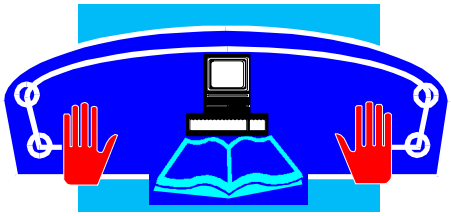

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NORTHWEST TERRITORIES

TRANSPORTATION STRATEGY UPDATE, 1994

Northwest Territories Transportation

NORTHWESTTERRITORIES

TRANSPORTATION STRATEGY UPDATE, 1994

NORTHWEST TERRITORIES
DEPARTMENT OF TRANSPORTATION

MAY 1995

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PART 10VERVIEW AND SUMMARY

1.0 Introduction

The vital role of transportation in modem society is well recognized. This role is even more crucial in a region such as the Northwest Territories which has very few people spread over a vast area. The high cost of living in many of our communities is a direct result of high transportation costs. Lack or inadequacy of transportation is also a major factor in frustrating the development of our abundant natural resources. Improved transportation systems are therefore essential if we are to achieve our full economic, social and political potential.

The Department of Transportation, established in April 1989, is the agency of the Government of the Northwest Territories mandated to provide the necessary transportation facilities in the Northwest Territories. The mission of the Department is:

> *"... to provide for the safe, accessible and reliable movement of people and goods to serve the social, economic and political needs and aspirations of the people of the Northwest Territories. "*

To provide a long-term plan for development of transportation in the Northwest Territories, the Department of Transportation published the Northwest Territories Transportation Strategy in the fall of 1990. Based on extensive consultation and analysis, this document presented the first ever comprehensive, long-term transportation plan for the North. It served as a useful guide and blueprint for the policies and programs of the Department of Transportation.

To reflect the fact that many short-term priorities have been accomplished and new priorities identified since 1990, it was decided to update the Transportation Strategy. The updated Strategy also needed to reflect current economic, social and political conditions.

Like the 1990 version, the updated Transportation Strategy is a comprehensive, long-term planning document, containing inventories, strategic and program objectives, assessment of needs, and identification of funding requirements.

This report is organized in two parts. Part I presents an overview and summary of current problems and issues in the Northwest Territories, accomplishments since 1990, and our strategic and program objectives and their funding requirements. Part II contains a detailed assessment of short and long-term needs in each of the air, highway and marine modes.

As an interim step in updating the Strategy, and to focus on the major short-tern priorities, a document entitled "The Transportation Agenda" was published in December 1993. It described the ten major objectives which must be pursued by the Department over the next several years, and proposed specific actions for each objective. The Transportation Agenda is included as an appendix to this report.

2. Transportation Problems and Issues

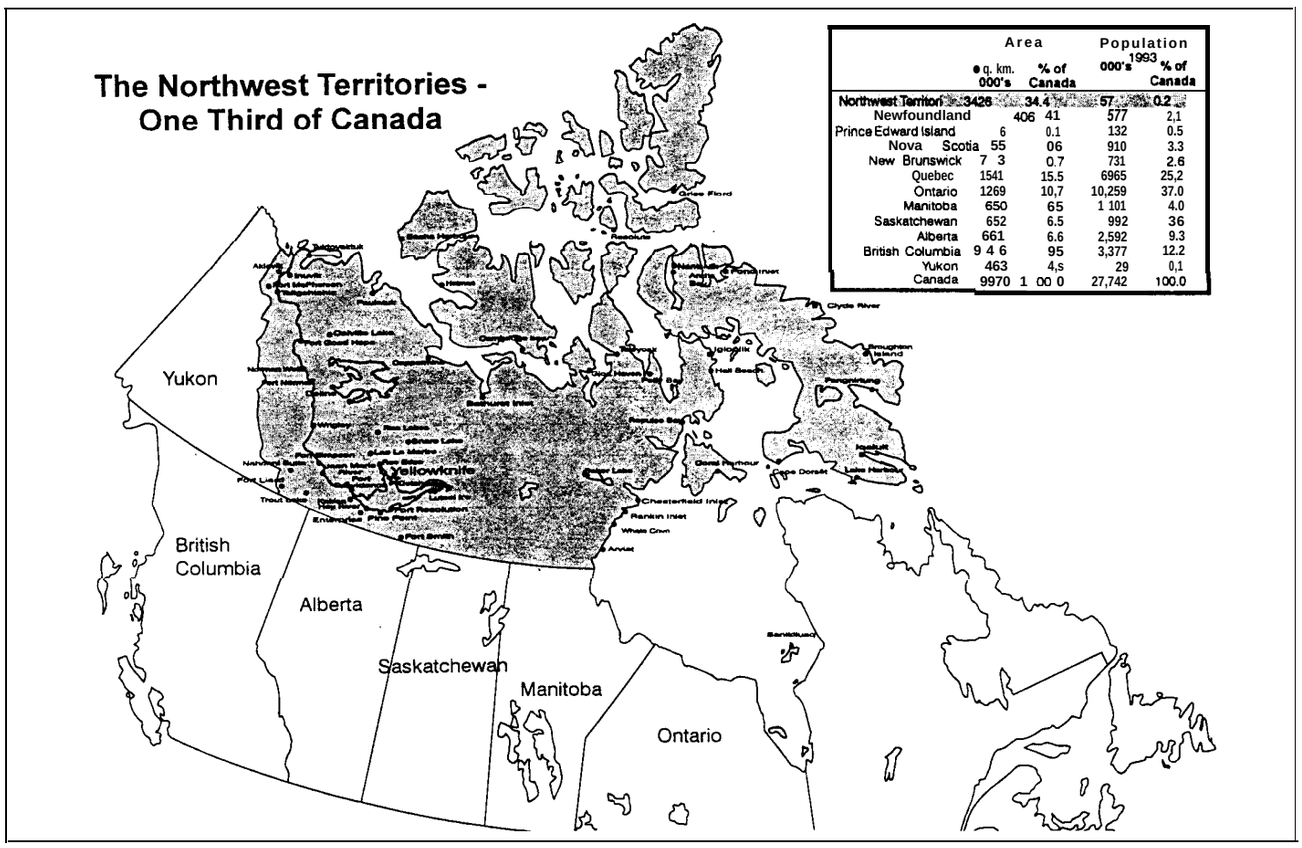
The Department is continually consulting with communities and other stakeholders, both formally and informally, about their transportation needs and priorities, and about the effectiveness of the Department's programs and operations.

In updating the Strategy, consultations were again conducted with carriers, industry representatives and Members of the Legislative Assembly. The purpose was to obtain comments and suggestions about transportation issues, problems and opportunities, to solicit suggestions about possible solutions to existing problems, and to establish needs and priorities.

The comments received indicate that while impressive progress has been made since 1990, much more remains to be done. The following broad statements about transportation problems and opportunities summarize the main points from the consultations and research conducted by the Department.

1. The great distances and the lack or inadequacy of transportation systems and services contribute to high costs as well as inequities within the Northwest Territories.

   The Northwest Territories has one-third of Canada's area, but only 0.2 percent of the population. Provision of adequate transportation to this sparsely populated region is demanding and expensive. Almost half of the population in the Northwest Territories depends solely on air transportation for year-round access, and on marine transportation or winter roads for annual resupply. Living costs in the Northwest Territories average 150 percent of those in southern Canada, and run as high as 200 percent. The effect of these high costs is compounded in the more remote communi-



	Area sq. km. 000's	Area % of Canada	Population 1993 000's	Population 1993 % of Canada
Northwest Territori	3426	34.4	57	0.2
Newfoundland	406	41	577	2,1
Prince Edward Island	6	0.1	132	0.5
Nova Scotia	55	06	910	3.3
New Brunswick	7 3	0.7	731	2.6
Quebec	1541	15,5	6965	25,2
Ontario	1269	10,7	10,259	37.0
Manitoba	650	65	1 101	4.0
Saskatchewan	652	6.5	992	36
Alberta	661	6.6	2,592	9.3
British Columbia	9 4 6	95	3,377	12.2
Yukon	463	4,s	29	0,1
Canada	9970 1	00 0	27,742	100.0

ties, since these communities also tend to be economically isolated, with higher unemployment and lower per capita incomes.

2. Underdeveloped surface transportation / highway systems discourage economic development in the Northwest Territories.
The North contains abundant mineral and petroleum resources. However, many of these deposits are hundreds of kilometres from tidewater and therefore uneconomic to develop because of the high cost of transportation.

Less than 10 percent of the Northwest Territories' land area is within 100 kilometres of a highway. Only 12 percent of the population has year-round highway access, with an additional 42 percent having highway service for ten to 11 months of the year.

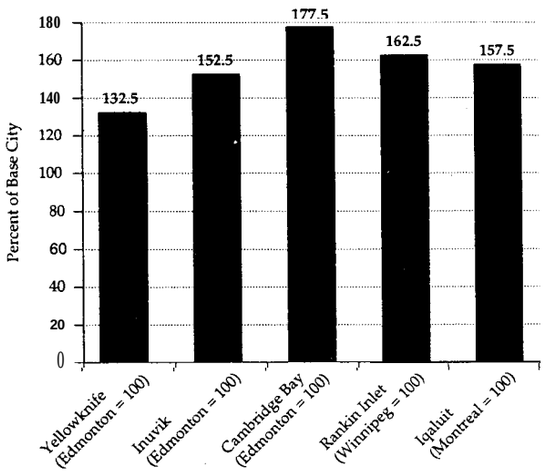
3. The existing highway system needs upgrading.
Many of our existing highways fail to meet current design standards, and only 24 percent of existing highways are paved. The remainder are gravel surfaced and generally narrow. High transportation costs, traffic accidents, and discouraged highway tourism are being blamed on road conditions.

4. There are few local access roads.
Many communities have expressed a need for local access roads and trails to allow residents improved access to local recreation, hunting and fishing areas.

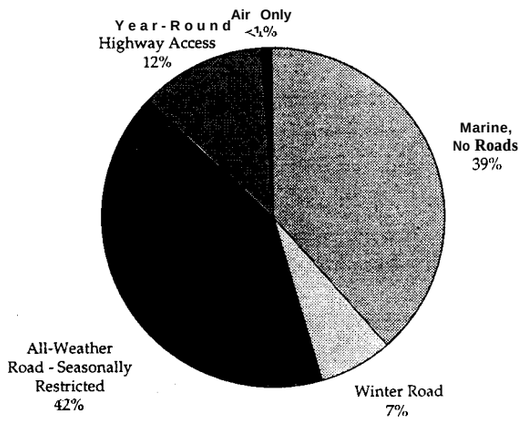
5. Many of our airport facilities need upgrading.
Approximately 88 percent of the Northwest Territories' population relies on air transportation as the only year-round means of access. Some of the 52 territorial and federal public airports in the Northwest Territories have runways which are too short or are otherwise inadequate to handle modem aircraft economically. Navigation aids and services do not meet current needs in many locations. Several airports conflict with community land use.

6. Marine facilities are inadequate.
Approximately 39 percent of the Northwest Territories population relies solely on annual marine resupply for fuel and a substantial portion of their dry cargo. At many locations, protected moorage and cargo marshalling areas are nonexistent or inadequate. The indigenous population relies heavily on subsistence harvests of fish and marine mammals, yet many communities do not have adequate community wharves to facilitate these activities.

Northwest Territories Living Cost Differentials (1991)



Northwest Territories Population by Available Transportation Mode (1993)



7. Lack of adequate transportation has social costs.
The high cost and relative lack of access to transportation in the North results in a sense of isolation, restricted access to goods and services, and fewer employment opportunities. The effectiveness of public programs in education, health care, social services and employment is reduced, Furthermore, there are marked inequalities across the North. The more remote communities incur the highest costs, lowest per capita incomes, and lowest levels of service.

3. Accomplishments Since the 1990 Strategy

3.1 Overview

Impressive progress has been made in improving transportation facilities in the Northwest Territories since the publication of the 1990 Transportation Strategy. This progress has been achieved by working in consultation and cooperation with communities, Members of the Legislative Assembly, the federal government, and the transportation consulting and contracting industry of the Northwest Territories.

The Department of Transportation's actual and estimated capital, and operation and maintenance expenditures from 1989/90 to 1994/95 are shown in the accompanying table.

Operation and Maintenance

The Department's operation and maintenance budget has increased steadily since 1989/90, from $27.4 million in 1989/90 to an estimated $47.6 million in 1994/95. This increase is due to the devolution of the Arctic Airports program to the territorial government, the conversion of several major capital projects to the operation and maintenance budget, and forced-growth implications of the capital budget on operation and maintenance costs. Fiscal restraint by the territorial government has limited the rate of increase.

Capital

Capital expenditures increased from $10.7 million in 1989/90 to a high of $40.4 million in 1991/92. This increase was the result of base transfers for roads and airports from the federal government. In 1992/93, the capital budget was reduced to $34.0 million as a result of fiscal restraint. The 1993/94 and 1994/95 capital budgets are $36.3 and an estimated $37.4 million respectively. The increase in 1994/95 is due to federal contributions under the Canada-Northwest Territories Strategic Transportation Improvement Agreement signed in 1993.

Major accomplishments in the five years 1990 to 1994 are listed below.

Department of Transportation Capital and Operation and Maintenance Expenditures ($000's)

	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95 Estimate
Capital Expenditures						
Department of Transportation	10,669	22,873	40,364	33,971	33,653	37,408
Total Territorial Government	140,521	160,311	173,794	167,834	176,450	180,710
Transportation as Percent of Total	7.6	14.3	23.2	20.2	19.1	20.7
Operation and Maintenance						
Department of Transportation	27,377	36,552	39,938	39,775	45,763	47,589
Total Territorial Government	831,478	887,059	970,061	959,557	981,035	1,002,105
Transportation as Percent of Total	3.3	4.1	4.1	4.1	4.7	4.7
Capital and Operation and Maintenance						
Department of Transportation	38,046	59,425	80,302	73,746	79,416	84,997
Total Territorial Government	971,999	1,047,370	1,143,855	1,127,391	1,157,485	1,182,815
Transportation as Percent of Total	3.9	5.7	7	6.5	6.9	7.2

3.2 Airports

Since 1990, new airports have been built to certification standards at the communities of Jean Marie River, Lac La Martre, Lutsel K'e, Paulatuk, Rae Lakes and Trout Lake. Construction is well underway at Déline, Fort Good Hope, Pelly Bay and Snare Lake.

New or expanded terminal buildings were provided at Arviat and Igloolik, and started at Coppermine, Pangnirtung, Rankin Inlet and Tuktoyaktuk.

Runway rehabilitation, including lighting, has been completed -or is underway at Arviat, Cape Dorset, Clyde River, Colville Lake, Fort Providence, Pond Inlet, Repulse Bay, Sanikiluaq and Taloyoak, and is scheduled to begin at Broughton Island and Igloolik. The runway at Chesterfield Inlet was extended and lighting was upgraded. The Rankin Inlet runway was widened, extended and paved, including the apron and taxiway by the Department of National Defence. High intensity runway edge lighting and approach lighting was installed at Rankin Inlet. Low intensity airfield lighting was installed at Colville Lake, Fort Providence, Jean Marie River and Trout Lake.

In terms of air navigation services, a major extension to the community airport radio stations' (CARS) hours of operation was implemented during 1991. Basic automated weather observation systems (AWOS) were installed at Colville Lake, Fort Providence, Lac La Martre, Rae Lakes, Sachs Harbour and Trout Lake. Advanced AWOS were installed at Cape Dorset, Clyde River and Pond Inlet.

Transfer of the nine "A" airports in the Northwest Territories from the federal government is scheduled for July 1,1995. This will increase the base funding of the Department by approximately $24.3 million annually. Along with the transfer will come the ability to manage the 52 public airports in the Northwest Territories as an integrated system.

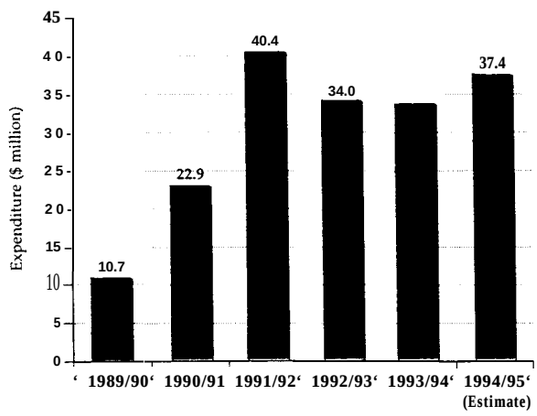
3.3 Highways

Reconstruction and paving of the arterial portion of the Mackenzie Highway (No. 1) was completed, and a total of 134 kilometres of the Yellowknife Highway (No. 3) were reconstructed and paved. Thus, as of the summer of 1994, of the 525 kilometres from the Alberta border to Yellowknife, 321 kilometres or 61 percent was paved.

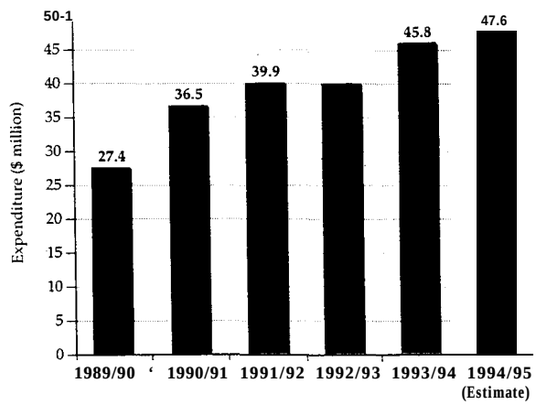
Reconstruction of the Dempster Highway (No. 8) was started, and the section from Inuvik to the airport was paved.

The paved portion of the 2,200 kilometre all-weather highway system increased from 14 percent in 1990 to 24 percent in 1994. The dust-free gravel portion of the highway system increased from 14 percent in 1990 to 49 percent in 1994.

Department of Transportation Historical Capital Expenditures



Department of Transportation Historical Operation and Maintenance Expenditures



The Liard Highway ferry at Fort Simpson was replaced with a new, shallower draft vessel, capable of operating at lower water levels.

The use of spray-ice technology at the Fort Providence crossing has extended the Highway 3 operating season.

3.4 Community Local Access Roads

From 1990 to 1993, community local access road projects were completed in Arctic Bay, Arviat, Fort Resolution, Gjoa Haven, and started in Jean Marie River and Wrigley.

In 1994, the Department increased funding for community local access road projects from $250,000 per year to $650,000. The Department also implemented a Contributions Policy enabling communities to undertake and manage road construction projects.

In 1994, community local access road projects were completed or underway in the communities of Arctic Bay, Arviat, Baker Lake, Broughton Island, Gjoa Haven, Igloolik, Jean Marie River, Pelly Bay, Resolute Bay, Taloyoak and Wrigley.

3.5 Marine Facilities and Resupply Systems

Improvements to local marine facilities have been made at 17 communities, including Arctic Bay, Arviat, Broughton Island, Cape Dorset, Chesterfield Inlet, Fort Resolution, Fort Simpson, Gjoa Haven, Igloolik, Iqaluit, Jean Marie River, Kakisa, Naharmi Butte, Pangnirtung, Rankin Inlet, Sanikiluaq, Taloyoak and Tsiigehtchic (Arctic Red River).

Improvements to marine resupply facilities were made in 12 communities, including Aklavik, Baker Lake, Cambridge Bay, Copperrnine, Fort Good Hope, Fort Providence, Gjoa Haven, Jean Marie River, Norman Wells, Paulatuk, Pelly Bay and Taloyoak.

Since 1990, several marine initiatives by the Department of Transportation in cooperation with the Department of Public Works and Services have helped reduce resupply costs significantly, particularly for petroleum products. The first ever marine resupply to Pelly Bay was started in 1993. From 1994 onwards, the savings are expected to be approximately $1.0 million per year. In 1993, the

Territorial Airports Certification Status

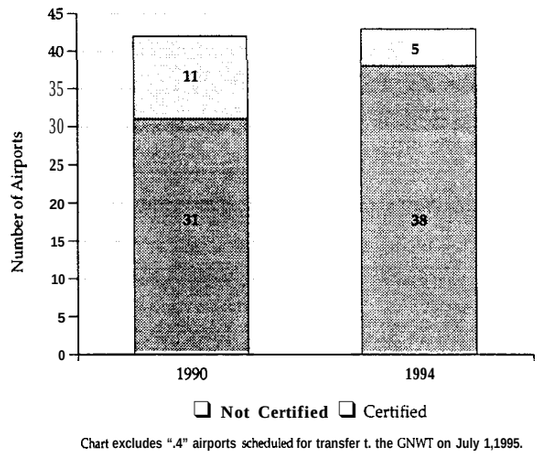
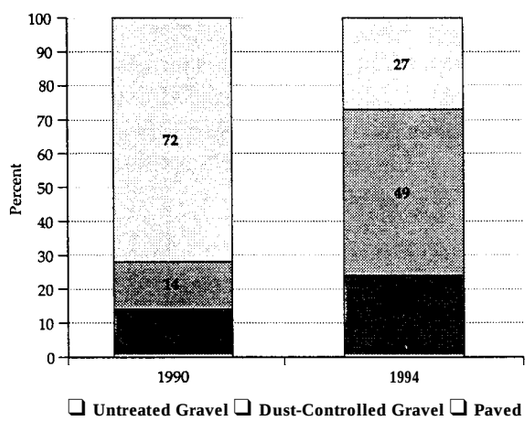


Chart excludes ".4" airports scheduled for transfer t. the GNWT on July 1,1995.

Percent of Highway System Length by Surface Type



delivery of the Keewatin region's diesel fuel to Churchill was by ship instead of rail, resulting in a savings to the territorial government of $900,000 in comparison to 1992. Also, in 1993, suppliers were allowed to arrange the most cost-effective method of resupplying bulk fuel to 11 Eastern Arctic communities. The result was a single contract for both the supply and delivery of bulk fuel, resulting in a savings of $1.1 million compared to historical Eastern Arctic costs. All of these cost savings are expected to continue in the future.

3.6 Mackenzie Highway Extension

The Mackenzie Highway (No. 1) was extended from Fort Simpson to Wrigley, with opening of the road and the ferry at N'dulee in June 1994.

4 Strategic and Program Objectives and Their Funding Requirements

4.1 Strategic and Program Objectives

To address the transportation problems and issues identified above, the updated 1994 Transportation Strategy proposes action under three strategic objectives over the next 20 years.

- Strategic objective 1, "Improving the Existing Transportation System", involves capital rehabilitation and upgrading of existing roads, airports and marine facilities to improve safety, reliability and accessibility, and to reduce transportation costs and inequities.
- Strategic objective 2, "Building New Transportation Corridors for Economic Development", involves building new highways, winter roads and ports to improve prospects for non-renewable and renewable resource development, and for tourism.
- Strategic objective 3, "Enhancing Safety, the Environment and Northern Involvement", involves selected initiatives to improve the efficiency and effectiveness of our transportation programs.

The 1990 Strategy included a fourth strategic objective, "Filling the Gaps: Transportation Subsidies". This objective has been eliminated as a discrete objective in the 1994 Strategy Update because of the government's fiscal situation, and because many initiatives outlined in the other three strategic objectives are geared towards "filling the gaps" by reducing transportation costs.

Each strategic objective is proposed to be accomplished through the implementation of a series of program objectives described in detail in Part II of this document.

Northwest Territories Transportation Strategy Update (1994)

Strategic Objectives

1. Improving the Existing Transportation System	2. Building New Transportation Corridors for Economic Development	3. Enhancing Safety, the Environment and Northern Involvement
Upgrading our existing airports, roads and marine facilities	Major new infrastructure to open remote areas for responsible development	Improving efficiency and effectiveness in program delivery

Programs

Airports	Highways	Community Local Access Roads	Marine Resupply Systems	Local Marine Facilities
Program Objectives (O&M)				
1. Operate and "maintain airports for safety, service and " reliability	1. Maintain current system 2. Continue dust-control program 3. Improve winter roads	1. Establish plan to provide maintenance funding	1. Maintain what we have 2. Improve marine resupply systems	1. Maintain what we have
Program Objectives (Capital)				
1. Rehab and restoration 2. Upgrade for certification 3. Construct/ upgrade for standards of safety, service, convenience 4. Improve air navigation systems 5. Upgrade to standards for future critical aircraft	1. Rehab and restoration 2. Highway upgrading 3. Highway paving 4. New bridges 5. New ferries 6. Ice crossing improvements 7. Winter road improvements	1. Construct community local access roads	1. Upgrade facilities to standards	1. Upgrade facilities to standards

Program Objectives	*Program Objectives*
1. Extend Mackenzie Valley Highway 2. Construct Arctic coast transportation corridor	1. Improve transportation safety 2. Increase local involvement 3. Minimize environmental impact 4. Enhance research and development

4.2 Future Funding Requirements

Strategic Objective One: "Improving the Existing Transportation System"

Capital Funding

Capital funding is required for infrastructure rehabilitation, upgrading and expansion. Capital infrastructure improvement needs are presented as either "Currently Justified" or "Future" needs.

Currently justified needs are those infrastructure improvements which are needed at present to address current deficiencies and/or demands for transportation facilities. Theoretically, all currently justified needs should be addressed immediately. However, since there is a practical limit to what can be physically accomplished, even if sufficient funds were available, a time frame of five years is assumed to be reasonable for the implementation of currently justified 'needs.

Future needs within 20 years are infrastructure improvements which are projected to be required to provide an adequate level of service for the anticipated transportation demands within the next 20 years.

*Currently **justified** capital needs* identified in the 1994 Strategy Update total $468 million.

The Department's current capital budget, for fiscal year 1994/95, is $37 million. Assuming this funding level remains constant over the next five years, the Department would have a total of $185 million which will meet only 40 percent of the $468 million in currently justified capital improvements.

Future Capital Requirements for Strategic Objective One: Improving the Existing Transportation System (1994 $000's)

Program	*Program Objective*	*Currently Justified Needs*	*Future Needs Within 20 Years*	*Total*
Airports	1. Rehabilitation and Restoration	23,000	84,000	**107,000**
	2. Upgrade for Certification	4,500	3,000	7,500
	3. Construct/Upgrade for Safety, Service and Convenience	14,000	63,000	77,000
	4. Improve Air Navigation Systems	**1,500**	**1,000**	2,500
	5. Upgrade to Standards for Future Critical Aircraft	0	100,000	100,000
	6. Airport Planning Studies	1,000	500	1,500
	Subtotal Airports	44,000	251,500	295,500
Highways	1. Rehabilitation and Restoration	45,500	108,000	153,500
	2/3. Highway Upgrading and Paving	346,000	92,000	438,000
	4. New Bridges	0	65,000	65,000
	5. New Ferries	0	29,000	29,000
	6. Ice Crossing Improvements	0	500	500
	7. Winter Road Improvements	500	500	1,000
	Subtotal Highways	**392,000**	**295,000**	**687,000**
Community Access Roads	1. Construct Community Local Access Roads	9,000	44,000	53,000
	Subtotal Community Local Access Roads	9,000	44,000	53,000
Marine Resupply Systems	1. Upgrade Facilities to Standard	11,000	7,500	18,500
	Subtotal Marine Resupply Facilities	**11,000**	7,500	18,500
Local Marine Facilities	1. Upgrade Facilities to Standard	**12,000**	**19,500**	**31,500**
	Subtotal Local Marine Facilities	12,000	19,500	31,500
Total		468,000	617,500	1,085,500

Since there is a significant capital funding shortfall, the Department must establish priorities for its capital expenditures.

The first priority is to protect existing transportation facilities through capital rehabilitation and restoration. This work is required because of deterioration over time and use, obsolescence, and safety concerns. This priority will require $68 million over the next five years and will have first call on the available departmental capital allocation.

The second priority is to upgrade or enhance existing transportation facilities and provide new transportation infrastructure where none presently exists. This includes upgrading existing airport facilities for certification and/ or safety, upgrading and paving of highways, upgrading marine facilities, and constructing new community marine facilities and access roads.

This second priority will require $400 million capital over the next five years. However, the available funding is only $117 million ($185 million total Department funding less $68 million for the first priority).

The capital projects the Department proposes to undertake in the next five years with available funds are listed in the Department's Five-Year Capital Plan. These projects thus have the highest priority among the currently justified needs. The Capital Plan is updated annually, and is sent to the communities and Members of the Legislative Assembly for consultation and review. The Legislative Assembly annually approves capital expenditures for projects in the first year of the Five-Year Capital Plan.

Future capital *needs within* ***20*** *years* total an additional $618 million. Thus, total capital needs over the next 20 years are $1,085 million or approximately $50 million per year in 1994 dollars. The Department's current capital expenditure level of $37 million per year would thus fulfil 74 percent of the needs.

Operation and Maintenance Funding

Operation and maintenance funding is annually approved by the Legislative Assembly, separate from the capital funding, for the purpose of operating transportation facilities and maintaining them at an adequate level of service, safety and reliability.

The Department's operation and maintenance allocation for 1994/95 is $48 million. If this funding level is kept at its current level in constant dollars, it can be assumed to be sufficient in the short-term to operate and maintain the existing transportation infrastructure at current levels of service, provided traffic volumes do not increase drastically.

As new facilities are built, as existing facilities are expanded/upgraded, and as usage of existing facilities increases, operation and maintenance funding will need to be adjusted accordingly.

Estimated Operation and Maintenance and Capital 1994/95 Expenditures by Mode (1994 $000's)

Mode	*Operation and Maintenance Expenditures*	*Capital Expenditures*	*Total Expenditures*
Airports	15,092	11,765	26,857
Highways	29,389	23,143	52,532
Local Community Access Roads	60	650	710
Marine Facilities	100	1,850	1,950
Subtotal	**44,641**	**37,408**	**82,049**
General (Administration, Financial)	2,948	0	2,948
Total	47,589	37,408	84,997

Note: Operation and maintenance expenditures for Planning and Engineering functions have been prorated to the Airports and Highways modes. General includes expenditures by the Directorate and Finance and Administration.

Source: 1994/95 Main and Capital Estimates

Strategic Objective Two: "Building New Transportation Corridors for Economic Development"

Funding within this strategic objective is required to promote economic development opportunities within the Northwest Territories. Two transportation corridors are proposed; extension of the Mackenzie Valley Highway and construction of a road to the Arctic coast. Funding requirements for these two corridors totals $1.1 billion. Stakeholders in these proposed corridors include governments, mining and business interests, and aboriginal groups. The Department will play a coordinating role to ensure that developments proceed to the benefit of all stakeholders.

Future Capital Funding Requirements for Strategic Objective Two: "Building New Transportation Corridors for Economic Development" (1994 $000's)

Program Objective	*Funding Requirements*
Extend Mackenzie Valley Highway	500,000
Construct Arctic Coast Transportation Corridor	600,000
Total	1,100,000

Strategic Objective Three: "Enhancing Safety, the Environment and Northern Involvement"

Funding requirements for this strategic objective will be met from within existing allocations and are therefore included in the funding requirements of the first strategic objective.

5 @ Implementing the Strategy

Based on the program objectives outlined in detail in Part II of this Strategy, the following ten major objectives have been identified for priority action by the Department.

Road
1. Accelerate Highway Upgrading Capital Program
2. Continue Mackenzie Highway Extension
3. Construct Arctic Coast Transportation Corridor
4. Enhance Community Local Access Roads Program

Air
5. Upgrade Airports to Standard
6. Improve Air Navigation Systems

Marine
7. Improve Local Marine Facilities
8. Improve Marine Resupply Systems

All Modes
9. Improve Transportation Safety
10. Increase Local Involvement in Transportation Expenditures

Success in achieving some of these objectives is within reach because it depends completely on our own actions (Objectives 4,7,9, 10). Achievement of these objectives will require increased allocations of funding and effort.

Success on other objectives will depend, at least partly, on the ability to influence others to share the costs, particularly the Government of Canada (Objectives 1,2, 3,5, 8).

Still other objectives depend on taking advantage of opportunities presented by changing technology or private sector developments (Objectives 3, 6). For objective 3, private/public sector partnerships maybe necessary to finance the infrastructure.

In all instances, the Department must pursue these objectives with all the available means. Detailed descriptions of these ten objectives and action plans for addressing the needs are presented in the Transportation Agenda (see Appendix).

