FINAL REPORT

BENEFIT-COST AND REGIONAL ECONOMIC IMPACT ANALYSIS: MACKENZIE HIGHWAY EXTENSION

Submitted to

Department of Transportation

by

Nichols Applied Management
Management and Economic Consultants
Edmonton **Calgary**

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EXECUTIVE SUMMARY

Extending the Mackenzie Highway north from Wrigley is a long-term objective of the Department of Transportation. This report discusses the findings of an economic evaluation and regional economic impact analysis of the construction and operation of a 482 km extension to Fort Good Hope and a 832 km extension all the way to the Dempster Highway. A 105 km spur from just south of Tulita to Deline is incorporated in the study as an option, recognizing the current opposition to the road in that community.

The study uses cost estimates developed by the Department of Transportation, assuming a conventional public tender construction approach (60 km/hour design standard, ten-year construction period). It also addresses a Community Construction Approach to the project in which the highway will be built in small increments over an extended period.

Study Methodology

The study, undertaken by Nichols Applied Management, relies on the following sources for inputs:

- key respondent interviews and a review of Department of Transportation files to identify the benefits and costs of the proposed project; and
- an analysis by the Department of Transportation of the estimated project costs.

It uses two related but distinct analyses to assess the project. They are:

- a benefit-cost analysis, which determines the economic viability of the project from the perspective of the territorial economy; and
- a regional economic impact analysis, which focuses on the economic benefits to the region.

The study's discussion of the organizational implications of the Community Construction Approach builds upon the results of a workshop conducted by the study team with northern-based education and community development experts.

Project Benefits

Key respondents identified a range of project benefits. They are listed below:

- Prices in the Mackenzie Valley communities of Tulita, Norman Wells, Fort Good Hope, and Deline are expected to decrease as transportation and storage costs are reduced.
- Tourism expenditures are expected to increase when the Mackenzie Highway forms a loop with the Dempster Highway, stimulating visitor numbers and causing visitors to stay longer in the Northwest Territories.
- People, businesses, and public sector organizations including the health system in the Mackenzie Valley communities will have increased access to Fort Simpson and points beyond. This will likely mean an increase in operating efficiencies. Individuals are expected to travel more frequently between the communities, reducing their isolation.
- The Department of Transportation will not have to maintain the winter road between Wrigley, Fort Good Hope, and Deline.
- Oil and gas companies exploring the region will face reduced transportation costs and avoid "stand-by" costs for equipment now barged up and idled until freeze-up.

Some identified benefits were not further quantified because no ready market value estimates were available. These include the anticipated increase in the quality and variety of goods available in Mackenzie Valley communities and the increased access for hunters and trappers.

Project Costs

The Department of Transportation developed a preliminary construction cost estimate. Other costs are incurred as well because additional money will have to spent to realize some of the benefits. The costs are listed below:

- The construction cost of the road between Wrigley and Fort Good Hope is estimated at $220 million. The cost of extending it to the Dempster Highway and to Deline is estimated at $160 million and $40 million, respectively.
- Maintenance of the all-weather road is estimated at $10,000 per kilometre or between $2.2 million and $4.4 million per year, depending on the project configuration.
- The tourism industry will need to spend money to supply the products desired by visitors. This includes the cost of restaurant meals, tour operator supplies, wholesale groceries, and bulk fuel.
- Increased mobility implies costs, including additional ground transportation costs and increased accidents.

Some costs were not quantified because no market values are available. These include the cost of increased hunting and trapping pressure and possible impacts of the road on wildlife migration patterns.

Benefit-Cost Analysis

The benefit-cost analysis compares the discounted benefits and costs of the Mackenzie Highway Extension. The discounted benefits need to be greater than the discounted costs for the project to be economically viable. A benefit-cost ratio of one or larger and a positive value of the net present value of the difference between the costs and benefits indicates economic viability.

The benefit-cost ratio of the project, assuming a 7.5% discount rate, is estimated at 0.16 for all scenarios. The estimates of the present value of the benefits (net of the present value of the costs) range from minus $173 million to minus $285 million.

	Wrigley to Ft Good Hope		Wrigley to Dempster Highway	
	With Deline	Without Deline	With Deline	Without Deline
	7.5% Discount Rate			
Net Present Value ($'000)	($197,000)	($173,000)	($285,000)	($267,000)
Benefit-Cost Ratio	0.16	0.16	0.16	0.16

This result is in line with other assessments of the economics of the Mackenzie Highway and similar roads. A 1983 study of the completion of the Mackenzie Highway to Wrigley places the benefit-cost ratio at 0.2, using a 10% discount rate. A 1990 study of The Mackenzie Highway Extension to the Dempster Highway, conducted in support of the 1990 Transportation Strategy Update, calculates a benefit-cost ratio of 0.45, using a 3% discount rate. Finally, a recent study of the Inuvik to Tuktoyaktuk road estimates the benefit cost ratio of that road project at 0.26, using a 7.5% discount rate.

The results of the benefit-cost analysis indicate that the Mackenzie Highway Extension is not viable from a strictly economic perspective. This result is confirmed by an analysis of the sensitivity of the results to changes in the underlying assumptions. Increasing the benefits and reducing the cost by an arbitrary 25% and including potential cost savings associated with the production of as yet unfound oil reserves raise the benefit-cost ratio to 0.41.

However, many public investments in infrastructure and programs are made on the basis of social rather than economic considerations. The regional economic impact analysis looks at the project from a regional development perspective, focusing on redistributing economic activity and benefits among regions.

Regional Economic Impact Analysis

The project will generate employment and income benefits to the region in the following ways:

- local hiring of construction workers and project spending on wages, materials, and equipment during construction;
- increased local hiring of maintenance workers and spending on wages, materials, and equipment for the maintenance of the all-weather road as compared to annual spending on the ice road; and
- increased tourism spending accruing to local operators and their suppliers.

These regional construction impacts are related to project scope and are estimated at:

- between $41 to $85 million of business and labour income; and
- between 1,250 and 2,360 person-years of on-site labour.

These economic impacts accrue to the region over the 10-year construction period. The project could also provide additional training positions for persons interested in equipment operations and the heavy duty mechanics trade.

The ongoing road maintenance will also provide economic benefits. These depend on the project scope and are estimated at:

- between $1.4 million and $2.8 million per year in additional business and labour income; and
- between 26 and 55 additional person-years of employment per year.

The anticipated increase in tourism will increase the employment opportunities in the region.

Seen from a regional perspective, the project strengthens the local economy by providing additional business and labour income and by creating additional jobs. This is significant for the Mackenzie Valley communities, where unemployment levels are high.

Assuming that the project is financed from outside the study area, the employment and income benefits will be without cost to the region. This means that the project will lead to a redistribution of income within the Northwest Territories or, if financed by the federal government, within Canada. The redistributive effect of the project is reduced if it is financed in part by regionally-based organizations. In that case, the project would likely pre-empt other investment in the region.

Community Construction Approach

It is possible to construct the road not as a short-term construction project, but as a long-term regional development initiative. The Community Construction Approach, defined as $1 million per year construction projects in each of the five Mackenzie Valley communities, shifts the focus from road building to long-term economic development. This approach has the following annual economic impacts:

- additional business and labour income estimated at $1.8 million; and
- additional employment estimated at nine on-site person-years.

The Community Construction Approach would provide:

- a modest stimulus to the regional economy; and
- some training opportunities for local people, especially if a way can be found to deliver the appropriate trades training in the region.

The Community Construction Approach would not place any undue stress on the labour market of the region and would provide some training positions for equipment operators and heavy-duty mechanics.

Organizational Considerations

Constructing the road using a Community Construction Approach implies that the Department of Transportation (DOT) would need to extend its range of activities to include community consultation, education, and economic development, which are the focal points of this approach.

An alternative is for DOT to build a partnership with claims organizations and other government departments, and maybe other organizations, such as cultural institutes, industry, and literacy groups. This has several advantages, such as:

- increased ownership of the project by the affected communities;
- access to existing channels for community consultations; and
- increased likelihood for maximization of education and economic development benefits.

The recent experience with the Nunavut Unified Human Resources Development Strategy (NUHRDS) suggests that the partnership be formalized by the creation of an independent project office or secretariat, which brings together representatives of the participating claims organizations and government departments.

Conclusion

The construction of the Mackenzie Highway Extension road can be a tool for regional economic development. It provides income and employment opportunities during construction and operation and will contribute to the further development of the tourism industry in the region.

The project is not attractive from a strict economic perspective. Its strengths are in the redistribution of wealth rather than in creating it.

1. INTRODUCTION

The Department of Transportation (DOT) of the Government of the Northwest Territories (NWT) is undertaking a number of background planning studies of three road projects. These economic, environmental, financing and pre-engineering studies pertain to the:

- Slave Geological Province Geological Corridor;
- Inuvik to Tuktoyaktuk road; and
- Mackenzie Highway Extension Project.

The benefit-cost and regional economic impact analysis of the Mackenzie Highway Extension Project is the subject of this report. It was undertaken by Nichols Applied Management, an economics and management consulting firm, in January to March, 1999.

