the least-cost alternative.

Transportation costs range from $4.62/cwt for water and rail shipments from Aklavik to Edmonton, to $127.00/cwt from Port Burwell to Montreal by air. Air costs are the least expensive of alternatives in five instances: Arctic Bay to Winnipeg, Grise Fjord to Winnipeg, Pond Inlet to Winnipeg, and Port Burwell to Montreal.

FEASIBILITY OF TRANSPORTING MARINE MAMMAL PRODUCTS

The potential market price of marine mammal products, in relation to the cost of transporting the products and other production costs, is of critical importance. While it is not possible within the scope of this study to make a direct assessment of a market price, it nevertheless can be estimated, since the market price of marine mammal meat products will have to compete with other human and/or pet food products. The prices of these competing products will initially at least define the upper limits to the prices for marine mammal products.

The feasibility of extending the utilization of marine mammal products is evaluated by comparing the prices of alternative foods to transportation costs. The market price must be greater than the cost of transportation, if not, then the utilization of these products is not economically feasible at this time. This section considers the feasibility to transporting marine mammal products (1) to southern Canada, and (2) between northern communities.

TRANSPORTATION TO SOUTHERN CANADA

The costs of transportation are compared to the prices received by producers of beef, pork and fish, for human consumption, and also to prices paid by manufacturers of animal feeds for meat and fish and their by-products.

1. Market for Human Consumption

Canadian consumption of meat, poultry, and fish was estimated at 156.0, 42.8, and 12.9 pounds per capita respectively in 1972.[22] Marine mammal products will need to have sufficient market potential to gain acceptance for human consumption in order to command equivalent market prices to other similar food products. Prices to primary producers of livestock and fish are recorded in Table 4.1. Price ranges generally reflect the grade and size of product.

The fish prices recorded in Table 4.1 are the final prices paid to fishermen by the Freshwater Fish Marketing Corporation in 1973. The Corporation establishes prices for different fish species to fishermen f.o.b. Winnipeg and also publishes prices to fishermen at various delivery points throughout Western Canada. The difference between the Winnipeg price and a delivery point price reflects the cost of transportation. The cost of

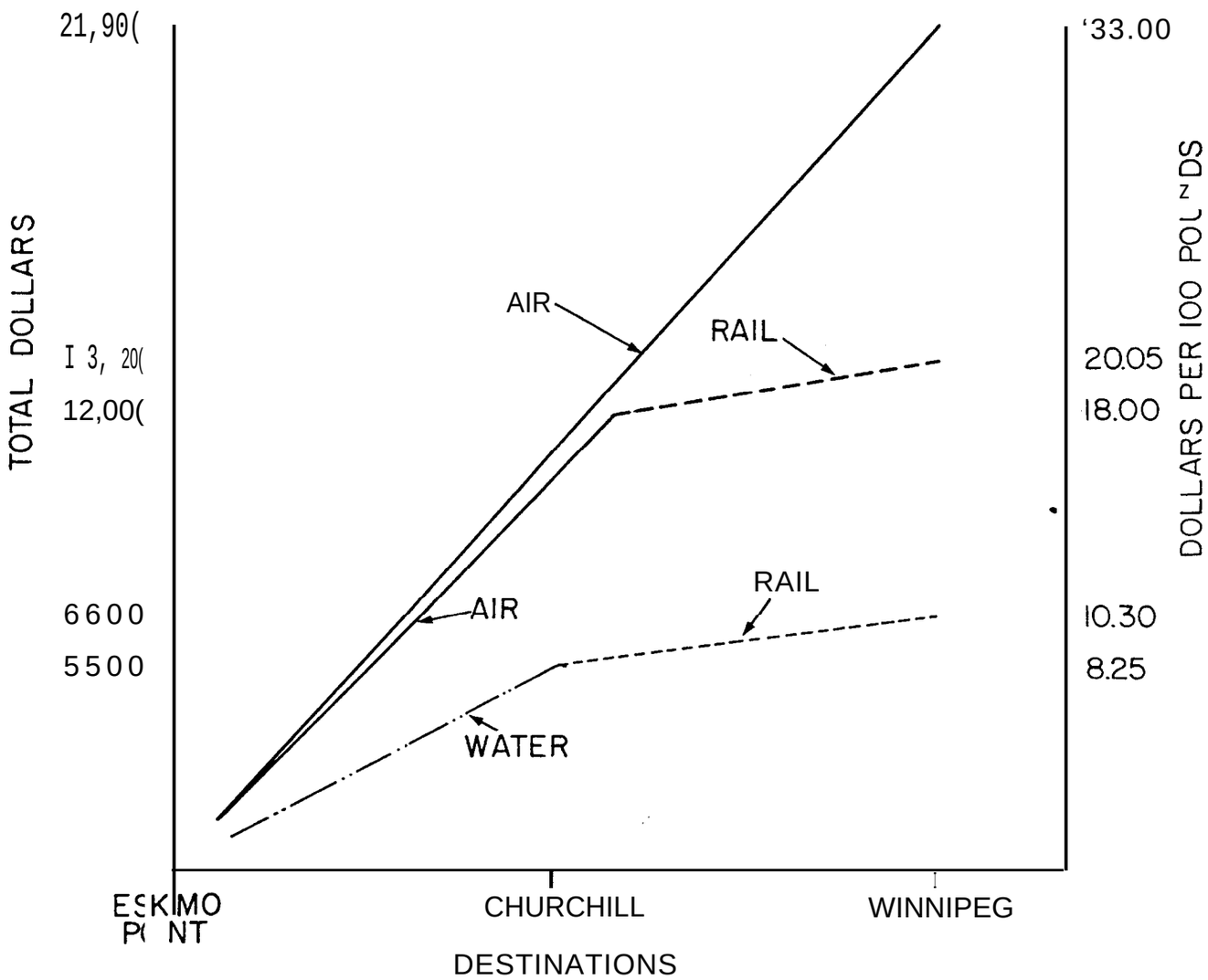


Figure 3.4 Transportation costs at Eskimo Point

Table 3.1. Least-Cost Transportation Alternatives
(Values expressed in dollars per 100 pounds)