Part II Three Strategic Objectives

1. Objective One: *Improving the Existing Transportation System*

1.1 Introduction

This chapter deals with the improvements required at existing airports, highways, community access roads and marine facilities. Existing transportation infrastructure owned by the Department of Transportation is estimated to have a replacement value of approximately $1.5 billion.

All of these facilities require ongoing maintenance. For example, gravel roads require periodic grading to maintain the traffic surface. Annual operation and maintenance budgets are established for this purpose.

In addition, most facilities require periodic capital restoration or replacement. Even with the best maintenance, the road embankment and drainage systems deteriorate over time and require capital refurbishment after 20 to 30 years of service.

These two activities represent the bare minimum in ongoing public investment. Operation and maintenance, and capital restoration are required just to maintain the status quo, to prevent facilities from deteriorating, and to continue to provide the current level of service.

Additional capital funding is used to upgrade existing facilities to a higher standard or level of service. This upgrading may respond to increased traffic, safety concerns, high user costs, or simply heightened public expectations of comfort and convenience. Upgrading could include paving a gravel road, lengthening a runway, or expanding a wharf.

Determining ***Needs***

In developing capital and operation and maintenance needs, a large number of factors must be considered. Theoretically, we should conduct a benefit/cost analysis on all projects. Projects with a benefit/cost ratio of greater than 1.0 would be undertaken immediately. However, this mathematical approach would be neither practical nor logical. Some rational judgement must be applied.

First, we must take a "system" approach. For example, all airports in an area maybe part of a route structure. It would make little sense to upgrade only some of the airports in this system to accommodate a larger aircraft. In such cases, we must evaluate upgrading the system rather than individual airports.

Many other factors such as govemment policy, federal-territorial cost-shared programs, environmental considerations, and priorities expressed by the users also influence project needs.

In determining needs we must remember that this evaluation is not static. Population, traffic, economic, social and technological changes may dictate re-evaluation and adjustment of priorities.

The upgrading needs presented in this section of the report are based on consideration of the various factors mentioned above.

1.2 Airports

1.2.1 Current Situation

Inventory

The Northwest Territories' Department of Transportation currently owns and operates 43 airports in the Northwest Territories. Transport Canada owns and operates an additional nine airports. As explained below, these will be transferred to the Department of Transportation in July 1995. There are a number of other public airports that are owned and operated by private concerns or communities.

Responsibility

In 1990, the responsibility for 38 Class B and C airports was devolved from Transport Canada to the territorial government, along with base funding. Together with four Class D territorial airports and the recent construction of a new airport at Snare Lake, the territorial government is fully responsible for upgrading, rehabilitation, and operation and maintenance of 43 territorial airports. Of these, 33 are operated on contract by local municipalities, six by Department staff, and four by private contractors.

The Department of Transportation is currently negotiating the devolution of the nine federal airports from Transport Canada to the territorial government. Transfer of these airports is scheduled for July 1, 1995. This will increase the base funding of the Department by approximately $24 million annually. Along with the transfer will come the ability to manage the 52 public airports in the Northwest Territories as an integrated system.

Transport Canada continues to be responsible for providing air navigation systems, and flight and weather information in the Northwest Territories. Transport Canada operates flight service stations (FSS) at the nine federally owned airports, and at two territorial airports. Community airports' radio stations (CARS) are managed by the Department of Transportation at 31 territorial airports. Transport Canada provides the funding for these CARS.

By 1996, it is expected that Transport Canada's responsibilities for air navigation services will be commercialized.

Inventory Of Northwest Territories Public Airports (1994)

Community	Owner	Classification	Certified (Yes/No)	Critical Aircraft	Length (m)	Runway Surface	Lights (Intensity)	Passenger Facility	Weather/Communication Type	Weather/Communication Hrs (Per Wk)	Weather/Communication Other	Navaids ILS	Navaids DME	Navaids NDB
1. Yellowknife	TC	A	Yes	B737	2286	paved	high	ATB	FSS	168		Y	Y	H
2. Iqaluit	TC	A	Yes	B737	2743	paved	high	ATB	FSS	168		Y	Y	M
3. Rankin Inlet	GNWT	A	Yes	B737	1829	paved	high	ATB	FSS	168			Y	M
4. Norman Wells	TC	A	Yes	B737	1829	paved	med	ATB	FSS	168			Y	M
5. Inuvik	TC	A	Yes	B737	1829	paved	high	ATB	FSS	168		Y	Y	H
6. Cambridge Bay	TC	A	Yes	B737	1542	gravel	med	ATB	FSS	168			Y	H
7. Resolute	TC	A	Yes	B737	1981	gravel	high	ATB	FSS	168		Y	Y	H
8. Fort Smith	TC	A	Yes	B737	1829	paved	med	ATB	FSS	168			Y	M
9. Hay River	TC	A	Yes	B737	1849	paved	high	ATB	FSS	168		Y	Y	M
10. Tuktoyaktuk	GNWT	B	Yes	Dornier 228	1524	gravel	med	PS	CARS	112			Y	M
11. Coppermine	GNWT	B	Yes	HS748	1524	gravel	low	PS	CARS	168				M
12. Baker Lake	GNWT	B	Yes	HS748	1280	gravel	med	ATB	FSS	168			Y	H
13. Arviat	GNWT	B	Yes	HS748	1219	gravel	med	ATB	CARS	65.5				M
14. Hall Beach	GNWT	B	Yes	B737	1646	gravel	med	ATB			RCO/RFSS	Y	H	
15. Pond Inlet	GNWT	B	Yes	HS748	1219	gravel	low	PS	CARS	40				H
16. Pangnirtung	GNWT	B	Yes	HS748	884	gravel	med	PS	CARS	64	AWOS			M

17. Nanisivik	GNWT	C	Yes	B737	1951	gravel	med	ATB	CARS	60			L
18. Fort Simpson	TC	C	Yes	DC3	1829	paved	med	ATB	FSS	168		Y	M
19. Déline (Fort Franklin)	GNWT	C	Yes	Tw Otter	762	gravel	low	PS	CARS	65			L
20. Cape Dorset	GNWT	C	Yes	HS748	1219	gravel	low	PS	CARS	40			M
21. Broughton Island	GNWT	C	Yes	HS748	1059	gravel	low	PS	CARS	64			L
22. Clyde River	GNWT	C	Yes	HS748	1067	gravel	low	PS	CARS	65			L
23. Taloyoak (Spence Bay)	GNWT	C	Yes	HS748	1100	gravel	med	ATB	CARS	84			M
24. Coral Harbour	GNWT	C	Yes	HS748	1524	gravel	med	ATB	CARS	168		Y	H
25. Igloolik	GNWT	C	Yes	HS748	1158	gravel	med	ATB	CARS	65			M
26. Pelly Bay	GNWT	C	No	HS748	1457	gravel	low	PS	CARS	70			L
27. Gjoa Haven	GNWT	C	Yes	HS748	1341	gravel	med	ATB	CARS	70			L
28. Aklavik	GNWT	C	Yes	Dornier 228	914	gravel	low	ATB	CARS	65			L
29. Sanikiluaq	GNWT	C	Yes	HS748	1158	gravel	low	PS	CARS	50			M
30. Fort Norman	GNWT	C	Yes	Tw Otter	914	gravel	low	ATB	CARS	40			L
31. Fort Good Hope	GNWT	C	No	Tw Otter	914	gravel	low	PS	CARS	65		Y	M
32. Holman	GNWT	C	Yes	HS748	1311	gravel	low	ATB	CARS	65			M
33. Lake Harbour	GNWT	C	Yes	Tw Otter	579	gravel	low	PS	CARS	40			M
34. Repulse Bay	GNWT	C	Yes	HS748	1036	gravel	med	ATB	CARS	65.5			M
35. Whale Cove	GNWT	C	Yes	HS748	1219	gravel	med	ATB	CARS	65.5			L
36. Lutsel K'e (Snowdrift)	GNWT	C	Yes	Tw Otter	914	gravel		PS*					L
37. Chesterfield Inlet	GNWT	C	Yes	HS748	1097	gravel	med	ATB	CARS	65.5			L
38. Sachs Harbour	GNWT	C	Yes	Dornier 228	1219	gravel	low	ATB	CARS	65	AWOS		M
39. Paulatuk	GNWT	C	Yes	Dornier 228	1220	gravel	med	PS	CARS	65			M
40. Lac La Martre	GNWT	D	Yes	Tw Otter	914	gravel	med	PS			AWOS		L
41. Wrigley	GNWT	D	Yes	Gulfstream 1	1067	gravel	low	PS	CARS	40		Y	M
42. Grise Fiord	GNWT	D	No	Tw Otter	610	gravel	low	PS	CARS	40			M
43. Fort McPherson	GNWT	D	Yes	Dornier 228	1067	gravel	low	PS	CARS	65			M
44. Fort Liard	GNWT	D	Yes	Tw Otter	914	gravel	low	ATB	CARS	40	AWOS		M
45. Rae Lakes	GNWT	D	Yes	Tw Otter	914	gravel	med	PS			AWOS		L
46. Fort Resolution	GNWT	D	Yes	Gulfstream 1	1265	gravel	med	ATB	CARS	65			M
47. Nahanni Butte	GNWT	D	No	Tw Otter	762	earth/gravel	med						
48. Fort Providence	GNWT	D	Yes	Tw Otter	914	gravel	low				AWOS		L
49. Trout Lake	GNWT	D	Yes	Tw Otter	762	gravel	low				AWOS		L
50. Jean Marie River	GNWT	D	Yes	Tw Otter	762	gravel	low						
51. Colville Lake	GNWT	D	No	Tw Otter	823	gravel/sand	low				AWOS		
52. Snare Lake	GNWT	D	Yes	Tw Otter	914	gravel	med *	PS *					

Abbreviations
ATB - Air Terminal Building
AWOS - Automated Weather Observation System
CARS - Community Airport Radio Station
DME - Distance Measuring Equipment
FSS - Flight Service Station
GNWT - Government of the Northwest Territories
H- High Power
ILS - Instrument Landing System
L - Low Power
M- Medium Power
NDB - Non-Directional Beacon
PS - Passenger Shelter
RCO/RFSS - Remote Communication Outlet/ Remote Flight Service Station
TC - Transport Canada
** - To be installed in 1995/96*

Transport Canada also provides most of the electronic air navigation aids in the Northwest Territories such as non-directional beacons (NDB) at nine federal and 25 territorial airports, distance measuring equipment (DME) at nine federal and seven territorial airports, and instrument landing systems (ILS) at five federal airports. The Department of Transportation has also provided NDB's at four smaller airports.

Classification

The classification of public airports in the Northwest Territories as class A, B, C or D has been updated in this document to reflect the airport's current role and air traffic. The updated classification takes into account the volume of passenger traffic, the number of aircraft movements, the role of the airport in terms of the type of airline service, comections to other airports, the type of aircraft serving the airport, remoteness, and the availability of alternative means of transportation.

It should be noted that a given airport's classification can change over time as factors determining the classification change.

Airport Standards and Critical Aircraft

The "critical aircraft", defined as the largest aircraft using a specific airport on a regular basis, determines most of the physical characteristics and zoning requirements for an airport as prescribed in Transport Canada's standards, guidelines and regulations.

The aircraft in current use in the North, such as the Boeing 737, Hawker Siddley 748 and Twin Otter, are expected to be in service for at least the next ten years. Therefore, airport improvements planned for the short and medium-term are based on providing facilities for the current critical aircraft. Selected locations may require upgrading as passenger and freight volumes increase, allowing air carriers to utilize larger and more efficient aircraft.

Future aircraft choices by carriers will depend on several factors.

- Demand: Market demand will obviously be the major influence on the optimum size and type of aircraft. The desire for efficiency will encourage continuing use of "combi" aircraft which efficiently carry a mix of passengers and cargo on the upper deck of the aircraft.
- Economics: Older aircraft are generally less expensive to purchase but more expensive to operate.
- Regulation: Air carrier regulation can often increase costs or restrict options. For example, current proposals which could have the effect of regulating "combi" aircraft configurations out of service would cause severe disruptions in the current air service patterns in the North.
- Facilities: Airport facilities (e.g. runway lengths and surface type, navigation aids) may effectively restrict options for service.

The long-term airport facility needs projected in this section are based on the assumption that the current critical aircraft will be replaced by one of the potential future critical aircraft within 20 years. It should be noted that facility requirements are similar for most aircraft of a similar range and capacity.

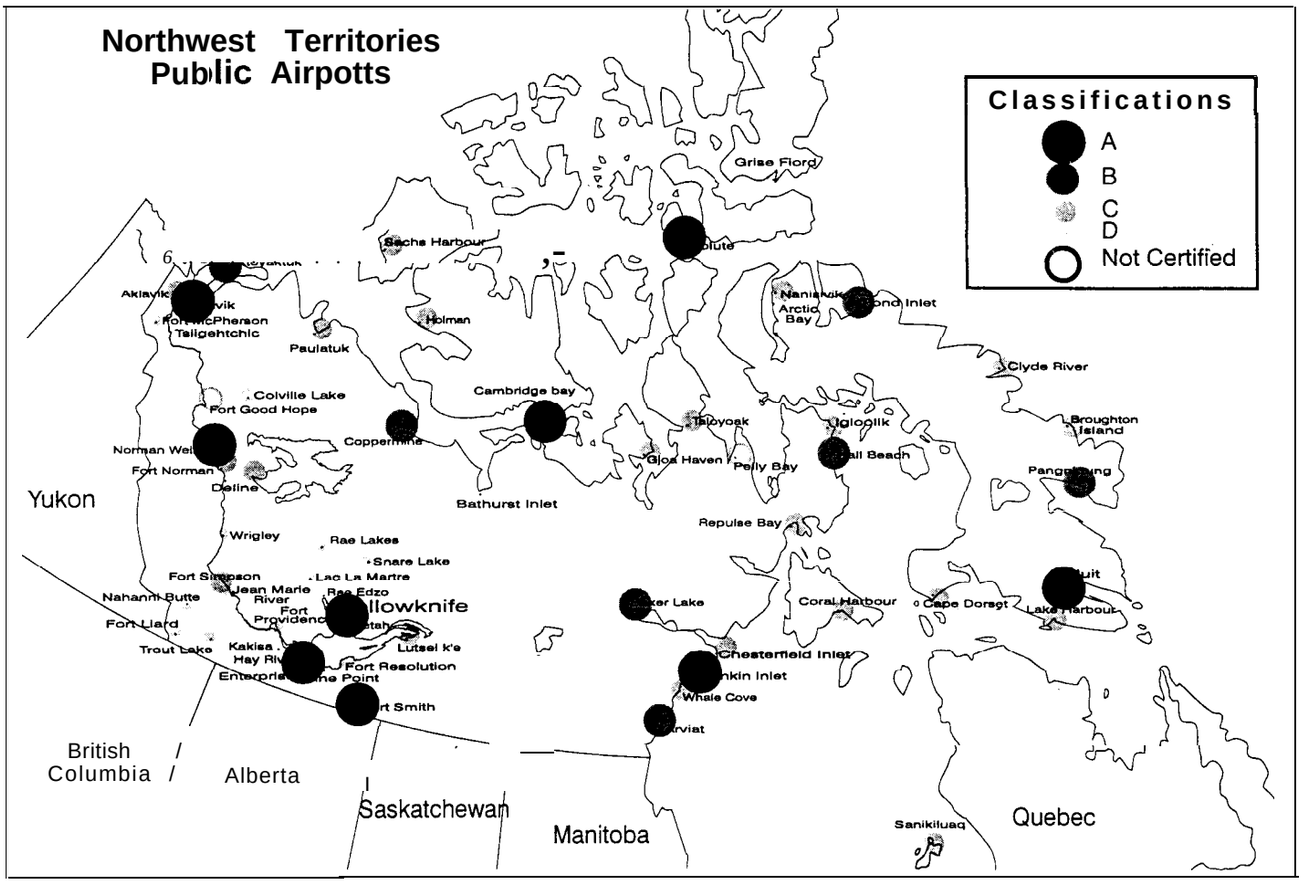
The Department will monitor air carrier plans and other technological and economic developments, and amend future plans for airport facilities according to needs.

Air Service and Traffic

It is not surprising, given the vast distances and lack of alternatives, that air routes are the lifeline of northern transportation. In fact, territorial residents use airplanes nearly five times as often as the average Canadian.

Air service in the Northwest Territories has followed a pattern similar to that in the south. Increased competition, especially on major north-south corridors, and affiliations between local and regional carriers have permitted regional carriers to offer efficient "brand name" service. This has resulted in most residents enjoying increased access to national airline networks, improved service levels, and a wider selection of full and discount fares.

Since the mid-1980's, there has been a gradual increase in jet service between major northern points, brought about by the expanded services of both Canadian North and First Air. Since 1991, the total number of flights has increased slightly, while the number of seats offered declined slightly. Trends in seating capacity are difficult to measure due to the frequent re-configuring of combination aircraft, as carriers adjust to more effectively serve the varied needs of their customers.



Airline's Current Aircraft And Potential Future Alternatives (1994)

Airline	*Largest Aircraft Currently Operating*	*Potential Future Alternatives*
NWT Air	Boeing 737-200	Boeing 737-500,
Canadian North	Boeing 737-200	757 or 767
First Air	Boeing 727	
Canadian North	Hawker Siddeley 748	BAe 146-300 or
First Air	Hawker Siddeley 748	Fokker 100
Buffalo Air	DC-4	
Canadian Regional	Fokker F28	
Calm Air	Hawker Siddeley 748	
Aklak Air	Twin Otter/King Air	Dornier 328 or F28
Ptarmigan Airways	Gulfstream 1	ATR 42, CASA 212
North Wright Air	King Air 200	Fokker 50 or
Air Tindi	Twin Otter	Dash 8-100
Keewatin Air	Merlin	Twin Otter
Air Baffin	Chieftain	

Classification Of Northwest Territories Public Airports (1994)

Community	*Aircraft Connecting To Hub*	*Pop.*	*Enplaned & Deplaned Passengers*	*Aircraft Movements*	*Classification Index*	*Classification*
1. Yellowknife	737	15179	197372	46719	11251	A
2. Iqaluit	737	3552	71393	12376	10852	A
3. Rankin Inlet	737	1706	24658	6640	4012	A
4. Norman Wells	737	627	27679	16951	3534	A
5. Inuvik	737	3206	57240	16600	3211	A
6. Cambridge Bay	737	1116	13423	5409	2372	A
7. Resolute	737	171	10191	4825	2220	A
8. Fort Smith	F28	2480	21140	9695	1256	A
9. Hay River	F28	3206	26626	7838	1128	A
10. Tuktoyaktuk	Twin Otter/King Air	918	12044	8689	953	B
11. Coppermine	737	1059	6783	2713	895	B
12. Baker Lake	HS748	1186	7435-	2439	885	B
13. Arviat	HS748	1323	7422	1015	628	B
14. Hall Beach	737	526	3683	2150	608	B
15. Pond Inlet	HS748	974	5175	1430	568	B
16. Pangnirtung	HS748	1135	7737	1077	548	B
17. Nanisivik	737/727	294	5294	528	413	c
18. Fort Simpson	G-1	1142	742%	3787	376	c
19. Déline (Fort Franklin)	Twin Otter	551	3953	3450	358	c
20. Cape Dorset	HS748	961	4759	901	298	c
21. Broughton Island	HS748	461	3215	1223	275	c
22. Clyde River	HS748	565	2785-	1102	244	c
23. Taloyoak (Spence Bay)	HS748/G-1	580	4218	579	238	c
24. Coral Harbour	HS748	578	2660-	1077	236	c
25. Igloolik	HS748	936	4518	431	232	c
26. Pelly Bay	HS748/G-1	409	3479	767	231	c
27. Gjoa Haven	HS748/G-1	783	3771	667	231	c
28. Aklavik	Twin Otter	801	5183	1728	207	c
29. Sanikiluaq	HS748	526	1814	1069	201	c
30. Fort Norman	Twin Otter	375	2106	2560	196	c
31. Fort Good Hope	Twin Otter	602	3261	1964	183	c
32. Holman	HS748/G-1	361	2365	695	178	c
33. Lake Harbour	Twin Otter	365	2805	844	160	c
34. Repulse Bay	HS748	488	2510	414	150	c
35. Whale Cove	HS748	235	1929	581	147	c
36. Lutsel K'e (Snowdrift)	Twin Otter/Caravan	286	2417	825	147	c
37. Chesterfield Inlet	HS748	316	2282	447	145	c
38. Sachs Harbour	Twin Otter/King Air	125	1393	560	123	c
39. Paulatuk	Twin Otter/King Air	255	1383	550	121	c
40. Lac La Martre	Twin Otter/Caravan	392	2024	680	81	D
41. Wrigley	Piper Aztec	174	2230	1019	53	D
42. Grise Fiord	Twin Otter	130	1115	204	52	D
43. Fort McPherson	Twin Otter	759	1210	724	45	D
44. Fort Liard	Norman Islander	485	2334	1117	34	D
45. Rae Lakes	Twin Otter/Caravan	252	863	375	30	D
46. Fort Resolution	Twin Otter	515	1759	837	26	D
47. Nahanni Butte	Twin Otter	85	480-	155	14	D
48. Fort Providence	Twin Otter	645	238	135	11	D
49. Trout Lake	Norman Islander	66	320	105	6	D
50. Jean Marie River	Twin Otter	49	245	105	6	D
51. Colville Lake	Twin Otter	69	72	31	3	D
52. Snare Lake	Twin Otter	126				

Note: Population, passengers and aircraft movements based on 2991 data

While total enplaned and deplaned revenue passengers increased steadily from 152,000 in 1970 to 644,000 in 1989, they decreased by nearly 4 percent per year until 1993. The general economic downturn and reduced government travel are the primary causes of lower air traffic volumes. The number of passengers grew by 2 percent to 576,000 in 1993. Future traffic levels are projected to grow at 3 percent annually to the year 2000, mainly due to a general economic recovery and increased mineral exploration and development, particularly for diamonds and gold.

Northern and remote communities are heavily dependent on air cargo service due to the lack of infrastructure for other modes of transport. Air cargo volumes for the top six Northwest Territories' airports remained fairly constant between 1985 and 1989. However, since 1989, cargo volumes have decreased by an average of nearly 10 percent per year. Increase in mineral exploration and development, and an economic recovery are expected to slowly reverse this downward trend.

Freight capacity on scheduled services is provided largely by Canadian North's B737 combis, First Air's B727 combis, NWT Air's B737 combis and Hercules, and Ptarmigan's Gulfstream combis, as well as other turboprop aircraft. "Combis" are aircraft carrying combined loads of passengers and cargo in separate compartments on the upper deck. Smaller independent carriers offer additional capacity for shipment of air cargo on both scheduled and charter services.

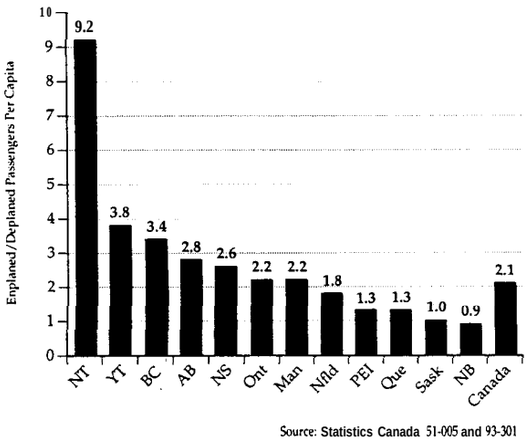
User Costs

Except for short haul flights, analysis of territorial airfares continues to show a significant premium on a cost per seat-kilometre basis for northern air travel compared to the "southern baseline" of high density, competitive routes of similar distances. The higher rates are attributed by carriers to higher operating costs, higher fuel costs, lower route densities, and poorer facilities and services.

Rates vary significantly between regions and from community to community. Most short haul routes in the Northwest Territories are somewhat cheaper than the southern baseline, while long haul routes (greater than 300 kilometres) are over 40 percent more expensive in the Mackenzie Valley, and over 70 percent more expensive on eastern and northern Arctic coast routes. Reasons for lower short haul rates are the use of smaller, cheaper

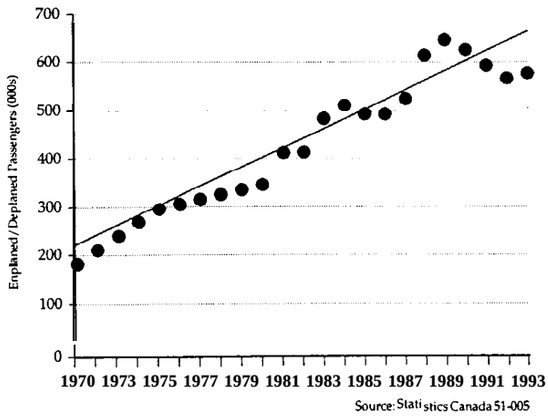
Per Capita Air Travel Activity (1993)

By Territory and Province



Source: Statistics Canada 51-005 and 93-301

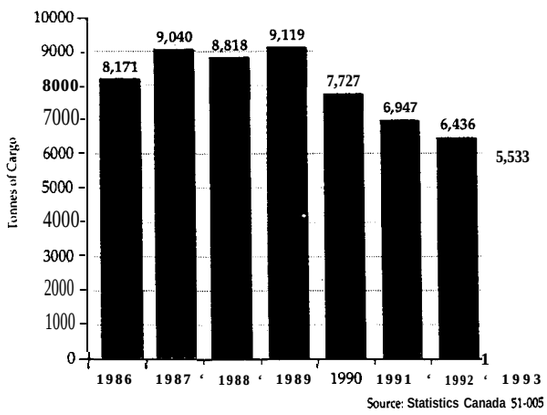
Annual NWT Enplaned/Deplaned Revenue Air Passengers



Source: Statistics Canada 51-005

Top Six NWT Airports

Enplaned Plus Deplaned Cargo



Source: Statistics Canada 51-005

aircraft and competition among the large number of air carriers licenced to serve the communities in the Mackenzie Valley.

Air freight rates follow a similar pattern to passenger rates. However, larger customers may negotiate rates or charter aircraft at costs well below the published air carrier tariffs.

Safety

Airports in the Northwest Territories have an excellent safety record. The Department of Transportation's basic objective continues to be that all airports meet and operate in accordance with airport certification and safety standards.

Periodic inspections by Transport Canada inspectors verify continued conformity. As well, Department staff monitor and inspect airports on a continuing basis. Deviations from airport certification safety standards are rectified by the Department through routine maintenance, major reconstruction / replacement, or new airport construction. In cases where deviations are prohibitively costly to alleviate, measures have and will continue to be taken, in cooperation with Transport Canada, to provide for an equivalent level of safety.

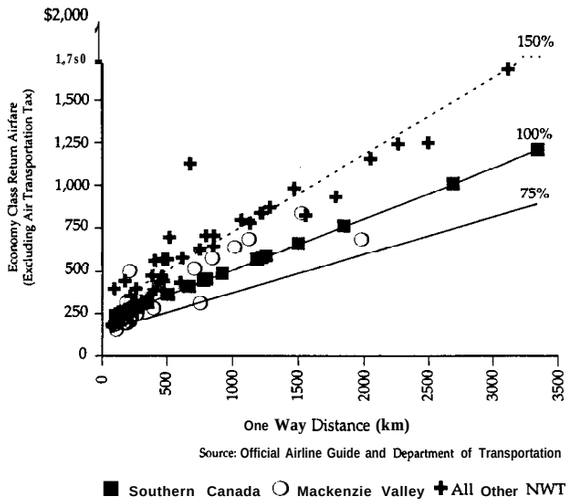
As of 1994, five of the 43 airports in the Northwest Territories owned by the Department of Transportation were not certifiable. As discussed below, within the next five years, three of the five airports will become certified. Art additional seven airports are presently in the process of becoming certified.

Current Expenditures

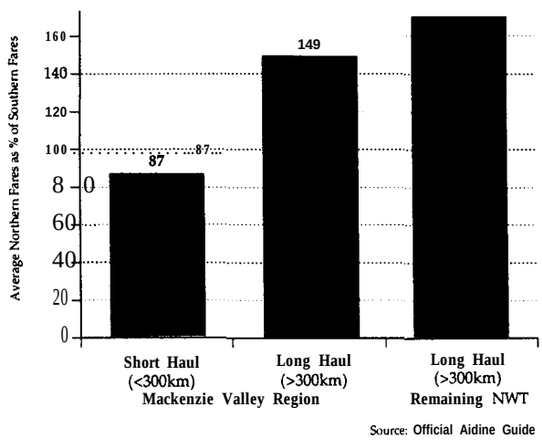
The Department's 1994/95 estimated expenditure on airports is $25.5 million, distributed as shown below.

Capital (1994/95 Capital Estimates)	
Rehabilitation and Restoration of Airport Infrastructure	$4.3 million
Airport Construction/Upgrading	$7.5 million
Total Capital	$11.8 million
Operation and Maintenance (1994/95 Estimates)	$13.7 million
Total	$25.5 million

Comparison of NWT Air Fares to Southern Canada Baseline (1994)



Comparison of NWT Air Fares to Southern Canada Baseline (1994)



The capital total includes a $1.8 million contribution from Transport Canada under the Canada/Northwest Territories Construction Contribution Agreement of 1991, and a $1.9 million contribution under the Strategic Transportation Improvement Agreement of 1993.

Transport Canada's 1994/95 expenditure at the nine federal airports is estimated at $22.4 million ($7.2 million for capital, and $15.2 million for operation and maintenance).

In 1994/95, Transport Canada provided $3.6 million to the Department of Transportation for the operation of 26 community airports' radio stations (CARS). This expenditure was additional to the $13.7 million spent by the territorial government on airport operation and maintenance.

1.2.2 Accomplishments and Problems

In 1990, the following 11 territorial airports did not meet certification requirements:

Colville Lake	Lac La Martre	Pelly Bay
Fort Good Hope	Lutsel K'e	Rae Lakes
Grise Fiord	Nahanni Butte	Trout Lake
Jean Marie River	Paulatuk	

Since 1990, new airports have been built to certification standards at six of these communities, namely Jean Marie River, Lac La Martre, Lutsel Ke, Paulatuk, Rae Lakes and Trout Lake. Construction is underway at Pelly Bay, Déline and Fort Good Hope. Pre-engineering and design is underway for a new airport at Nahanni Butte.

In 1990, nine territorial airports were considered to have restrictions to improvements at their current location and/or were in conflict with community land use, or posed restrictions to the orderly planning and expansion of growing communities:

Déline	Lake Harbour	Paulatuk
Fort Good Hope	Nahanni Butte	Rae Lakes
Lac La Martre	Pangnirtung	Repulse Bay

Of these, Lac La Martre, Paulatuk and Rae Lakes now have new airports, and construction has started on new airports at Déline and Fort Good Hope. Pre-engineering and design is underway at Nahanni Butte.

In 1990, there were no airports at Rae-Edzo, Snare Lake and Tsiigehtchic (Arctic Red River). Construction of a new airport at Snare Lake was started in 1993 and opened to traffic in 1994. Completion is scheduled for 1995. Needs assessment studies are ongoing at Rae-Edzo and Tsiigehtchic (Arctic Red River).

Other facilities required at airports included terminal buildings, maintenance equipment, and parking garages and navigation aids.

The type and size of terminal facilities depend on the number of passengers, air carrier requirements, and aviation services to be provided from the terminal. Terminal buildings can thus range from small modular buildings at C and D airports serving low traffic volumes, to small terminal buildings at B and C airports serving modest traffic volumes, to full-fledged air terminal buildings at A airports housing a full range of air carrier and navigation services.

The following eight of the 43 territorial airports do not have terminal facilities as of the end of 1994:

Colville Lake	Jean Marie River	Snare Lake
Fort Providence	Lutsel K'e	Trout Lake
Grise Fiord	Nahanni Butte	

In addition to ongoing maintenance, all airport facilities require periodic capital rehabilitation, renovation, expansion or replacement due to age, obsolescence or additional traffic demands.

Since 1990 the following major rehabilitations, improvements/expansions have been undertaken at territorial airports.