1.1 PROJECT SCOPE AND HISTORY

Highway 1, the Mackenzie Highway, runs from the Alberta-NWT border to Fort Good Hope, a distance of 1,170 kilometers. The first 187 kilometers of the highway from the Alberta border to the junction with Highway 3 are paved. The section from the junction to Wrigley (km 690) is mostly dust-controlled gravel, and beyond Wrigley, the Mackenzie Highway is a winter road only. There is a 105 km long spur at km 914, south of Tulita, to Deline on the shores of Great Bear Lake.

The extension of the Mackenzie Highway beyond Fort Simpson has been actively pursued since 1972. Construction took place between 1972 and 1977 and in 1993/94. These activities brought the all-weather part of the highway to Wrigley. The current planning initiative looks at extending the all-weather part of the highway from Wrigley to Tulita, Norman Wells and Fort Good Hope. Potentially the project could include an all-weather spur to Deline. The final part of the project includes extending the road all the way to the Dempster Highway, between Tsiigehtchic and Inuvik. This latter extension would bring the total length of the Mackenzie Highway to 1,506 km.

The Department of Transportation has prepared preliminary cost estimates for the road using 60 km/hour and 80 km/hour design

standards. The latter one has improved sight lines and curves to allow for higher speeds. The total costs of the road, excluding the Deline spur, is estimated at $380 million and $450 million for the 60 km/hour and 80 km/hour road specifications, respectively. Including the Deline spur, the total cost of the project is estimated at $420 million for the 60 km/hour standard and $500 million for the 80 km/hour standard. This report uses the cost estimate for the 60 km/hour standard throughout the analysis.

1.2 PROJECT SETTING

The proposed project traverses the Mackenzie Valley, a sparsely populated area with potential for oil and gas exploration and production. The area is extensively forested and Norman Wells, which is roughly the mid-point of the proposed road, is the location of the NWT's only producing oil field. The Norman Wells Pipeline connects this field to the pipeline system in Alberta.

With the exception of Norman Wells, the communities in the valley are predominantly Dene. The Dene of Deline, Fort Good Hope and Tulita and the Metis of Fort Good Hope, Tulita, and Norman Wells are represented by the Sahtu Tribal Council and the communities are part of the Sahtu Land Claim. The northern portion of the proposed road will fall inside the area covered by the Gwich'in Land Claim.

Economic activity in most communities is limited as evidenced by a generally low participation in the labour force and high unemployment rates. Average incomes are lower by about one-third as compared to the western NWT. These numbers do not reflect the considerable involvement of people in the communities in subsistence hunting and gathering and other traditional pursuits.

Norman Wells is the exception among the communities in the Mackenzie Valley. It is an essentially non-aboriginal community with a developed wage economy, underpinned by the oil production activity of Imperial Oil. Labour force participation and average incomes are higher as compared to the western NWT and unemployment rates lower. Table 1 provides selected socio-economic statistics on the communities affected by the project.

TABLE 1

Selected Socio-Economic Statistics

	Wrigley	Tulita	Deline	Norman Wells	Fort Good Hope	Western NWT
Population	167	450	616	798	644	39,672
Labour Force Activity						
Participation Rate (%)	65.2	68.4	60.8	90.2	63.4	77.2
Unemployment Rate (%)	26.7	23.1	25.0	6.9	17.3	11.7
Employment/Population Ratio (%)	43.5	54.4	45.6	84.8	52.4	68.2
Educational Attainment						
Pop 15+ Less than grade 9 (%)	41.7	28.1	34.2	3.5	32.9	14.7
15-19 attending school (%)	0.0	83.3	100.0	83.3	80.0	73.3
Ethnic Distribution						
Dene (%)	87.9	74.4	87.7	10.0	82.0	27.8
Metis (%)	0.0	14.4	2.5	10.6	7.8	9.3
Other Aboriginal (%)	0.0	2.2	1.6	3.1	1.6	11.0
Non- Aboriginal (%)	9.1	7.8	8.2	75.6	10.2	51.8
Average Income ($)	18,827	19,690	20,620	46,571	19,094	33,766

Source: Statistics Canada, 1996 Census

1.3 STUDY METHODOLOGY

This study investigates two alternative approaches to the highway construction period:

- A Public Tender Approach, which assumes that the road project is built with a view of connecting the affected communities as quickly and efficiently as possible. For the purposes of this analysis the Public Tender Approach assumes:
  - a 10-year construction period starting in the year 2000, with an average annual expenditure of $40 million; and
  - construction proceeding from Wrigley northward, with a spur to Deline, built after the link between Wrigley and the Dempster Highway is completed;

- A Community Construction Approach, which assumes that the project is built with a view to maximizing the training and economic development opportunities for the affected communities. For the purposes of this analysis the Community Construction Approach assumes:

  - an annual expenditure for road building of $1 million in each of the affected communities;
  - a construction period of 40 years or more;
  - a focus on connecting the communities with each other and to the Mackenzie Highway at Wrigley, leaving the connection with the Dempster Highway as the last part of the project; and
  - construction starting simultaneously in Wrigley, Tulita, Norman Wells, Deline and Fort Good Hope.

The study recognizes that the spur from south of Tulita to Deline is currently not supported by Deline. This road segment is included in the study to estimate the potential benefits, costs, and economic impacts. The actual construction of this segment is, of course, subject to community consultation and approval, as well as other political and fiscal realities and constraints at the Territorial level.

This study process started with a number of key respondent interviews and a review of files with a view to:

- identify all costs and benefits associated with the project; and

- provide input in the estimation of the monetary value of these costs and benefits.

The costs and benefits, thus identified, form the basis of an examination of the Public Tender Approach to constructing the Mackenzie Highway project using both a benefit-cost and an economic impact analytical framework. The analysis of the Community Construction Approach focuses on the regional economic impact of the project, because the length of time needed for project completion reduces significantly the discounted value of most economic benefits. This issue will be discussed in more detail in Section 5.

The two analytical approaches are discussed below.

1.3.1 Benefit-Cost Analysis

Benefit-cost analysis is a method of evaluating the merits of a public investment in terms of economic efficiency. A proposed project satisfies economic efficiency criteria if 1) it represents the lowest cost solution to the problem at hand and 2) it yields benefits that are larger than its costs. This study takes as its initial premise that the chosen alignment is the lowest cost solution to extending the Mackenzie Highway. Hence, the economic evaluation of the project is limited to examining the relative costs and benefits associated with the project as compared to the current infrastructure of an ice road in winter, barge transportation in summer, and scheduled and charter air service year-round.

The economic evaluation adopts a territorial accounting stance because the costs of the project are borne within the territorial economy, where most of the benefits accrue and most cost are borne.

The benefit-cost analysis compares the dollar value of the benefits and costs of the public investment. It consists of the following steps:

- adjustment of the stream of future benefits and costs by using an appropriate real discount rate to reflect that costs incurred or benefits received in the future are not of equal value to those incurred or received now; and,

- comparison of the cumulative values of the costs and benefits by calculating the ratio of benefits to costs (B/C ratio), the difference between the cost and benefit streams (Net Present Value or NPV), and the Internal Rate of Return (IRR), which is the discount rate at which the costs and benefits of the project are equal in present value terms.

The evaluation criteria include the level of the B/C ratio and NPV, with a B/C ratio that is higher than one and a positive NPV indicating a project that is economically efficient. The IRR measure allows decision makers to assess whether the project's rate of return is acceptable or not, most often in comparison to other projects.

For the purposes of the benefit-cost analysis, it is assumed that the road construction period will be 10 years, starting in the year 2000. The analysis of costs and benefits includes the period to 2030, covering one year of preparatory work, 10 years of construction, and 19 years of operation.

All benefit and cost estimates are presented in $1998 dollars. In other words, the analysis is presented in real monetary terms and excludes the impact of inflation.

1.3.2 Economic Impact Analysis

Government expenditures may be undertaken for other reasons than economic efficiency, such as to preserve or to stimulate the economy in a specific region. This perspective is taken by the economic impact analysis of the Mackenzie Highway project, which focuses on the project's impact on the region in terms of income and employment.

What constitutes a project cost and benefit changes with the geographic perspective. For example, the capital costs of the road are not a cost in their entirety to the region because these are likely borne by the territory, and indirectly by all taxpayers. In addition, some of the benefits to the region extend beyond those that are directly associated with the project and include benefits from the re-spending of the additional income that the direct beneficiaries gain from the project. If regional benefits are larger than regional costs, the project is deemed to contribute to the general economic development of the region and may help to achieve a more equitable income distribution across the territorial economy.

The impact analysis assumes the same 10-year construction period as used for the benefit-cost analysis. It presents as well the annual income and employment benefits associated with the operation of the road.

1.3.3 Community Construction Approach

The report considers as well the economic impact of the Mackenzie Highway project if it were executed over an extended time period of 40 years or more. This approach assumes that the road construction would be undertaken by the communities, supported by an annual Department of Transportation contribution of $1,000,000 each.