Marine Mammal Settlements	Net Harvest Lbs.	To: Winnipeg		To: Montreal		To: Edmonton	
		Air Transport	Least-Cost Alternative	Air Tranaport	Least-Cost Alternative	Air Transport	Least Cost Alternative
Aklavik	73.800					22.00	4.62
Arctic Bay	224,000	56.00	58.05	78.00	74.00	62.00	54.77
Baker Lake		58.00	10.30				
Belcher Islands (Sanikilauq Harbour)	190,800	92.00	79.05				
Broughton Island	289,300			70.00	37.25		
Cambridge Bay	22,500					16.00	8.87
Cape Dorset	210,500	82.00	34.30	66.00	33.25		
Chesterfield Inlet		59.00	10.30				
Clyde River	224,300			85.00	52.25		
Coppermine	352,900					33.00	8.34
Coral Harbour	296,000	71.00	10.30	81.00	48.25		
Eskimo Point	66,500	33.00	10.30				
Frobisher Bay	18,400			39.00	6.25		
Gjoa Haven	78,000					51.00	10.44
Grise Fjord	74,300	59.00	61.05	81.00	77.00	65.00	57.77
Hall Beach *	365,000	93.00	45.30	81.00	49.25		
Holman Island	600,000					48.00	8.34
Igloolik*	365,000	94.00	55.30"	89.00	52.25	95.00	65.44
Lake Harbour	63,800			58.00	25.25		
Mackenzie Delta (Inuvik)	212,500					16.00	4.62
Pangnirtung	588,800			61.00	28.25		
Paulatuk	10>600					Charter Only	7.58
Pelly Bay	39,500	75.00	67.30	86.00	68.25	63.00	59.77
Pond Inlet	462,800	78.00	80.05	100.00	90.25	84.00	76.77
Port Burwell				127.00	129.25		
Rankin Inlet		48.00	10.30				
Repulse Bay	159,200	93.00	36.30				
Resolute Bay	77,900	22.00	24.05	44.00	40.00	28.00	20.77
Sachs Harbour	25,500					43,00	6.42
Spence Bay	22,500					53.00	10.44
Tuktoyaktuk	152,800					26.00	4.95
Whale Cove	33,500	46.00	10.30				

* Harvest for Hall Beach and Igloolik aggregated

Table 4.1 Livestock and Fish Prices to Producers at Edmonton, Winnipeg and Montreal, 1973-1975[23 24]
(values expressed in dollars per 100 pounds)

Product	Edmonton	Winnipeg	Montreal
Livestock			
Steers*	36.00-28.00	37.00-30.00	39.00-29.00
Heifers*	34.00-27.00	34.00-25.00	27.00
Cows and Bulls*	24.00-17.00	25.00-19.00	27.00-19.00
Calves*	31.00-23.00	53.00-28.00	55.00-19.00
Hogs**	50.00-38.00	48.00-34.00	51.00
Fish			
whitefish (export grade)**	42.00-14.00	46.00-18.00	
whitefish (continental grade)**	29.00-11.00	33.00-15.00	
Pickerel**	52.00-42.00	56.00-46.00	
Lake Trout		32.00-26.00	
Pike**	17.00-13.00	19.00-15.00	
Mullet**		5.00	

* live weight
** dressed weight

transportation between Winnipeg and Edmonton for fresh dressed pickerel (Table 4.1) is $4.00/cwt or 7 percent of the price at Winnipeg. The highest freight allowance reported by the Corporation is $18.00/cwt for fish shipped from Savaae Island, Manitoba to Winnipeg. 25 This allowance represents approximately 32 percent of the price of pickerel at Winnipeg.

Beef and hog producer prices are generally lower or on par with prices paid for fresh pickerel and export whitefish. Livestock producers, however, directly incur shipping costs to stockyards or assembly points. The 1973 freight rates for livestock in carload lots from stations in Alberta and Saskatchewan to Winnipeg ranged from less than $1.00/cwt to slightly more than $2.00/cwt. [26] A comparison of least-cost transportation alternatives (Table 3.1) with producer prices of fish and livestock prices (Table 4.1) illustrates the following:

1. Transportation costs from 8 communities are greater than producer prices for dressed hogs at $51.00/cwt, and from 9 communities for steer meat at $39.00/cwt.
2. Transportation costs from 13 communities are greater than" producer prices for cows and bulls at $27.00/cwt.
3. Transportation costs from 12 communities are greater than or equal to landed prices for continental grade whitefish and lake trout at $50.00/cwt and $32.00/cwt.
4. Transportati.on costs from 9 communities are greater than the landed price of pickerel at $56.00/cwt.
5. Transportation costs from 29 communities are greater than or equal to the landed price of mullets at $5.00/cwt.

The feasibility of transporting marine mammal products to southern markets is questionable, given the unknown marketability of the products and the producer prices for competing foods. Only 3 communities can ship products at a cost of less than $5.00/cwt and only a handful

Table 4,2 Selected Materials Purchased by Animal Feed and Pet Food Manufacturers[28]

Material	Quality Purchased (lbs)	cost	Cost per 100 pounds
Fish by-products			
Fish, fresh or frozen	19,236,000	$ 952,000	$4.95
Fish meal	86,692,000	8,857,000	10.22
Meat and tankage by-products			
Processed			
Bone meal	1,514,000	100,000	6.61
Blood meal	27,506,000	2,186,000	7.95
Unprocessed			
Bones - inedible	19,846,000	409,000	2.06
Carcass meat, raw	57,852,000	4,600,000	7.95
Tallow - ined ble	73,208,000	5,427,000	7.41
Oils			
Crude oils			
Animal	6,108,000	575,000	9.41
Marine	238,000	50,000	21.01
Refined oils			
Animal	1,714,000	737,000	43.00
Marine	918,000	183,000	19.93

more can ship for less than $10.00/cwt. These communities may have transport costs low enough to meet feasibility criteria, but, when refrigeration and storage costs are considered in shipping by water and rail, it is likely that marine mammal products will not be able to compete with meat and fish in southern markets.