Air Terminal Buildings

- ***New*** terminal buildings were provided at Arviat and Igloolik and a new passenger shelter was provided at Paulatuk.
- Major expansions and renovations were underway at Coppermine and Tuktoyaktuk and construction of new air terminal buildings were underway at Rankin Inlet and Pangnirtung.

Runways and Airfield Lighting

- Runway rehabilitation including lighting has been completed or is underway at Arviat, Cape Dorset, Clyde River, Fort Providence, Pond Inlet, Repulse Bay, Taloyoak and Sanikiluaq, and is scheduled to begin at Broughton Island and Igloolik.
- Chesterfield Inlet runway was extended by 183 metres and lighting was upgraded.
- Rankin Inlet runway was widened and extended to 1829 metres and paved along with the apron and taxiway. High intensity runway edge lighting and approach lighting were installed.
- Low intensity airfield lighting was installed at Colville Lake, Fort Providence, Jean Marie River and Trout Lake.

Air Navigation Services

- A major extension to the CARS hours of operation was implemented during 1991.
- Basic automated weather observation systems (AWOS) were installed at Colville Lake, Fort Providence, Lac La Martre, Rae Lakes, Sachs Harbour and Trout Lake.
- Advanced AWOS were installed at Cape Dorset, Clyde River and Pond Inlet in 1994.

1.2.3 Program Objectives

The operation and maintenance, and capital program objectives at territorial airports are described below.

Operation and Maintenance

Operating and maintaining the 43 territorial airports at an acceptable level of safety, service and reliability will remain the Department's highest priority in the airport program.

The $13.7 million budgeted for operation and maintenance in 1994/95 provided for ongoing operation, maintenance and reconditioning of runways, taxiways, aprons, buildings, lights and equipment, and for resurfacing /regravelling of runways, taxiways and aprons. Future operation and maintenance needs are expected to increase as additional facilities and services are provided at the territorial airports.

Capital

The objectives of the airport capital program are described below. For each objective, the needs are presented in two categories. "Currently justified" needs are deficiencies which exist now and should ideally be addressed in the next five years, while "future" needs are ones which will arise as existing facilities become deficient because of age, obsolescence, increase in traffic and /or user demand.

1. *Rehabilitation and Restoration*

Air terminal building rehabilitation, replacement or expansion is currently underway or is required at:

Broughton Island	Holman	Sanikiluaq
Cape Dorset	Pangnirtung	Taloyoak
Coppermine	Pond Inlet	Tuktoyaktuk
Fort McPherson	Rankin Inlet	Wrigley
Gjoa Haven	Sachs Harbour	

Rehabilitation/replacement of lights, equipment and garages is required at many other airports.

The cost of addressing these currently justified needs over the next five years is estimated at $23 million.

Additional future needs of $84 million are forecast within the next 20 years.

2. *Upgrade for Certification*

At the end of 1994 only five airports (Colville Lake, Fort Good Hope, Grise Fiord, Pelly Bay and Nahanni Butte) were not certifiable. Of these, three have the highest priority for upgrading/relocation and are programmed for improvement over the next five years.

Fort Good Hope, Pelly Bay	(completion in 1995)
Nahanni Butte	(completion in 1998)

Upgrading the remaining two non-certified airports at Colville Lake and Grise Fiord cannot currently be justified due to the low existing and forecast traffic volumes and the high costs of construction.

Territorial Airports Certification Status

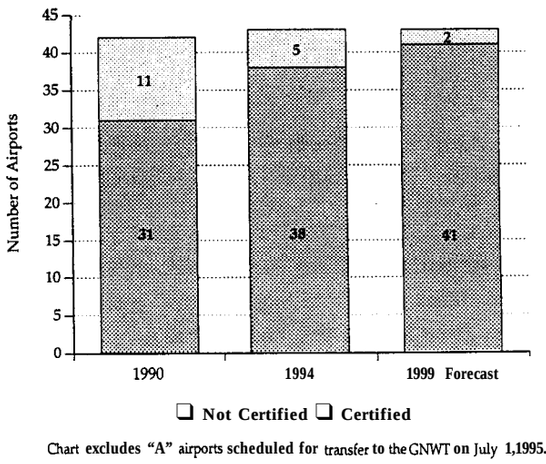


Chart excludes "A" airports scheduled for transfer to the GNWT on July 1,1995.

3. *Construct/Upgrade for Current Standards of Safety, Service and Convenience*

This objective includes providing airport facilities at communities where none presently exists or upgrading/relocating existing airports for improved safety, service, convenience or to reduce conflict with community land use requirements.

Many airports, although certified, do not meet standards for efficient and safe operation. Others have runways which are too short, restrict the efficient use of aircraft, have inadequate lighting, or approach and navigation aids, that are not satisfactory.

Currently justified needs are listed below.

New or *Upgraded Airport:*

Coppermine	(upgrade airport runway and apron)
Deline	(relocate airport)
Rae/Edzo	(new airport)

New Hazard Beacons:

Broughton Island	Lutsel K'e
Cape Dorset	Pangnirtung
Lake Harbour	Repulse Bay

New or Replacement Passenger Shelters/Terminals:

Colville Lake	Grise Fiord	Pelly Bay
Deline	Jean Marie River	Snare Lake
Fort Good Hope	Lutsel K'e	Trout Lake
Fort Providence	Nahanni Butte	Wrigley

Airports in several other communities such as Lake Harbour, Pangnirtung and Repulse Bay have restrictions to improvements because of location or are in conflict with community land use. Relocating these airports is very expensive, estimated to cost $12 to $15 million each, and cannot currently be justified.

4. improve *Air Navigation Systems*

The Department's objective is to maintain and enhance the level of safety and reliability of air navigation systems in the Northwest Territories by taking advantage of new and emerging technology in automated weather reporting and satellite navigation systems and global positioning systems (GPS).

It is anticipated that new aviation technology will lead to significant improvements in air safety and reliability at reduced costs.

We will work with the federal and commercial agencies to ensure that these technological improvements are implemented at federal and territorial airports in the Northwest Territories, at minimal impact to communities.

5. *Upgrade to Standards for Future Critical Aircraft*

Future needs for upgraded airport facilities to accommodate projections of air traffic, aircraft types and characteristics, and aviation regulations are forecast at 16 territorial airports. Factors influencing future needs can change, and therefore reduce or increase the future requirements for airport facilities.

1.2.4 Program Funding Requirements

Operation and Maintenance

The operation and maintenance requirements for the existing territorial airports are estimated at $14 million per year in constant 1994 dollars. The funding level will need to be adjusted as facilities are added or upgraded. It is assumed that the Department will receive sufficient allocations from the territorial government to meet these funding requirements.

Transport Canada plans to commercialize the Canadian Civil Air Navigation System (ANS). At the same time, Transport Canada is also closing down several flight service stations in the Northwest Territories as a cost-cutting measure. These two initiatives could have a far reaching impact on the air navigation system in the Northwest Territories.

The replacement of flight service stations and community airport radio stations with unmanned, automated weather observation systems and remote communication outlets will result in a reduction in the annual funding provided by Transport Canada for the operation and maintenance of these stations. If it is determined that there is a need to retain manned weather observation and communication outlets for special safety or operating requirements, the Department will seek ongoing funding from Transport Canada for the operation of these facilities.

The overall impact of commercialization of the ANS program will be carefully monitored to ensure that remote communities will continue to receive adequate service.

Capital

The total current and future (20 year) capital needs for airport improvements are estimated at $295 million. Of these, $44 million are currently justified on the basis of certification, service and safety needs.

Air-ports Program Capital Needs (1994 $000's)

Program Objective/Task	*Currently Justified Needs*	*Future Needs Within 20 Years*	*Total*
1. Rehabilitation and Restoration			
Restoration and Replacement of terminals, lighting, equipment and garages	23,000	83,658	106,658
2. Upgrade For Certification			
Colville Lake (relocate airport)		3,000	**3,000**
Fort Good Hope (relocation)'	500		500
Nahanni Butte (relocation)	2,900		2,900
Pelly Bay (upgrading)	1,120		1,120
Lutsel K'e (Snowdrift) (upgrade completion)	20		20
Subtotal - Objective 2	**4,540**	**3,000**	**7,540**
3. Construct/Upgrade for Safety, Service and Convenience			
New ATB's or Passenger Shelters			
Colville Lake	200		200
Déline (Fort Franklin)	200	750	950
Fort Good Hope	200	1,500	1,700
Fort Providence	200		200
Grise Fiord	200		200
Jean Marie River	200		200
Lutsel K'e (Snowdrift)	200	750	950
Nahanni Butte'	200		200
Pelly Bay	350		350
Snare Lake	200		200
Trout Lake	200		200
Wrigley	200		200
Aklavik		1,500	1,500
Clyde River		1,500	1,500
Coppermine		2,000	2,000
Fort Resolution		750	750
Lac La Martre		750	750
Lake Harbour		250	250
Paulatuk		750	750
Pond Inlet		1,500	1,500
Rae Lakes		1,100	1,100
Sachs Harbour		1,500	1,500
Upgrade Lighting			
Aklavik		500	500
Fort Norman		500	500
Sachs Harbour		500	500
Hazard Beacons			
Broughton Island	200		200
Cape Dorset	200		200
Lake Harbour	200		200
Lutsel K'e (Snowdrift)	200		200
Pangnirtung	200		200
Repulse Bay	200		200
Coppermine (runway upgrade and extension)	1,200	1,500	2,700
Déline (Fort Franklin) (new airport)	3,500		3,500

Airports Program Capital Needs (1994 $000's)

Program Objective/Task	*Currently Justified Needs*	*Future Needs Within 20 Years*	*Total*
Pangnirtung (apron expansion)	500		500
Rae-Edzo (new airport)	3,000		3,000
Rankin Inlet (apron expansion)	500		500
Rankin Inlet (commercial lot development)	500		500
Snare Lake (new airport)	800		800
Arctic Bay (runway extension, apron/taxiway development)		6,000	6,000
Grise Fiord (upgrade airport)		2,000	2,000
Lake Harbour (new airport)		14,000	14,000
Pangnirtung (upgrade/relocate airport)		15,000	15,000
Trout Lake (relocation)		5,000	5,000
Tsiigehtchic (Arctic Red River) (new airport)		3,500	3,500
Subtotal - Objective 3	**13,750**	63,100	76,850
4. Improve Air Navigation Systems			
Precision Approach Path Indicator			
Broughton Island	200		200
Cape Dorset	200		200
Clyde River	200		200
Lake Harbour	200		200
Pangnirtung	200		200
Pond Inlet	200		200
Sanikiluaq	200		200
Differential Global Positioning System			
Baker Lake	200		200
Other Selected Locations		800	800
Subtotal - Objective 4	***1,600***	**800**	**2,400**
5. Upgrade to Standards for Future Critical Aircraft			
Aklavik (runway extension)		1,500	1,500
Arviat (runway extension, apron/taxiway expansion)		1,000	1,000
Baker Lake (runway extension, apron/taxiway expansion)		14,000	14,000
Broughton Island (runway extension, apron/taxiway expansion)		1,000	1,000
Cape Dorset (runway extension or relocation)		5,000	5,000
Chesterfield Inlet (runway extension)		1,000	1,000
Clyde River (runway extension, apron expansion)		1,500	1,500
Gjoa Haven (runway extension/widen, apron/taxiway expansion)		3,000	3,000
Holman (runway extension/widen, apron/taxiway expansion)		3,000	3,000
Igloolik (runway extension, apron/taxiway expansion)		1,000	1,000
Pound-Inlet (runway extension, apron expansion, taxiway widen)		2,500	2,500
Repulse Bay (relocate airport)		12,000	12,000
Runway Paving (selected locations)		50,000	50,000
Sanikiluaq (runway extension, apron/taxiway expansion)		1,000	1,000
Taloyoak (Spence Bay) (runway extension)		1,500	1,500
Whale Cove (runway extension, apron/taxiway expansion)		1,000	1,000
Subtotal - Objective 5	0	100,000	100,000
Airport Planning Studies	**1,000**	**500**	**1,500**
Total Capital Needs	**43,890**	251,058	**294,948**

The Department's current capital plan proposes to spend $37 million on airports over the next five years. Of this amount, $23 million must be allocated for rehabilitation and restoration of existing airport facilities.

For the remaining $14 million, upgrading airports to meet certification and operational standards for current critical aircraft will be given priority. Airport construction/upgrading is underway at Coppermine, Deline, Fort Good Hope, Lutsel Ke, Nahanni Butte, Pelly Bay and Snare Lake. As a result, by the end of 1998, all but two of the territorial airports (Colville Lake and Grise Fiord) will have certified status.

To address all currently justified needs over the next 5 years would require an additional $7 million.

The Department will pursue several possible sources for additional funds for current and future capital needs of the airport program.

The devolution of the nine Arctic "A" airports from Transport Canada to the territorial government will occur on July 1, 1995. The Department of Transportation will then be responsible for the planning, capital improvement and operation and maintenance of the entire public airport system in the Northwest Territories.

We will continue to seek funding from Transport Canada under cost-shared agreements for capital improvements at territorial airports.

1.3 Highways

1.3.1 Current Situation

Inventory

The Northwest Territories' highway network consists of 2,200 kilometres of all-weather roads, and 1,300 kilometres of winter roads. Private mining companies construct an additional 800 kilometres of winter roads. Most of this system was constructed between 1960 and 1983. The current estimated replacement value exceeds one billion dollars.

The Northwest Territories' highway system includes five vehicle ferries. They are located on Highway 3 south of Fort Providence, Highway 1 at Fort Simpson, Highway 1 at N'dulee between Fort Simpson and Wrigley, Highway 8 at Fort McPherson, and Highway 8 at Tsiigehtchic (Arctic Red River).

This highway and ferry network provides all-weather access to 54 percent of the Northwest Territories' population, and seasonal winter access to an additional 7 percent. In addition, off-highway residents of the Mackenzie Valley and the Western, Central and High Arctic benefit from the highway system, since goods are transported by truck to Hay River, Yellowknife and Inuvik for transshipment by barge or air. In total, 70 percent of the population receives significant benefits from the highway system.

Responsibility

Most of the Northwest Territories' highway system was built by the federal government. Responsibility for highway and ferry operations and maintenance was transferred to the territorial government in 1981. Responsibility for capital rehabilitation was transferred in 1984 (intra-territorial highways) and 1990 (inter-territorial highways).

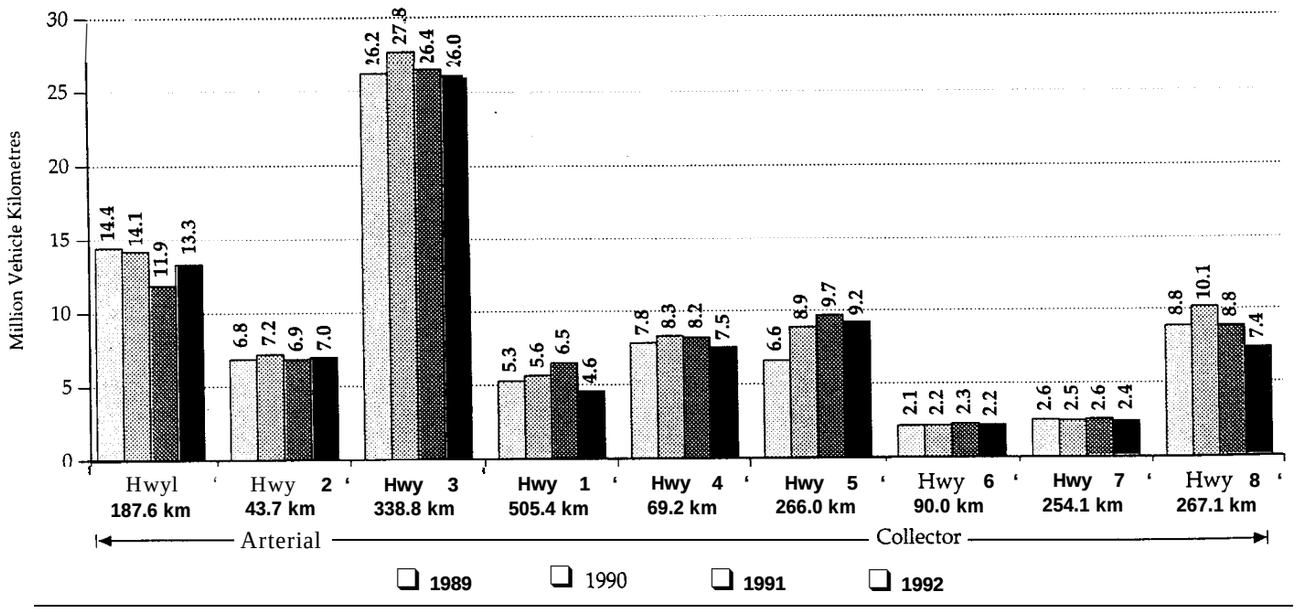
The federal government retains responsibility for any new highway construction, and for providing additional funding for operation, maintenance and rehabilitation required for new highways. However, at this time the federal government has no plans for any new road construction in the North.

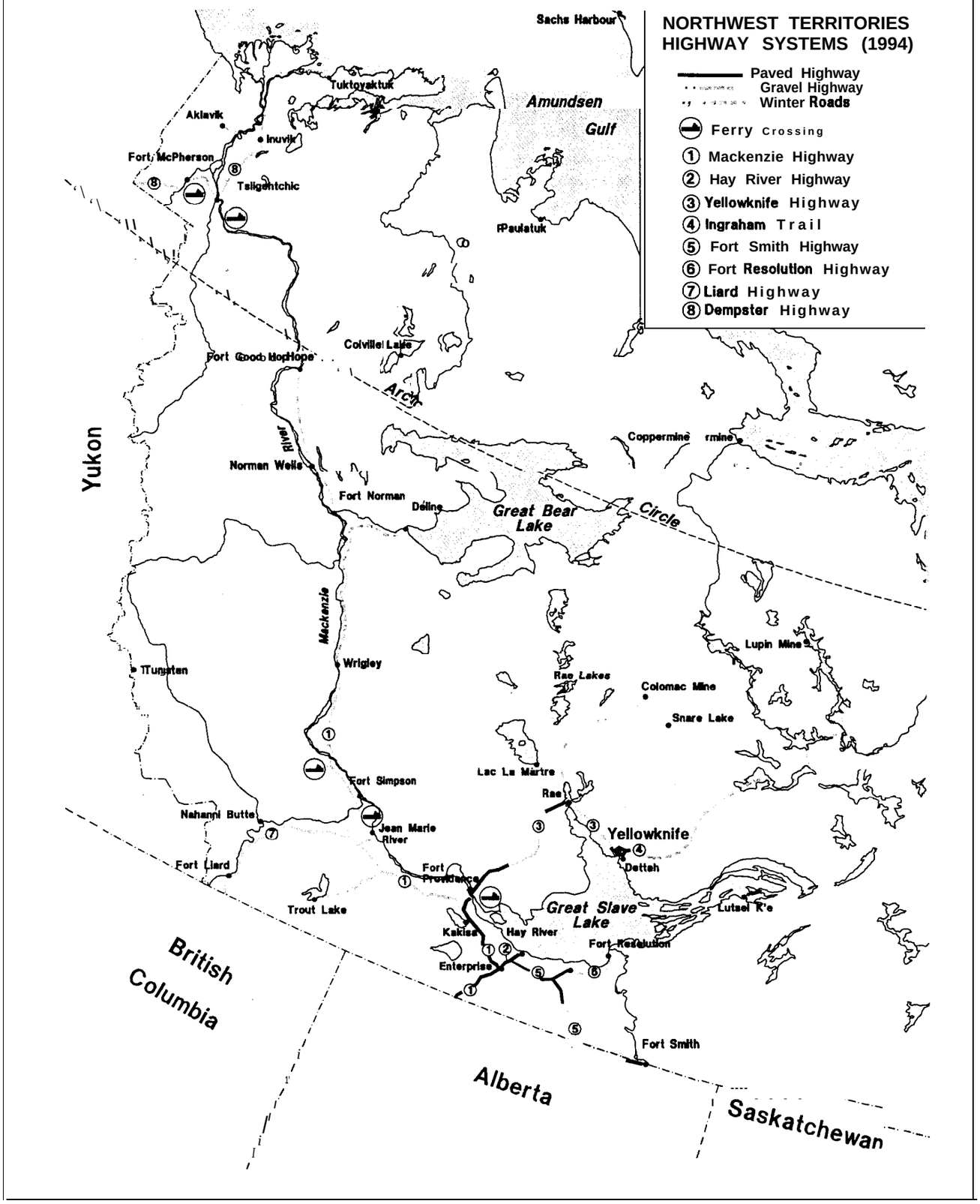
Traffic

Traffic volumes vary widely throughout the system. There is an ongoing program of mechanical and visual counts and surveys to monitor changes in the number, type and size of vehicles on the system.

The arterial routes between the Alberta border and Hay River and Yellowknife carry more than 50 percent of the estimated 80 million vehicle-kilometres driven on territorial highways each year.

Travel on Northwest Territories Highways




NORTHWEST TERRITORIES
HIGHWAY SYSTEMS (1994)
Paved Highway
Gravel Highway
Winter Roads
Ferry Crossing
1 Mackenzie Highway
2 Hay River Highway
3 Yellowknife Highway
4 Ingraham Trail
5 Fort Smith Highway
6 Fort Resolution Highway
7 Liard Highway
8 Dempster Highway
Sachs Harbour
Tuktoyaktuk
Amundsen Gulf
Aklavik
Inuvik
Fort McPherson
Tsiigehtchic
Paulatuk
Colville Lake
Fort Good Hope
Arctic Circle
Yukon
Norman Wells
Mackenzie River
Fort Norman
Déline
Great Bear Lake
Coppermine
Wrigley
Tungsten
Lupin Mine
Rae Lakes
Colomac Mine
Snare Lake
Lac La Martre
Fort Simpson
Rae
Nahanni Butte
Jean Marie River
Yellowknife
Dettah
Fort Liard
Fort Providence
Trout Lake
Great Slave Lake
Lutsel K'e
Kakisa
Hay River
Fort Resolution
Enterprise
British Columbia
Alberta
Saskatchewan
Fort Smith

Classification

The Northwest Territories' highway system includes eight numbered highways, access roads to communities and recreation areas, and a network of seasonal winter roads. It does not include municipal roads and streets, nor roads funded privately for resource exploration.

Highways are classified according to the nationally recognized system of the Transportation Association of Canada (TAC). All highways are Rural Undivided and are categorized as Arterial, Collector or Local, depending on their function. Design speeds range from 50 to 100 kilometres per hour.

The arterial route from the Alberta border to Hay River and Yellowknife has been identified as part of the National Highway System by the Council of Ministers Responsible for Transportation and Highway Safety.

Standards

Design standards are also based on TAC guidelines. The design road width, alignment, sight distance and grade standards are mainly determined by the design speed and traffic volumes.

For all-weather roads, the selection of road surface type (gravel, dust-controlled gravel or pavement) is based on analysis of safety and economics for each road section.

User Costs

A Transport Canada study suggests the average direct operating cost for heavy trucks is $0.95 per kilometre on paved surfaces, and $1.15 per kilometre on gravel surfaces. It should be noted that direct costs include driver time, fuel and maintenance only; fixed costs such as administration, depreciation, licencing, etc. are not included. The total operating expenses for commercial vehicles are at least double the figures noted. The corresponding rates for passenger vehicles have been calculated at $0.31 per kilometre for paved surfaces and $0.36 per kilometre for gravel surfaces.

Based on the total volume and mix of vehicles on the highway system, this results in an estimated direct annual user cost of over $50 million for the 80 million vehicle kilometres logged annually in recent years.

In 1991, class I trucking companies (those with revenues exceeding $1 million) reported operating revenues of $35 million on shipments of 283,000 tonnes. This represented movements of 366 million tome-kilornetres at an average rate of $0.096 per tome-kilometre. These figures are for shipments which originated in, or were destined for, the Northwest Territories. Twenty-five million dollars of the revenue was from shipments which originated in the province of Alberta.

Safety

The causes of vehicular accidents can be grouped into two broad categories: driver or environmental conditions, and road surface or design.

In terms of road surface and design, the Department of Transportation has made significant progress in both dust-control and paving of the highway system. The paved portion of the highway system has increased from 14 percent in 1990 to 24 percent in 1994, while the dust-controlled gravel portion has increased from 14 percent to 49 percent. The percentage of the highway system meeting geometric design standards has increased from 40 percent to 55 percent over the same period. Highway upgrading has focused on sections with the highest traffic volumes.

The Department is also undertaking initiatives focusing on public awareness and safety education such as improved driver testing and licencing standards, seat-belt campaigns, impaired driver programs, and driver demerit point regulation.

Current Expenditures

The Department of Transportation's estimated highway expenditure for 1994/95 is $49.8 million, distributed as shown below.

Capital (1994/95 Capital Estimates)	
Ferry Services	$0.4 million
Highway Operations and Maintenance	$1.8 million
Highway Reconstruction	$20.9 million
Total Capital	$23.1 million
Operation and Maintenance (1994/95 Main Estimate)	
Ferry Services	$4.4 million
Highway Operations and Maintenance	$19.8 million
Motor Vehicles	$2.5 million
Total Operation and Maintenance	$26.7 million
Total	$49.8 million

All-Weather Highway Classifications and Surface Type (1994)

Classification	*Length (km)*			
	Total	Paved	Dust-Controlled Gravel	Untreated Gravel
Arterial 100				
Mackenzie Hwy. No.1 Km 0 - 187.6	187.6	187.6		
Hay River Hwy. No. 2 Km 0 - 43.7	43.7	43.7		
Yellowknife Hwy. No. 3	338.8	133.5	205.3	
Subtotal	**570.1**	**364.8**	**205.3**	**0.0**
Collector 90				
Mackenzie Hwy. No. 1 Km 187.6 - 690	502.4		332.2	170.2
Fort Smith Hwy. No. 5	266.0	89.0	177.0	
Fort Resolution Hwy. No. 6	90.0	23.5	66.5	
Liard Hwy. No. 7	254.1		79.1	175.0
Dempster Hwy. No. 8	269.3	10.0	104.6	144.7
Subtotal	**1,381.8**	**122.5**	**759.4**	**489.9**
Collector 80				
Ingraham Trail, Hwy. No. 4	69.2	22.3	46.9	
Kakisa Lake Access	12.9		12.9	
Ft. Simpson Access	3.4		3.4	
Ft. Providence Access	5.5	5.5		
Rae Access	10.5	10.5		
Detah Access	11.3		11.3	
Hay River Reserve Access	14.2		14.2	
Ft. Liard Access	5.3		5.3	
Subtotal	**132.3**	**38.3**	**94.0**	**0.0**
Local 70				
Hay River Hwy. No. 2 Km 43.7 - 48.6	4.9	2.0	2.9	
Yellowknife Access	1.7	1.7		
Ft. McPherson Access	1.1		1.1	
Inuvik Access	0.6	0.6		
Inuvik Marine Bypass	3.2		3.2	
Miscellaneous Minor Access	3.5	3.5		
Subtotal	**15.0**	**7.8**	**7.2**	**0.0**
Local 50				
Miscellaneous Minor Access	50.3		22.2	28.1
Local 50 (1 LANE)				
Nanisivik - Arctic Bay Road	37.9			37.9
Miscellaneous Minor Access	25.3			25.3
Subtotal	**63.2**	**0.0**	**0.0**	**63.2**
Totals	2,202.7	533.4	1,088.1	581.2
Percent	100.0	24.2	49.4	26.4

Inventory of Northwest Territories Winter Roads (1994)

	From	To	Length (km)
Highway No. 1	Wrigley	Fort Norman	248
	Fort Norman	Norman Wells	85
	Norman Wells	Fort Good Hope	147
Highway No. 3	Fort Providence Ice Crossing		13
Off Highway No. 1	Highway No. 1	Trout Lake	126
	Highway No. 1	Jean Marie River	27
	Highway No. 1	Fort Franklin	105
Off Highway No. 3	Highway No. 3	Lac La Martre	145
	Jct. LL Martre/Rae Lakes	Rae Lakes	100
Off Highway No. 7	Highway No. 7	Nahanni Butte	22
Off Highway No. 8	Inuvik	Tuktoyaktuk	194
	Jct. Tuk/Aklavik	Aklavik	86
Other Ice Roads	Yellowknife	Detah	6
Total Length of Winter Roads			1304

Note: *Winter roads built by the mining companies to Lupin and Colomac gold mines add another 800 kilometres to the winter road network.*

Northwest Territories Highways - Geometric Design Standards

PSADT	Design Year Traffic PSADTT	Design Speed km/h	Useable Width m	Min Pavement Width m	Min Curve Radius m	Stopping Sight Distance m	Min SAG k	Min Crest k	Max Gradient %
100	10	8	390	200	50	70	6		
200-1000		90	9	7.5	300	170	40	55	6
or		80	8.5	7.5	230	140	30	35	8
100-200	>15	70	8	7	170	110	25	22	8
		90	8.5	7.5	300	170	40	55	6
100-200	<15	80	8	7.5	230	140	30	35	8
		70	7.5	7	170	110	25	22	8
		50	7	6.5	80	65	11	7	10
		90	8	na	300	170	40	55	6
<100		80	7.5	na	230	140	30	35	8
		70	7	na	170	110	25	22	8
		50	6.5	na	80	65	11	7	10
<30		50 (1 lane)	4	na	80	130	11	18	10

Notes:
Traffic: PSADT = peak season (3 consecutive months) average daily traffic.
PSADTT = peak season average daily truck traffic.
For PSADT> 1000 refer to Transportation Association of Canada standards.
Width: For sideslopes steeper than 4:1 add 0.5m rounding to each shoulder.
Allow 0.5m additional shoulder width if guardrail required.
Design width to allow for projected strengthning/resurfacing within design life.

1.3.2 Accomplishments and Problems

Accomplishments

The 1990 Transportation Strategy identified specific initiatives directed at improving the territorial highway system. During the period 1990 to 1994, significant progress was made towards implementation of these initiatives.

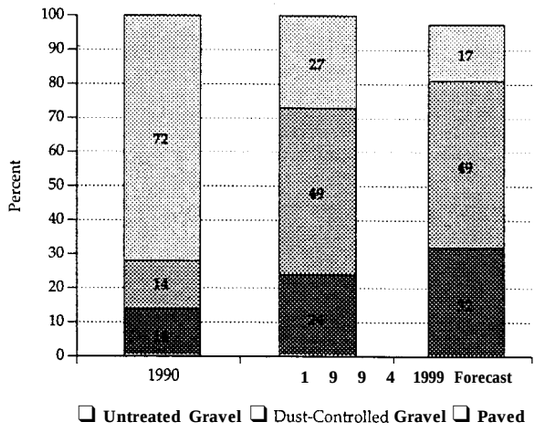
- The Mackenzie Highway from Fort Simpson to Wrigley was completed and opened to traffic in the summer of 1994.
- Reconstruction and paving of the arterial portion of the Mackenzie Highway (from the Alberta border to the junction with Highway 3) was completed in 1993.
- A total of 132 kilometres or almost 40 percent of the Yellowknife Highway was reconstructed and paved as of the end of 1994.
- Work commenced on the reconstruction of the Dempster Highway in 1993.
- The Liard Highway ferry was replaced with a shallow draft vessel capable of operating at lower water levels.
- Fort Good Hope is now serviced by a winter road on an annual basis.
- A shorter winter road route to Lac La Martre was cleared in 1993.
- The total paved portion of the highway system was increased from 14 percent in 1990 to 24 percent in 1994.
- The dust-controlled gravel portion of the highway system has increased from 14 percent in 1990 to 49 percent in 1994.
- Improved spray-ice technology has been used at the Fort Providence crossing to speed up ice bridge opening and extend the highway operating season.

Problems

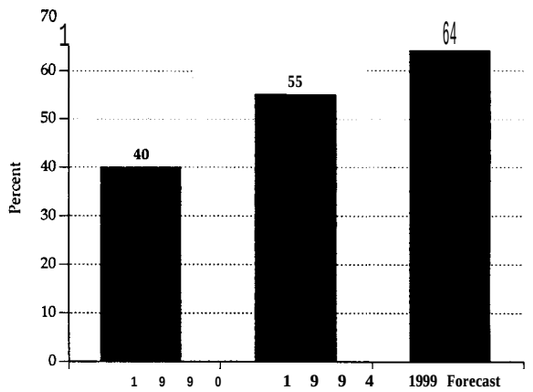
The problems stated in the 1990 Transportation Strategy still exist today although their extent has been reduced. The major public and business concerns are the generally poor surface condition and narrowness of many highways, and the effects these conditions have on vehicle operating costs, safety and discouragement of tourism.