The economic impact of the Community Construction Approach is considered using the same techniques as outlined in Section 1.3.2. No benefit-cost analysis has been performed on this scenario because the construction schedule postpones most significant benefits until well past the 31-year time period under consideration. In addition, the discounting procedures of the benefit-cost analysis reduce the current value of benefits far into the future to relatively low values.

1.3.4 Comparing the Different Approaches

The findings of the benefit-cost and regional economic impact analyses may be in line with each other. In this case the two methodologies provide an unambiguous policy input. In other cases, the findings may be contradictory and in those instances the relative weight that should be applied to the two forms of analysis may need to be determined by political and regulatory decision-makers.

1.4 OUTLINE OF THE REPORT

The study commences in Section 2 with the identification and quantification of benefits that can be attributed directly to the Mackenzie Highway project. Section 3 describes and quantifies the project costs.

The results of the benefit-cost analysis are presented in Section 4. This section also presents the results of an analysis of the sensitivity of the benefit-cost analysis resulting from changes in the underlying assumptions. One further extension of the analysis presented in Section 4 considers the impact of additional oil production in the region on the economics of the road.

Section 5 presents the findings of the regional economic impact analysis and Section 6 covers the regional economic impacts of the Community Construction Approach.

Additional information about the benefit and cost estimates and other support information is provided in a Technical Appendix.

2. IDENTIFICATION AND QUANTIFICATION OF BENEFITS

Discussions with key respondents, a review of the files, and experience with other roads in the region suggest the following benefits of extending the Mackenzie Highway:

- reduced cost of living in the communities due to lower freight rates and reduced storage costs;
- increased tourism spending in the region if the highway system connects with the Dempster Highway and allows vehicle traffic to make an "Arctic Loop";
- increased access of community members, businesses, and public sector organizations to the rest of the NWT;
- reduced travel time;
- increased opportunity for providing people with transferable skills and equipping them for the wage economy;
- reduced length of the winter road system and the associated costs; and
- increased access to renewable resources, especially oil and gas.

These benefits will be discussed below. Some of these benefits imply expenditures over and above the cost of constructing the road. For example, increased tourism spending in the region implies increased capital and operational spending on tourism facilities and services.

2.1 REDUCED COST OF LIVING

Currently, communities in the Sahtu are supplied mainly by barge in the summer, over the winter road for 6-8 weeks in winter, and by air year-round. Bulk goods, such as fuel and construction materials, are supplied almost entirely by barge. Dry goods are supplied primarily by barge during the summer and by truck when the winter road is open.

Perishables, such as meat, produce, frozen food, and tobacco are flown in unless the winter road is open in which case they are trucked. The exception is Norman Wells, which has year-round scheduled air service and receives some perishables by air on a year-round basis.

Key respondents indicate that most of the goods currently shipped by air will shift to road transportation once an all-weather road is constructed. Freight rates are lower for land than for air transportation. In addition, trucking costs will likely decrease from current levels to reflect the lower costs associated with travel over an all-weather as opposed to a winter road. Some items currently barged in will also shift to road transportation but most bulk goods, such as fuel, will likely continue to be supplied by barge.

The expected shift to lower cost transportation will reduce the cost of living. The transportation cost effect will be augmented by:

- reduced inventory costs; and,
- increased competition between stores in the Sahtu and the ability of consumers to travel outside the region to take advantage of lower prices elsewhere.

The decline in the cost of living can be expressed as an average percentage reduction in retail prices and is estimated to be between 3% and 9% of total retail sales, with an average reduction of 6%.

Total retail sales in Sahtu communities in 1998 are estimated at $19.7 million, resulting in an estimated reduction in the cost of living associated with the all-weather road of between $600,000 and $1.8 million per year. On average, the cost of living benefit is estimated at $1.2 million per year. This benefit, which accrues mainly to local area residents, will increase with the population growth in the region.

The cost of living benefit increases as more communities are connected by road. Assuming a Public Tender Approach to the construction of the Mackenzie Highway Extension and a 10-year construction period starting in the year 2000, Tulita will be connected in 2003, Norman Wells in 2004, Fort Good Hope in 2005 and Deline in 2009. Table 2 shows how the net present value of the cost of living benefit, discounted at 7.5%, increases to $10.6 million as additional communities are connected to the road network.

TABLE 2

Cost of Living Benefit by Community

Road Reaches	NPV @7.5% ($'000)
Tulita	2,200
Norman Wells	5,900
Fort Good Hope	8,600
Dempster Highway	8,600
Deline	10,600

The information in Table 2 incorporates population growth, assuming the same 2% growth rate that the Sahtu communities have exhibited between 1986 and 1996.

2.2 INCREASED TOURISM SPENDING

Tourism is a small and underdeveloped industry in the Mackenzie Valley. Visitor estimates from the 1994 NWT Exit Survey suggest that only 120 tourists visited Fort Simpson in that year. This translates to an average of two visitors per day for July and August, the peak period.

The low level of tourism development notwithstanding, many key respondents indicated that the spectacular scenery of the Mackenzie Valley holds tourism potential. The major barriers are access, distance from major population centres, and limited tourism infrastructure.

The tourism potential of the area will likely not be tapped until the Mackenzie Highway extension meets up with the Dempster Highway, creating a road loop. The current limited visitor numbers support this observation. If there is a loop, it is reasonable to expect that:

- the majority of rubber tire tourists to Inuvik will use the Mackenzie Highway for one leg of their trip;
- the Mackenzie Highway will stimulate the total number of visitors to Inuvik; and
- people will spend more time in the NWT.

The latter is because the NWT portion of the loop using the Mackenzie Highway leg is 1,500 kilometres longer than that of the Dempster Highway, which is located mainly in the Yukon.

The total tourism spending induced by the Mackenzie Highway loop is estimated at $1.8 million in year 10 when the loop is completed and $10 million in year 30, the last year considered in the analysis. The present value of this benefit stream, discounted at 7.5%, is $20 million.

Not all tourism spending is a net benefit to the region or the Territory. Additional capital will need to be spent to develop the tourism infrastructure and the operation of tourism facilities will require resources that should be counted as costs for the purposes of the benefit-cost analysis. These costs are addressed in Section 3.

2.3 INCREASED ACCESS

The Mackenzie Highway Extension will increase the access of the 2,675 people living in the affected Mackenzie Valley communities. This has a significant social aspect as families and friends can gather more frequently. It also has implications for the access of community members to services in Fort Simpson and Yellowknife and in Inuvik if the final section to the Dempster Highway is completed.

2.3.1 Efficiency Benefit

For community-based organizations and businesses, a year-round road will mean increased efficiencies. Face-to-face meetings with people in the region will become less dependent on the schedule of air service, less subject to delays and cancellation due to weather, and cheaper as road travel displaces air transportation. Other efficiencies include the speedier re-supply of construction and other materials and parts.

The study does provide a rough estimate of the cost of delays and awkward scheduling and the cost of avoidable air charters now incurred by community-based organizations and businesses. Taken together, the benefit of increased access and the resulting gain in efficiency is estimated at $155,600 per year if all communities are connected. This efficiency benefit, which will grow as the communities expand, accrues to local area companies and organizations. It is offset partially by the increased cost of road transportation incurred by businesses and organizations. These costs are discussed in Section 3.

2.3.2 Reduced Isolation

More significant is the value that can be ascribed to reduced isolation of the residents of the communities, which many respondents mentioned as a key benefit. The communities are now connected by road during an average of 60 days in the winter. In 1997, the winter road season was only around 30 days.

The winter road usage is relatively light. The 5-year average daily traffic count ranges from 24 just south of Tulita to 30 between Norman Wells and Fort Good Hope. This compares to an average daily traffic count of 67 over the past five years on the Inuvik to Tuktoyaktuk ice road. The lower usage may be related to the fact that residents from Tuktoyaktuk are faced with a 140 km trip to a regional centre, easily done in a day or a weekend, while people from Fort Good Hope, in contrast, are faced with a 680 km trip to reach Fort Simpson, which provides fewer amenities than Inuvik. Even people from Tulita are 460 kilometers from Fort Simpson.

Assuming that the average daily usage of the all-weather road will mirror that of the winter road, the total additional trips made by community members can be estimated. Assuming a non-market value of $50 per trip, the total value of these induced trips is estimated at $928,000 per year if all communities are connected. This benefit, which will grow as the communities expand, accrues to local area residents and the breakdown among highway segments is provided below. Once the connection with the Dempster Highway is established, it is likely that at least some of the travel of residents of Fort Good Hope will be diverted to Inuvik.

The increase in vehicle trips between communities in the Mackenzie Valley implies increased costs, most significantly in terms of increased number of accidents. These costs will be discussed in Section 3.

2.3.3 Medical Travel

The Mackenzie Highway will have an impact on medical transportation costs. The need for some air evacuation will remain, but most non-critical cases will be transported by road if there is an all-weather road. The cost savings on medical transportation is estimated at $81,600 per year, assuming the communities had road access now. This benefit, which will increase as communities grow, accrues to the health system.

year, assuming the communities had road access now. This benefit, which will increase as communities grow, accrues to the health system.