2. Market for Animal Consumption

Marine mammal protein may be marketable for processing into animal feeds. The feed industry produces feeds, premixes and feed concentrates for poultry, hogs, cattle, fur bearing animals, dogs and cats.[27] Table 4.2 records the cost of selected animal proteins as reported by large feed industry establishments.. Animal feed raw materials range in price from $2.06/cwt for meat and meat tankage to $10.22/cwt for fishery by-products. Oil, which is an important by-product Of marine mammals varies in price from $9.41/cwt to $43.00/cwt.

A comparison of least-cost transportation alternatives (Table 3.1) with prices for feed raw materials (Table 4.2) illustrates the following:

1. Transportation costs from 30 communities are greater than or equal to the price of fresh and frozen fish at $4.95/cwt.
2. Transportation costs from 26 communities are greater than or equal to the price of unprocessed carcass meat at $7.95/cwt.
3. Transportation costs from 15 communities are greater than or equal to prices paid for crude and processed marine oils at $21.01/cwt and $19.93/cwt.

On the basis of transportation

costs alone, at present, it is not feasible to attempt utilization of marine mammals into animal food.

TRANSPORTATION BETWEEN SETTLEMENTS

Consideration of intersettlement trade assumes the movement of marine mammal products from settlements with surpluses to settlements with shortages. However, the annual harvest of seals in the north is under-utilized at present and any intersettlement trade therefore would appear to be unnecessary.

The situation with respect to beluga and narwhal is different. Sixteen communities harvested 940 beluga and/or narwhal in 1973. It is possible then that muktuk (epidermal layer) and back muscle, which are considered delicacies, may have potential for intersettlement trade.[29]

Four communities, Arctic Bay, Coral Harbour, Pond Inlet and Tuktoyaktuk each harvested in excess of 100 beluga and narwhal. If surplus whale meat were available in the communities, transportation of the meat to communities with no production could be feasible. Problems of course exist with variability of supply, and an absence of processing and storage facilities in harvesting communities.

The cost of air transportation from the above four "surplus" communities to communities with with no whale production are listed as follows:

	Dollars per hundredweight
Arctic Bay to:	
Igloolik	$41.00
Frobisher Bay	77.00
Coral Harbour to:	
Rankin Inlet	40.00
Chesterfield Inlet	41.00
Frobisher Bay	46.00
Igloolik	47.00
Baker Lake	53.00
Pelly Bay	59.00
Lake Harbour	63.00
Broughton Island	77.00
Port Burwell	169.00
Pond Inlet to:	
Igloolik	38.00
Frobisher Bay	89.00
Tuktoyaktuk to:	
Sach Harbour	17.00
Holman Island	31.00
Cambridge Bay	44.00
Coppermine	47.00
Gjoa Haven	82.00
Spence Bay	84.00
Pelly Bay	97.00

Because transportation costs between most settlements are high, it is unlikely that prices received by whale meat producers will be sufficient to cover expenses. only the cost of transportation between Tuktoyaktuk and Sachs Harbour appear to be in a reasonable range, and the availability of whale meat to Sachs Harbour could be important particularly if imported meats from the south are expensive. Even in this instance, there is probably little likelihood that a whale meat trade could develop, given the investment requirements to supply this small market.

VOLUME DISCOUNTS

It is felt that the general commodity rates recorded in this study will usually underestimate specific transportation costs for marine mammals especially where special handling is required. Under certain circumstances, however, the specific commodity rate could be less. Northern shippers may be able to obtain discounts from air carriers. At present, air carriers generally operate northern operations with empty back-hauls, and rates are set at a level to recover round trip costs on the outbound trip.[30]

Four air carriers offer customers guaranteed volume discounts. These discounts apply when a customer contracts with the airline to ship an agreed upon volume of cargo during a specified time period (generally one

year). The discount offered by Nordair Limited between Pangnirtung and Frobisher Bay is approximately 68 percent, reducing the regular rate of $22.00/cwt to $7.00/cwt for annual shipments in excess of 400,000 pounds of cargo. Similar discounts are available from other Baffin Island communities to Frobisher Bay, Nordair also has discounts from Resolute Bay and Frobisher Bay to Montreal. For shipments from Resolute Bay the cost is $15.00/cwt reduced from $41.00/cwt or 63 percent for annual volumes in excess of 700,000 pounds and from Frobisher Bay for annual volumes in excess of 1,000,000 pounds, the discounted rate is $10.00/cwt, or 74 percent of the regular rate of $39.00/cwt.[31]

Transair Limited also offers guaranteed volume discounts for its northern operations. The discount structure is listed below.[32] It does not apply from Resolute Bay to Winnipeg.

Discount	Volume in Excess of:
9%	400,000 pounds
14%	700,000 pounds
19%	1,000,000 pounds
26%	1,500,000 pounds

Two other airlines, Pacific Western and Northward, also have indicated that they offer customers guaranteed volume discounts. Northward offers discounts of 4 and 15 percent[33] while Pacific Western has container rates which give customers discounts of approximately 28 percent.[34]

The availability of volume discounts to northern shippers can substantially reduce transportation costs. Unfortunately, the discount structure at present could only have a small impact on costs of transporting marine mammal products. Only a few harvesting communities, Pangnirtung and Holman Island, for example produce more than 400,000 pounds of products. The majority of communities would be unable to obtain tariff discounts. It would be possible, however, to take advantage of discounts, by shipping the harvest production from several communities to a single community for reshipment to market. Thus for example, air transportation cost between Frobisher Bay and Montreal at $10.00/cwt compares favorably to the cost by water at $6.25/cwt and for shipments from Resolute Bay to Montreal the cost by air at $15.00/cwt is less than the cost by water at $40.00/cwt. The volume discounts do not favour air when the alternative transport mode is rail or road. For example, the minimum air rate from Churchill to Winnipeg is $11.00/cwt while the corresponding rail rate is $1.76/cwt.

The application of guaranteed volume discounts at the present time to transporting marine mammal products to northern and southern markets does not increase the feasibility of the proposal. This situation will likely remain unchanged until either the discount structure changes or the volume of individual community harvest increase.

CONCLUSIONS

The opportunity to increase the utilization of the marine mammal harvest through the promotion of inter-settlement trade and trade with southern centres in the absence of a transportation subsidy, is extremely limited. Transportation costs, with few exceptions, are in excess of producer prices of competing food products. Where costs are lower, the profitability of investments in processing, storage and refrigeration facilities need to be assessed. It is likely, however, that the margin that exists in these cases will be too small to make any community operation viable.