There are also complaints about the twice yearly interruptions in service when neither ferries nor ice bridges

Percent of Highway System Length by Surface Type



Percent of Highway System Length Meeting Geometric Design Standards



are operational. The Mackenzie River crossing at N'dulee, Liard River, Peel River and Arctic Red River are closed for up to four weeks at freeze-up, and two to four weeks at spring break-up, while the Fort Providence crossing of the Mackenzie River suffers some disruption in the early winter, and about four weeks closure in the spring,

Winter road conditions and periods of operation are also a concern to the citizens and businesses utilizing this seasonal network.

In summary, there are five main user concerns stemming from current highway conditions:

- Safety
- Vehicle Operating Costs

. Discouraged Tourism
- Ferry / Ice Crossing Interruptions
- Winter Road Conditions

1.3.3 Program Objectives

The operation and maintenance and capital objectives of the highway program are described below.

Operation and Maintenance

1. Maintain Current System

The first priority in the highway program is to operate and maintain the highway system at an acceptable level of service to ensure safe and reliable travel. A number of activities are conducted to meet this objective, including:

- maintenance and minor structural upgrading of roads, both paved and gravel;
- maintenance of bridges, culverts and drainage structures;
- annual construction and maintenance of winter roads;
- operation and maintenance of highway ferries;
- delivery of engineering and construction management services; and
- administration and enforcement of highway related regulations.

2. *Continue Dust-Control Program*

Dust-control is currently provided on 49 percent (over 1,000 kilometres) of the highway system. Providing dust-control improves user safety and stabilizes the surface, reducing gravel loss. The objective is to maintain the current level of dust-control on the highway system.

3. Improve *Winter Roads*

Winter roads provide relatively low-cost, seasonal access to off-highway communities. These roads are used extensively for community resupply of freight and for local access to the all-weather highway network.

Existing winter roads are continually being improved through realignment, and by providing temporary bridges where river and stream crossings delay openings and cause premature closing due to slow ice growth or overflows. Additional funding would allow for the annual construction of winter roads to Snare Lake, Colville Lake and Lutsel Ke, and for the extension of the winter road network from Fort Good Hope to Inuvik.

Capital

1. Rehabilitation and Restoration

Existing highway infrastructure, including bridges, culverts, pavements, roadway embankments, ferries and maintenance camps and equipment, require periodic rehabilitation, restoration or replacement to maintain the current level of service. The highest capital priority is to provide rehabilitation and restoration to existing infrastructure as it is required.

Specific activities under this objective include:

- bridge and culvert replacement or rehabilitation;
- highway pavement overlays;
- highway maintenance infrastructure (buildings and equipment) replacement or rehabilitation; and
- ferry rehabilitation and upgrading.

2. *Highway Upgrading*

Reconstruction is required on many road sections to correct width and alignment deficiencies, and to bring highways to an acceptable standard and level of service for current and anticipated traffic volumes and truck loadings.

Many times, when a highway has deteriorated to the point where rehabilitation or replacement is required, upgrading is also warranted because of increased traffic. For example, the remaining gravel sections of the Yellowknife Highway are overdue for reconstruction to restore the subgrade, drainage and cross section. At the same time, widening of this highway is required to meet the acceptable standards. Since the marginal cost of widening the highway to meet current standards adds only 10 percent to the cost, the Department of Transportation combines highway upgrading with replacement and rehabilitation schedules.

Currently justified highway upgrading needs on the Northwest Territories' highway system, in order of priority, are:

- Yellowknife Highway (kilometre 96-215,245- 333);
- Dempster Highway (kilometre 0- 257);
- Local access roads (total of 48 kilometres);
- Fort Smith Highway (kilometre 86- 263);
- Fort Resolution (kilometre 0- 90); and
- Ingraham Trail (kilometre 0- 69).

Future highway upgrading needs within 20 years include:

. Mackenzie Highway (kilometre 187- 471); and
- Liard Highway (kilometre 0- 254).

3. *Highway Paving*

Paving highways improves safety, reduces vehicle operating costs, and helps attract tourists. Paving also reduces maintenance costs where gravel reserves for resurfacing of gravel highways are scarce and/or expensive.

Currently justified paving needs include:
- Yellowknife Highway (kilometre 96-215,245- 333); and
- Fort Smith Highway (kilometre 232- 252).

Future paving needs include:
- Fort Smith Highway (kilometre 86- 232); and
- Fort Resolution Highway (kilometre 23- 90).

4. New *Bridges*

Bridges have been proposed or requested at the four crossings now served by ferry. However, at current traffic levels, bridges are not economically justified at any of these locations. In the future, bridges maybe justified at the Fort Providence, Fort Simpson and Fort McPherson ferry crossings. In the case of Tsiigehtchic (Arctic Red River), additional consideration must be given to the problem during freeze-up and spring break-up when the community has no transportation service except by helicopter. For this community, a long-term option is a bridge on the Arctic Red River connecting the community to the Dempster Highway year-round.

5. New *Ferries*

Like other infrastructure, the five vehicle ferries on the Northwest Territories' highway system will require periodic rehabilitation and replacement. In addition, increasing traffic at the Fort Providence crossing requires enlargement of the existing ferry to provide an acceptable level of service. A second ferry will likely be required at Fort Providence within 20 years.

6. *Ice Crossing Improvements*

River crossings at five locations are interrupted for two to four weeks during both winter freeze-up and spring break-up, due to ice and/or low water levels. Efforts should be pursued to minimize these service interruptions. The Department's management of ice at the Fort Providence crossing has allowed this ferry to operate intermittently well into winter while the ice bridge is being constructed. Research is also being conducted on methods of accelerating ice bridge formation, and on new technologies for vessel design and ice management.

7. *Construct New Winter Roads*

Extension of the Mackenzie winter road from Fort Good Hope to the Dempster Highway would provide a continuous road link to all Mackenzie Valley communities for three months of the year. This would be an interim step toward the completion of the all-weather Mackenzie Highway.

1.3.4 Program Funding Requirements

Operation and Maintenance

The current level of operation and maintenance funding for highways is $27 million per year. This level of funding is sufficient to meet current needs. The funding level will be adjusted as highways are upgraded and/or paved, and as new facilities are reconstructed. It is anticipated that the Department will receive sufficient funding from the territorial government to meet future needs. However, fiscal restraint may force the Department to reduce service levels or reduce maintenance standards.

Capital

Total current and future (20 year) capital needs are $687 million, of which $392 million are currently justified.

The Department's current five year capital plan proposes to spend $24 million per year over the next five years. Of this amount, an estimated $8 million is required annually for capital rehabilitation and restoration of existing bridges, culverts, pavements, maintenance infrastructure and ferry equipment. This leaves approximately $16 million per year for upgrading, mainly road reconstruction and paving.

Over the next five years, expenditures of $16 million per year will accomplish the following.

. Completion of the reconstruction and first stage paving of the Yellowknife Highway from Fort Providence to Rae-Edzo.

- Commencement of reconstruction and paving of the Yellowknife Highway from Rae-Edzo to Yellowknife.
- Continuation of the reconstruction of the Dempster Highway.
- Upgrading of the M.V. Merv Hardie Ferry at Fort Providence to allow for increased carrying capacity.

Over the next 20 years, major objectives include:

- Ongoing rehabilitation and restoration of highway and ferry infrastructure.
- Completion of the reconstruction and paving of the Yellowknife Highway between Rae-Edzo and Yellowknife.
- Reconstruction and paving of the Fort Smith Highway, Fort Resolution Highway and Ingraham Trail.

At the current annual expenditure level of $16 million, highway upgrading and paving needs will take over 20 years to complete. Additional capital expenditures of **$20** million per year would be required to satisfy all currently justified highway upgrading needs within the next ten years.

It is unlikely that significant additional funding can be allocated from within departmental or territorial government appropriations. Increases in user fees through highway fuel taxes and licence fees would offer very limited potential, due to the low population and traffic densities.

The jointly funded federal / provincial / territorial National Highway Program has been shelved because of federal fiscal constraints. However, the territorial government must continue efforts for a bilateral program with the federal government to accelerate the upgrading of substandard territorial highways to an acceptable standard. The Department will also study innovative methods of accelerating highway reconstruction.

Highway Program Capital Needs (1994 $000's)

ObjectiveRusk	*Currently Justified Needs*	*Future Needs Within 20 Yrs*	*Total*
1. Capital Rehabilitation and Restoration			
Bridges and Culverts	11,000	21,000	*32,000*
Pavement Overlays	13,000	30,000	43,000
Maintenance Infrastructure	18,000	48,000	66,000
Ferry Infrastructure	3,500	9,000	12,500
Subtotal	45,500	108,000	153,500
2/3. Highway Upgrading and Paving			
Yellowknife Highway No. 3 (km 96-215,245-333 reconstruction / paving)	157,000	0	157,000
Dempster Highway No. 8 (km 0-257 reconstruction)	70,000	0	70,000
Access Roads (48 km total reconstruction)	15,000	0	15,000
Fort Smith Highway No. 5 (km 86-263 reconstruction / paving)	54,000	0	54,000
Fort Resolution Highway No. 6 (km 0-90 reconstruction / paving)	25,000	0	25,000
Ingraham Trail No. 4 (km 0-69 reconstruction / paving)	25,000	0	25,000
Mackenzie Highway No. 1 (km 187-471 reconstruction)	0	42,000	42,000
Liard Highway No. 7 (km 0-254 reconstruction)	0	50,000	50,000
Subtotal	346,000	92,000	438,000
4. New Bridges	0	65,000	65,000
5. New Ferries	0	29,000	29,000
6. Ice Crossing Improvements	0	550	550
7. Construct New Winter Roads	250	750	1,000
Total Capital Needs	391,750	295,300	**687,050**

Note: Access roads include Detah, Fort Liard, Fort McPherson, Fort Simpson, Hay River Reserve and Kakisa.

1.4 Community Local Access Roads

1.4.1 Current Situation

Background

Considerable interest has been expressed by communities for access to nearby attractions. These attractions may include recreational sites, historical sites, local resources, river portages, and access to open water in support of fishing, hunting and tourism opportunities.

In the 1990 transfer of highway reconstruction to the territorial government, a small funding base was negotiated for community local access roads. These funds provide the basis for the Department of Transportation's community local access roads program.

Consultations conducted by the Department indicate that this program is a high priority at the community level, due mainly to the high utility of projects within the community, local involvement in the project, and the opportunities for employment and training.

Classification and Standards

Depending on their intended purpose, community local access roads may be high standard, all-weather roads, seasonal roads (winter, summer, fair-weather) or trails for restricted vehicle use (four-by-four, all-terrain vehicle (ATV), light traffic only). In general they have low traffic volumes and low operating speeds. In some cases it is acceptable to start with a very low standard and upgrade over a period of years. In fact, most of the requested roads follow some sort of existing route.

Under these conditions, it is not necessary or even advisable to establish a classification system or a set of design standards as has been done for highways. Such a system may tend to result in over-design and costs which may put a proposed project out of reach.

The design standard for each trail or road is determined on the basis of the intended vehicle types and season(s) of use, the expected traffic volume, and local conditions such as soil, drainage, permafrost, snowdrifting and the environment.

Current Expenditures

As proposed in the 1993 Transportation Agenda, the Department has increased expenditures under this program from $250,000 in 1993/94 to $650,000 in 1994/95.

Of the $650,000 expended in 1994/95, $300,000 was provided to communities in the form of a contribution for community managed projects. The remaining $350,000 was used by the Department to construct local access roads.

1.4.2 Accomplishments and Problems

Accomplishment ts

Prior to 1994, local access roads were constructed in six communitiess:

Arviat	Road to float plane base.
Arctic Bay	Victor Bay Road.
Fort Resolution	Nagel Channel Road (cost shared with Economic, Development and Tourism, and Renewable Resources).
Gjoa Haven	*Swan* Lake Road.
Jean Marie River	Initiation of access road to the Mackenzie Highway.
Wrigley	Airport access road (completed in 1994).

In 1994, the Department implemented two objectives as outlined in the 1993 Transportation Agenda. First, funding for this program was increased to $650,000. This has allowed for significantly more activity under this program. Second, the Department implemented a Contribution Policy allowing the Department to provide funding to communities wishing to undertake and manage local access road projects.

In 1994, community local access roads were constructed under the Department's control in the following communities:

Broughton Island	Bridge over the Kuruluk River (two year project to be completed in 1995/96).
Jean Marie River	*Ongoing* construction of access road to the Mackenzie Highway.
Wrigley	Upgrade access road at Willowlake River.

In 1994, the following communities were provided with a contribution to construct local access roads.

Arctic Bay	Extension of the Victor Bay Road.
Arviat	Access road to Maguse River (multi-year project started in 1994/95).
Baker Lake	Access road to Whitehills Lake (multi-year project started in 1994/95).
Gjoa Haven	Access road to Taseyjoak Lake (multi-year project started in 1994/95).
Igloolik	Igloolik Point Road (multi-year project started in 1994/95).
Pelly Bay	Access road to Barrow River (multi-year project started in 1994/95).
Resolute Bay	Access Road to Sight Point.
Taloyoak	Upgrade ATV trail to Netsilik Lake and Redfish Lake.

Problems

Historically the main problem was the lack of substantial progress. With the increase in funding and the implementation of a Contribution Policy, these problems have been alleviated.

The Department plans to increase the funding for this program to $750,000 in 1995 and $1 million in 1996. It is probable that there will be more requests for local access roads than can be delivered within the available budget. In that case, prioritization of requests and some rationing of funds maybe required.

1.4.3 Program Objectives

The Department's operational and maintenance and capital objectives for this program are described below.

Operation and Maintenance

1. Establish Plan to Provide Maintenance Funding

As local roads are constructed, they will be included in the community inventory of municipal roads and streets. Maintenance grants will be provided through the Department of Municipal and Community Affairs. It will therefore be necessary to ensure that adequate funding is made available as the inventory of local access roads expands.

Capital

1. Construct Community Local Access Roads

Local access road projects may be managed by the Department or by the community. Where the community desires to manage and construct an access road and can demonstrate their ability, the Department will provide financial assistance to the community to initiate and implement a local access road project.

Community initiative and control will help minimize costs by ensuring that design and construction standards are appropriate to the situation. The program is responsive to community initiative, and has the added benefit of local commitment to, and proprietary interest in, the project. Community involvement and contributions in-kind will help achieve more out of the available funding. The Department will provide advice and technical expertise as required.

Where the community does not have the expertise to properly manage the project, and where the need can be justified, the Department will construct the access road. The community will be involved in the project to the maximum extent practical.

If the number of candidate projects under this program exceeds the available funding in a given year, projects will be prioritized based on the following factors:

- total cost of project and community contribution in terms of materials, labour or equipment;
- benefits resulting from the project;
- resource and/or environmental impacts; and
- equitable distribution of available funds among different regions and communities.

1.4.4 Program Funding

Operation and Maintenance

Annual maintenance needs are estimated to be 2 percent of capital costs. It is assumed that the Department will receive sufficient allocations from the territorial government to meet these funding needs. Maintenance grants will be provided to the community through the Department of Municipal and Community Affairs.

Capital

In response to the high priority given by communities to projects under this program, the Department increased funding from $250,000 in 1993/94, to $650,000 in

1994/95. It is proposed to increase funding further to $750,000 in 1995/96, and $1 million per year from 1996/97 onwards. This increase in funding will be obtained through internal reallocation of resources.

A few years of experience in the implementation of this program will demonstrate the level of demand for funding. If required, additional funding maybe obtained through reallocation of existing territorial government resources.

Additional activity and funding can be generated under this program by cost-sharing various projects with other territorial government departments or agencies, where the road serves the purpose of other programs.

1.5 Marine Resupply Systems

1.5.1 Current Situation

Inventory

There are 30 off-highway communities in the Northwest Territories with a combined population of 22,000 or 40 percent of the territorial population. These communities rely exclusively on marine resupply for petroleum products and most dry cargo.

Marine facilities in these off-highway communities can include wharves, breakwaters, landings, cargo marshalling areas, and other infrastructure required for loading and unloading and protecting resupply vessels.

Responsibility

Marine resupply facilities in the Northwest Territories are owned by either the Canadian Coast Guard Northern Region (CCGN), the territorial government, or private interests.

Transport Canada through the CCGN has a mandate to provide service in support of commercial boating activities in northern waters. These services and programs include the provision and maintenance of public marine facilities, the placement of navigation aids, dredging, ice escort, search and rescue, spill and emergency response, communications, vessel and crew certification, and marine policies and regulatory development. The CCGN also coordinates aspects of supplying dry cargo to the communities of the Eastern Arctic (Eastern Arctic Sealift) on behalf of p ublic and private interests. The CCGN owns and operates 21 public marine facilities in the western Northwest Territories. In the Eastern Arctic, only the public harbour facilities at Nanisivik and Iqaluit are owned by the CCGN.

The Department of Public Works and Services (PW&S), Government of the Northwest Territories, assists in maintaining most resupply landings in the Keewatin and Baffin regions.

Private interests, principally resource development and transportation companies, have constructed facilities to support marine-based activities in the Northwest Territories. Private facilities are located at Hay River, Yellowknife, Norman Wells, Inuvik, Tuktoyaktuk, Nanisivik and Polaris.

Traffic

The 30 off-highway communities are serviced by three major resupply systems. Eastern Arctic communities are supplied by sealift from Montreal and other Atlantic ports. Keewatin communities are supplied by tug and barge out of Churchill. Mackenzie Valley and Western Arctic communities are served by tug and barge from Hay River, Norman Wells (petroleum products) and, to a lesser extent, Inuvik.

Marine resupply to Northwest Territories' communities in 1994 exceeded 33,000 tomes of dry cargo and 80 million litres of petroleum products. This represents roughly 85 percent of the total marine resupply activity in the Northwest Territories. The additional marine resupply activity is associated with Defence Canada's 24 North Warning Sites and the two base metal mines in the north Baffin (Polaris and Nanisivik). Approximately 2,100 tomes of dry cargo and 6.0 million litres of bulk fuel are typically shipped to the 24 North Warning Sites in the Eastern Arctic (delivery from Montreal), and approximately 1,400 tomes of dry cargo and 9.0 million litres of bulk fuel are typically shipped to Western Arctic North Warning Sites (delivery from Hay River).

Of the tonnages and volumes transported into territorial communities in 1994, Eastern Arctic communities accounted for 35 percent of the total dry cargo tomage and bulk fuel volume. Keewatin communities accounted for 25 percent of the dry cargo tonnage and 30 percent of the bulk fuel volume. Mackenzie Valley and Western Arctic communities accounted for 40 percent of the dry cargo tomage and 35 percent of the bulk fuel volumes.

Dry cargo tomages have remained relatively stable since 1990. Bulk fuel demand has increased since 1990 at a rate of approximately 3 percent per year. As a result, fuel storage infrastructure has been expanded in many communities.

The greatest potential for traffic variation exists in the Mackenzie / Western Arctic. This system has historically resupplied oil and gas exploration projects in the Mackenzie / Beaufort area, Defence Canada's North Warning Sites, and communities in the Fort Smith, Inuvik and Kitikrneot regions. Dry cargo tonnages have decreased substantially in recent years from historic levels due to a

significant decrease in oil exploration activity in the Mackenzie / Beaufort areas. Development of new mines and a deep draft port in the Coronation Gulf area could eventually result in lower annual freight volumes in the Mackenzie / Western Arctic system, depending on the method of resupply chosen by the operators of the proposed new mines.

Classification

Marine resupply facilities are classified as "A", "B" or "C", depending on the tonnage or volume of goods handled at each community.

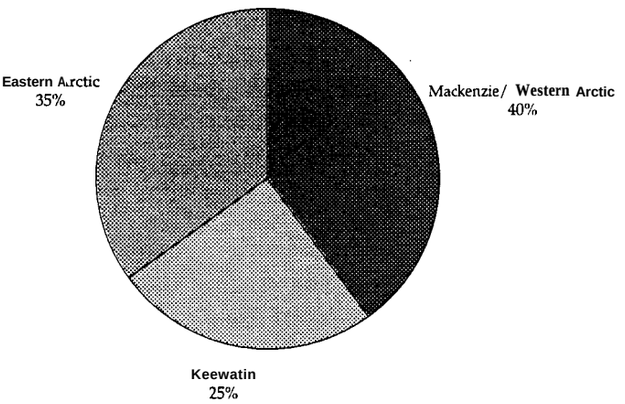
Standards

Site to site variations in natural features such as tides, ice conditions, hydrology, wind, geology, topography and land use require considerable flexibility in establishing design standards. Designs are therefore based on level of service requirements, rather than standard solutions.

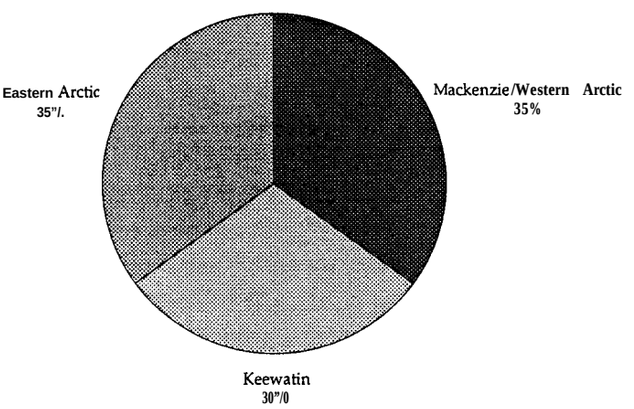
The type of facility required will vary from simple protection of land use and provision of deadmen for anchorage, where natural conditions are favorable, to providing dredging, navigation aids, breakwaters, wharves, marshaling areas, moorage and access roads where natural conditions are more extreme.

In developing facilities for any site, both resupply and local use (hunting, recreation, fishing, tourism, etc.) activities are considered. It may be desirable to provide facilities serving multiple uses, such as a commercial fishery, where appropriate, or conversely, to ensure that local and resupply facilities are separated to minimize potential conflict.

Dry Cargo Marine Resupply Traffic by System (1994)



Bulk Fuel Marine Resupply Traffic by System (1994)



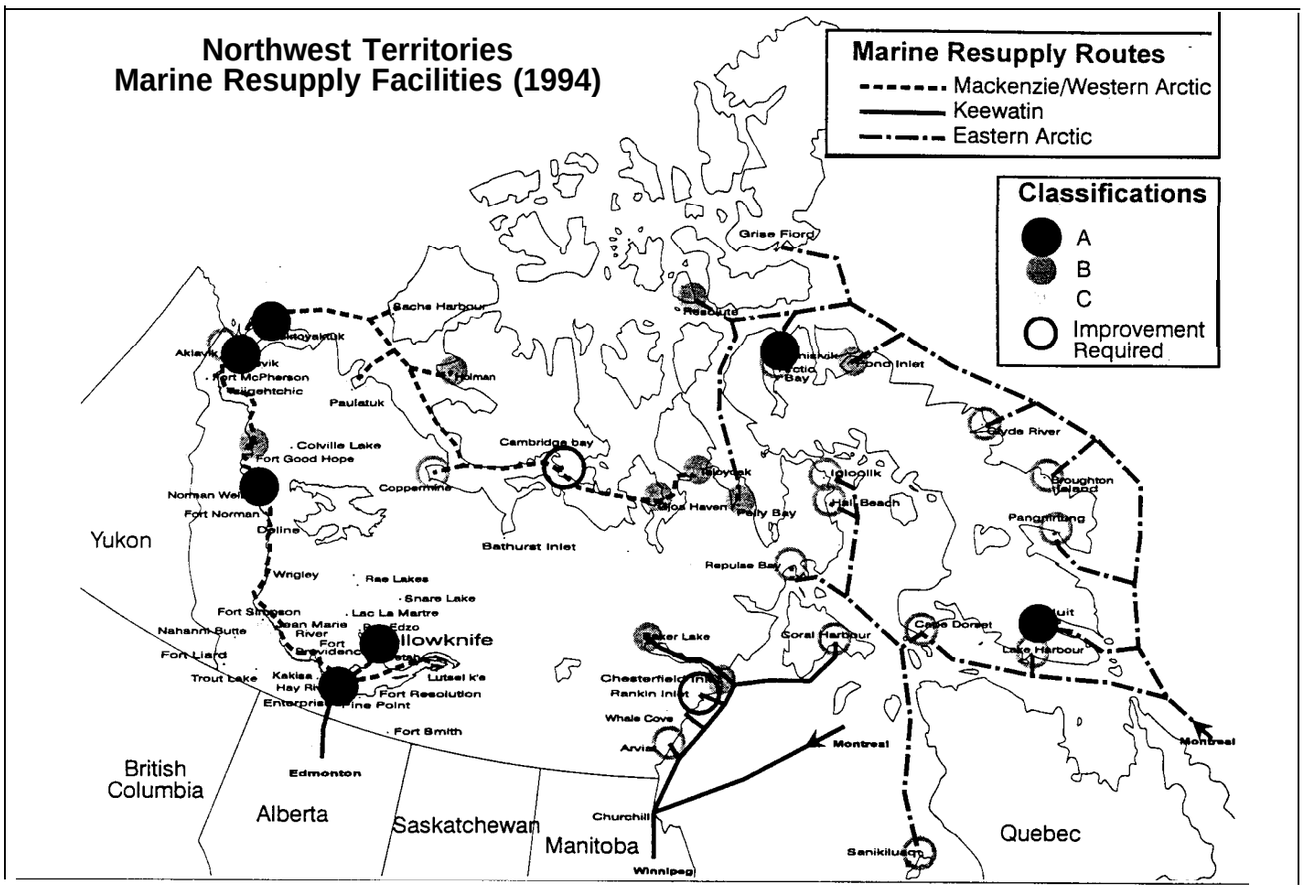
Marine Resupply Facility Classification and Standard

	A	B	C
Classification	*>10,000* t per year dry cargo and fuel in or out	2,000-10,000 t per year	<2,000 t per year
Standard	protected access at all tide or water levels	secure moorage at all tide or water levels	access for loading / unloading fuel / dry cargo at least 4 hr / day
	secure moorage for loading / unloading fuel / dry cargo	access for loading / unloading fuel / dry cargo at least 4 hr / day	access for heavy equipment
	access for heavy equipment	access for heavy equipment	secure marshalling / storage area
	secure marshalling / storage area	secure marshalling / storage area	

Marine Resupply Facilities Classifications (1994)

Community	*Population*	*Commercial Fishery*	*Annual Cargo (Tonnes)*	*Ownership Of Facility*	*Resupply Facility Classification*
Yellowknife	15,179	yes	>10000 E	P	A
Iqaluit	3,552	no	87730	T	A
Hay River	3,206	yes	>10000 E X	T/P	A
Inuvik	3,206	no	>10000 E	T/P	A
Nanisivik	294	no	32660 X	T	A
Rankin Inlet	1,706	yes	16590	G	A
Tuktoyaktuk	918	no	>10000 E	T/P	A
Norman Wells	627	no	>10000 E X	T/P	A
Cambridge Bay	1,116	yes	10460	T	A
Baker Lake	1,186	yes	7040	G	B
Arviat	1,323	yes	7020	G	B
Pangnirtung	1,135	yes	6730	G	B
Igloolik	936	no	6430	G	B
Coppermine	1,059	yes	6060	T	B
Cape Dorset	961	no	5570	G	B
Hall Beach	526	no	5000 E	T	B
Taloyoak	580	yes	4870	T	B
Gjoa Haven	783	no	4500	T	B
Coral Harbour	578	no	3960	G	B
Pond Inlet	974	yes	3900	G	B
Clyde River	565	yes	3680	G	B
Resolute	171	no	3432	G	B
Broughton Island	461	yes	3360	G	B
Holman	361	no	3085	T	B
Arctic Bay	543	no	3010	G	B
Sanikiluaq	526	no	2920	G	B
Repulse Bay	488	no	2720	G	B
Chesterfield "Inlet	316	yes	2303	G	B
Lake Harbour	365	no	2190	G	B
Pelly Bay	409	yes	2010	T/G	B
Aklavik	801	no	>2000 E	T	B
Fort Good Hope	602	no	>2000 E	T	B
Fort Norman	375	no	<2000 E	T	c
Lutsel K'e	286	no	<2000 E	G	c
Wrigley	174	no	<2000 E	T	c
Whale Cove	235	yes	1790	G	c
Paulatuk	255	no	1510	T	c
Sachs Harbour	125	no	1420	T	c
Grise Fiord	130	no	1220	G	c
Fort Simpson	1,142	no	<400 E	T	c
Fort McPherson	759	no	<400 E	P	c
Fort Liard	485	no	<400 E	P	c
Tsiigehtchic (Arctic Red River)	144	no	<400 E	T	c
Jean Marie River	49	no	<400 E	T	c

Legend of Abbreviations
E - Estimate
X - Major distribution or export centre
G - Facility owned by the territorial government
T - Facility owned by the federal government (Transport Canada, National Defence Canada)
P - Privately owned

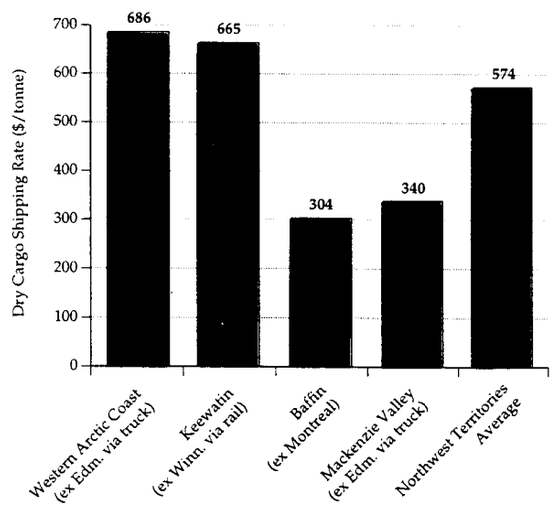


User Costs

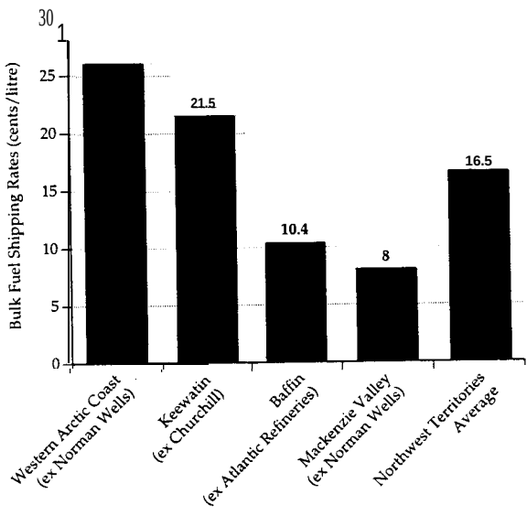
Dry cargo rates for both the Eastern Arctic and Keewatin range from about $600 to $700 per tonne. This includes packing at source and cartage at destination. Keewatin rates also include rail costs from Winnipeg to Churchill. Comparable Mackenzie / Western Arctic rates vary from about $400 to $800 per tonne, including trucking charges from Edmonton to Hay River.

Bulk fuel shipping costs average $0.10 per litre in the Baffin, $0.20 per litre in the Keewatin (includes rail and holding costs in Churchill), and range from $0.09 to $0.35 per litre from Norman Wells to Western Arctic destinations. Historically, the cost to ship fuel to Pelly Bay has been approximately $0.64 per litre which includes tanker delivery charges to Hall Beach and airlift to Pelly Bay. However, since 1993 diesel fuel resupply has been provided by Canadian Coast Guard icebreaker, resulting in substantial cost savings for the territorial government.

Dry Cargo Marine Shipping Rates (1994)



Bulk Fuel Marine Shipping Rates (1994)



Current Expenditures

The federal government spent approximately $250,000 in 1994 to operate, maintain and enhance the 24 marine facilities owned by the CCG in the Northwest Territories.

Public Works and Services of the territorial government spent between $50,000 and $75,000 to rebuild and maintain barge resupply landings in the Keewatin.