Table 3 shows how the overall access benefit grows as additional communities are connected to the road system.

TABLE 3

Access Benefit by Community

Road Reaches	NPV @7.5% ($'000)
Tulita	2,600
Norman Wells	6,800
Fort Good Hope	9,950
Dempster Highway	9,950
Deline	12,180

2.4 REDUCED TRAVEL TIME

Reduced travel time is the key variable in a standard benefit-cost analysis of a road. Even a small saving in travel time and costs generates considerable benefits for well-traveled roads. The Mackenzie Highway Extension, however, will likely see vehicle numbers in line with the, on average, 40 vehicles per day that travel the winter road with an increase during the summer tourist period. At these volumes, the benefit of reduced travel time will remain very small.

For these reason, the estimation of time saving of the Mackenzie Highway Extension focuses on the reduced time due to delays, discussed in Section 2.3.

2.5 INCREASED TRAINING OPPORTUNITIES

The Mackenzie Highway Extension project by itself does not increase the opportunities for training people as heavy duty mechanics and equipment operators, the two trades most needed for road construction and maintenance. Aurora College's Tebacha Campus in Fort Smith provides most of the trades training in the western Northwest Territories. Students from the Sahtu region can apply for trades training there, regardless of the status of the project. There are no indications that the

Proponents of the Mackenzie Highway Extension suggest that the location of the training may shift to the Sahtu region, creating a regional impact.

2.6 REDUCED WINTER ROAD COSTS

The Department of Transportation currently maintains a winter road system between Wrigley and Fort Good Hope, with a spur to Deline. There will be no need for this road, which is now open for about two months, if an all-weather road is constructed. The avoided expenditure on winter road maintenance is estimated at about $1 million per year by the time all communities are connected. This benefit grows as the all-weather road is extended, because the Mackenzie Highway Extension follows essentially the alignment of the current winter road. The net present value of this avoided cost, discounted at 7.5%, is $9.2 million. This benefit accrues to the GNWT Department of Transportation.

2.7 INCREASED ACCESS TO RESOURCES

The construction of an all-weather road will have impacts on oil and gas activity in the Sahtu by reducing the costs associated with this activity. Opportunity and transportation costs associated with exploration in the area are considerable, primarily because of the need to move equipment up by barge long before fieldwork can begin. The associated "stand-by" costs include interest costs as well as foregone productivity of the equipment elsewhere. Combined with the actual costs of transportation, these result in equipment movement and set-up costs, which are about 20% of total exploration costs. In Alberta, these costs comprise only about 10% of total costs. Thus, building a highway could result in cost savings to companies engaged in oil and gas exploration in the area of as much as 10%.

Actual exploration expenditures in the region are not readily available. However, intended annual spending by companies that have been awarded exploration licenses in the Sahtu in 1995, 1996 and 1997 range from a low of $1 million to a high of $12 million for the period to 2001. No new licenses have been awarded since 1997 due to a review of the licensing system, leading to reduction in exploration expenditures. Assuming that bid prices for future licenses will be similar to those in 1995 and 1996, the average spending on oil and gas exploration can be estimated at $10 million per year.

The estimated 10% reduction in costs that can be ascribed to the road and an average exploration expenditure of $10 million imply a cost saving of $1 million per year. Most of the exploration activity is taking place in close to the pipeline going south from Norman Wells; the $1 million per year in benefits is assumed to start being realized as soon as the highway reaches Norman Wells. The net present value of this benefit, discounted at 7.5%, is estimated at $7.7 million.

The road will also have an impact on the cost of production of fields that may be found and brought into production. The probability, timing, and production costs are subject to much uncertainty. Therefore, these potential cost reductions have not been included in the study, except as part of the sensitivity analysis, presented in Section 4

The study does not include an estimate of the cost reduction that the road will likely cause for the existing Norman Wells field. That field's operations are optimized for the current winter road and barge transportation system and the savings will likely be small. In addition, the field is declining and there will only be a relatively short period of time in which these marginal cost savings would be realized.

2.8 OTHER BENEFITS

Other non-quantified benefits will accrue from road construction and maintenance. It will likely increase the number of skilled workers in the region, provide fresher and more varied goods in the stores, and provide easier access to community-based hunters and trappers to traditional lands.

2.9 SUMMARY OF BENEFITS

Table 4 shows the annual values of the quantified benefits and their net present values. The information in the table indicates that:

- tourism spending is the largest benefit associated with the road. However, this spending implies costs beyond the construction of the road;

- the benefit of reduced cost of living is of the same order-of-magnitude as the avoided winter road costs. However, the latter is more than offset by the cost of maintaining the all-weather road;

- the increased access to resources is considerable and could become larger if commercial oil reserves are found in the near term.

TABLE 4

Summary of Benefits
($ 000)

		Cost of Living	Tourism Spending	Increased Access	Reduced Winter Road Costs	Access to Resources	Total
Present Value Discounted @ 7.5%		10,587	20,060	12,183	9,245	7,765	59,840
Project Year	**Year**						
1	1999	-	-	-	0	0	0
2	2000	-	-	-	240	0	240
3	2001	-	-	-	409	0	409
4	2002	-	-	-	567	0	567
5	2003	219	-	252	741	0	1,211
6	2004	619	-	712	869	1,000	3,200
7	2005	957	-	1,101	869	1,000	3,928
8	2006	976	-	1,124	869	1,000	3,969
9	2007	996	-	1,146	869	1,000	4,012
10	2008	1,016	-	1,170	1,057	1,000	4,242
11	2009	1,374	1,800	1,582	1,057	1,000	6,813
12	2010	1,402	1,836	1,614	1,057	1,000	6,908
13	2011	1,431	1,873	1,646	1,057	1,000	7,006
14	2012	1,460	2,182	1,680	1,057	1,000	7,377
15	2013	1,489	2,508	1,714	1,057	1,000	7,767
16	2014	1,519	2,852	1,748	1,057	1,000	8,175
17	2015	1,550	3,214	1,784	1,057	1,000	8,604
18	2016	1,581	3,596	1,820	1,057	1,000	9,053
19	2017	1,613	3,998	1,856	1,057	1,000	9,525
20	2018	1,646	4,422	1,894	1,057	1,000	10,018
21	2019	1,679	4,868	1,932	1,057	1,000	10,536
22	2020	1,713	5,337	1,971	1,057	1,000	11,078
23	2021	1,748	5,830	2,011	1,057	1,000	11,645
24	2022	1,783	6,349	2,052	1,057	1,000	12,240
25	2023	1,819	6,894	2,093	1,057	1,000	12,863
26	2024	1,856	7,466	2,136	1,057	1,000	13,514
27	2025	1,893	8,068	2,179	1,057	1,000	14,197
28	2026	1,932	8,700	2,223	1,057	1,000	14,911
29	2027	1,971	9,363	2,268	1,057	1,000	15,658
30	2028	2,011	10,058	2,314	1,057	1,000	16,439

3. IDENTIFICATION AND QUANTIFICATION OF COSTS

The following major costs have been incorporated into the analysis:

- road construction and operating costs;
- tourism industry operating and maintenance costs; and
- costs of access.

These costs are discussed below.

3.1 ROAD CONSTRUCTION AND OPERATING COSTS

The Department of Transportation estimates that the construction cost of the Mackenzie Highway Extension from Wrigley to the Dempster Highway and including a spur to Deline at $420 million. This assumes a 60km/hour design standard. The road to Deline is estimated at just below $40 million and the stretch between Fort Good Hope and the Dempster Highway at $160 million. Thus the capital cost of the project ranges between $220 million and $420 million depending on the scope.

For the purposes of the benefit-cost analysis, the study team has assumed that the total road system will be constructed over a 10-year period, starting in the year 2000. This timeframe is for illustration purposes only. The annual costs of the project are estimated at $42 million and the number of kilometers built in each year will depend on the particulars of the segment under construction.

The maintenance costs are assumed to be $10,000 per kilometer or $9.4 million per year for the total project, including the Deline spur. The maintenance costs start up as soon as the first segment -- Wrigley to Tulita -- is completed. They increase with each community connected to the road system.

The present value of the construction and maintenance cost of the total road system, discounted at 7.5%, is $270 million. Table 5 shows the Net Present Value of four configurations of the road system that will be considered.

TABLE 5

Cost of Construction and Maintenance

Road System	NPV @7.5% ($'000)
Wrigley to Fort Good Hope	165,000
Plus Deline Spur	187,000
Wrigley to Dempster Highway	250,000
Plus Deline Spur	270,000

3.2 TOURISM INDUSTRY OPERATING AND MAINTENANCE COSTS

There is a cost associated with increased tourism spending. For example, a restaurant meal purchased by a visitor implies a restaurant, which has capital and operating costs, including wages and food costs. Similarly, visitor spending on a tour implies tour-operator spending on wages, fuel, etc.