Therefore, from an economic point of view, attempts to reduce or eliminate the apparent biological waste of the marine mammal resource, at this time, could result in economic waste - the misallocation of other valuable resources. Further, the desire to increase marine mammal utilization may create future resource management problems by placing increased exploitation pressure on marine mammal populations.

Finally, with reference to the use of transportation subsidies to reduce the biological waste of the harvest, it is felt that the institution of a subsidy to encourage utilization would prove to be a poor solution. First, there are undoubtedly more productive uses for public funds. Second, it is extremely difficult, once introduced, to remove a subsidy, particularly where the development proposal has proved to be uneconomic. And last, when communities become dependent on a subsidized enterprise, attempts to terminate the subsidy for economic reasons often bring about difficult social problems

APPENDIX A

MARINE MAMMAL WEIGHTS

The mean gross weights of adult marine mammals are estimated as follows:[35]

Ringed Seal	150 lbs.
Bearded Seal	200 lbs.
Harp Seal	300 lbs.
Harbour Seal	200 lbs.
Walrus	1,500 lbs.
Narwhal	3,000 lbs.
Beluga Whale	2,500 lbs.

McLaren (1958) has estimated that 28 percent of a ringed seal consists of meat and viscera which are edible by humans, and another nine percent, including the head and remaining viscera, are edible by dogs.[36] The remaining body weight of the ringed seal is composed of 32 percent blubber, 18 percent bone, six percent skin, and five percent blood.[37]

When fat is included in the diet at a dietary formula for six pounds of meat to one pound of blubber, 30 percent of the ringed seal carcass weight can be consumed by humans. Applying an equivalent dietary formula of meat and fat for dogs, another 11 percent of the ringed seal can be utilized for dog food.[38] Thus, approximately 41 percent of the ringed seal can be eaten by humans or animals.

Although the remaining 59 percen-t is not readily edible, further utilization is possible. The hide, which represents six percent of gross weight, currently represents the primary monetary value of the seal. The blubber, which formerly was rendered to oil to provide fuel for heat and light, has potential for such uses as soap and lubricants. The bone and blood of the ringed seal may also have potential uses such as for fertilizer.

For purposes of this study, the “recoverable” weight for marine mammals is estimated at 50 percent of gross weight. This estimate is based on recommendations of the Northwest Territories Marine Mammal Working Group. In the interests of comparison, Table A.1 summarizes the recovery rate for beef industry, which is noted for its high degree of by-product utilization.

Table Al. Products from 1,000-pound Choice Steer[39]

Slaughter Products (Pounds)		Wholesale Cuts (Pounds)		Edible Offal (Pounds)		Inedible Offal (Pounds)	
Carcass	610.0	Round	110	Fat	53.5	Viscera	75.2
Hide	75.0	Loin	118	Tongue	5.0	Blood	35.0
Offal, edible	100.8	Prime ribs	59	Liver	12.5	Fill	59.0
Offal, inedible	209.2	Rump	29	Heart	2.7	Heads and feet	40.0
		Flank	39	Sweetbreads	0.3		
		Chuck	155	Tail	1.5		
		Plate	80	Kidneys	1.5		
		Foreshank	20	Tripe	18.0		
				Meat Trimmings	5.2		
				Brains	0.5		
Total	995.0	Total	610	Total	100.8	Total	209.2

APPENDIX B

AIR FREIGHT RATES FOR SCHEDULED AIR CARRIERS
SERVING THE NORTHWEST TERRITORIES

Classes of service, communities served and air tariffs for each of the nine air transportation companies operating scheduled air services within the Northwest Territories are presented according to the four geographical areas served:

1. Frobisher Bay: Figure B.1

   Austin Airways Limited
   Nordair Limited
   St. Felicien Air Services Ltée.

2. Churchill: Figure B.2

   Lambair Ltd.
   Transair Limited

3. Yellowknife - Hay River: Figure B.3

   Northward Airlines Ltd.
   Northwest Territorial Airways Limited
   Pacific Western Airlines Ltd.

4. Resolute Bay: Figure B.4

   Kenting-Atlas Aviation Limited
   Nordair Limited
   Pacific Western Airlines Ltd.
   Transair Limited