The Department of Transportation's community wharves program, described in the next section, has, in the past, resulted in improved facilities in communities where facilities are multi-use. More recently, the Department has also specifically programmed improvements to resupply facilities. As part of the Strategic Transportation Improvement Agreement, a total of $2.5 million will be spent over four years beginning in 1994/95 to upgrade resupply facilities in Rankin Inlet and Pangnirtung. Costs are split 50/50 between the territorial and federal governments.

The Department also spent $250,000 in 1994/95 to conduct hydrographic surveys in support of commercial shipping in the Coronation Gulf. This expenditure was part of a three way cost-shared agreement, with matching funding being provided by the federal government and Metall Mining of Canada.

1.5.2 Accomplishments and Problems

Accomplishments

Since 1990, several initiatives by the Departments of Transportation, and Public Works and Services have helped reduce marine resupply costs significantly, particularly for petroleum products.

In 1991 and 1992, the Department cost-shared the completion of the hydrographic survey of the approaches to Pelly Bay. This enabled the first ever marine resupply of diesel fuel to Pelly Bay in 1993 (instead of airlift), at a net cost saving to the territorial government of over $200,000. In 1994, both diesel and dry cargo were resupplied to Pelly Bay. From 1994 onwards, the saving is expected to be approximately $1.0 million per year.

In 1993, the delivery of the Keewatin region's diesel fuel to Churchill by ship, instead of rail, saved the territorial government $900,000 in comparison to 1992. These annual savings are expected to continue in the future.

Also, in 1993, suppliers were allowed to arrange the most cost-effective method of resupplying bulk fuel to 11 Eastern Arctic communities. As a result, a single contract for both the supply and delivery of bulk fuel was used in 1993. A $1.1 million saving was achieved compared to historical Eastern Arctic costs. Comparable savings are expected to continue in the future.

In addition to realizing cost savings in the delivery of community resupply tonnages, the following resupply facility improvements have been made since 1990:

Aklavik	improvements to dry cargo landing
Baker Lake	repairs to the fixed wharf
Cambridge Bay	repairs to the fixed wharf
Coppermine	replacement of anchoring deadmen
Fort Good Hope	improvements to the dry cargo landing
Fort Providence	improvements to public wharf access road
Gjoa Haven	construction of fixed wharf and expansion of the cargo marshaling area
Jean Marie River	replacement of anchoring deadmen
Norman Wells	repairs to the fixed wharf
Paulatuk	replacement of anchoring deadmen

Pelly Bay	construction of new dry cargo landing facility and development of bulk fuel delivery system
Taloyoak	construction of fixed wharf and expansion of the cargo marshaling area

Most of these improvements were the result of departmental initiatives with funding provided by the CCGN, Harbours and Ports Division.

Problems

Many of the marine resupply problems identified in the 1990 Transportation Strategy remain today. The main problems are the high cost of resupply services and the lack of adequate resupply facilities.

Northerners are requesting a greater role in resupply operations. While progress has been made in increasing northern employment, many southern based operators employ few northern residents.

The future of the Churchill rail line is uncertain. This will have an impact on the resupply of Keewatin communities.

1.5.3 Program Objectives

The operation and maintenance and capital program objectives to maintain and upgrade marine resupply facilities, and to improve existing marine resupply systems, are described below.

Operation and Maintenance

1. Maintain What *We* Have

The Department's objective is to continue working with CCGN Harbours and Ports Division to provide adequate maintenance for Canadian Coast Guard-owned facilities. The Department also plans to decentralize the operation and maintenance responsibility for marine facilities to its regional offices.

2. *Improve Marine Resupply Systems*

We must work to improve service and safety, reduce costs, and increase northern and local business and employment opportunities in marine resupply operations. There are potentially millions of dollars to be saved through improving resupply systems and contracting procedures.

The following areas have been identified for further systems studies:

- the cost of purchasing, transporting and handling bulk fuel,
- containerization options or others ystem approaches to reduce costs and damage to goods during shipment, and
- an overall review of marine resupply systems in the Baffin, Keewatin and Kitikmeot regions, with a view to reducing costs and coordinating with resupply systems in Greenland and Arctic Quebec.

We will also work with other circumpolar jurisdictions to determine additional means of improving marine resupply systems serving the Northwest Territories.

Capital

1. Upgrade Facilities to Standard

Marine resupply facilities need to be upgraded to current and future level of service standards. Although the CCG has taken an active role in addressing some of these infrastructure needs, more work is required to identify and quantify current and projected future needs.

The priorities are safety and environmental concerns, and protecting adequate cargo marshaling sites in communities which rely on marine resupply.

The following communities have facility upgrading needs which are currently justified on the basis of costs, economic benefits and / or safety:

Arctic Bay	Hall Beach
Arviat	Igloolik
Aklavik	Lake Harbour
Broughton Island	Pangnirtung
Cambridge Bay	Paulatuk
Cape Dorset	Rankin Inlet
Clyde River	Repulse Bay
Coppermine	Sanikiluaq
Coral Harbour	Whale Cove
Grise Fiord	

1.5.4 Program Funding

Operation and Maintenance

Current operation and maintenance expenditures are estimated at $300,000 per year. This funding is provided by CCG Harbours and Ports, and by the Department of Public Works and Services of the territorial government. This level of expenditure is sufficient to meet current needs. As new facilities are added, the level of funding must be adjusted to meet operational requirements.

As part of ongoing activities, the Department will continue to pursue further rationalization of marine resupply systems. The Department will investigate improvements to the resupply of bulk fuel and dry cargo to communities in the Keewatin, Baffin and Western Arctic regions, and will work cooperatively with the Canadian Coast Guard, the Department of National Defence, other circumpolar jurisdictions (Greenland, Arctic Quebec and Alaska) and the commercial shipping industry to find long-term, cost-effective solutions for marine resupply problems in the North. In rationalizing marine resupply systems and facilities, the objective will be to improve service and safety, reduce costs, and increase northern and local business and employment opportunities.

It is anticipated that ongoing rationalization of marine resupply systems will result in significant cost savings to the territorial government and consumers.

Capital

Current and future capital needs total $18 million. Of these, $11 million are currently justified on the basis of costs, economic benefit and safety.

Proposed capital expenditures over the next five years total $4.0 million, including federal contributions to upgrade facilities at Pangnirtung and Rankin Inlet, and for ongoing rehabilitation or relocation of CCG facilities in Aklavik, Cambridge Bay and Paulatuk.

The Department will continue to work with Transport Canada to seek additional funding for the required facility upgrading. Transport Canada, through the CCG, is mandated to provide service in support of commercial marine activities in northern waters, including the provision and maintenance of public marine facilities.

The Department will work to ensure that the federal government meets this mandate.

Private interests, principally resource development and transportation companies, will also likely affect the future marine resupply system. The Department needs to be aware of current developments and be prepared to act where shared facilities can be arranged to the mutual benefit of all parties.

Marine Resupply Program Capital Needs (1994 $000's)

Program Objective	*Currently Justified Needs*	*Future Needs Within 20 Years*	*Total Needs*
Upgrade Facilities to Standard			
Aklavik	75	250	325
Arctic Bay	25	100	125
Arviat	225	350	575
Baker Lake	500		500
Broughton Island	25	100	125
Cambridge Bay	150		150
Cape Dorset	125		125
Chesterfield Inlet	100		100
Clyde River	125		125
Coppermine	1,100	300	1,400
Coral Harbour	1,000		1,000
Fort Good Hope	100	25	125
Fort Norman	100	25	125
Fort Providence		250	250
Gjoa Haven		200	200
Grise Fiord	50	100	150
Hall Beach	25	400	425
Hay River		800	800
Holman	140		140
Igloolik	25	400	425
Inuvik	50		50
Iqaluit	1,025		1,025
Jean Marie River	40		40
Lake Harbour	25	1,100	1,125
Norman Wells	150	400	550
Pangnirtung	625	200	825
Paulatuk	300	400	700
Pelly Bay	70	350	420
Pond Inlet	550		550
Rankin Inlet	3,000		3,000
Repulse Bay	225		225
Resolute Bay	300		300
Sachs Harbour	25		25
Sanikiluaq	200	100	300
Taloyoak	150		150
Tuktoyaktuk	50	1,000	1,050
Whale Cove	200	100	300
Yellowknife		500	500
Total Capital Needs	10,875	7,450	18,325

1.6 Local Marine Facilities

1.6.1 Current Situation

Inventory

Residents of virtually every community in the Northwest Territories depend on the use of small vessels for recreation, tourism, subsistence and commercial harvesting of fish and marine mammals, and access to other local resources such as carving stone. In recent years, expansion of commercial fishing has led to the use of larger boats in many communities.

Marine facilities are required for loading, unloading and protecting vessels. Infrastructure requirements depend upon site conditions, and may include wharves, breakwaters, dredged access channels and anchoring basins, and boat launching and landing facilities.

Since the initiation of the Community Wharves program in 1984, the Department of Transportation has provided local marine facilities in 24 communities. The remaining 38 communities have facilities which were developed through local initiative.

The federal department of Fisheries and Oceans owns and operates four facilities in support of commercial fishing operations on Great Slave Lake (Hay River, Moraine Bay, Simpson Island and Wool Bay).

Responsibility

The Small Craft Harbours Branch (SCHB) of Fisheries and Oceans Canada is mandated to provide port and harbour facilities in support of commercial fishing vessels, recreational boaters and other small craft.

The territorial government established the community wharves program in 1984 to provide facilities in support of local marine activity. This program was established to meet local marine needs, since funding through SCHB was limited.

Private interests have constructed facilities in support of marine-based activities. A variety of small fixed and floating wharves and boat launch ramps have been constructed by tourism operators, mineral exploration companies, and through local initiative.

Traffic

The level of local marine activity is difficult to-measure. However, characteristics of local marine traffic can be observed.

The open water season is short, particularly in the Arctic regions where communities may be ice free for as few as two months each year.

Local marine traffic is generated by recreation, tourism, subsistence and commercial harvesting of resources, access to surrounding areas for land-based hunting activities and non-renewable resources (carving stone), and the movement of supplies. Subsistence harvesting is crucial to the population in supplying marine mammals and fish. This is particularly true in the more traditional native communities, where virtually every household may be expected to participate in the marine harvest. In many of the larger centres, recreation, tourism and inter-community travel may represent the majority of local marine activity.

Traffic generally involves relatively small craft, and may also include float planes. Float plane operations are generally more prevalent in the Mackenzie Valley, where distances between communities are shorter than between Arctic coast communities.

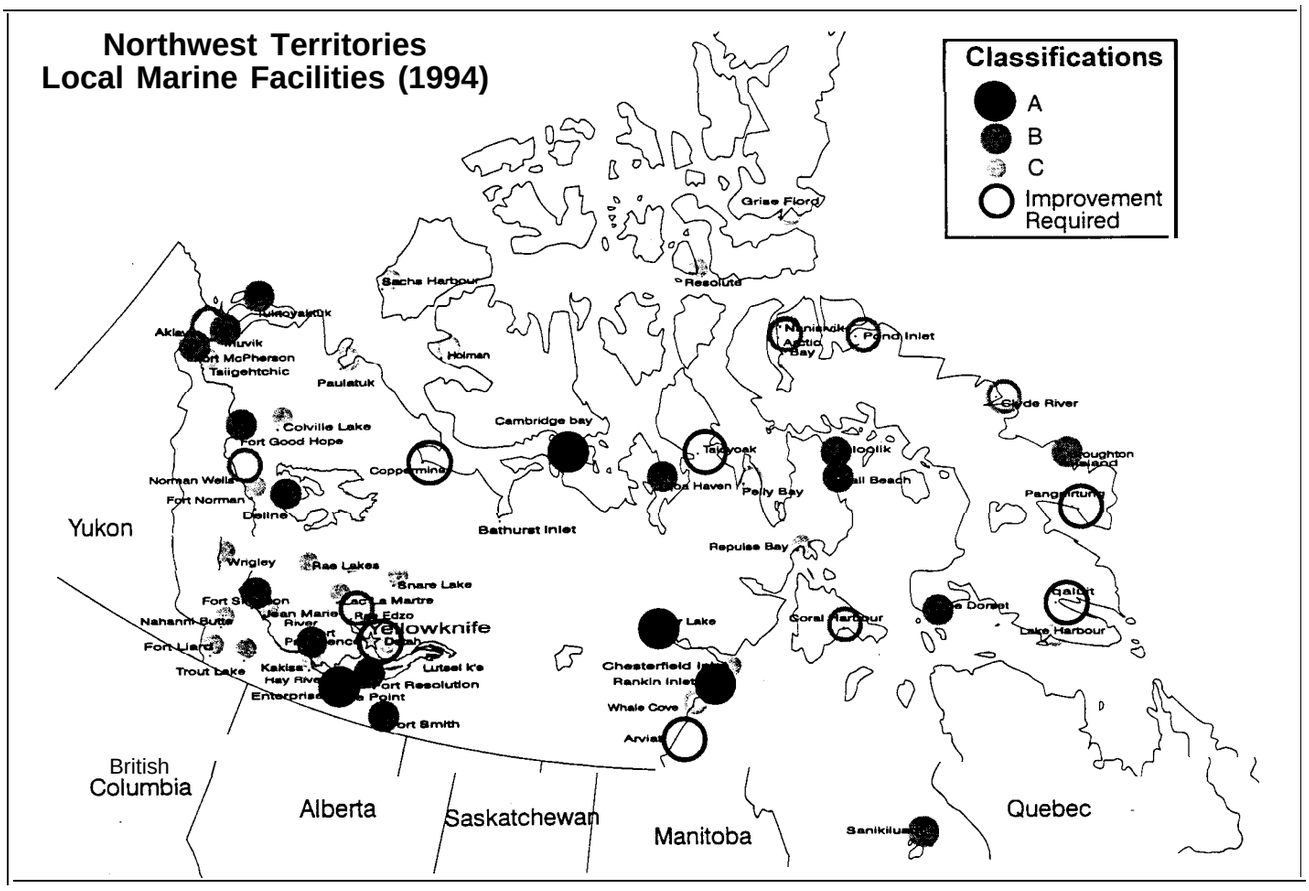
The overall level of local marine activity across the Northwest Territories is increasing, placing higher demands on existing infrastructure.

Classification

Local “A”, “B” and “C” classifications are established for local marine facilities. Classification is based on population of the community and the existence or prospect of commercial harvesting activities.

Standards

Site to site variations in natural conditions such as water depth, tides, ice conditions, wind, geology, shoreline condition and surrounding land use require considerable flexibility in developing standards. Design standards are therefore based on providing adequate levels of service and safety, rather than on standardized infrastructure solutions.



Marine Local Community Facility Classification And Standard

	A	B	c
Classification	subsistence harvest for population >500 and significant commercial harvest	subsistence harvest for population >500 or significant commercial harvest	subsistence harvest for population >500
Standard	secure moorage	secure moorage	secure moorage
	protected access for loading/unloading all tide or water levels	protected access for loading/unloading at least 4 hours daily	protected access for loading/unloading at least 4 hours daily
	access for loading/ unloading equipment	access for loading/ unloading equipment	
	access for seasonal launching /haulout	access for seasonal launching/haulout	

Local Marine Facilities Classifications (1994)

Community	Population	Commercial Fishery	Ownership Of Facility	Local Facility Classification
Yellowknife	15,179	yes	T	A
Hay River	3,206	yes	F/T	A
Rankin Inlet	1,706	yes	G	A
Pangnirtung	1,135	yes	G	A
Arviat	1,323	yes	G	A
Baker Lake	1,186	no	G	A
Cambridge Bay	1,116	yes	T	A
Coppermine	1,059	yes	T	A
Taloyoak	580	yes	T	A
Iqaluit	3,552	yes	T	A
Inuvik	3,206	no	T	B
Tuktoyaktuk	918	no	T	B
Norman Wells	627	no	T	B
Hall Beach	526	no	T	B
Cape Dorset	961	no	G	B
Igloolik	936	no	G	B
Pond Inlet	974	yes	G	B
Aklavik	801	no	T	B
Gjoa Haven	783	no	G	B
Fort Good Hope	602	no	T	B
Arctic Bay	543	no	G	B
Coral Harbour	578	no	G	B
Clyde River	565	yes	G	B
Broughton Island	461	yes	G	B
Fort Smith	2,480	"no	C	B
Rae-Edzo	1,521	no	G	B
Fort Simpson	1,142	no	G	B
Fort McPherson	759	no	C	B
Fort Providence	645	no	T	B
Déline	551	no	T	B
Fort Resolution	515	yes	T	B
Sanikiluaq	526	no	G	B
Nanisivik	294	no	T	C
Resolute	171	no	G	C
Repulse Bay	488	no	G	C
Fort Liard	485	no	G	C
Fort Norman	375	no	T	C
Lake Harbour	365	no	G	C
Holman	361	no	T	C
Chesterfield Inlet	316	yes	G	C
Lutsel K'e	286	yes	G	C
Paulatuk	255	no	T	C
Whale Cove	235	yes	G	C
Wrigley	174	no	T	C
Sachs Harbour	125	no	T	C
Grise Fiord	130	no	G	C
Lac La Martre	392'	no	G	C
Pelly Bay	409	yes	G	C
Rae Lakes	252	no	G	C
Detah	150	no	G	C
Snare Lake	127	no	G	C
Tsiigehtchic (Arctic Red River)	144	no	G	C
Nahanni Butte	85	no	G	C
Jean Marie River	49	no	G	C
Trout Lake	66	yes	G	C
Colville Lake	69	no	C	C
Kakisa	39	yes	G	C

Legend of Abbreviations
G - Owned by the territorial government
T - Owned by Transport Canada, Canadian Coast Guard
F - Owned by Fisheries and Oceans Small Craft Harbours
C - Owned by the community

Current Expenditures

Estimated capital expenditures in 1994/95 on local marine facilities was $1.8 million. This total includes **$300,000** federal funding under the Canada-Northwest Territories Strategic Transportation Improvement Agreement. An additional $100,000 was allocated to the operation and maintenance of facilities previously constructed under the program.

The Canada-Northwest Territories Strategic Transportation Improvement Agreement will provide additional federal funding of $1.7 million over five years beginning in 1993 to improve local marine facilities at Coral Harbour, Iqaluit and Pangnirtung.

1.6.2 Accomplishments and Problems

Accomplishments

Since 1990, improvements have been made at the following communities:

Arctic Bay	constructed a breakwater
Arviat	constructed an armoured wharf
Broughton Island	constructed a breakwater and provided a floating wharf
Cape Dorset	constructed an armoured wharf
Chesterfield Inlet	constructed an arrnoured wharf and breakwater

Fort Resolution	enhanced the breakwater, provided a floating wharf and boat launch
Fort Simpson	developed a new boat launch facility
Gjoa Haven	constructed a breakwater and provided a floating wharf, as well as a fixed wharf (funded by Canadian Coast Guard)
Igloolik	constructed a breakwater and provided a floating wharf
Iqaluit	constructed several small channels through the tidal flat area
Jean Marie River	provided a floating wharf
Kakisa	constructed a boat launch facility and provided a floating wharf and breakwater
Nahanni Butte	provided a floating wharf
Pangnirtung	constructed breakwaters, a new wharf and dredged an access channel through the tidal flat (in progress)
Rankin Inlet	constructed breakwater, fixed wharf and boat launch facility (in progress)
Sanikiluaq	constructed a breakwater and floating wharf
Taloyoak	constructed a fixed wharf (funded by Canadian Coast Guard)
Tsiigehtchic	provided a floating wharf (Arctic Red River)

All of these projects were built with significant levels of local involvement (contractors, equipment, materials and labour).

The Department has also provided or contributed to maintenance projects at several freshwater facilities in the freshwater communities of the western Northwest. Territories.

The Department has developed a comprehensive inventory and needs assessment of local marine facilities across the Northwest Territories in consultation with local stakeholders including community administrative councils, hunters and trappers associations, commercial fishery and tourism interests.

Problems

Despite this progress there are many unfulfilled needs. Improvements to local marine facilities are required at virtually every community. Concerns related to safety and protection of vessels and equipment are common. This problem continues as the number of vessels in the communities grows and as local interests invest in larger craft.

Although there has been growing interest in expanding commercial fishing activities, the lack of marine infrastructure is viewed as one of the factors that limits these prospects.

1.6.3 Program Objectives

Given below is a description of the operation and maintenance and capital program objectives for local marine facilities.

Operation and Maintenance

1. Maintain What We Have

Local marine facilities must be operated and maintained to standards which ensure that the infrastructure continues to meet the needs for which it was originally constructed.

The $100,000 provided for operation and maintenance of local marine facilities in 1994/95 was used to reshape several breakwaters after their initial season of operation, repair fixed and floating wharves, and launch and retrieve existing floating wharves at selected freshwater communities. Future operation and maintenance requirements are projected to be approximately five percent of the capital expenditure per year. The Department plans to decentralize the operation and maintenance of community wharves to its regional offices.

Capital

1. Upgrade Facilities to Standard

Local marine facilities need to be upgraded to current level-of-service standards in 37 communities. Priority will be given to safety and environmental concerns and

to promoting and supporting the establishment of viable renewable resource harvesting operations.

The Department also plans to develop a long-term plan for improvements to marine facilities in the Northwest Territories, in cooperation with Canadian Coast Guard, Northern Region and Fisheries and Oceans Canada, Small Craft Harbours Branch.

1.6.4 Program Funding Requirements

Operation and Maintenance

The current level of operation and maintenance funding is sufficient to meet existing needs. The funding level will need to be adjusted as new infrastructure is added or upgraded. It is assumed that the Department will receive sufficient allocations from the territorial government to meet these forced-growth needs.

Capital

The total currently justified and future (20 year) needs are $31 million. Of these, $12 million are currently justified on the basis of costs, economic benefit and safety.

The Department's current capital allocation to the community wharves program is $1.5 million per year. This is clearly insufficient to meet currently justified needs in a reasonable time frame.

Local Marine Facility Capital Needs (1994 $000's)

Program Objective/ Task	*Currently Justified Needs*	*Future Needs Within 20 Years*	*Total*
Upgrade Facilities to Standard			
Feasibility Studies	360	1,380	1,740
Freshwater Wharves - Various	520	2,160	2,680
Aklavik	50		50
Arctic Bay	350		350
Arviat	540		540
Baker Lake	60		60
Bathurst Inlet		30	30
Broughton Island		200	200
Cambridge Bay	450	50	500
Cape Dorset		1,550	1,550
Chesterfield Inlet	120		120
Clyde River	550		550
Colville Lake		115	115
Coppermine	350		350
Coral Harbour	1,250	3,000	4,250
Déline		500	500
Detah		60	60
Fort Good Hope	50	500	550
Fort Liard		50	50
Fort McPherson		150	150
Fort Norman		50	50
Fort Resolution	10	100	110
Fort Simpson	20		20
Fort Smith	50	500	550
Gjoa Haven		30	30
Grise Fiord	650		650
Hall Beach		1,250	1,250
Hay River	300	20	320
Holman	50		50
Igloolik		450	450
Inuvik	40		40
Iqaluit	950	900	1,850
Jean Marie River	20		20
Kakisa		30	30
Lac La Martre		100	100
Lake Harbour	550		550
Lutsel K'e	60		60
Nahanni Butte		60	60
Norman Wells		35	35
Pangnirtung	600	600	1,200
Paulatuk	50		50
Pelly Bay	20	450	470
Pond Inlet	800	850	1,650
Rae Lakes	100		100
Rae-Edzo	5	20	25
Rankin Inlet	420		420
Repulse Bay		550	550
Sachs Harbour	150	1,000	1,150
Sanikiluaq		250	250
Snare Lakes	50		50
Taloyoak	90		90
Trout Lake	60		60
Tsiigehtchic (Arctic Red River)	60		60
Tuktoyaktuk	35		35
Whale Cove	50	500	550
Wrigley		25	25
Yellowknife	2,000	2,000	4,000
Total Capital Needs	**11,805**	**19,550**	**31,355**

To meet this shortfall several actions will be pursued. We intend to increase funding for this program by reallocation from within the Department's capital targets. Funding will be increased from $1.5 million per year to $2 million per year beginning in 1996/97.

In addition, as part of the Strategic Transportation Improvement Agreement, the federal government will provide a total of $1.7 million for local marine facilities at Coral Harbour, Iqaluit and Pangnirtung over the five years of the agreement (1993 to 1997).

Total capital funding for local marine facilities over the next five years is estimated at $10.4 million. This level of funding will allow us to undertake local marine projects over the next five years in the following communities:

Arviat	Holrnan	Pelly Bay
Clyde River	Iqaluit	Pond Inlet
Coppermine	Lake Harbour	Rankin Inlet
Coral Harbour	Pangnirtung	Taloyoak
Grise Fiord	Paulatuk	Whale Cove

The Department will continue to work with the Canadian Coast Guard, Harbours and Ports, to ensure that public marine facility needs in the western Northwest Territories are addressed.

The Department will pursue additional bilateral agreements with Transport Canada similar to the Canada-Northwest Territories Strategic Transportation Improvement Agreement.

The Department will also seek funding from the federal government through the Small Craft Harbour Branch of Fisheries and Oceans Canada whose mandate includes port and harbour facilities in support of commercial fishing and recreational boating.

2. Objective Two: *Building New Transportation Corridors for Economic Development*

2.1 Introduction

The Northwest Territories holds enormous potential for mineral, oil and gas, renewable resource and tourism developments. However, the economics of these sectors are adversely affected by "remoteness" and the lack or inadequacy of transportation infrastructure.

Less than 10 percent of the land area of the Northwest Territories is within 100 kilometres of a highway. Only 12 percent of the population has year-round highway access, with an additional 42 percent having service for ten to 11 months of the year.

It is not surprising, therefore, that of the seven mines currently operating in the Northwest Territories, three (Miramar-Con, Royal Oak-Giant and Ptarmigan) are on all-weather highways. Two base metal (zinc/ lead) mines (Nanisivik and Polaris) are located on tidewater, providing immediate access to cost-effective marine transportation for the delivery of mineral concentrates to the marketplace. Resupply requirements for the sixth and seventh mines (Lupin and Colomac) justify the annual construction of winter roads for the movement of fuel, materials and equipment.

Most of the discovered and potential mineral deposits in the Kitikrneot and Keewatin regions are large distances from tidewater or existing roads. New roads and ports will be required to serve them if they are to be developed.

It is unlikely that individual mines could afford to build hundreds of kilometres of access roads. Also, it is preferable that transportation infrastructure be available to all developments, and for tourism and inter-community passenger and goods transportation. Therefore, governments must take the lead role in providing and managing public transportation infrastructure that benefits all users.

As mentioned earlier, the existing road network in the Northwest Territories was built by the federal government. Transfer of responsibility and base funding for the maintenance and capital upgrading of existing roads to the territorial govemrnent was completed in 1990. Construction of new roads in the Northwest Territories remains a federal responsibility.

The Department of Transportation must work with the federal government, the mining industry and stakeholder groups to develop and implement cooperative plans for new roads and ports supporting resource development in the Northwest Territories.

Strategic objective two, "Building New Transportation Corridors for Economic Development", involves building new roads and ports to provide low cost, reliable access that will encourage and sustain resource and other economic developments.

Given below is an overview of renewable and non-renewable resource development prospects in the Northwest Territories, followed by four program objectives/initiatives for the provision of roads and ports which will be required to bring economic prospects to fruition.

2.2 An Overview of Economic Prospects in the Northwest Territories

From the time the first all-weather road was constructed in the Northwest Territories, the main impetus for infrastructure development has been economic development. The major economic prospects in the Northwest Territories, and the role transportation infrastructure would play in the development of these prospects, are described below.

Mineral Development

Mining and mineral exploration constitutes a major component of the territorial economy. The industry employs about 1,700 people in the Northwest Territories, of which more than half are Northerners. In 1989, the value of mineral production reached almost one billion

dollars. In 1993, largely due to reduced commodity prices, the six operating mines produced just under $400 million in gold, silver, lead and zinc. The value of our mineral exports exceeds the combined total of oil and gas, tourism, arts and crafts, fish, fur and lumber.

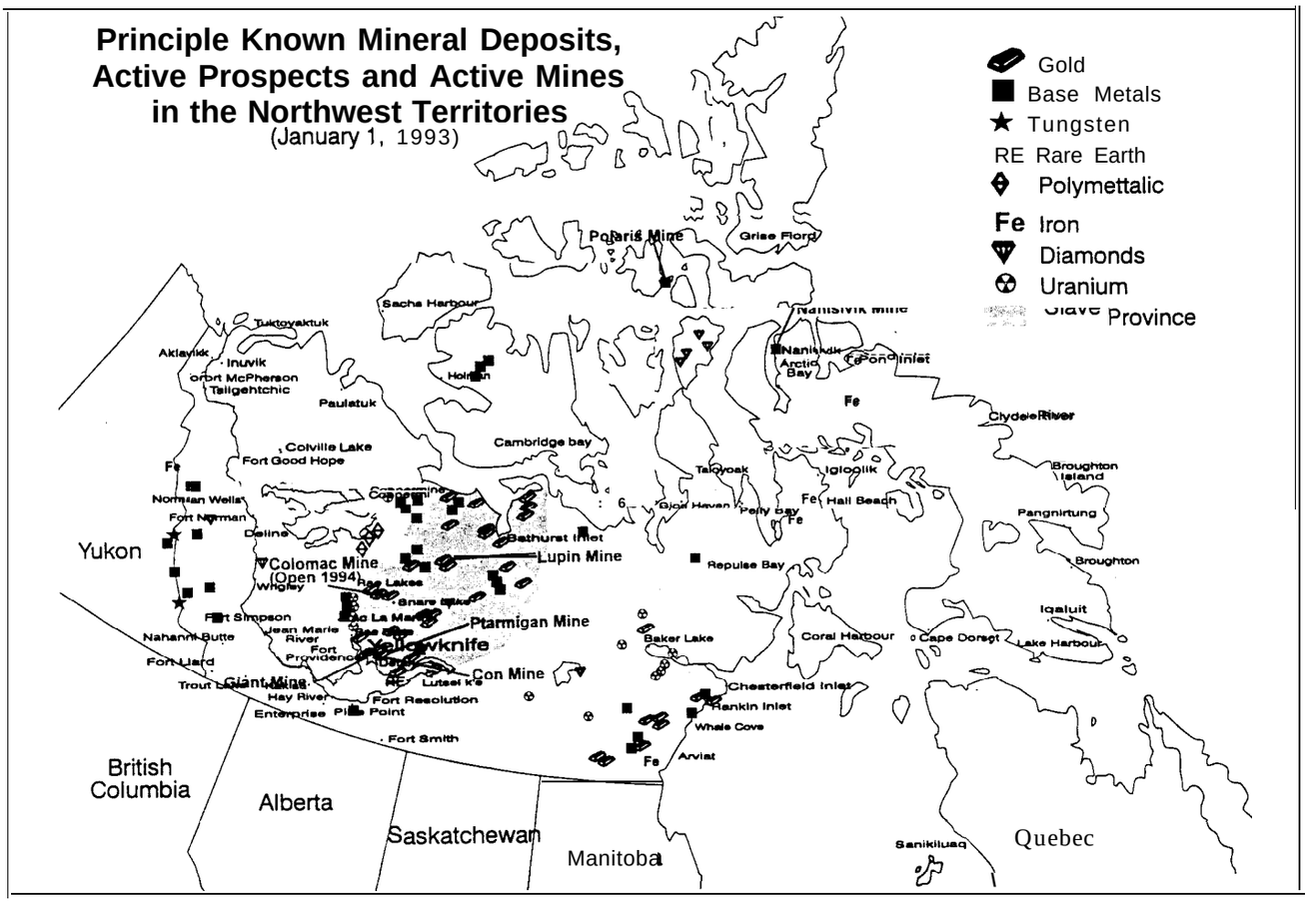
Exploration has increased dramatically and, in the next few years, we may see new gold, base metal and diamond mines go into production. These have the potential to triple the value of our mineral exports and to increase the territorial gross domestic product by more than 50 percent.

The seven mines currently operating have limited reserves. If a strong mineral industry is to be maintained, new mines must be brought into production during this decade.