The tourism operating and maintenance costs were estimated as a percentage of the total tourism spending. The total cost associated with increased tourism expenditures is estimated at $1.2 million in the first year that the road between Wrigley and the Dempster Highway is open, increasing to $6.8 million in year 30, the last year of the analysis. The present value of this cost, discounted at 7.5%, is $14.7 million. This cost is borne by the operators of tourism facilities as well as by the general retail sector in the region.

3.3 COST OF ACCESS

As discussed in Section 2.3, increased access has been incorporated in the analysis by including:

- an estimate of increased business efficiency including reduced cost of medical travel; and
- a non-market value for the reduced isolation as measured by the increased number of trips of community residents.

These aspects of increased access have costs associated with them. The cost associated with the shift by agency and private business personnel from air to road transportation imply increased road transportation costs, estimated at $14,600 per year. This cost is borne by local area companies and public sector organizations. The shift of medical travel to increased reliance on road transportation for non-urgent patient travel is estimated at $36,500 per year.

The cost of increased vehicle trips due to the year-round road access for non-business reasons has two aspects. They are:

- increased vehicle expenses; and
- increased accidents.

The total costs of additional vehicle expenses is assumed to be roughly equal to the cost of avoided flights, implying that people substitute the one expense for the other, leaving the total resources allocated to travel approximately equal.

The cost of increased accidents on the other hand is likely to increase. Assuming that the all-weather road will experience similar traffic volumes as the winter road, the number of accidents will likely increase three-fold. The total property-related cost of accidents is estimated at $39,000 per year and the societal costs at $305,000. These latter costs include costs for medical/rehabilitation treatments, legal and insurance implications, and others, including lost income. Most of these costs are borne by the territorial government.

Taken together, the net present value of the cost of increased access, discounted at 7.5%, is estimated at $3.8 million.

3.4 OTHER COSTS

Not all costs have been quantified. For example, the road increases the access to lands used for hunting, trapping, and fishing. There may be a cost, especially if the increased access leads to increased competition for the resources from persons from outside the region. Other non-quantified environmental costs include possible impacts on wildlife migration patterns and road kill. These non-quantified costs will need to be considered in interpreting the findings of the economic evaluation in Section 4.

3.5 SUMMARY OF COSTS

Table 6 shows the quantified costs as they occur over time. These costs relate to the complete highway system, including the Dempster Loop and the Deline Spur. The information indicates that:

TABLE 6

Summary of Costs
($ 000)

		Road Constr/O&M	Tourism Costs	Road Transp	Total Costs
Present Value		353,004	14,656	3,898	371,558
Project Year	**Year**				
1	1999	0	0	0	0
2	2000	41,845	0	0	41,845
3	2001	41,845	0	0	41,845
4	2002	41,845	0	0	41,845
5	2003	44,554	0	75	44,629
6	2004	45,430	0	212	45,642
7	2005	46,815	0	328	47,143
8	2006	46,815	0	334	47,149
9	2007	46,815	0	341	47,156
10	2008	46,815	0	348	47,163
11	2009	51,184	1,223	471	52,878
12	2010	9,339	1,248	480	11,067
13	2011	9,339	1,273	490	11,101
14	2012	9,339	1,483	500	11,321
15	2013	9,339	1,704	510	11,553
16	2014	9,339	1,938	520	11,797
17	2015	9,339	2,184	531	12,054
18	2016	9,339	2,444	542	12,324
19	2017	9,339	2,717	553	12,609
20	2018	9,339	3,005	564	12,908
21	2019	9,339	3,308	575	13,222
22	2020	9,339	3,627	587	13,552
23	2021	9,339	3,962	599	13,899
24	2022	9,339	4,315	611	14,264
25	2023	9,339	4,685	623	14,647
26	2024	9,339	5,074	636	15,049
27	2025	9,339	5,483	648	15,470
28	2026	9,339	5,912	662	15,913
29	2027	9,339	6,363	675	16,377
30	2028	9,339	6,836	689	16,863

- the annual cost peaks at $51 million in the 10th year of the construction phase, when construction costs are augmented by operating costs of the already completed system;

- the costs of constructing and maintaining the all-weather road are almost 25 times larger than the next largest cost, which is the cost associated with tourism;

- the cost of servicing the tourism industry increases in line with the anticipated number of visitors; and

- the construction and maintenance cost are more than 18 times higher than the tourism spending benefit.

The comparison between costs and benefits is discussed in detail in the next section.

4. BENEFIT-COST ANALYSIS

This section of the report summarizes the results of the benefit-cost analysis of the Mackenzie Highway Extension. The analysis incorporates the estimates of project costs and benefits discussed earlier in Sections 2 and 3, respectively. This section presents the benefit-cost analysis results for four scenarios:

- Wrigley to Fort Good Hope, excluding a spur to Deline;
- Wrigley to Fort Good Hope, including a spur to Deline;
- Wrigley to Dempster Highway, excluding a spur to Deline; and
- Wrigley to Dempster Highway, including a spur to Deline.

The major difference between the first and second set of two scenarios is that the tourism benefit will only be realized when the connection to the Dempster Highway is completed. The difference between the scenarios with and without Deline relate mostly to the number of people that are affected by the project.

4.1 FINDINGS

The economic evaluation of the project involves a comparison of the costs and benefits that are expected to accrue throughout the construction and operational phases of the project. Society is not indifferent to the time at which benefits are realized and costs are incurred, attributing a higher monetary value to costs and benefits in the near as compared to in the more distant future.

The economic evaluation therefore requires a comparison of costs and benefits on some common base to reflect the time value of money. The study team has calculated the following measures:

- the benefit-cost ratio, which is the ratio between the net present value of the benefits over the net present value of the costs, using an appropriate discount rate; and

- the absolute value of the present value difference between benefits and costs.

The determination of an appropriate discount rate is somewhat judgmental and the question of what discount rate is appropriate for public investments such as roads and dams has been the subject of much debate.

This study uses discount rates ranging from 5% to 10%, with 7.5% as a selected mid-point. The defined range is based on a review of various academic studies and on the evaluation practices that have been applied in other jurisdictions and organizations, as discussed in some detail in the Technical Appendix.

The findings of the economic evaluation of the 60 km/hour all-weather road can be summarized as shown in Table 7. The findings for the various scenarios, using the mid-point of the assumed range of discount rates, can be summarized as follows:

TABLE 7

Summary of Economic Evaluation
Mackenzie Highway Extension Project

	Wrigley to Ft Good Hope		Wrigley to Dempster Highway	
	With Deline	Without Deline	With Deline	Without Deline
	7.5% Discount Rate			
Present Value ($'000)				
Benefits	$37,676	$32,869	$54,290	$49,482
Costs	$234,918	$205,480	$339,598	$316,688
Net Benefit	($197,243)	($172,611)	($285,308)	($267,206)
Benefit-Cost Ratio	0.16	0.16	0.16	0.16

- the benefit-cost ratio for the project is 0.16 for all four scenarios;

- the Present Value of the net benefits ranges between minus $172 million and minus $285 million; and

- the economic return of the Mackenzie Highway Extension is undetermined due to the limited number of years in which the benefits outweigh the costs.

As shown in the table, the scenarios that include the Dempster Highway loop have both higher benefits and costs than the scenarios that exclude that loop. The net benefit of the Dempster Highway scenarios is more negative than those without that loop. Including the Deline spur increases both the benefits and the costs. The net benefit, however, declines. The information presented in Table 7 supports the conclusion that the Mackenzie Highway Extension is not viable from a strict economic perspective.

These findings are in line with other analyses of the Mackenzie Highway and similar roads. For example, a 1983 study of the completion of the Mackenzie Highway to Wrigley places the benefit-cost ratio at 0.2, using a 10% discount rate. A 1990 study of The Mackenzie Highway Extension to the Dempster Highway, conducted in support of the 1990 Transportation Strategy Update, calculates a benefit-cost ratio of 0.28, using a 0.45, using a 3% discount rate. Finally, a recent study of the Inuvik to Tuktoyaktuk road, using a very similar methodology as used here, estimates the benefit-cost ratio of that road project at 0.26, using a 7.5% discount rate.

4.2 SENSITIVITY ANALYSIS

4.2.1 Changes to Underlying Assumptions

The benefit-cost analysis of the Mackenzie Highway Extension project is future-oriented. This means that all of the identified costs and benefits are subject to much uncertainty. The results, however, are relatively robust as evidenced by a sensitivity analysis conducted on the benefit-cost results. Changing the discount rate to 5% and increasing the benefits by an arbitrary 25% and reducing the costs by the same percentage does not materially affect the results. The best case scenario -- cost minus 25%, benefits plus 25%, and a 5% discount rate -- yields a benefit-cost ratio of 0.30 for the Wrigley to Fort Good Hope scenario, assuming no spur to Deline.

4.2.2 Impact of New Oil Finds

The sensitivity analysis can also address the impact of additional oil finds in the Norman Wells region, where several companies are conducting exploration programs. The suggestion here is not that the

Mackenzie Highway Extension project would cause additional production, but that the road will have a positive impact on the timing of exploration activities and on the cost of additional production, if found.