Austin Airways Limited

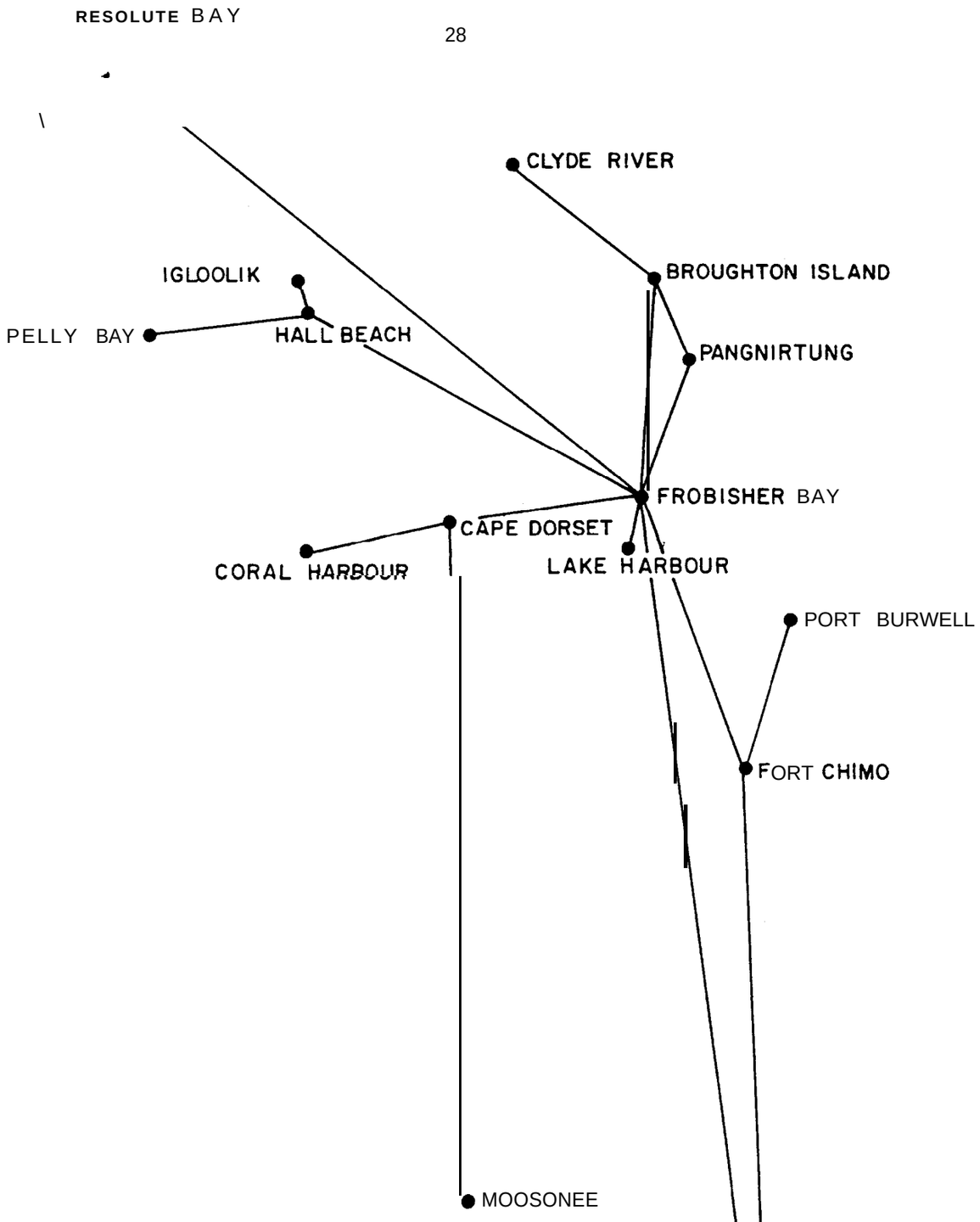
Toronto Island Airport
Toronto, Ontario

Austin Airways operates a Class 2 service from Moosonee, Ontario to Cape Dorset.

General Commodity Rates

Effective date: June 5, 1974

Between	and	Dollars per pound


RESOLUTE BAY
CLYDE RIVER
IGLOOLIK
BROUGHTON ISLAND
PELLY BAY
HALL BEACH
PANGNIRTUNG
FROBISHER BAY
CAPE DORSET
CORAL HARBOUR
LAKE HARBOUR
PORT BURWELL
FORT CHIMO
MOOSONEE

Resolute Bay and Fort Chime, Quebec, and Class 3 services from Frobisher Bay to Broughton Island, Pangnirtung, Cape Dorset, Coral Harbour, Clyde River, Igloolik, Hall Beach and Pelly Bay.

General Commodity Rates

Effective date: February 1, 1974

Between	and	Freight in Dollars per pound Under 100 lbs	Over 100 lbs
Broughton Island:			
	Clyde River	$0.29	$0.28
	Frobisher Bay	0.33	0.31
	Montreal	0.74	0.70
	Pangnirtung	0.16	0.14
Cape Dorset:			
	Coral Harbour	0.26	0.24
	Frobisher Bay	0.29	0.27
	Montreal	0.70	0.60
Clyde River:			
	Frobisher Bay	0.48	0.46
	Montreal	0.89	0.85
Coral Harbour:			
	Frobisher Bay	0.44	0.42
Fort Chime:			
	Montreal	0.85	0.81
	Frobisher Bay	0.30	0.28
	Montreal	0.34	0.32
Frobisher Bay:			
	Hall Beach	0.45	0.43
	Igloolik	0.48	0.46
	Lake Harbour	0.19	0.19
	Montreal	0.41	0.39
	Pangnirtung	0.24	0.22
	Pelly Bay	0.64	0.62
	Resolute Bay	0.43	0.41
Hall Beach:			
	Igloolik	0.12	0.10

St. Felicien Air Service Ltée.

C.P. 910
St. Felicien, Quebec

St. Felicien operates a Class 3 service from Fort Chime, Quebec to Port Burwell.

General Commodity Rates

Effective date: August 16, 1974

Between	and	Dollars per pound
Fort Chimo	Port Burwell	$0.95

Lambair Ltd.

P.O. Box 808
The Pas, Manitoba

Lambair operates a Class 3 service from Churchill, Manitoba, to Sanikilauq Harbour.

General Commodity Rates

Effective date: March 15, 1974

Between	and	Dollars per pound
Churchill	Sanikilauq Harbour	$0.77

Transair Limited

Winnipeg International Airport
Winnipeg, Manitoba

Transair operates Class 1 and Class 2 services from Winnipeg to Churchill, Class 2 services from Churchill to Rankin Inlet, Baker Lake, Coral Harbour and Resolute Bay, and Class 3 services from Churchill to Eskimo Point, Chesterfield Inlet, Whale Cove, Repulse Bay, Hall Beach, Rankin Inlet, Baker Lake and Coral Harbour.