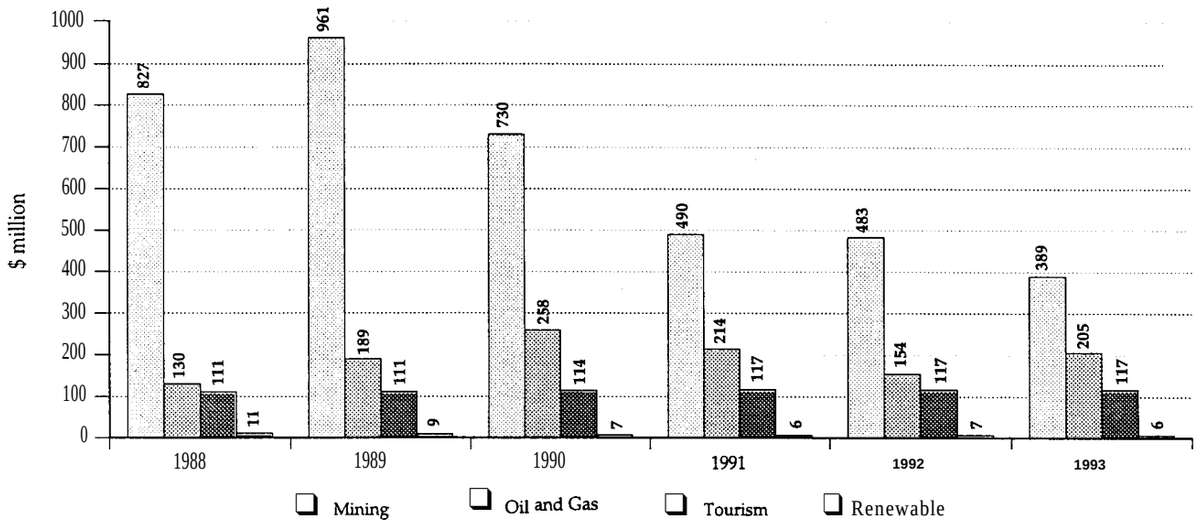
Known reserves are enormous, while areas of high potential have yet to be fully explored. There is little doubt that many known ore bodies and others yet to be discovered would be in production if located in southern Canada, with ready access to transportation facilities.

The Slave Geologic Province, the area between Great Slave Lake and the Coronation Gulf, is one of the richest and most promising mining regions in Canada, perhaps the world. The discovery of diamonds near Lac de Gras in 1991 set off one of the largest staking rushes in North American history. However, mineral development has been held back by the lack of adequate transportation infrastructure.

Geologic properties in the Keewatin region have not been well defined or developed, although the region's long-tern mineral potential is considered high. Again, the lack of adequate transportation services and infrastructure are among the factors which have hampered exploration.



Northwest Territories Exports



Source: Bureau of Statistics

Economic mineral deposits are much easier to discover and develop in northern Canada than in traditional mining regions of southern Canada. This is a result of the relatively unexplored nature of the mineral-rich greenstone belts in the North, the thin cover of overburden, and the high probability of discovering shallower and less costly ore bodies in northern regions. The major hindrance to northern mining operations is the cost of transportation. Plant, materials and personnel must be brought into the production site, and products must be shipped out to the marketplace.

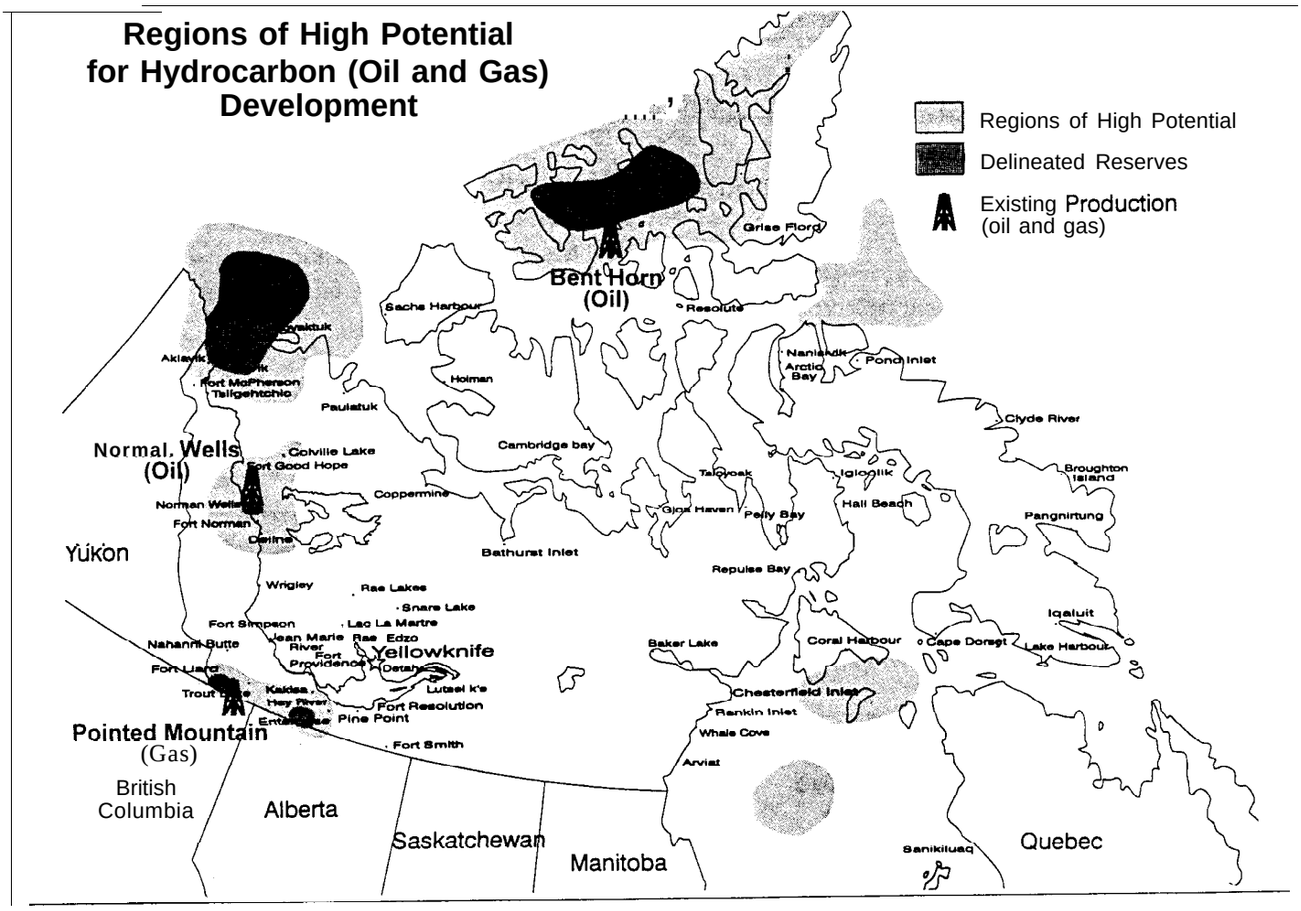
A number of mineral properties in the Northwest Territories could go into production if all-weather roads were provided. However, no one mine on its own can justify investment in the hundreds of kilometres of road required. Investment in infrastructure is most beneficial in areas which offer broad and sustainable development opportunities. Providing road access to such areas will stimulate mining and exploration, in turn creating hundreds of direct mining positions and possibly thousands of jobs in the support sectors.

Oil and Gas

The Northwest Territories has substantial known and potential reserves of oil and gas. The best known of these is the Beaufort Sea / Mackenzie Delta area. This area is not yet producing, although by 1990, about $4.5 billion had been spent on exploration, and reserves were estimated at over 1.4 billion cubic metres of oil and 2 trillion cubic metres of natural gas. Construction of a gas or oil pipeline has been considered for a number of years. However, market conditions do not currently warrant such development.

Norman Wells has been producing oil and gas since the 1920's. A major expansion of the oilfield and construction of a pipeline south boosted production to approximately 1 million cubic metres per year in 1985, and over 1.5 million cubic metres annually in recent years.

Other producing fields include Bent Horn in the High Arctic, which ships relatively small quantities of oil (57,000 cubic metres in 1993) to eastern Canadian refineries, and Pointed Mountain near the border with British Columbia and Alberta, which produced over 100 million cubic metres of gas in 1993.



Other identified gas reserves include those delineated in the Queen Elizabeth Islands in the High Arctic, the Cameron Hills, the Liard District, and the Mackenzie Valley.

" The oil and gas industry is less reliant on all-weather highways than the mining industry. However, highways would reduce costs for resupply of exploration and production activities, and provide access for the delivery of pipeline construction supplies and for pipeline maintenance.

Tourism

Tourism is a growth industry in the Northwest Territories. The number of pleasure travelers has doubled in the past decade to more than 55,000 per year. Expenditure on pleasure travel exceeded $50 million in 1992. Untapped market potential, and world trends to increase leisure and recreation, will mean further growth.

Upgrading existing transportation facilities and services along with substantial advances in marketing and training will help to realize this potential. New roads into the hinterlands will increase this potential further. Routes which are designed to take advantage of attractive scenery, and which allow for convenient parks and visitor facilities, provide the greatest tourism opportunities. Road connections forming a loop or with an "exotic" terminus (the Arctic Ocean) are considered especially attractive to the motoring tourist. Paved roads and the reduction of dust have been cited by visitors as the most needed, tourism-related improvements in the Northwest Territories.

Arts and Crafts

The arts and crafts sector provides a much needed source of employment in small communities where job opportunities are scarce. Transportation infrastructure can, as a spin-off benefit, reduce the cost of supplying raw materials to northern artists and crafts people, and enhance marketing opportunities.

Renewable Resources

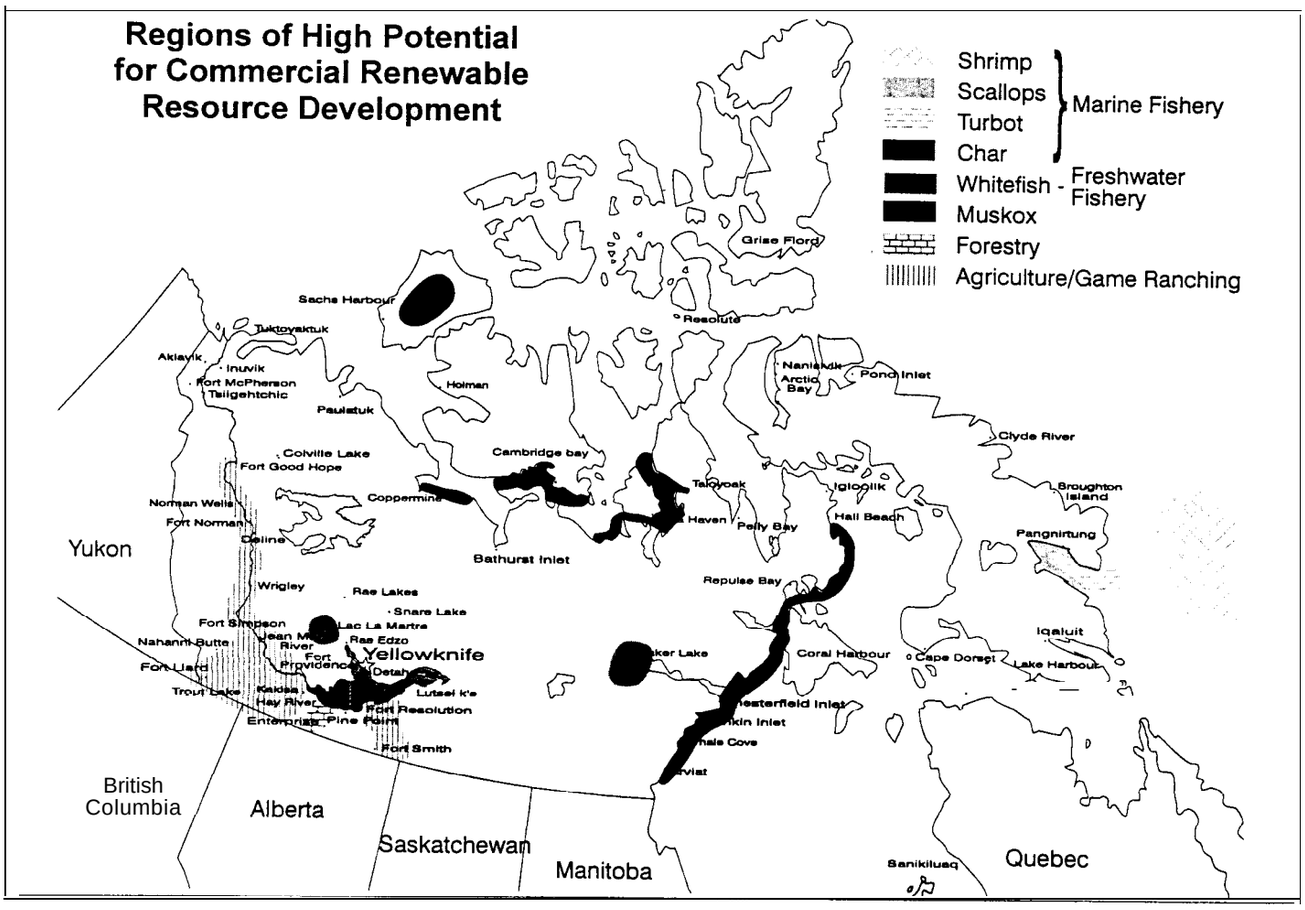
There are substantial untapped, sustainable, commercial yields of fish, lumber and game in the Northwest Territories. These resources are small in value relative to the non-renewable resource potential. However, commercial and subsistence harvesting are important in terms of community-based employment, and represent opportunities to reduce reliance on imported goods.

The expenditure of hundreds of millions of dollars on roads to access these resources cannot be justified by their potential harvest value. However, the spin-off benefits of improving or constructing roads and other transportation infrastructure include greater access to resources, reduced shipping costs, and higher product quality.

Promising fisheries initiatives can benefit from the development of marine infrastructure. Adequate wharf facilities provide protection and mooring for vessels during inclement weather, and facilitate the safe and efficient transfer of goods.

Employment Potential

Road construction and subsequent maintenance provide considerable employment. Every $100 million of road construction creates in excess of 350 person years of employment in the Northwest Territories. At least 30 cents of every dollar is realized in direct employment benefits. A large proportion of employment is in unskilled, apprenticeship and trade categories, and considerable training opportunities exist. The wages paid



generate income tax revenues and reduce dependence on social assistance. Spending of these new, disposable incomes will generate other jobs in retail, construction and service sectors.

The potential employment benefits to northern residents are the greatest in regions with high unemployment. The benefits are also greater if a steady, moderate level of ongoing employment is provided, rather than the short-term, high level of activity characterized by mega-projects.

Living Costs and Mobility

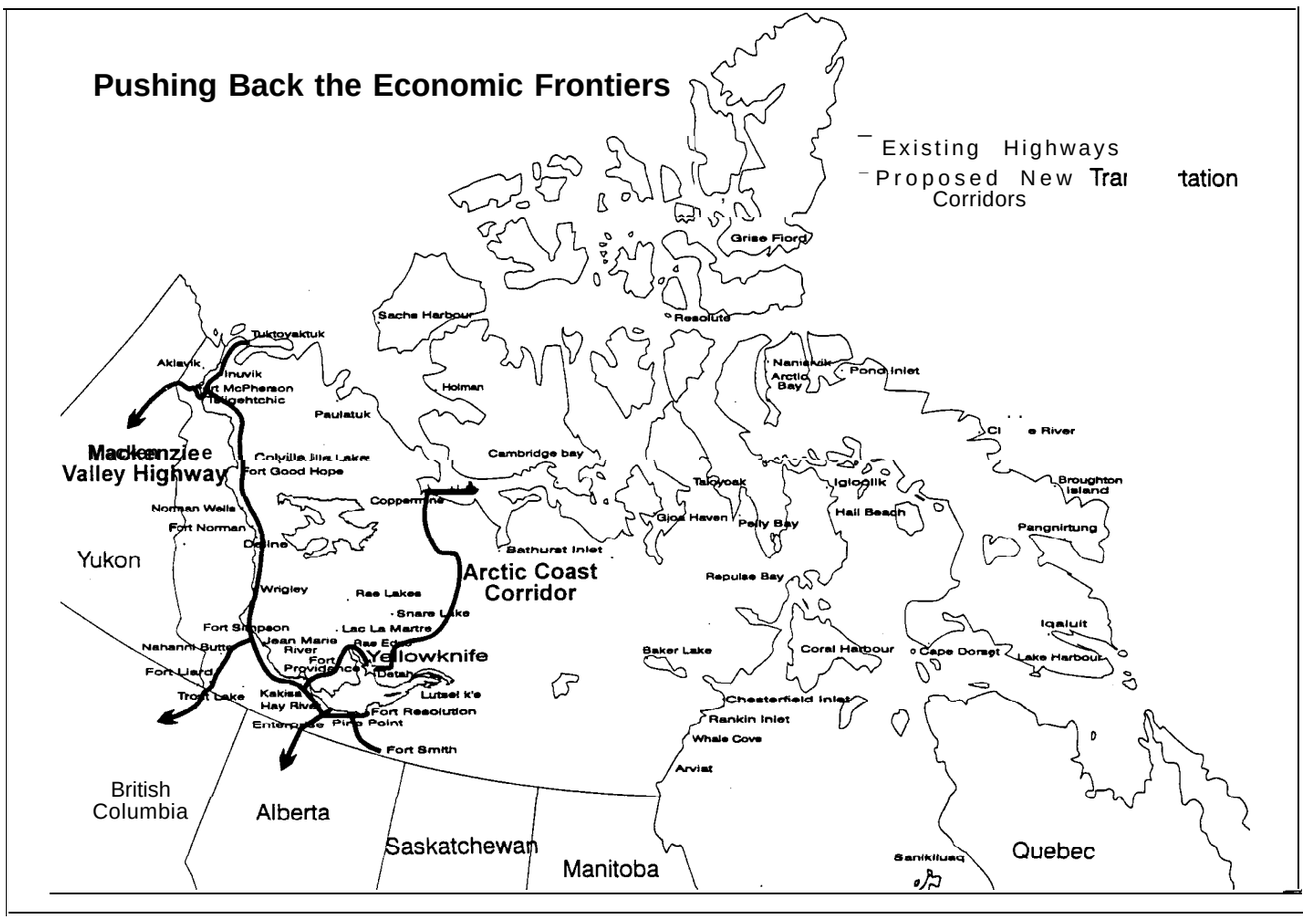
Providing roads will significantly reduce the costs of living and doing business in the smaller communities. In addition to the communities served directly, the costs in more remote communities will be reduced as roads are extended north and as new, closer transportation hubs are developed. For example, a road to the Arctic coast would likely result in the growth of a regional transportation hub at the terminus of the road, resulting in lower resupply costs for the whole region.

Lower transportation costs will increase individual mobility and freedom-to-move, particularly in more remote communities. The benefits of road access will increase in direct proportion to the growing population. Improved access will also support the economic transition of the smaller communities.

2.3 Proposed Transportation Infrastructure for Economic Development

The 1990 Transportation Strategy proposed five new transportation corridors to support the resource and other economic development prospects described above,

- Mackenzie Highway extension to Inuvik,
- Inuvik to Tuktoyaktuk Road,
- Arctic Coast Highway,



- Keewatin Road, and
- Fort Smith to Fort MacKay Road.

During the consultation process to update the Strategy, the general consensus was that the 1990 Strategy was too unrealistic or optimistic in proposing these five corridors. However, it was also recognized that transportation infrastructure plays an important role in the development of the economy of the Northwest Territories.

To provide transportation infrastructure required to support the resource and other economic developments described above, the Department will focus on two transportation corridors.

- Yellowknife to the Arctic Coast road and port, and
- Mackenzie Valley Highway from Wrigley to Inuvik and Tuktoyaktuk.

Keewatin roads were considered unrealistic given the current population base in the region, the distances between communities, the high construction costs, and the lack of substantial mineral exploration or development prospects. Should resource developments occur in the future, the Department will consider its role in the provision of the required transportation infrastructure.

At the present time, a winter road is constructed from Fort Smith south through Wood Buffalo National Park, to Fort Chipewyan and Fort MacKay. Since this route lies entirely within Alberta, the role of the territorial government and the Department of Transportation is limited to providing support and lobbying with the federal and Alberta governments, municipal governments and aboriginal groups to encourage the implementation of this project.

The two transportation corridors are described below in terms of their scope, benefits, costs and proposed implementation plan.

2.3.1 Arctic Coast Transportation Corridor

Scope

At present, transportation infrastructure in the Slave Geologic Province consists of a winter road from Yellowknife to the Lupin mine, constructed annually by the mine owner, Echo Bay Resources. This winter road is also used by many other companies exploring for diamonds and other minerals in the area between Yellowknife and the Lupin mine. A public winter road to Rae Lakes and Lac la Martre is constructed annually by the Department of Transportation. A winter road is also constructed annually by the mine owner to resupply the Colomac mine.

Winter roads are typically open for only three months of the year. Mines dependent on a winter road require much higher working capital, and encounter other operational inefficiencies. An all-weather road in the Slave Geologic Province would encourage greater exploration and development. Moreover, it could make many marginal deposits economic to develop. To illustrate, Metall Mining of Canada, owners of the Izok Lake base metal deposit, have cited high transportation costs as a major inhibiting factor in the development of the Izok Lake deposit. Metall has stated that an all-weather road, built by cost-sharing with governments or other mining companies, would reduce transportation costs, and would help make the project profitable.

costs

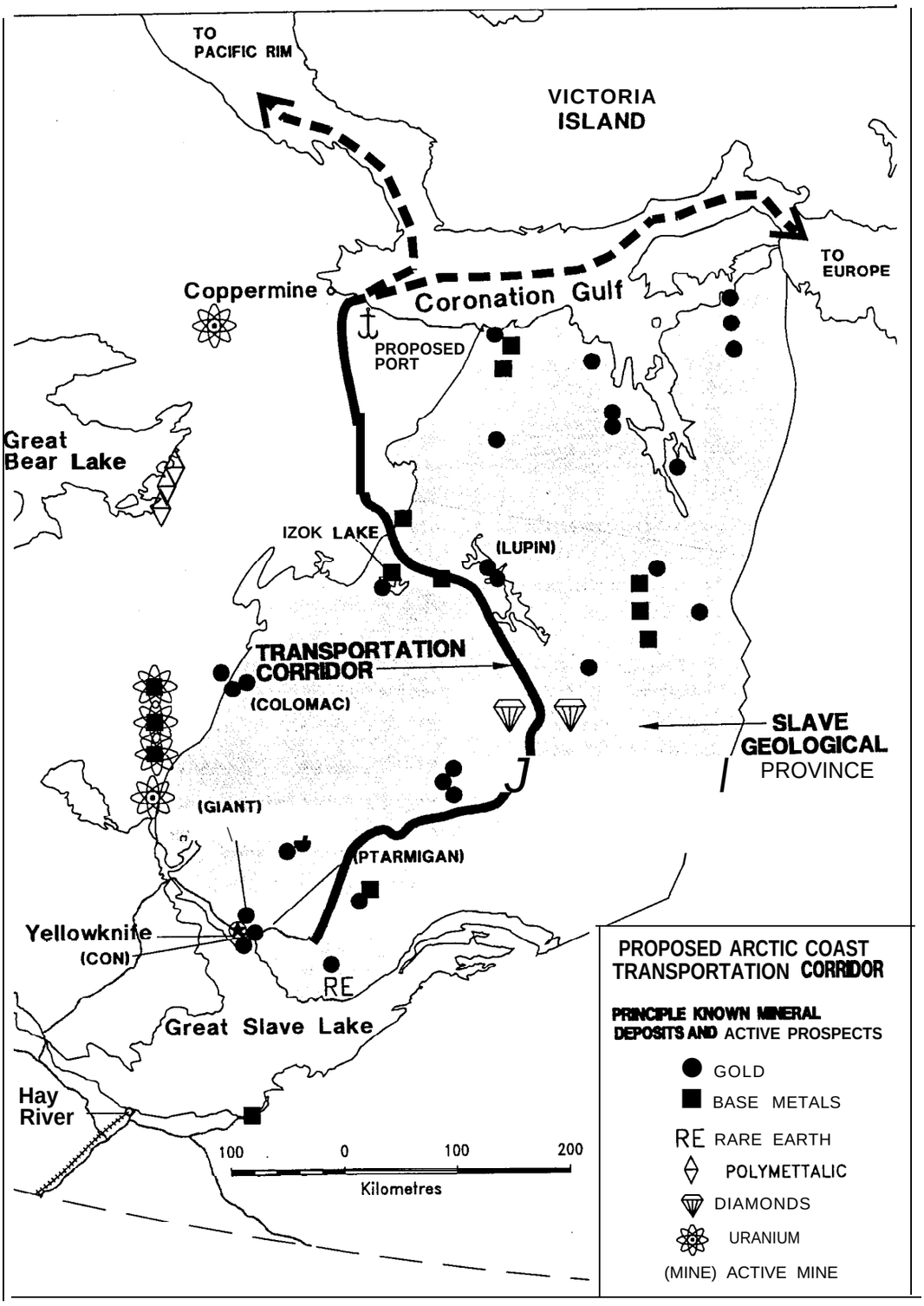
A winter road is constructed annually by Echo Bay Mines to resupply the Lupin gold mine. An extension of the winter road from Lupin to Izok Lake has been constructed in the past to facilitate exploration of the Izok Lake base metal deposit. A winter road connection from Izok Lake to the Arctic coast near Coppermine, a distance of 280 kilometres, has been estimated by Metall Mining to cost $35 million. Annual operation and maintenance expenditures are estimated at $2 million. A winter road corridor connecting Yellowknife, Lupin, Izok Lake and Coppermine would cost an estimated $5 million per year to construct, operate and maintain.

An all-weather road from the Yellowknife area to the Arctic coast would be approximately 850 kilometres in length, and would cost $600 million to build and $11 million per year to maintain.

The capital cost of a port near Coppermine on the Coronation Gulf is estimated at $50 million, with operation and maintenance costs of $3 million per year.

Benefits

The northern section of the Arctic Coast road is a prerequisite for the viability of the Izok Lake mine. It would also enable northern resupply to the Lupin mine, thereby reducing operating costs at this site, and potentially extending the mine's economic life.


TO
PACIFIC RIM
VICTORIA
ISLAND
TO
EUROPE
Coppermine
Coronation Gulf
PROPOSED
PORT
Great
Bear Lake
IZOK LAKE
(LUPIN)
TRANSPORTATION
CORRIDOR
(COLOMAC)
SLAVE
GEOLOGICAL
PROVINCE
(GIANT)
(PTARMIGAN)
Yellowknife
(CON)
RE
Great Slave Lake
Hay
River
100
0
100
200
Kilometres
PROPOSED ARCTIC COAST
TRANSPORTATION CORRIDOR
PRINCIPLE KNOWN MINERAL
DEPOSITS AND ACTIVE PROSPECTS
GOLD
BASE METALS
RE RARE EARTH
POLYMETTALIC
DIAMONDS
URANIUM
(MINE) ACTIVE MINE

The road would further open up the Slave Geologic Province to mineral exploration and development. Surface access would reduce exploration, development and mine resupply costs, and provide better certainty with respect to the transport of mineral products.

The road would also benefit Northerners generally, by providing training and employment opportunities associated with the road itself and with the potential mining activities which would follow construction of the road. It would encourage support activities to locate in Yellowknife, providing additional business opportunities and employment. The road would also provide alternatives for shipment of resupply commodities to remote northern communities, either by land from Yellowknife or by direct sealift into the port. Direct access to the Arctic coast would also encourage tourism, especially if the road was all-weather.

Governments, both federal and territorial, would benefit through increased economic activity, taxes (income, business, fuel, etc.), royalties and reduced reliance on social assistance and unemployment insurance.

A report, prepared by the Conference Board of Canada in December 1994, estimated the economic impact of mineral development scenarios. The most probable mineral development scenario consisted of the construction of an all-weather road from Yellowknife to the Arctic coast, a port near Coppermine, development of the Izok Lake base metal mine, extension and expansion of the Lupin gold mine, and the development of two diamond mines and two new gold mines. The report estimated that $31.9 billion in gross domestic product (GDP) and over 212,000 person-years of employment would accrue to Canada over the next 20 years under this scenario. Of this total, $23 billion in GDP and 62,000 person-years of employment would be created in the Northwest Territories.

Future Activities

It is unlikely that any single mining development could support the large investment in the all-weather Arctic coast transportation corridor. Therefore, a cooperative effort between the mining industry and the federal and territorial governments is required to meet this need. The mining industry would be the direct beneficiary of any infrastructure development through improved and reliable year-round access. Governments would benefit through increased economic activity, royalties and taxes. This type of cooperative effort is being utilized to complete the hydrographic survey of the Coronation Gulf. Federal and territorial governments and Metall Mining are cost-sharing the incremental $2.7 million required over the next four years by the Canadian Hydrographic Service to complete this work.

The territorial government plans to take a lead role in coordinating stakeholders, including mining and business interests, aboriginal groups and governments, to ensure developments proceed to the benefit of all stakeholders.

The federal government must be convinced that investment in this project is worthwhile, since mining in the North benefits the entire nation and produces substantial revenues for the federal government. The Department will also seek support from other provinces whose economies will benefit from developments in the North.

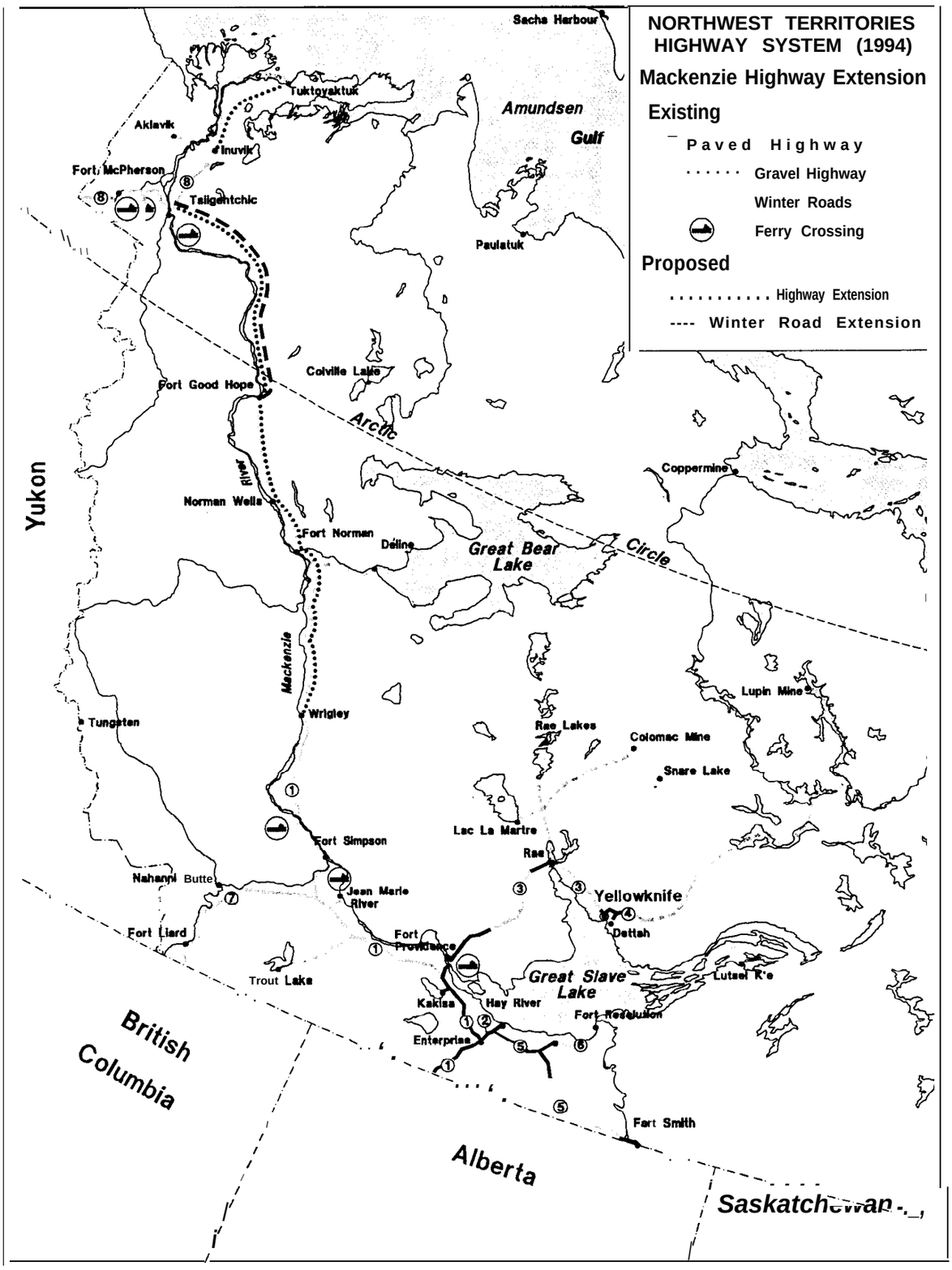
The Department's objective is that through cooperation and involvement of all stakeholders, a jointly-funded, publicly-managed transportation infrastructure will be realized for the benefit of all present and future users and stakeholders.