The sensitivity analysis assumes that additional oil reserves will be found and brought into production over the 2002 to 2012 period to fill the existing pipeline to capacity. This assumption reflects the fact that the existing and increasing pipeline capacity is one of the motivating factors for the ongoing exploration and avoids the need to include in the analysis additional pipeline construction, which is yet more uncertain than the discovery of economic oil reservoirs. The analysis furthermore assumes that the production cost savings relate the approximate 50% of costs that are transportation sensitive and that the cost saving is in the same order-of-magnitude as derived for the cost-of-living impact.

Under these assumptions, the cost savings associated with "new oil" are estimated to start at $270,000 in 2002 and increase to $4.7 million in 2028, the last year under consideration. The net present value of this benefit, discounted at 7.5%, is $24.4 million. Inclusion of this benefit in the benefit-cost analysis increases the benefit-cost ratio of the overall project from 0.16 to 0.23. The benefit-cost ratio of the road project from Wrigley to Fort Good Hope (excluding the Deline spur) increases from 0.16 to 0.27 by the inclusion of the "new oil" benefit. The best case scenario for this project (cost minus 25%, benefits plus 25% and inclusion of the "new oil" benefit) has a benefit-cost ratio of 0.41 and a NPV of minus $92,000.

4.2.3 Lower Road Standard

Another analysis of the sensitivity of the results is changing the timing of the benefits by assuming a lower road standard. This will allow for earlier connection of all communities, while accepting higher maintenance costs, a higher incidence of road failure, and occasional road closings. This sensitivity analysis further assumes that once the low standard road is built, it will be upgraded over time.

The major implication of lowering the road standard will be to reduce the number of years needed to complete the different road segments by perhaps as much as a factor of 2. The improvement to the bridges will likely extend the winter road season beyond what it would have been, giving the communities longer access to the reduced freight rates, increased mobility, and others.

For the purposes of this sensitivity analysis, it has been assumed that the benefits accrue within five years. The exception is tourism, considering that the low initial quality may reduce the attractiveness of the road for tourism. This scenario results in a benefit-cost ratio of the total road projects of 0.24.

4.2.4 Conclusion of Sensitivity Analysis

The results of the sensitivity analysis stress the robustness of the finding that the Mackenzie Highway Extension is not economically viable.

4.3 LIMITATIONS TO THE ANALYSIS

The results of the economic evaluation must be qualified. First, it has not been possible to quantify in monetary terms all costs and benefits associated with the project, including the potential future cost savings if additional oil production takes place in the region.

Second, there are the inherent uncertainties of estimating future costs and benefits, which can be affected by numerous unforeseen factors. These uncertainties are particularly relevant in respect of the project benefits, which extend over many years into the future. The development of the tourism industry, for example, can affect the ultimate economic returns of the project.

Third, and perhaps most importantly, the economic criteria are not the only ones that should be considered. Indeed, many public investments in infrastructure and programs are made on the basis of social rather than economic considerations. One set of such social considerations captured under the heading of regional economic development and can come into play if policy makers see the need to redistribute economic activity and benefits among regions. The next section explores the appropriateness of the Mackenzie Highway project from the latter perspective.

5. REGIONAL ECONOMIC IMPACT ANALYSIS

This section focuses on the distribution of project costs and benefits and presents the findings of the regional economic impact analysis of the Mackenzie Highway project. The study region is defined as Mackenzie Valley from Fort Simpson to the Dempster Highway. Selected socio-economic information on this region is presented in section 1.3.

The economic impact of the construction of the Mackenzie Highway project is discussed first, followed by the impact of the post-construction phase. The analysis uses the same ten-year construction timeframe as the benefit-costs analysis presented in the previous section.

The regional economic analysis shifts the analytical focus from economic efficiency to the distribution of the benefits. Most of the benefits in terms of income and employment accrue to the region, while most of the costs, with construction and maintenance being the most significant, will likely be borne by the tax payers in the NWT and Canada.

The project will generate employment and income benefits to the region in the following ways:

- local spending on wages, materials, and equipment during construction;
- increased local spending on wages, materials, and equipment annually for the maintenance of the all-weather road as compared to spending on the winter road; and
- increased tourism spending accruing to local operators and their suppliers.

The project will also generate income, or more precisely, reduced expenditures for oil and gas exploration and service companies. These impacts accrue to out-of the region companies and are not considered here.

5.1 CONSTRUCTION

5.1.1 Construction Employment Impact

The preliminary cost estimates for the Mackenzie Highway Extension from Wrigley to Fort Good Hope is $220 million. Completing the road all the way to the Dempster Highway will increase the estimated construction cost to $380 million. Adding the spur to Deline is estimated at an additional $40 million, putting the total project cost at $420 million.

Table 8 shows the estimated total on site labour requirement of the project, broken down by the different segments. This employment will be created over a six to 10 year period and the average annual person years of on site labour is estimated at 170.

TABLE 8

Employment Creation (person-years)

Road System	On Site Labour	On Site Supervision
Wrigley to Fort Good Hope	1,250	70
Plus Deline Spur	1,460	85
Wrigley to Dempster Highway	2,150	120
Plus Deline Spur	2,360	135

The percentage of on site labour that will recruited from the local labour force is assumed to increase from 20% in the early years of the project to 75% later on. The reasons for this increase include:

- The local labour force that can be drawn upon for the project increases as the project connects communities. (Alternatively the project could institute a system of flights to bring workers to and from the site, but that possibility has not been costed and is not considered here); and

- The project will also provide an incentive for local people to get the skills training needed to work on the project.

Under these assumptions, the number of local workers on the project will increase from 30 in the first year to about 130 in the later years as more communities are connected and training levels increase.

5.1.2 Construction Income Impact

The total income impact of the project on the region will increase as the number of local workers increases. In the early years, the annual income impact of the project is estimated at $4.6 million or 11% of the total annual expenditure of $42 million. This is expected to increase to about $11 million or 26% of total annual expenditure.

An estimated 50% of the $4.6 million annual income impact in the early years of the project is expected to accrue to the local labour force. Late in the project, the local labour force receives an estimated 80% of the $11 million annual income impact. The total income impact on local businesses as payments for equipment, fuel, and other materials is anticipated to remain relatively steady over the life of the project in monetary terms. As a percentage of the growing annual regional income impact, it declines from 50% to 20%.

Overall, the income impact of the project depends on its scope and Table 9 shows the estimated income impacts for the four different scenarios.

TABLE 9

Income Impact on the Region

Road System	($'000)
Wrigley to Fort Good Hope	41,000
Plus Deline Spur	49,600
Wrigley to Dempster Highway	77,000
Plus Deline Spur	85,600

5.2 OPERATION AND MAINTENANCE

5.2.1 Operations and Maintenance Employment Impact

The operation and maintenance of the road system is estimated to create 32 to 62 person years of employment depending on the scenario. This employment impact is reduced by the fact that the all-weather road system pre-empts the winter road activities currently undertaken, eliminating an estimated six or seven person years of employment. The net employment impact of road operations and maintenance expenditure is estimated at 26 to 55 person years of employment.

5.2.2 Operations and Maintenance Income Impact

Table 10 shows the total annual maintenance costs for the project broken down for the four different scenarios.

TABLE 10

Annual Operating and Maintenance Costs

Road System	($'000)
Wrigley to Fort Good Hope	4,820
Plus Deline Spur	5,870
Wrigley to Dempster Highway	8,320
Plus Deline Spur	9,370

An estimated 70% of the income will accrue to the owners of the machinery used in the road maintenance and the balance to the regional labour force. Much of the business income will flow directly out of the region as payments for equipment, parts, and fuel. Adjusting for the direct flow-through of the project expenditure on equipment results in an estimate of the income impact in the region of $1.4 and $2.8 million depending on the scenario.

There is also some lost income to the region due to the cessation of winter road construction. The total cost of winter road construction is estimated at $1 million dollars, of which an estimated $340,000 will remain in the region. This offsets some of the all-weather operation and maintenance income impact on the region.

5.3 REGIONAL ECONOMIC IMPACT SUMMARY

The construction of the Mackenzie Highway Extension will provide considerable economic benefits to the region in terms of income and employment creation.

The Public Tender Approach concentrates the project benefits in the 10-year construction project. It will stress the local labour market and there will be a need to bring workers in from outside the region. This reduces the effectiveness of the expenditure as a regional economic development tool. The following section will explore an alternative approach to building the road that focuses not on maximizing the economic benefits, but on maximizing the regional economic impacts.

6. COMMUNITY CONSTRUCTION APPROACH

6.1 INTRODUCTION

The economic assessment of the project using a benefit-cost framework is influenced heavily by the timing of the cost and the benefits. As with most projects, the construction costs are incurred early on in the project's life, while the benefits accrue over time. In the case the Mackenzie Highway projects, the tourism benefit is expected to grow to its full potential over time, pushing most of the benefits to the later years of the period under analysis.