General Commodity Rates

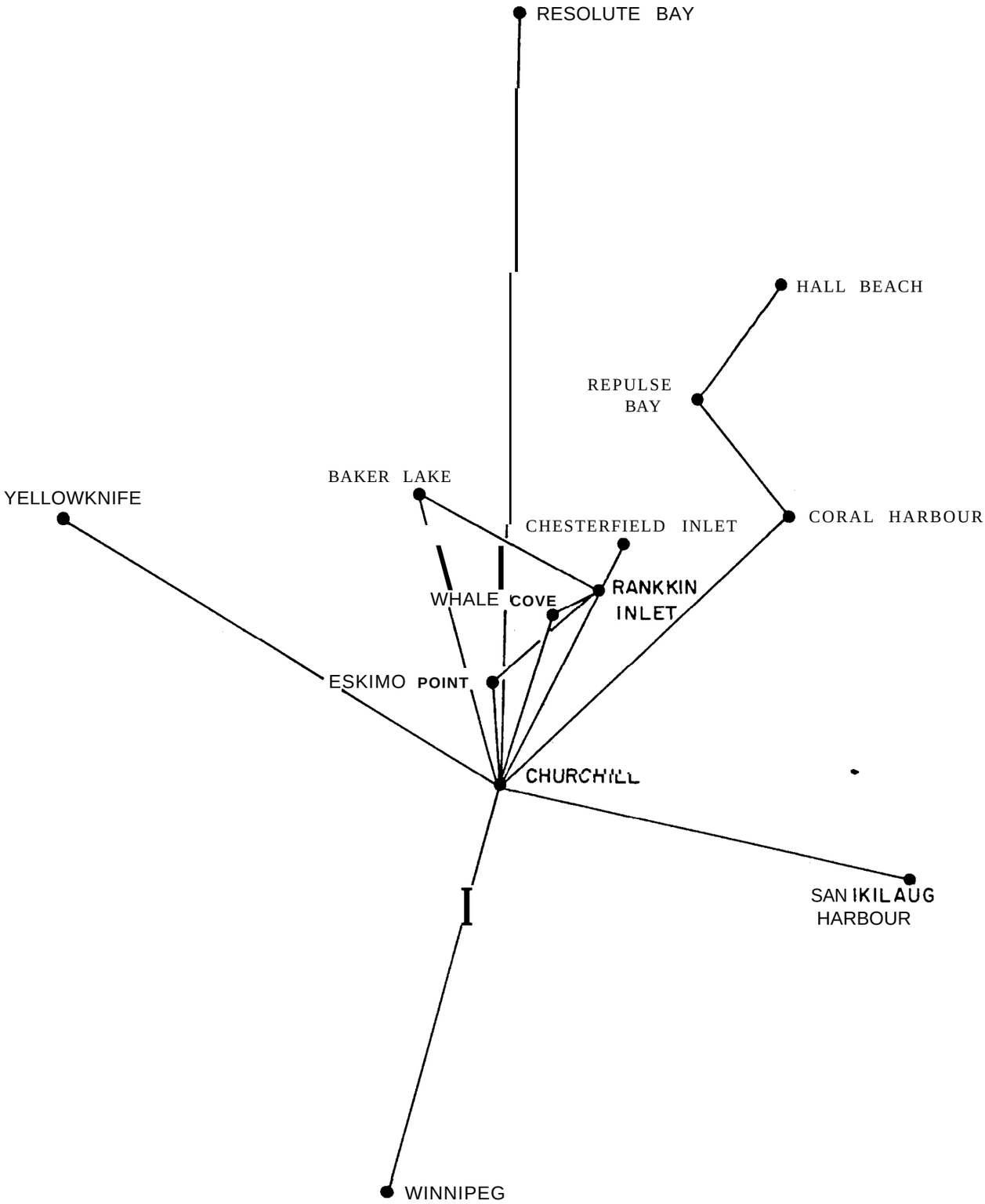


Figure B.2 Air transportation Churchill Region

Between	and	Freight in Dollars per pound Under 100 lbs	Under 500 lbs	Over 500 lbs
	Rankin Inlet	$0.22		
	Repulse Bay	0.72		
	Toronto	0.82	$0.78	$0.73
	Whale Cove	0.25		
	Winnipeg	0.64	0.61	0.58
Chesterfield Inlet:				
	Churchill	0.44		
	Coral Harbour	0.41		
	Eskimo Point	0.26		
	Hall Beach	0.68		
	Rankin Inlet	0.09		
	Repulse Bay	0.60		
	Toronto	0.83	0.79	0.74
	Whale Cove	0.15		
	Winnipeg	0.65	0.62	0.59
Churchill:				
	Coral Harbour	0.56		
	Eskimo Point	0.18		
	Hall Beach	0.83		
	Rankin Inlet	0.33		
	Repulse Bay	0.81		
	Resolute Bay*	0. 38*	0.34*	
	Toronto	0.39	0.35	0.30
	Whale Cove	0.31		
	Winnipeg	0.21	0.18	0.15
	Yellowknife	0.28	0.23	0.21
Coral Harbour:				
	Eskimo Point	0.56		
	Hall Beach	0.35		
	Rankin Inlet	0.40		
	Repulse Bay	0.26		
	Toronto	0.95	0.91	0.86
	Whale Cove	0.46		
	Winnipeg	0.77	0.74	0.71
Eskimo Point:				
	Hall Beach	0.82		
	Rankin Inlet	0.19		
	Repulse Bay	0.69		
	Toronto	0.57	0.53	0.48
	Whale Cove	0.13		
	Winnipeg	0.39	0.36	0.33
Hall Beach:				
	Rankin Inlet	0.73		
	Repulse Bay	0.29		
	Toronto	0.99	0.95	0.93

Between	and	Freight in Dollars per pound Under 100 lbs	Under 500 lbs	Over 500 lbs
	Whale Cove	$0.80		
	Winnipeg	0.99	$0.95	$0.93
Rankin Inlet				
	Repulse Bay	0.57		
	Toronto	0.72	0.68	0.63
	Whale Cove	0.08		
	Winnipeg	0.54	0.51	0.48
Resolute Bay:				
	Churchill*	0.23*	0.22*	
	Winnipeg*	0.22*	0.22*	
Toronto:				
	Whale Cove	0.70	0.66	0.61
	Winnipeg	0.18	0.17	0.15
	Yellowknife	0.44	0.42	0.40
Whale Cove:				
	Winnipeg	0.52	0.49	0.46
Winnipeg:				
	Resolute Bay	0.46	0.44	
	Yellowknife	0.32	0.30	0.28

*Price listed indicates a one-way charge - it does not apply in opposite direction.

Northward Airlines Ltd.

10240 124th Street
Edmonton, Alberta

Northward operates Class 2 and Class 3 services from Inuvik to Aklavik, Tuktoyaktuk and Sachs Harbour, Class 3 services from Yellowknife to Coppermine and Holman Island, and Class 3 services from Cambridge Bay to Gjoa Haven, Spence Bay and Pelly Bay and Holman Island, Coppermine and Yellowknife. Northward is not permitted to carry traffic between Yellowknife and Cambridge Bay and Coppermine and Cambridge Bay.