The Department of Transportation is working with mining companies and other stakeholders to determine what infrastructure will best meet the needs and when it should be built. In 1995, in cooperation with the federal government and the mining industry, the Department plans to coordinate the preparation of a financing options study for public transportation infrastructure in the Slave Geologic Province.

2.3.2 Mackenzie Valley Highway

Scope

In 1972, the federal government began the extension of the Mackenzie Valley Highway from Fort Simpson to Inuvik. Work was halted in 1977 at a point 18 kilometres south of Wrigley. The remaining 18-kilometre section to Wrigley was subsequently completed in the early 1980's. As part of the transfer of the highway reconstruction program from the federal government, the Government of the Northwest Territories assumed responsibility for


NORTHWEST TERRITORIES
HIGHWAY SYSTEM (1994)
Mackenzie Highway Extension
Existing
Paved Highway
Gravel Highway
Winter Roads
Ferry Crossing
Proposed
Highway Extension
Winter Road Extension
Sachs Harbour
Tuktoyaktuk
Amundsen
Gulf
Aklavik
Inuvik
Fort McPherson
Tsiigehtchic
Paulatuk
Colville Lake
Fort Good Hope
Arctic
Yukon
River
Norman Wells
Coppermine
Fort Norman
Deline
Great Bear
Lake
Circle
Mackenzie
Wrigley
Tungsten
Lupin Mine
Rae Lakes
Colomac Mine
Snare Lake
Lac La Martre
Fort Simpson
Rae
Nahanni Butte
Jean Marie
River
Yellowknife
Dettah
Fort Liard
Fort
Providence
Trout Lake
Great Slave
Lake
Lutsel K'e
Kakisa
Hay River
Fort Resolution
Enterprise
British
Columbia
Alberta
Fort Smith
Saskatchewan

completing the Mackenzie Highway from Fort Simpson to Wrigley. The territorial government spent over $7 million to complete the highway to Wrigley which was opened to traffic in the summer of 1994.

At present, a winter road is constructed annually by the Department of Transportation from Wrigley to as far north as Fort Good Hope.

The proposed Mackenzie Highway extension would connect Wrigley, at the end of the existing all-weather road, to the Dempster Highway south of Inuvik, a distance of approximately 800 kilometres. Comecting Inuvik to Tuktoyaktuk would add another 160 kilometres to the highway. The road would provide all-weather access for the communities of Fort Norman, Fort Franklin, Norman Wells, Fort Good Hope and Tuktoyaktuk for ten to 11 months of the year.

costs

Capital costs of the 800-kilometre road from Wrigley to the Dempster Highway south of Inuvik are estimated at $500 million. Once completed, an estimated $8 million will be required annually for maintenance.

The 160-kilometre section from Inuvik to Tuktoyaktuk would cost an estimated $160 million to construct, with annual maintenance costs of $3 million.

Benefits

The construction of this route would provide considerable training and employment opportunities for the smaller, less developed communities in the region. It would also positively impact the economies of the more developed centres of Yellowknife, Hay River, Norman Wells and Inuvik. Living costs would be reduced for all valley communities north of Wrigley.

This route is regarded as showing high potential for tourism development. The link would create a loop from the Yukon and Alaska via the Dempster Highway, boosting tourism traffic in the western Northwest Territories.

The main attraction for renewable resources would be access to the forest reserves of the valley.

In the oil and gas sector, a Mackenzie Valley Highway would likely help stimulate exploration activity, and would certainly reduce the costs of pipeline construction and operation. It would also shorten the distance and reduce costs for road resupply of Mackenzie Delta / Beaufort Sea exploration and development.

Based on annual expenditures of $25 million, the project would be expected to generate 174 direct and 75 indirect person years of employment in the Northwest Territories for each year of construction.

Future Activities

The Department will pursue the extension of the Mackenzie Valley Highway as an employment creation initiative. Funding sources include federal infrastructure funding and existing training and social assistance programs. This will be supplemented by territorial training and infrastructure funds. In 1995, the Department will provide funding to the Mackenzie Valley Highway Industrial Agreement Committee to undertake this research.

The main objective of this project is local employment with work in several locations on an ongoing basis. The Department does not intend to undertake this project as a mega-project.

If federal funding can be secured, the Department will implement the project in consultation with local communities and business development corporations.

3. Objective Three: *Enhancing Safety, the Environment and Northern Involvement*

3.1 Doing Things Right

The first two strategic objectives describe what needs to be done. The strategic objectives of upgrading existing infrastructure and expanding highways and other transportation facilities will help accomplish the Department's mission and goals.

However, "doing the right things" is not enough, the Department must also "do things right". Doing things right means continuous improvement in effectiveness and efficiency. It means being aware of the current and anticipated social, physical and political environments and their interaction with transportation in and for the Northwest Territories. It means developing and utilizing human and technological resources, laws and regulations, policies and programs which will facilitate doing the right things. The third strategic objective "Excellence in Northern Transportation" encompasses these various aspects as selective program objectives.

3.2 Program Objectives

3.2.1 Improve Transportation Safety

Safety is an essential characteristic demanded by users of trarisportation facilities and services. Unique northern aspects such as severe climate and long distances play an important role in transportation safety in the Northwest Territories.

In terms of infrastructure improvements, the Department of Transportation has made significant progress in reconstructing and paving the highway system and in upgrading airports and marine facilities. Improvements have also been made to the way facilities are operated and maintained.

However, improving transportation safety also requires improving user skills and awareness, and ensuring the safety of vehicles.

The driver is the most critical element in safety. Safety initiatives must focus on public awareness and safety education. The Department is taking initiatives in areas such as improved driver testing and licencing standards, seat-belt campaigns, impaired driver programs, driver demerit point regulation, safety education at schools, all-terrain vehicle (ATV) safety programs, and programs to encourage the safe operation and handling of small boats.

The Department has also adopted the National Safety Code for heavy commercial vehicles and amended the *All-Terrain Vehicle Act.*

However, more needs to be done. The current 60 percent use of seat-belts in the Northwest Territories, compared to the national average of 88 percent, must be improved. The Department must continue to promote responsible attitudes to impaired driving, monitor the safety performance of the trucking industry, improve the safety record of small boat operations, and amend the laws and regulations related to transportation safety as required.

To improve transportation safety in the Northwest Territories, the Department has developed a comprehensive traffic safety strategy. The strategy deals with all aspects of transportation safety, including drivers and other users, vehicles and transportation infrastructure. It identifies key target areas and action plans to reduce both the frequency and severity of accidents. The Department has started to implement this strategy, with initial efforts focusing on driver training for Department employees, seatbelt and impaired driving enforcement campaigns, and an ad campaign to increase public awareness of traffic safety issues.

The Department has also signed a Memorandum of Understanding with the Canadian Coast Guard, Northern Region, to assist in educating the public in the Northwest Territories on small boat safety. The Department will distribute information on small boat safety throughout the Northwest Territories on behalf of the Canadian Coast Guard.

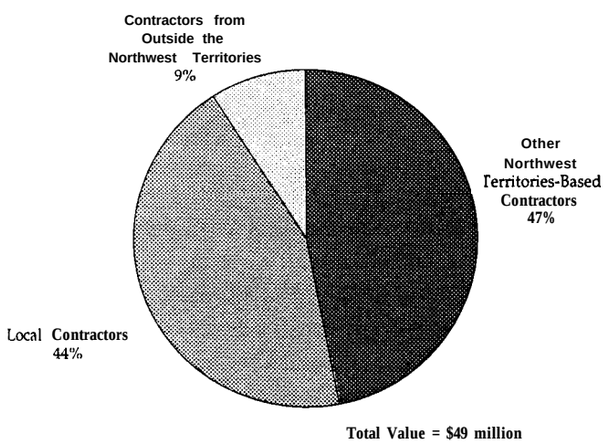
3.2.2 Increase Local Involvement in Transportation Expenditures

Government expenditures represent a very sizable portion of the economic activity in the Northwest Territories. The territorial government has implemented various policies, including the Business Incentive Policy, to maximize the benefits of government expenditures to Northerners in general, and local residents in particular, through direct contracts, other business and employment opportunities, and training and development.

The Department of Transportation has been a leader in the government's efforts in this area. The Department has successfully applied the Business Incentive Policy and in addition implemented many other innovative approaches.

- Transportation projects have been sized and scheduled to ease bidding by local contractors.
- Negotiated contracts have enabled local contractors and community development corporations to undertake projects without competition.
- The Department has utilized its project managers working with locally hired workers on several major airport projects.
- The Department has established a training centre at Baker Lake for airport operators.
- All of the Department's highway and ferry operation and maintenance activities employ local or northern personnel or contractors.

Distribution of the Department of Transportation's 1993/94 Contract Awards



- Of the 43 airports owned by the Department, 33 are operated under contract by local communities.
- All operators of the 31 community airports' radio stations (CARS) are local residents.

The results have been impressive. In fiscal 1993/94, of the $49 million in capital, operation and maintenance contracts awarded by the Department, over 91 percent were awarded to northern and local contractors and organizations (44 percent went to local companies, and 47 percent to other Northwest Territories-based companies).

Because of the need to create and sustain employment at the local community level, the Department must increase the local content in its contracts. To do so, action on several fronts will be undertaken. The Department will make greater use of special contracting approaches which incorporate training programs and incentives to maximize local employment and subcontracting opportunities.

The Department will also encourage communities to get more involved in the delivery of programs by, for example, taking steps to devolve management of airports to communities, and using the Department's Contributions Policy for construction of local access roads and community wharves in partnership with local communities.

3.2.3 Minimize Environmental Impact

Protection of the biophysical environment is particularly important to Northerners. The Department's objective is to protect the natural environment and mitigate negative effects of transportation developments when planning, designing, implementing and operating transportation facilities.

The Department has and will comply with all legislation, regulations and policies established for environmental protection. An important part of the Department's effort in this regard is pro-active consultation with communities and other stakeholders. Also, the Department has and will develop environmental guidelines for various aspects of planning, design, construction and operation of its transportation facilities.

3.2.4 Enhance Research and Development in Arctic Transportation

To find innovative, effective solutions to the North's unique transportation problems, the Department must invest in research and development. The Department has invested in studying ice behaviour, marine transportation in the Arctic, ice-bridge construction and ice-strength evaluations. The Department's staff has also participated in technical exchanges with Russian and Greenland transportation experts to the mutual benefit of each.

The Department intends to enhance these efforts, and fund selective research efforts with universities, national and international transportation organizations and exchange visits. The ultimate purpose is to keep the Northwest Territories transportation professionals in the public and private sector on the leading edge of Arctic transportation engineering, technology and management.

3.3 Funding Requirements

The Department will fund these four program objectives from its regular budget allocations.

APPENDIX

NORTHWEST TERRITORIES

TRANSPORTATION AGENDA

December 1993

FOREWORD

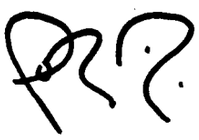
The vital role of transportation in the modern society is well recognized. This role is even more crucial in a region such as the Northwest Territories which has very few people spread over a vast area. The high cost of living in many of our communities is a direct result of high transportation costs. Lack or inadequacy of transportation is also a major factor in frustrating the development of our abundant natural resources.

Improved transportation systems and services are essential if we are to achieve our full economic, social and political potential. Over the past few years, we have made some progress in addressing the deficiencies in our transportation infrastructure. However, we recognize that our needs for transportation improvements far exceed the financial resources currently available to us.

We must use the funding we do have judiciously to achieve the maximum benefit, and, because our future depends upon improved transportation, we must also recognize the needs that are not being met and find the means to address them.

This document identifies ten major objectives which must be pursued over the next several years and the resources which must be found to achieve them. Taken together these objectives define the agenda of the Minister of Transportation for the next several years.

This is the agenda that I intend to pursue, with the continued advice and support of all Members of the Legislative Assembly.



The Honorable John Todd
Minister Responsible for Transportation

INTRODUCTION

The Government of the Northwest Territories published the Northwest Territories Transportation Strategy in the fall of 1990. Based on extensive consultation and analysis, this document presented the first-ever comprehensive, long-term transportation plan for the North. It has served as a guide and blueprint for the policies and programs of the Department of Transportation.

By 1993 the Transportation Strategy needed updating to reflect the fact that many short term priorities have been accomplished since 1990, while new priorities have been identified. Advice has been sought from all Members of the Legislative Assembly on how the 1990 Strategy has met or fallen short of needs, and on changes that should be made to reflect the current economic, social and political conditions.

Like the 1990 version, the updated Transportation Strategy is a comprehensive, long-term planning document, containing detailed inventories, assessment of needs and priorities, and identification of both short and long-term objectives. It identifies needs that are not being met, as well as those that are.

The Minister and the Department of Transportation also need a separate document to focus on the major shorter-term priorities for addressing needs that are not being met. This Transportation Agenda describes the ten major objectives which must be high on the Minister's agenda. It is not a catalogue of all the programs that are being undertaken, nor does it identify priorities for the long-term future. Rather it is a set of realistic objectives on which progress can and should be made over the next two to five years. Specific actions are proposed for each objective.

The following ten major objectives have been identified for action over the next few years:

ROAD

1. Accelerate Highway Upgrading Capital Program
2. Continue Mackenzie Highway Extension
3. Construct Arctic Coast Transportation Corridor
4. Enhance Community Local Access Roads Program

AIR

5. Upgrade Airports to Standard
6. Improve Air Navigation Systems

MARINE

7. Improve Local Marine Facilities
8. Improve Marine Resupply Systems

ALL MODES

9. Improve Transportation Safety
10. Increase Local Involvement in Transportation Expenditures

These objectives are listed by transportation mode and are not in order of priority. Success in achieving some of these objectives is within our reach because it depends completely on our own actions (Objectives 4, 7, 9, 10). Success on other objectives will depend, at least partly, on our ability to influence others, particularly the government of Canada (Objectives 1, 2, 3, 5, 8). Still other objectives depend on taking advantage of opportunities presented by changing technology or private sector developments (Objectives 3, 6). However, in all instances we must pursue these objectives with the means available to us.

Each of these ten objectives is discussed in a separate section below. Each section briefly presents the background, progress made since 1990, current needs and deficiencies, accomplishments proposed with funds available to the Department of Transportation and action plans for addressing the unfulfilled needs.

1. Accelerate Highway Upgrading Capital Program

The two major features of a highway which influence road safety, user costs and tourism potential are road geometry (adequate width and alignment) and surface condition (paved, dust-controlled or untreated gravel).

The Northwest Territories all-weather highway network totals 2200 kilometres. Responsibility and base funding for capital rehabilitation and upgrading of the highway system was transferred from the federal government to the Government of the Northwest Territories in 1990. When the 1990 Transportation Strategy was released, only 40 percent of this system met geometric standards, with only 14 percent paved and an additional 14 percent dust-controlled.

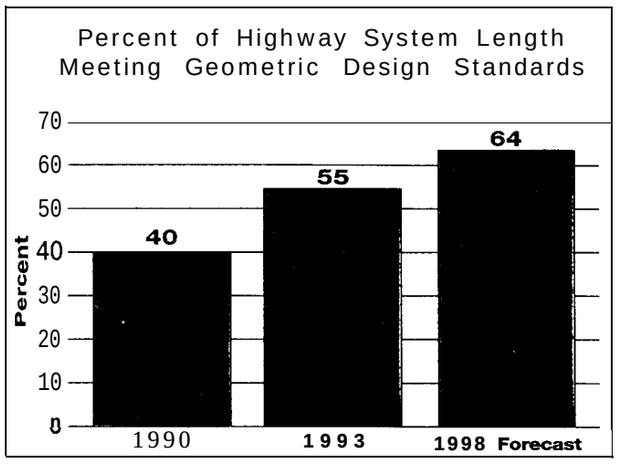
By 1993, an aggressive upgrading program and enhanced dust-control measures have resulted in substantial improvements. Fifty-five percent of the system now meets geometric standards; 22 percent is paved and an additional 47 percent is dust-controlled.

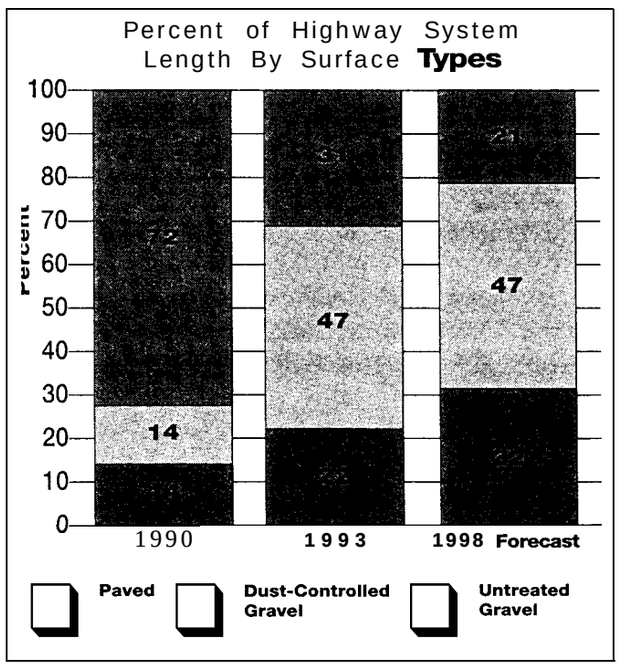
Upgrading and paving programs have targeted those highway sections which carry the most travel (vehicle-kilometres). Currently, although only 22 percent of our highway kilometres are paved, they carry approximately 58 percent of all highway travel in the Northwest Territories. A full 92 percent of highway travel is on highways which are paved or dust-controlled.

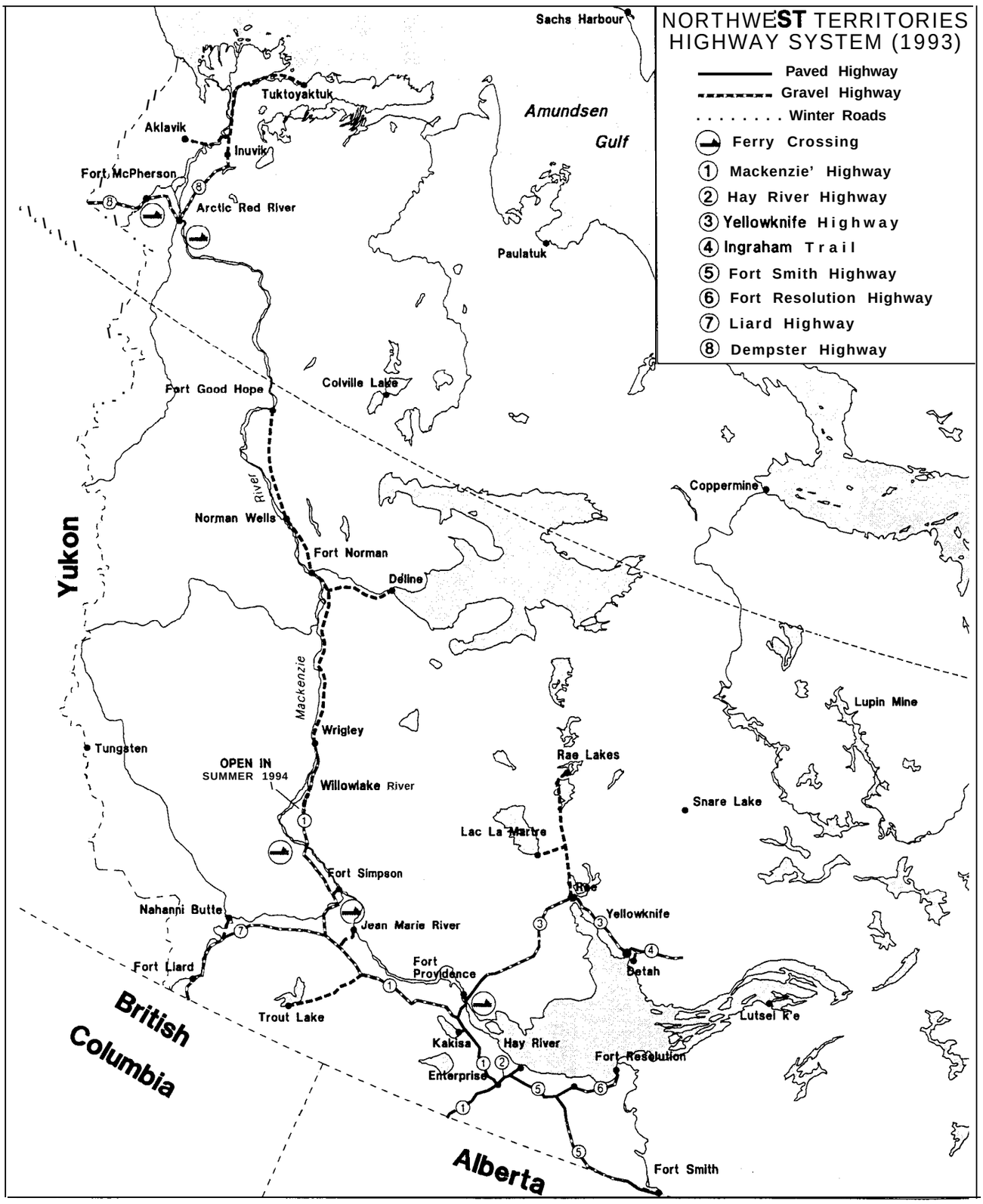
Forecast capital expenditures on highway reconstruction will average $24 million per year over the next five years. Of this amount, an estimated $8 million per year must be allocated for repair and rehabilitation of existing bridges, culverts and pavements. This leaves about $16 million per year for upgrading, including road reconstruction and new paving.

Nearly $360 million in upgrading needs can be currently justified on the basis of safety, user costs and tourism benefits. At current funding levels this work will take over 20 years to complete.

Additional capital expenditures of $20 million per year would be required to satisfy all highway upgrading needs within the next ten years.






NORTHWEST TERRITORIES
HIGHWAY SYSTEM (1993)
Paved Highway
Gravel Highway
Winter Roads
Ferry Crossing
1 Mackenzie' Highway
2 Hay River Highway
3 Yellowknife Highway
4 Ingraham Trail
5 Fort Smith Highway
6 Fort Resolution Highway
7 Liard Highway
8 Dempster Highway
Sachs Harbour
Tuktoyaktuk
Amundsen
Gulf
Aklavik
Inuvik
Fort McPherson
Arctic Red River
Paulatuk
Fort Good Hope
Colville Lake
Coppermine
Norman Wells
Fort Norman
Deline
Yukon
Mackenzie River
Lupin Mine
Wrigley
Tungsten
OPEN IN
SUMMER 1994
Willowlake River
Rae Lakes
Snare Lake
Lac La Martre
Fort Simpson
Rae
Nahanni Butte
Jean Marie River
Yellowknife
Fort Liard
Fort Providence
Betah
Trout Lake
Lutsel K'e
British
Columbia
Kakisa
Hay River
Fort Resolution
Enterprise
Alberta
Fort Smith

It is unlikely that significant additional funding can be allocated from within departmental or territorial government appropriations. Increases in user fees through highway fuel taxes and licence fees would offer very limited potential, due to the low population and traffic densities.

The Government of the Northwest Territories must seek federal financial assistance by supporting the National Highway System initiative. This proposal calls for a joint federal-provincial/territorial cost-shared program to upgrade Canada's national highway system. It would be similar to the Trans-Canada Highway program of the 1960's. A 1992 federal proposal could have made an additional $8 million per year available to the Northwest Territories for this purpose. However, unanimous support from all jurisdictions was not achieved and the proposal has been withdrawn.

If a national program cannot be agreed upon, the territorial government must pursue a bilateral program with the federal government to accelerate the upgrading of substandard territorial highways to an acceptable standard.

Major Highway Upgrading Needs

Priority	Project	Length (km)	cost ($ roil)
1	Highway 3 Complete Reconstruction and Paving	250	170
2	Highway 8 Reconstruction	257	70
3	Access Roads Reconstruction and/or Paving	48	15
4	Highway 5 Reconstruction and Paving	177	55
5	Highway 6 Reconstruction and Paving	90	25
6	Highway 4 Reconstruction and Paving	69	25
	Total	891	$360

Note: Access roads include *Detah, fort Liard, Fort* McPherson, Fort Simpson, Hay River Reserve *and Kakisa.*

2. Continue Mackenzie Highway Extension

In 1972 the federal government began the extension of the Mackenzie Valley Highway from Fort Simpson to Inuvik. Work was halted in 1977 at a point 18 kilometres south of Wrigley. The remaining 18-kilometre section to Wrigley was subsequently completed in the early 1980's. However, this section was not opened to year round traffic due to the lack of bridge/ferry infrastructure. At present a winter road is constructed annually by the Department of Transportation on the highway route as far north as Fort Good Hope.

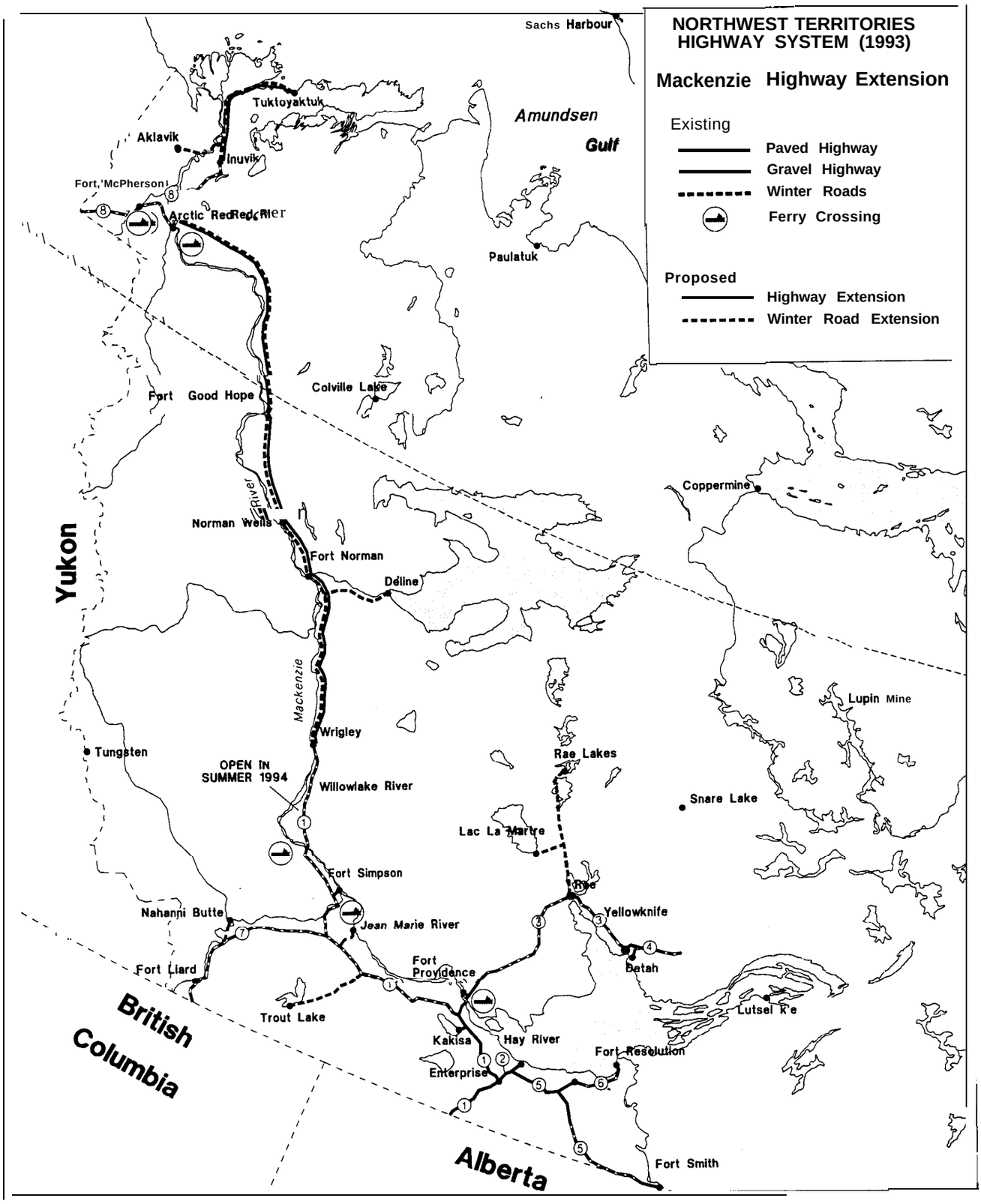
As part of the transfer of the highway reconstruction program from the federal government, the Government of the Northwest Territories assumed responsibility for completing the Mackenzie Highway from Fort Simpson to Wrigley. The territorial government will have spent over $6 million on the project by the time it is open to traffic in the summer of 1994.

Construction of the remainder of the Mackenzie Highway from Wrigley northwards remains a federal responsibility.

The proposed highway between Wrigley and the Dempster Highway south of Inuvik is 800 kilometres in length. Capital costs are estimated at $500 million. Once completed, an estimated $8 million will be required annually for maintenance.

The 160-kilometre section from Inuvik to Tuktoyaktuk would cost an estimated $160 million to construct, with annual maintenance costs of $3 million.

Completion of the Mackenzie Highway to Inuvik and Tuktoyaktuk would provide many benefits including training and employment opportunities, lower transportation costs for resupply, increased mobility and business opportunities. The road would benefit the oil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Fort Good Hope
Colville Lake
Coppermine
Norman Wells
Fort Norman
Deline
Yukon
Mackenzie
Wrigley
Lupin Mine
Tungsten
OPEN IN SUMMER 1994
Willowlake River
Rae Lakes
Snare Lake
Lac La Martre
Fort Simpson
Rae
Yellowknife
Nahanni Butte
Jean Marie River
Fort Liard
Fort Providence
Behan
Lutsel K'e
Trout Lake
Kakisa
Hay River
Fort Resolution
Enterprise
British Columbia
Alberta
Fort Smith

and gas industry and allow harvesting of renewable resources through the provision of relatively inexpensive transportation and improved reliability. Tourism opportunities are also considered significant as this highway would complete the loop with the Dempster Highway in the Yukon Territory.

Completion of the section from Fort Simpson to Wrigley in 1994 demonstrates the territorial government's commitment to the Mackenzie Highway. Consideration is also being given to extending the winter road from Fort Good Hope to Inuvik, thus providing a seasonal road link to Inuvik and Tuktoyaktuk from the southern Northwest Territories.

Construction of the Mackenzie Valley Highway must not be undertaken as a mega-project. The main objective is local employment, with work in several locations on an ongoing basis. Work must begin now, and not wait for an oil or gas pipeline to materialize.

The extension of the Mackenzie Highway from Wrigley to Inuvik and Tuktoyaktuk must be proposed to the federal government as a joint Canada-Northwest Territories employment-creation initiative.

3. Construct Arctic Coast Transportation Corridor

The Slave Geologic Province, between Great Slave Lake and the Arctic coast, holds enormous potential for mineral developments. A host of base metal, gold and diamond deposits have been discovered, with several developments impending, such as the base metal mine at Izok Lake.