Under the Community Construction Approach time is not of the essence. The focus is on maximizing training and general economic development benefits, while allowing the project's sponsors to spread out the heavy capital costs. This means the economic benefits considered in the benefit-cost analysis are pushed back far into the future. From a strictly economic perspective, future benefits are less and less valuable the further they are in the future. By way of illustration, $1 million 40 years in the future (discounted at 7.5%) is worth only $55,000 now. In other words, the value of a benefit is reduced by 94% if it is realized 40 years from now.

Table 11 shows the anticipated completion years of the different segments of the road building project and shows that the different segments of the highway will take between 45 and 60 years to complete. If the project construction starts in, say, 2002, the first segment will not be completed until 2047 while the cost of living benefits will not materialize until the Wrigley to Tulita segment is completed in the year 2062.

It follows that a benefit cost analysis framework is not an appropriate assessment tool for the Mackenzie Highway project, conceived as a regional economic development tool and assuming a Community Construction Approach. The focus should be on the regional benefit and impacts, which are the subject of this section.

TABLE 11

Construction Schedule
Community Construction Approach
(60 km/hour standard)

Highway Segment	Years to Completion
Deline Spur	45
Tulita to Norman Wells	46
Norman Wells to Fort Good Hope	58
Wrigley to Tulita	60

The construction schedule in the table assumes the following simultaneous construction projects:

- construction from Wrigley to Tulita;
- construction from Tulita to Wrigley;
- Construction from Norman Wells to Tulita;
- Construction from Fort Good Hope to Norman Wells;

Each of these construction projects receives $1 million per year. The actual number of kilometer of road built will differ by road segment, reflecting differences in terrain and the number of river and stream crossings. The construction schedule shown in Table 1 assumes a bridge over the Bear River at Tulita, rather than a ferry crossing.

This construction schedule assumes that the budget of completed sections is reallocated to an adjacent segment. The construction of the segment between Fort Good Hope and the Dempster Highway would not be undertaken until all communities are connected to the road system in the southern NWT. This final section is not included in the impact assessment of the Community Construction approach because it would not even start till the year 2060 or thereabouts.

6.2 REGIONAL ECONOMIC IMPACTS

6.2.1 Construction Employment Impact

One of the driving forces behind the concept of the Community Construction Approach is the maximization of local benefits. The $1 million per year construction budget for each of the communities will allow most of the labour to be supplied locally. The 45+ year duration of the construction period will allow training programs to be mounted to ensure that all on-site labour and most of the on-site supervision will be local even that capacity is not resident in the communities now.

The Department of Transportation has formulated a typical construction scenario for the Community Construction Approach. It consists of one month in winter of hauling and drainage work and four months of summer construction. This scenario indicates the following on site employment creation:

- 108 person-month or 9 per-years of on site labour; and
- 5 person-month of on-site engineering supervision

The typical summer construction crew will likely consist of 30 people:

- 21 heavy equipment operators (dozers, trucks, graders, excavators);
- 3 labourers;
- 3 camp and 2 office/garage support persons; and
- one supervisor.

Some of the equipment operators and labourers and the support personnel would work both the winter haul and on preparatory crushing.

Contrasting this estimate with the number of unemployed persons in each of the communities, shown in Table 12, it appears likely that the local labour forces can accommodate the project. This conclusion is strengthened further if one considers that a least a number of the persons 15 years and older and currently not in the labour force are actually discouraged workers. These discouraged workers may be enticed back into the labour force if opportunities for meaningful work exist.

TABLE 12

Labour Forces, by Community

	Wrigley	Tulita	Deline	Norman Wells	Fort Good Hope
Population 15 years and older	115	285	395	560	410
Labour Force	75	195	240	505	260
Unemployment Rate (%)	26.7	23.1	25.0	6.9	17.3

Source: Statistics Canada, 1996 Census

The information in the table also indicates that the project labour requirement is relatively large for each of the communities. In the case of Wrigley, the smallest of the affected communities, a seasonal demand for 30 workers constitutes 26% of the total population 15 years and older and 40% of the labour force. For the other communities these numbers range between 5% and 11% of total population 15 years and older and between 6% and 15% of the labour force. In the case of Wrigley, it will be possible to draw on workers from Fort Simpson, a community of 1,257 people. The lack of all-year road access will limit the ability of workers from other communities to work on crews based out of Tulita, Norman Wells, Fort Good Hope, and Deline.

This analysis does not suggest that only unemployed or discouraged workers will take up road construction-related jobs. Indeed, it is likely that a number of currently employed persons will aspire to road work, considering the long-term nature of the project and the likelihood that it could be combined with traditional pursuits and other seasonal work. It is furthermore likely that a number of currently unemployed or discouraged workers face some real barriers to employment, suggesting that the road project would benefit if it recruits workers from the currently employed work force. These observations have a number of implications including:

- skill training for road building needs to start prior to project start-up and be open to all community members interested; and

- the range of training provided in the communities should not be limited to road building skills only and include as well general office, managerial, cooking, and other.

- skills training should be supported where possible by life skills training and other family and personal support systems.

6.2.2 Construction Income Impact

The analysis of construction income impacts presented here assumes the same construction program as outlined in Table 10. It does not include the segment from Fort Good Hope to the Dempster Highway. The total cost of the project, thus defined, is $297 million over 60 years. The average annual cost of the project is $5 million.

The breakdown of the costs is presented in Table 13. It shows that an estimated 37% of the costs flows to workers in the form of wages and salaries. Most of the employment income flows to workers in the region.

TABLE 13

Capital Cost Estimate, Community Construction Approach

	Total Costs	Annual Cost (in $'000)	% of total
On site Labour	84,400	1,420	28%
On site Engineering	8,600	140	3%
On site Equipment	128,500	2,160	43%
On site Materials	16,500	280	6%
On site Fuel/Parts	45,280	760	15%
YK Engineering/Design	13,600	230	5%
YK Equipment	300	5	0.1%
Total	297,000	5,000	100%

The largest single cost category is payment for equipment. Fuel, parts and materials are other major cost categories. These expenditures, amounting to an average of almost $320 million annually accrue to community-based contractors. Unlike wages, however, this project expenditure (and business income) is mostly an immediate flow through. For example most of the project payment for fuel is offset by a payment of the community-based contractor to the bulk fuel supplier and onward to the wholesale suppliers in Alberta. Similar direct onward flows of project payments will likely occur for equipment (lease payments) and materials.

This flow through notwithstanding, a part of the project payments remain in the communities in the form of overhead charges and profit margins. The local part of the equipment, fuel, parts and materials expenditure together with the wages paid to local workers is estimated to be $106 million over the life of the project or 1.8 million annually. This is 36% of total and annual expenditure. This percentage may be somewhat lower in the initial years of the project if the project needs to rely on some workers from outside the region. The leakage of wage income out of the region can be minimized by timely implementation of a training initiative.

This labour income estimate can be compared with the $68 million total annual income of all people 15 years and older in the Mackenzie Valley communities. Thus, the road construction would increase incomes in Mackenzie Valley Communities by about 2.5% annually for the duration of the project. An important aspect of the Community Construction Approach is that the labour income would accrue to workers in all affected communities, providing an important economic stimulus fairly evenly throughout the region.

6.2.3 Operations and Maintenance Employment Impact

The operation and maintenance of the road system is estimated to create 32 to 39 person years of employment once all communities are connected to the road system in the southern NWT. This employment impact is reduced by the fact that the all-weather road system pre-empts the winter road activities currently undertaken, eliminating an estimated six or seven person years of employment. The net employment impact of road operations and maintenance expenditure is estimated at 26 to 32 person years of employment.

6.2.4 Operations and Maintenance Income Impact

Once all communities are connected by road, the average annual operations and maintenance costs is anticipated to be $5.9 million. The operations and maintenance costs are assumed to start when the first communities are connected and traffic starts to flow. Using the same construction completion schedule as outlined in Table 10, the operations and maintenance expenditure will be $1 million when the first two communities are connected in the 45th year after the start of the construction. It will increase over the next 15 years to reach $5.9 million when all communities are connected to the road system in the NWT.

An estimated 70% of the income (or $4.1 million) at full built out will accrue to the owners of the machinery used in the road maintenance and the balance (30% or $1.8 million) to the regional labour force. Much of the business income will flow directly out of the region as payments for equipment, parts, and fuel. Adjusting for the direct flow-through of the project expenditure on equipment results in an estimate of the income impact in the region of $2.2 million. This income impact will not be realized until 60 years after the start of construction.

There is also some lost income to the region due to the cessation of winter road construction. The total cost of winter road construction is estimated at $1 million dollars, of which an estimated $350,000 will remain in the region. This offsets some of the all-weather operation and maintenance income impact on the region.

6.3 VARIATIONS OF THE COMMUNITY CONSTRUCTION APPROACH

6.3.1 One Segment At A Time

The discussion of the Community Construction Approach has assumed simultaneous construction based out of all five affected communities. An alternative approach is to concentrate all construction on a single segment of the highway. Although the location of the construction would be subject to community consultations, there is some logic to starting the construction from Wrigley and work northward. In that way, the benefit of connecting communities to the existing road system is realized at the earliest possibility.