Effective March 16, 1974

From	to	Freight in Dollars per pound Under 100 lbs	Over 100 lbs
Aklavik:			
	Inuvik	$0.07	$0.07
Cambridge Bay:			
	Gjoa Haven	0.38	0.35
	Pelly Bay	0.53	0.47
	Spence Bay	0.40	0.37
	Holman Island	0.40	0.37
Coppermine:			
	Holman Island	0.17	0.15
	Sachs Harbour	0.32	0.28
	Yellowknife	0.29	0.23
Gjoa Haven:			
	Cambridge Bay	0.38	0.35
	Pelly Bay	0.33	0.28
	Spence Bay	0.18	0.17
Holman Island:			
	Cambridge Bay	0.40	0.37
	Coppermine	0.17	0.15
	Sachs Harbour	0.15	0.13
	Yellowknife	0.46	0.38
Inuvik:			
	Aklavik	0.12	0.09
	Sachs Harbour	0.29	0.29
	Tuktoyaktuk	0.16	0.14
Pelly Bay:			
	Cambridge Bay	0.53	0.47
	Gjoa Haven	0.33	0.28
	Spence Bay	0.25	0.23
Sachs Harbour:			
	Coppermine	0.30	0.25
	Holman Island	0.13	0.10
	Inuvik	0.29	0.29
	Tuktoyaktuk	0.17	0.17
	Yellowknife	0.51	0.44
Spence Bay:			
	Cambridge Bay	0.40	0.37
	Gjoa Haven	0.18	0.17
	Pelly Bay	0.25	0.23
Tuktoyaktuk:			
	Inuvik	0.10	0.10
	Sachs Harbour	0.17	0.17

Figure B.3 Air transportation Yellowknife-Hay River Region

From	to	Freight Dollars per pound Under 100 lbs	Over 100 lbs
Yellowknife:			
	Coppermine	0.28	0.26
	Holman Island	0.47	0.42
	Sachs Harbour	0.60	0.53

Northwest Territorial Airways

Box 100
Yellowknife, Northwest Territories

Northwest Territorial Airways operates Class 3 services from Yellowknife to Coppermine and Cambridge Bay.

General Commodity Rates

Effective date: March 1, 1974

From	and	Freight in Dollars per pound Under 100 lbs	Under 500 lbs	Over 500 lbs
Yellowknife:				
	Cambridge Bay N.	$0.40	0.38	0.37
	Cambridge Bay N.	0.40	0.20	
	Coppermine N.	0.28	0.26	0.25
	Coppermine S.	0.28	0.20	
Cambridge Bay:				
	Coppermine	0.28	0.26	

Pacific Western Airlines Ltd.

Vancouver Airport
Vancouver, British Columbia

Pacific Western Airlines Ltd. operates Class 1 services from Edmonton to Yellowknife, Hay River and Inuvik and Class 2 services from Yellowknife to Edmonton and Cambridge Bay and a Class 3 service from Yellowknife to Resolute Bay.

General Commodity Rates

Effective date: August 1, 1974

From	to	Freight in Dollars per pound Under 100 lbs	Over 100 lbs
Cambridge Bay			
	Edmonton	$0.18	$0.16
	Yellowknife	0.12	0.10

From	to	Freight in Dollars per pound Under 100 lbs	Over 100 lbs
Edmonton:			
	Cambridge Bay	$0.29	$0.26
	Hay River	0.18	0.16
	Inuvik	0.29	0.26
	Resolute Bay	0.51	0.47
	Yellowknife	0.19	0.17
Hay River:			
	Cambridge Bay	0.24	0.21
	Edmonton	0.10	0.10
	Inuvik	0.26	0.23
	Resolute Bay	0.39	0.35
	Yellowknife	0.07	0.07
Inuvik:			
	Edmonton	0.18	0.16
	Hay River	0.16	0.14
	Yellowknife	0.16	0.14
Resolute Bay:			
	Edmonton	0.31	0.28
	Hay River	0.24	0.21
	Yellowknife	0.20	0.18
Yellowknife:			
	Cambridge Bay	0.18	0.16
	Edmonton	0.12	0.10
	Hay River	0.07	0.07
	Inuvik	0.26	0.23
	Resolute Bay	0.33	0.24

Kenting Atlas Aviation Limited

Hangar Number Three, McCall Field
Calgary, Alberta

Kenting Atlas Aviation operates Class 3 services from Resolute Bay to Arctic Bay, Grise Fjord, Igloolik and Pond Inlet.

General Commodity Rates

Effective date: June 5, 1974

Between	and	Dollars per pound
Resolute Bay	Arctic Bay	$0.34
Arctic Bay	Pond Inlet	0.24
Pond Inlet	Grise Fjord	0.43
Grise Fjord	Resolute Bay	0.37
Arctic Bay	Igloolik	0.41