Mining is one of the major economic development potentials in the Northwest Territories. Potential benefits of mining include training and employment opportunities both in mining and associated activities, business opportunities in the service and support sectors, and ownership and investment opportunities with a share in profits. Mining could also lead to increased territorial revenues in the form of royalties and business and income taxes, and create spin-off economic activity resulting from new infrastructure and the mining support sector. The settlement of comprehensive claims will position aboriginal groups to play a major role in mineral developments.

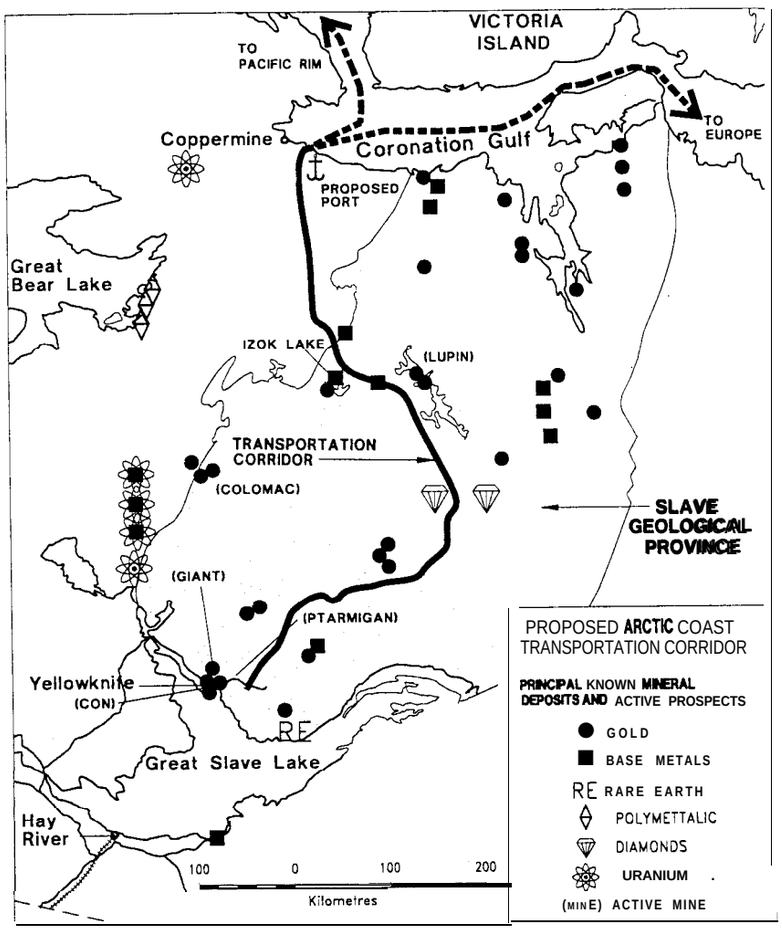
At present, transportation infrastructure in the Slave Geologic Province consists of a winter road from Yellowknife to the Lupin mine, constructed annually by the mine owner Echo Bay Resources, and a public winter road to Rae Lakes and Lac la Martre constructed by the Department of Transportation. A private winter road to the Colomac mine is also planned for the winter of 1993/94.

Because of remoteness, transportation costs related to mining exploration and development in the Slave Geologic Province are extremely high. A road from Yellowknife to a new port on the Arctic Coast is considered essential to serve the needs of current and potential mining exploration and developments in the region.

In the short term a transportation corridor consisting of a winter road connecting Yellowknife, Lupin and Izok Lake to a port on the Arctic Coast is required. This winter road would likely be sufficient for existing developments plus Izok Lake. However, a winter road would not adequately serve the needs of the other promising mineral deposits in the region.

Winter roads are typically open for only three months of the year. Mines dependent on a winter road would require much higher working capital and would encounter other operational inefficiencies. An all-weather road in the Slave Geologic Province would encourage greater exploration and development. Moreover, it could make many marginal deposits economic to develop.

Therefore, our long-term objective must bean all-weather road from Yellowknife to a port on the Attic Coast. This 850-kilometre all-weather road is



estimated to cost $600 million for construction and $11 million per year for maintenance. A port on the Arctic Coast is estimated to cost $5o million to construct and $3 million per year to operate and maintain.

It is unlikely that any single development could support this magnitude of investment. Therefore, a cooperative effort between the mining industry and the federal and territorial governments is required to meet this need. The mining industry would be the direct beneficiary of any infrastructure development through improved and reliable year round access. Governments would benefit through increased economic activity, royalties and taxes.

The territorial government should take a lead role in coordinating stakeholders, including mining and business interests, aboriginal groups and governments, to ensure developments proceed to the benefit of all.

The federal government must be convinced that investment in this project is worthwhile since mining in the North benefits the entire nation and produces substantial revenues for the federal government. We will also seek support from other provinces whose economies will benefit from developments in the North.

We will continue to work with mining companies and other stakeholders to determine what infrastructure will best meet needs and when it should be built. Finally, in cooperation withthe federal government and the mining industry, we need to develop and implement a proposal for financing the necessary investments in public infrastructure.

4. Enhance Community Local Access Roads Program

Consultations with Members of the Legislative Assembly and communities have confirmed a high priority for local access roads to nearby attractions such as recreational and tourism sites, historic sites and local resources. Local access roads are particularly important for off-highway communities.

Depending on their intended purpose, local access roads may be high standard all-weather roads, seasonal roads (winter, summer, fair-weather) or trails for restricted vehicle use (four by four, all terrain vehicle (ATV), light traffic only). In general they have low traffic volumes and low operating speeds.

Two recurring themes in the comments received from communities were the desire by the communities to undertake the work themselves with local equipment and labour, and the suggestion that most of these access roads required minimal standards.

Since initiation of the Department's community local access roads program, progress has been relatively slow due to the low funding level ($250,000 in 1993) and the absence of a framework for community involvement.

Two actions are proposed to overcome these problems. First, we must increase the funding available for this program. This can be accomplished through reallocation from other transportation programs.

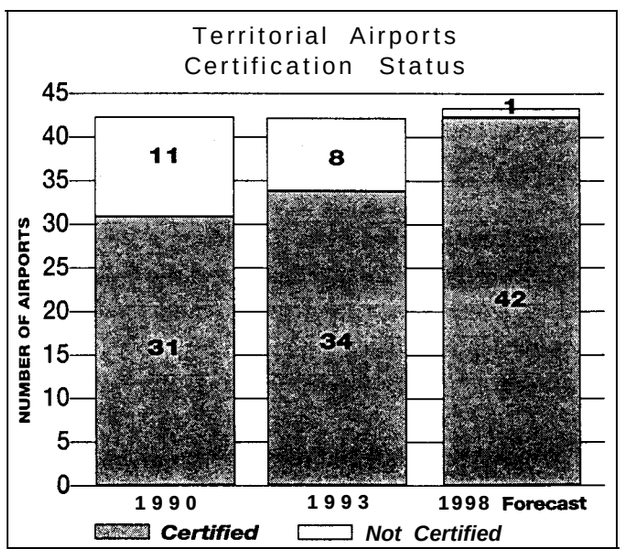
Second, we must give the communities more control over decisions regarding local access road projects. The Department will therefore implement a Contributions Policy as a means to provide financial assistance to communities to build local access roads. We believe that such a policy will help minimize costs by ensuring that design and construction standards are appropriate and that there is local commitment and ownership for the project.

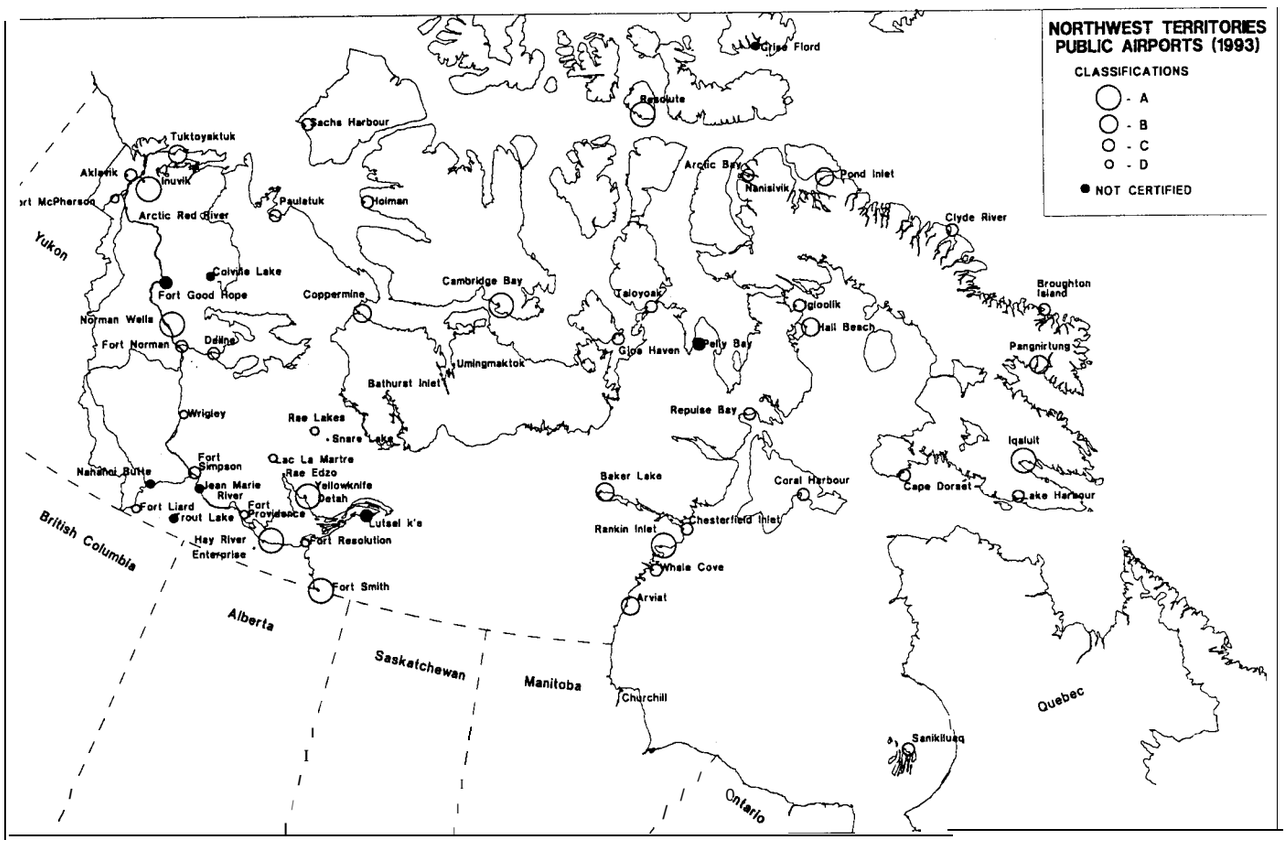
5. Upgrade Airports to Standard

There are 55 public airports in the Northwest Territories. Nine airports are owned and operated by Transport Canada, 42 by the Northwest Territories Department of Transportation, and four by private concerns or local communities. Responsibility for the territorial airports was transferred from Transport Canada in 1990, along with base funding.

At the time of transfer, many airports had major deficiencies. In 1990, eleven airports did not meet certification requirements. Several others had restrictions to improvement because of location.

Since 1990, the Department of Transportation has made significant progress. We have negotiated two cost-sharing agreements with the federal government. The five-year Airport Construction Contribution Agreement of 1991, and the five-year Strategic Transportation Improvement Agreement signed in 1993, together provide almost $15 million in federal funding for upgrading nine territorial airports.





Since 1990, the Department has built new airports at Lac la Martre, Paulatuk and Rae Lakes. New air terminal buildings have been built at Arviat and Igloolik. In addition, we have undertaken safety and lighting improvements and rehabilitation and restoration of runways at many other airports.

The underlying rationale of our airport program is that we must give priority to rehabilitating existing airport infrastructure and to improving airports at off-highway communities to meet certification and operational standards for current critical aircraft.

The Department's current capital plan proposes to spend $45 million on airports over the next five years. Airport construction/upgrading is scheduled at Coppermine, Deline, Fort Good Hope, Lutsel k'e, Nahanni Butte, Pelly Bay and Snare Lake. Necessary rehabilitation and restoration of runways, lights and terminal buildings will be undertaken at many other airports. As a result, by the end of 1998, all but one territorial airport will have certified status.

Although we are making good progress in the airports program, many deficiencies will remain unaddressed at current budget levels. Several certified airports have limitations which restrict their use. The communities of Rae/Edzo and Arctic Red River do not have airports.

To address all currently justified but unfunded needs would require an additional $10 million over the next five years.

Airports in several other communities such as Lake Harbour, Pangnirtung and Repulse Bay have restrictions to improvements because of location or are in conflict with community land use. However, relocating these airports would be very expensive, estimated to cost $12

million to $15 million each, and cannot currently be justified.

Changing aircraft characteristics, facility aging, normal "wear and tear", and various external technological and socio-economic developments will create additional needs for airport infrastructure. For example, the expected closure of the Nanisivik mine and airport will require substantial upgrading of the community airport at Arctic Bay.

The aircraft in use by northern airlines, such as the Twin Otter and Hawker Siddley 748, are no longer in production. The aircraft that will replace these may require expensive lengthening of runways at many territorial airports. Depending on the aircraft characteristics, paving of the runways at some territorial airports may be justified.

We must monitor socio-economic developments in the North and the plans of air earners for their future aircraft fleets, with a view to providing the airport facilities needed for safe, reliable and economical service.

These factors will create additional demands for funds. There are several possible funding sources that will be pursued.

We are currently negotiating the devolution of the nine Arctic "A" airports from Transport Canada to the territorial government. If negotiations are successful and the transfer is approved, responsibility for these federal airports will be transferred to the Northwest Territories, along with base funding. The Department of Transportation will then be responsible for the planning, capital improvement and operation and maintenance of the entire public airport system in the Northwest Territories. We anticipate that the resulting economies of scale will give us some leeway in addressing deficiencies in other parts of our airport program.

Transport Canada has a program to provide financial assistance for local airports. We will seek funding from Transport Canada under this program for capital improvements at applicable territorial airports.

The Department has been successful in negotiating two bilateral agreements with Transport Canada for airport improvements. We will continue to lobby the federal government for additional funding for air transportation infrastructure upgrading and development in the Northwest Territories.

6. Improve Air Navigation Systems

Air Navigation Systems (ANS) include electronic navigation aids, air traffic control services, flight information services and weather services. The type and level of ANS provided for various routes and airports depend mainly on the volume and type of air traffic, the climate and weather conditions, and the location of the airport with respect to major air routes.

Transport Canada is responsible for providing ANS in the Northwest Territories. To provide flight and weather information, Transport Canada operates flight service stations at the nine federally owned airports and at four territorial airports; two of the latter will be converted to community airport radio stations (CARS) in 1994. CARS are managed by the Department of Transportation at 29 territorial airports (31 in 1994) for Transport Canada which provides the funding.

Since 1990 the Department of Transportation has significantly improved the reliability of CARS. The success of the CARS program can at least partly be attributed to economies and service improvements realized by training and hiring staff from local communities.

Transport Canada also provides most of the electronic air navigation aids in the Northwest Territories such as non-directional beacons (NDB) at nine federal and 25 territorial airports, distance measuring equipment

(DME) at nine federal and seven territorial airports, and instrument landing systems at five federal airports. The Department of Transportation has also provided NDB's at four smaller territorial airports.

The Northwest Territories has an excellent record of air transportation safety. The Department of Transportation's objective is to maintain and enhance the level of safety and reliability of ANS by taking advantage of new and emerging technology which can provide better service at the same or lower cost.

Automated weather observation systems (AWOS) have supplemented the CARS program in some communities by providing twenty-four hour weather information. In the near future, AWOS and remote communications outlets (RCO) are expected to provide better coverage at lower cost.

A technological revolution is occurring in global navigational satellite systems which will make most ground-based electronic navigation aids, such as NDB's and DME's, redundant in the next decade. Aircraft-based global positioning system (GPS) receivers have been approved for non-precision approaches and enroute navigation.

In the next few years, ground-based differential global positioning systems (DGPS) could replace the instrument landing systems at five Transport Canada airports in the Northwest Territories. Thus, significant savings in capital replacement and in operations and maintenance costs will be achieved. DGPS may also be warranted at selected territorial airports depending on the future growth in air traffic.

It is anticipated that the new aviation technology in automated weather reporting and satellite navigation systems will lead to significant improvements in air safety and reliability at reduced cost. An added benefit will be savings in flight times and operating costs to airlines, which should lead to reductions in air freight and passenger rates.

We will work with Transport Canada to ensure that these technological improvements are implemented at federal and territorial airports in the Northwest Territories. We must also ensure that training programs are established to maximize opportunities for local residents in the maintenance, calibration and repair of the new electronic equipment.

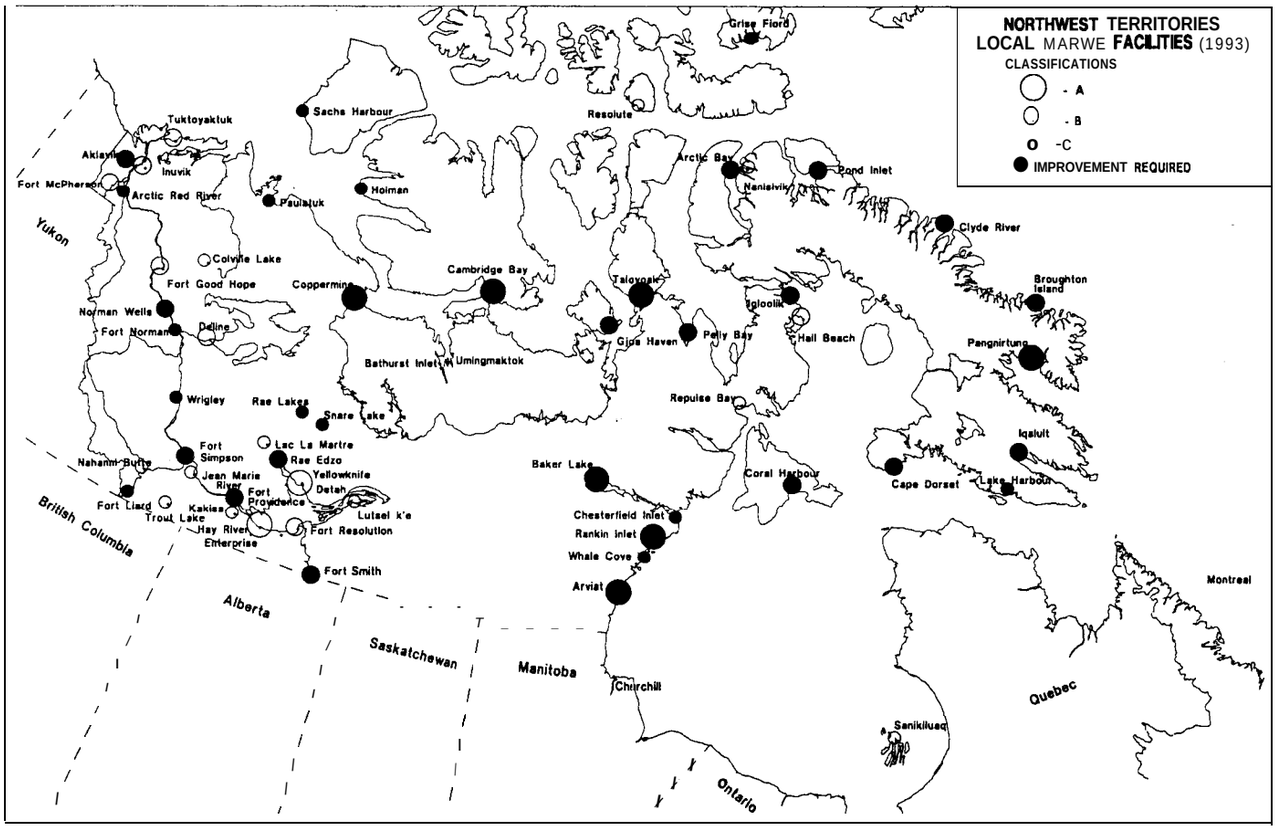
7. Improve Local Marine Facilities

Residents of virtually every community in the Northwest Territories depend on the use of small vessels for recreation, tourism, subsistence and commercial harvesting of fish and marine mammals, and access to other local resources such as carving stone. In recent years, expansion of commercial fishing has led to the use of larger boats in many communities.

Marine facilities are required for loading and unloading, protection, access, and repair of boats. Infrastructure requirements depend upon site conditions and may include wharves, floating docks, breakwaters and boat launching and landing facilities.

Site to site variations in natural conditions such as water depth, tides, ice conditions, wind, geology, topography and land use require considerable flexibility in developing standards. Design standards are therefore based on providing adequate levels of service and safety, rather than on standardized infrastructure solutions.

Many communities, especially those on tidewater, do not have adequate local marine facilities. Since 1990, improvements have been undertaken at the following 16 communities: Arctic Bay, Arctic Red River, Arviat, Broughton Island (in progress), Cape Dorset, Chesterfield Inlet, Fort Resolution, Fort Simpson, Gjoa Haven, (in progress) Igloolik, Iqaluit (in progress), Jean Marie River, Kakisa, Nahanni Butte, Pangnirtung (in progress) and Sanikiluaq.



Despite this progress there are many unfulfilled needs. Upgrading or replacement of local marine facilities to correct deficiencies is required at 37 communities. Members of the Legislative Assembly and communities have put a high priority on these improvements.

The cost of addressing all currently identified deficiencies and needs is estimated at $19 million. The Department's current capital allocation of $1 million per year for local marine facilities is clearly insufficient.

To meet this shortfall several actions will be pursued. We intend to substantially increase funding for this program by reallocation within the Department's capital targets.

The Canada-Northwest Territories Strategic Transportation Improvement Agreement will provide additional federal funding of $1.7 million over five years beginning in 1993. This will allow us to significantly increase the scope of the local marine facilities at Pangnirtung and Coral Harbour. We will pursue additional bilateral agreements with Transport Canada.

We will also seek funding from the federal government through the Small Craft Harbour Branch of Fisheries and Oceans Canada whose mandate includes port and harbour facilities in support of commercial fishing and recreational boating.

8. Improve Marine Resupply Systems

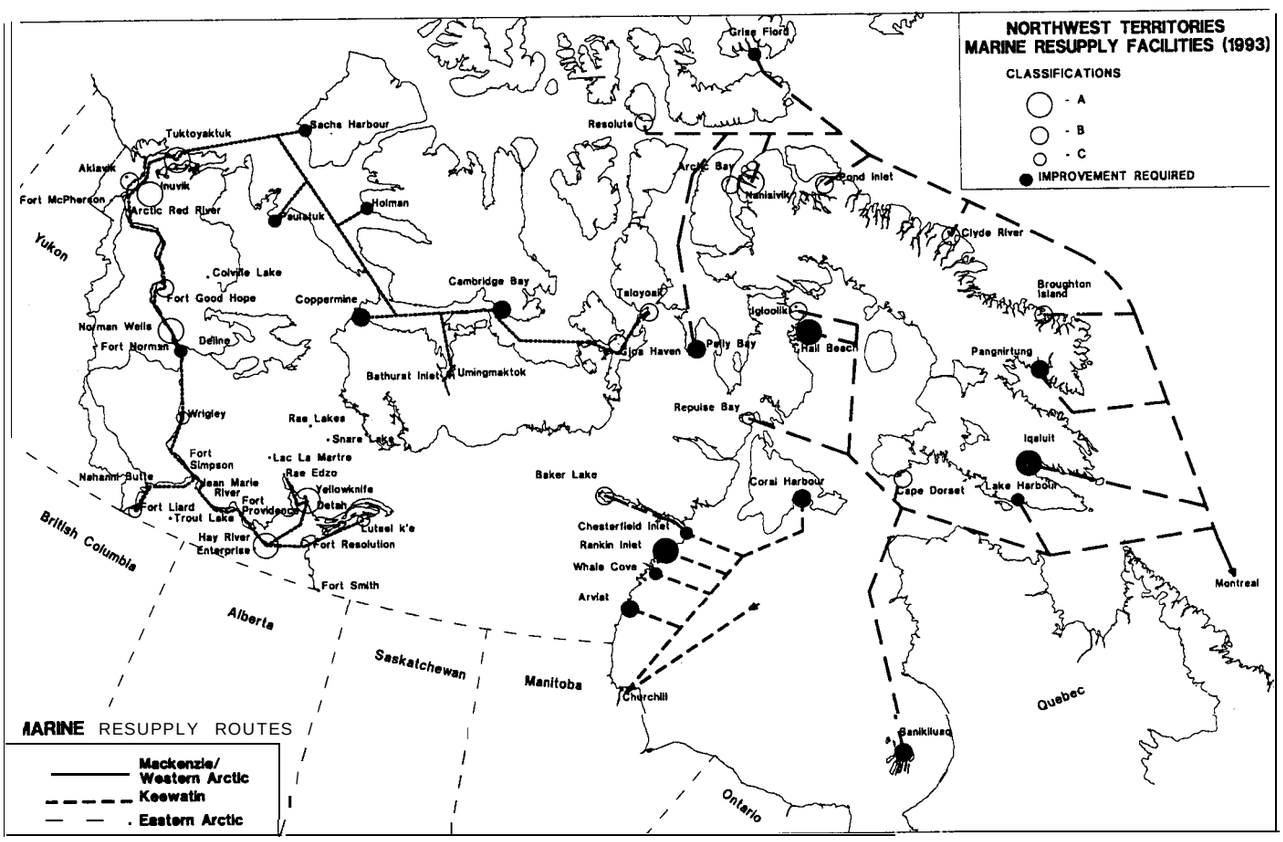
There are 30 off-highway communities in the Northwest Territories with a combined population of 22,000 or 40% of the territorial population. These communities rely exclusively on marine resupply for petroleum products and most of the dry cargo.

Transportation costs are a major component of the landed cost of petroleum products in most regions of the Northwest Territories. Costs are particularly high for Pelly Bay, the western Arctic coast and the Keewatin. If shipping costs in these areas could be reduced to typical Baffii region rates, it would mean savings in the order of $4 to $6 million per year. The fuel price at the Norman Wells refinery is also high at 26 cents per litre, compared to 18 to 21 cents per litre at Montreal.

Although volumes for dry cargo are much lower than for petroleum products, unit costs are much higher. Again, costs are high for Pelly Bay, the western Arctic coast and the Keewatin.

Several initiatives taken by the Department of Transportation since 1990 have helped reduce marine resupply costs significantly, particularly for petroleum products.

In 1991 and 1992 the Department cost-shared the completion of the hydrographic survey of the approaches to Pelly Bay. This enabled the first-ever marine resupply of diesel fuel to Pelly Bay in 1993 (instead of airlift), at a net cost saving to the territorial government of over $200,000. From 1994 onwards the saving are expected to be approximately $500,000 per year. In future years, the use of marine resupply for gasoline and dry cargo as well as for diesel will yield substantial additional savings.



In 1993 the delivery of the Keewatin region's diesel fuel to Churchill by ship, instead of rail, saved the territorial government $900,000 in comparison to 1992. These annual savings are expected to continue in the future.

Also, in 1993 suppliers were allowed to arrange the most cost-effective method of resupplying bulk fuel to eleven eastern Arctic communities. As a result, a single contract for both the supply and delivery of bulk fuel was used in 1993. A $1.1 million saving was achieved compared to historical eastern Arctic costs. Comparable savings are expected to continue in the future.

There are millions more to be saved through improving resupply systems, contracting procedures and, where necessary, improved marine facilities. The 1993 Strategic Transportation Improvement Agreement provided additional federal funding of $1.8 million to upgrade marine resupply facilities at Rankin Inlet and Iqaluit, and to conduct hydrographic surveys to prove the viability of deep-draft shipping routes to the Coronation Gulf We will continue to seek additional federal assistance to improve marine resupply facilities.

We must pursue further rationalization of marine resupply systems in the Northwest Territories. We will continue to investigate improvements to the resupply of bulk fuel and dry cargo to communities in the Keewatin, Baffin and western Arctic coast regions. We will work cooperatively with the Canadian Coast Guard, the Department of National Defence, other circumpolar jurisdictions and the commercial shipping industry to find long-term, cost-effective solutions for marine resupply problems in the North. In rationalizing our marine resupply systems and facilities, our objectives will be to improve service and safety, reduce costs, and increase northern and local business and employment opportunities.

9. Improve Transportation Safety

Safety is an essential characteristic demanded by users of transportation facilities and services. Unique northern aspects such as severe climate and long distances play an important role in transportation safety in the Northwest Territories, particularly on our highway system.

In terms of infrastructure improvements, the Department of Transportation has made significant progress in dust-control or reconstruction and paving of our highway system, and upgrading of our airports and marine facilities.

Improving transportation safety also requires improving driver skills and awareness, and ensuring safety of vehicles.

The driver is the most critical element in road safety. Safety initiatives undertaken by the Department of Transportation must focus on public awareness and safety education. We are taking initiatives in areas such as improved driver testing and licensing standards, seat-belt campaigns impaired-driver programs, driver demerit point regulation, safety education at schools and all-terrain vehicle (ATV) safety programs.

The Department has also adopted the National Safety Code for heavy commercial vehicles and amended the All-Terrain Vehicle Act.

However, more needs to be done. The current 60 percent use of seat-belts in the Northwest Territories, compared to the national average of 88 percent, must be improved. We must continue to promote responsible attitudes to impaired driving, monitor the safety performance of the trucking industry, and amend the laws and regulations related to transportation safety as required.

To improve transportation safety in the Northwest Territories, we will develop and implement a comprehensive transportation safety strategy. The strategy will deal with all aspects of transportation safety including drivers and other users, vehicles and the transportation infrastructure. It will identify key target areas and action plans to reduce both the frequency and severity of accidents.

10. Increase Local Involvement in Transportation Expenditures

Government expenditures represent a very sizable portion of the economic activity in the Northwest Territories. The territorial government has implemented various policies, including the Business Incentive Policy, to maximize the benefits of government expenditures to Northerners in general, and local residents in particular, through direct contracts, other business and employment opportunities, and training and development.

The Department of Transportation has been a leader in the government's efforts in this area. We have successfully applied the Business Incentive Policy, and in addition implemented many other innovative approaches.

Transportation projects have been sized and scheduled to ease bidding by local contractors.

Negotiated contracts have enabled local contractors and community development corporations to undertake projects (without competition).

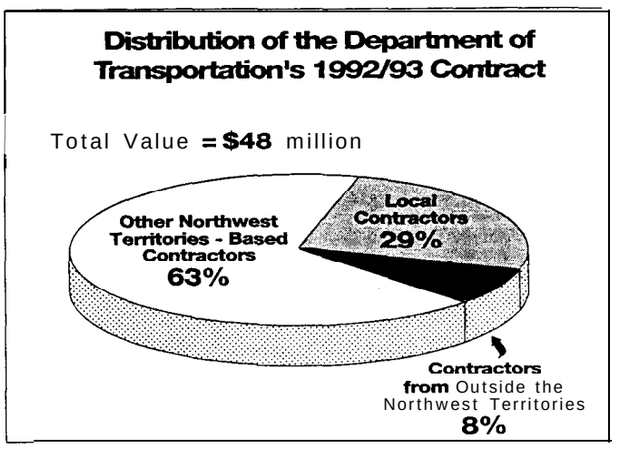
The Department has utilized its project managers working with locally hired workers on several major airport projects.

The Department has established a training centre at Baker Lake for airport operators.

All of the Department's highway and ferry operation and maintenance activities employ local or northern personnel or contractors.

Of the 42 airports owned by the Department, 35 are operated under contract by local communities.

All operators of the 29 community airport radio stations (CARS) are local residents.



The results have been impressive. In fiscal 1992/93, of the $48 million in capital, operation and maintenance contracts awarded by the Department, over 92 percent were awarded to Northern and local contractors and organizations (29 percent went to local companies and 63 percent to other Northwest Territories-based companies).

Because of the need to create and sustain employment at the local community level, the Department must increase the local content in its contracts. To do so we plan action on several fronts. We will make greater use of special contracting approaches which incorporate training programs and incentives to maximize local employment and sub-contracting opportunities.

We will also encourage the communities to get more involved in the delivery of our programs by, for example, taking steps to devolve management of airports to communities, and using the Department's Contributions Policy for construction of local access roads in partnership with local communities.