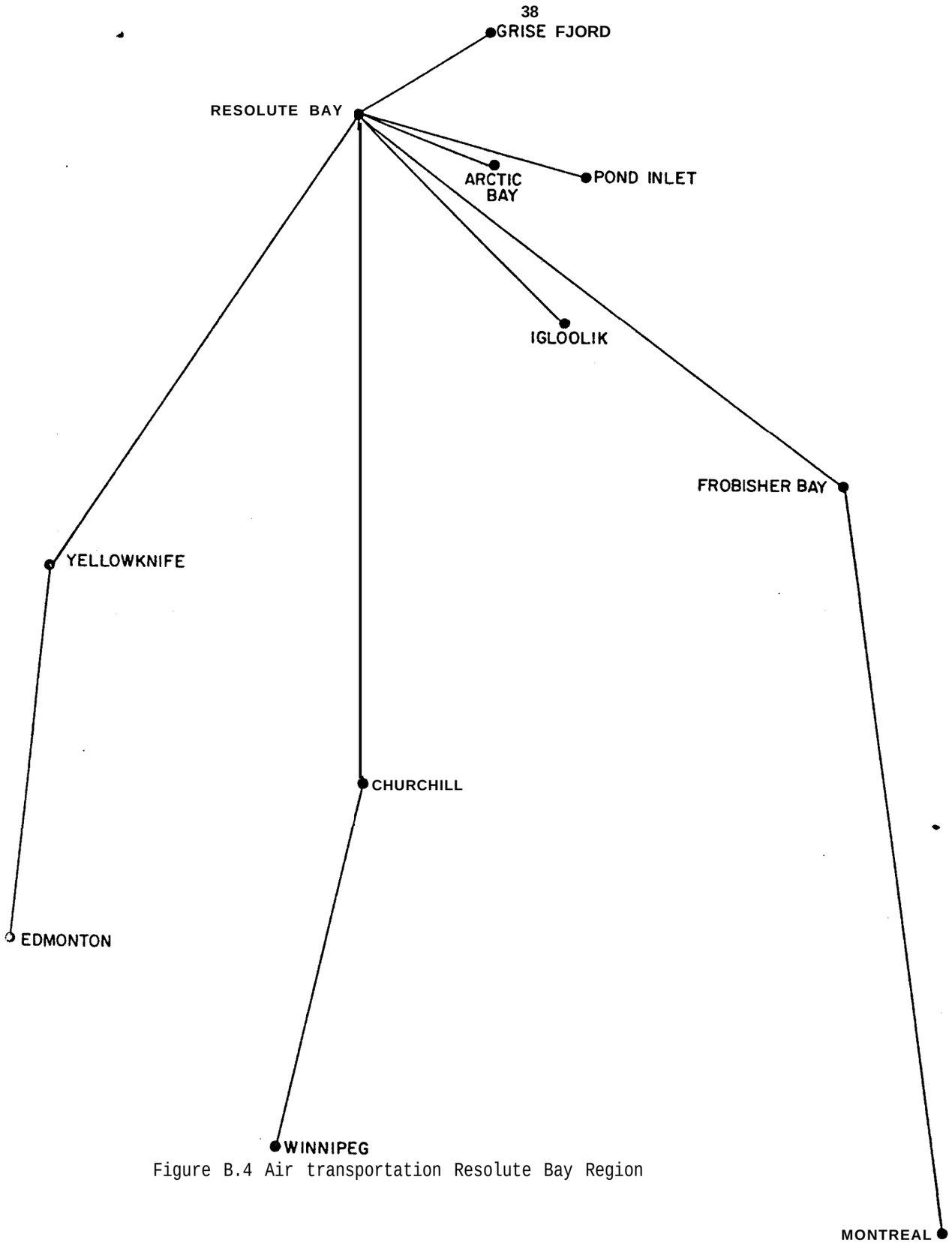


Figure B.4 Air transportation Resolute Bay Region

Between	and	Dollars per pound
Resolute Bay	Pond Inlet	$0.56
Pond Inlet	Igloolik	0.38
Resolute Bay	Igloolik	0.72
Arctic Bay	Grise Fjord	0.37

Nordair Ltd.

Hangar Number Six, Dorval Airport
Dorval, Quebec

Nordair operates a Class 2 service from Montreal to Resolute Bay.

General Commodity Rates

Effective date: February 1, 1974

Between	and	Dollars per pound Under 100 lbs	Over 100 lbs
Montreal:			
	Resolute Bay	$0.46	$0.44
Frobisher Bay:			
	Resolute Bay	0.43	0.41

Pacific Western Airlines Ltd.

Vancouver Airport
Vancouver, British Columbia

Pacific Western Airlines Ltd. operates a Class 3 service from Yellowknife to Resolute Bay.

General Commodity Rates

Between	and	Dollars per pound Under 100 lbs	Over 100 lbs
Yellowknife	Resolute Bay	$0.33	$0.29
Resolute Bay	Yellowknife	0.20	0.18
Edmonton	Resolute Bay	0.51	0.47
Resolute Bay	Edmonton	0.31	0.28

Transair Limited

Winnipeg International Airport
Winnipeg, Manitoba

Transair operates a Class 2 service from Churchill to Resolute Bay.

General Commodity Rates

Between	and	Dollars per pound: Under 100 lbs	Dollars per pound: Over 100 lbs
Churchill	Resolute Bay	$0.38	$0.34
Resolute Bay	Churchill	0.23	0.22
Winnipeg	Resolute Bay	0.46	0.44
Resolute Bay	Winnipeg	0.23	0.22

APPENDIX C

RAILWAY FREIGHT RATES

Canadian National Railway

123 Main Street
Winnipeg, Manitoba
R3C 2P8

Freight Rates

Churchill, Manitoba to Winnipeg, Manitoba

Values expressed in cents per 100 pounds

Weight Class	General Commodity Rate	Seal and Whale Meat
30,000 to 40,000 lbs	205	248
40,000 to 50,000 lbs	193	248
50,000 to 60,000 lbs	186	233
60,000 to 70,000 lbs	181	233
70,000 to 80,000 lbs	178	233
80,000 lbs and up	176	233

Great Slave Lake Railway

13025 St. Albert Street
Edmonton, Alberta

Freight Rates

Hay River, Northwest Territories to Edmonton, Alberta

Values expressed in cents per 100 pounds

Weight Class	General Commodity Rate	Seal and Whale Meat
30,000 to 40,000 lbs	177	177
40,000 to 60,000 lbs	164	164
60,000 to 80,000 lbs	156	156
80,000 to 100,000 lbs	149	149
100,000 to 120,000 lbs	145	145
120,000 and up	143	143

Ontario Northland Railway

195 Regina Street
North Bay, Ontario

Freight Rates

Moosonee, Ontario to Montreal, Quebec

Values expressed in cents per 100 pounds

Weight Class	General Commodity Rate	Seal and Whale Meat
30,000 to 40,000 lbs	204	
40,000 to 60,000 lbs	179	259
60,000 to 80,000 lbs	165	249
80,000 lbs and up	157	244

Moosonee, Ontario to Toronto, Ontario

Values expressed in cents per 100 pounds

Weight Class	General Commodity Rate	Seal and Whale Meat
30,000 to 40,000 lbs	179	
40,000 to 60,000 lbs	157	226
60,000 to 80,000 lbs	146	126
80,000 lbs and up	140	211

"REFRIGERATION CHARGES

Frozen Products

$150.33 per car.

Non-Frozen Products (April 16 to October 14)

In mechanical reefers 41 ft. and over - $93.05 per car.
In mechanical reefers under 41 ft. $83.75 per car.

Non-Frozen Products (October 15 to April 15)

$57.27 per car.

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