Concentrating the construction effort on one section of the highway has the following implications from a socio-economic perspective:

- reduced likelihood that all on-site labour and supervision is supplied locally due to the narrowing of the labour force catchment area;

- some efficiencies in equipment usage and a reduction in the number of local area contractors that could bid on project tenders.

With these caveats, there may be opportunities to manage this construction scenario to yield similar economic impacts as the

Community Construction Approach discussed in the previous section. The management practices would need to include:

- establishing a work rotation schedule and a community-work commute system that would allow interested workers for all Mackenzie Valley communities to work on the highway;

- co-ordinating equipment location and availability with local area contractors and movement of community-based equipment to the construction site and back.

Although concentrating on one section may lead to an earlier connection of Tulita with the existing road system, the construction period will still exceed 27 years. This means that the cost of living and other economic benefits that may arise from the road are not close enough in the future to falsify the conclusion that a benefit cost analysis is not an appropriate analytical framework for the Community Construction Approach.

6.3.2 Lower Road Standard

Another variation of the Community Construction Approach is lowering the road standard to allow for earlier connection of all communities, while accepting higher maintenance costs, a higher incidence of road failure, and occasional road closings. Assuming the construction approach would start simultaneously in all five communities, this variation could be further described as follows:

- Improvements to bridge crossings to lengthen the winter road season; and

- Road construction (to a limited standard).

The lower road standard will decrease the average construction cost per kilometer from about $380,000 to $120,000, a saving on more than 70%. Cost savings will also be achieved due to the reduced requirement for surveying and road design costs. The total cost saving is estimated at 44%, assuming similar cost as estimated for the 60 km/hour road standard for structures and a 20% reduction in the cost of surveying, designing, and supervision.

The major implication of lowering the road standard will be to reduce the number of years needed to complete the different road segments by approximately 40%. Table 14 presents the estimated completion schedule under these assumptions. The improvement to the bridges will likely extend the winter road season beyond what it would have been, giving the communities longer access to the reduced freight rates, increased mobility, and others.

TABLE 14

Construction Schedule
Community Construction Approach (low standard)

Highway Segment	Years to Completion
Tulita to Norman Wells	21
Deline Spur	21
Wrigley to Tulita	27
Norman Wells to Fort Good Hope	28

The annual economic impacts of building programs using a 60 km/hour or a lower standard will be similar if the total annual expenditures are similar. The reduced standard road will be completed earlier, but it is reasonable to assume that the construction will continue after completion to bring the road to the 60 km/hour standard.

The benefits of access will be available earlier if the road standard is lower. However, even under this scenario, the access of all communities to the road system in the southern NWT will not be accomplished until 20 to 30 years after the start of the construction period. This places these benefits so far in the future that their present value is sufficiently diminished to ensure that the discounted net benefits will be very small.

6.4 ORGANIZATIONAL CONSIDERATIONS

6.4.1 Introduction

The concept of the affected communities building the Mackenzie Highway extension on a piecemeal basis over an extended period of time gives rise to a number of questions. The following listing of examples is not meant to be exhaustive or the ordering indicative of importance:

- Who owns the program in view of the fact that program funds may come from different sources (DOT, Education, Culture and Employment (ECE), Resources Wildlife and Economic Development (RWED), others):
  - Where is the program located?
  - How do the different participating departments steer the program collectively?
- Who are the program participants in the communities (the communities themselves, private contractors located in the communities, others)
  - How do you select the program participants?
  - How do you funnel the money to them?
- How do you set and enforce standards (with respect to road standards, local participation, training component, etc.):
  - How do you deal with aspirations of the communities that may be at odds with the program (e.g. 4x4 trail vs. all-weather road)
  - What is the accountability framework.

The following section provides an approach to answering these and other questions. This discussion starts with an analysis of organizational alternatives and then provides an overview of the likely program activities and how they relate to the projects objectives. Two organizational alternatives are considered here:

- the Department of Transportation acts as the lead agency and co-ordinates with other departments, agencies, and groups as necessary; and

- a government-land claims group partnership organization acts as the lead agency, essentially co-opting all key players as project owners.

The first organizational alternative is similar to and a further development of the way the department conducts its road building business now. The second alternative is an approach that reflects the political realities of the NWT and addresses the capacity constraints that face DOT and other departments.

6.4.2 Department of Transportation As Lead Agency

A road project can be executed in many different ways. A very common approach is for the proponent, in this case the Department of Transportation, to act as the prime contractor. This would mean that DOT would:

- take the lead in the approval process, hiring specific expertise, such as environmental and socio-economic consultants, where necessary;
- undertake the required consultation with the affected communities;
- do the engineering, either in-house or on a contracted basis, and put together appropriately sized tender packages;
- conduct a tendering process and enter into contracts with selected construction firms; and
- be responsible for contract administration and quality control.

Because the Community Construction Approach has other objectives than road building, DOT will also have to become involved in:

- developing strategies and managing to maximize local content; and
- working with other agencies, such as ECE and Human Resources Development Canada (HRDC), with a view to integrating training opportunities into the road building process.

In view of the emergence of impact benefit agreements, such as signed between BHP and the Akaitcho Treaty 8 and Dogrib Treaty 11 councils and the North Slave Metis Alliance, DOT may have to enter into detailed benefit negotiations with the communities or land claims organizations.

This summary of the activities suggest significant staffing implications for the Department. In addition, this approach would extend the range of activities normally undertaken by the Department from infrastructure building and maintenance to community consultation, education, and economic development.

6.4.3 Road Building Partnership As Lead Agency

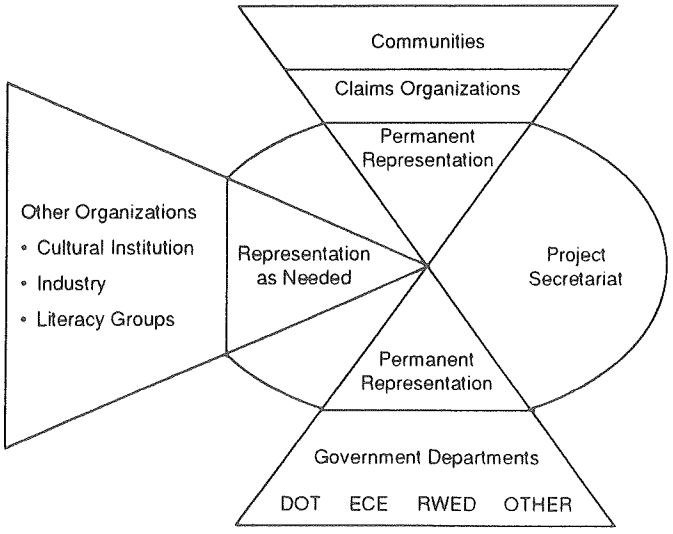
An alternative approach for DOT is to seek partners to augment its strength in infrastructure building and maintenance. Logical partners include:

- the claims organizations, such as the Gwich'in Tribal Council and the Sahtu Secretariat Incorporated; and
- other government departments, especially ECE and RWED.

No doubt there are other organizations, such as Cultural institutes, industry, and literacy groups, that could play a constructive role in the partnership. The involvement of these more peripheral groups could be included in the project on an as needed basis. Figure 1 shows a graphical representation of the partnership concept. The key potential partners are discussed in more detail below.

FIGURE 1

Partnership Concept



The partnership approach will likely be slower than the "DOT as Lead Agency" way. This relates to the need to mobilize all different partners and do the necessary work to ensure that there exists a shared understanding and vision of the project. In addition, the mere fact of co-ordinating a diverse group of participants will take time. However, in the context of an construction period in excess of 45 years, this initial time needed to put into place the partnership appears less important.

The partnership may also increase the overall cost of the project. The partnership approach will likely place more emphasis on the non-road benefits of the projects as compared to the "DOT as Lead Agency" approach. This has budget implications. However, if DOT were to enter into Impact Agreements along the lines done by BHP, the cost differences between the two approaches may be reduced.

6.4.3.1 Claims Organizations

A partnership approach that includes the claims organizations has several advantages over the "DOT as Lead Agency" approach. If the claims organizations were to be part of the planning and execution of the project, it would mean:

- increased ownership of the project by the affected communities;
- existing channels for community consultations; and
- increased likelihood for maximization of education and economic development benefits.

There is a increased likelihood that non-road building benefits are maximized under the partnership approach because applications for education and economic development initiatives will carry more weight when done by claims organizations than by DOT. In addition, the claims organizations will place more emphasis on the non-road building benefits than DOT would. Education and economic development are central to the claims organizations, while DOT is focused on transportation infrastructure building and maintenance.

There are other advantages to partnering with the claims organizations:

- the approach is cognizant and supportive of the growing strength of the claims organization and the emerging self government initiatives;

- it may provide an avenue for and contribute generally to the institutional strengthening of the claims organizations; and

- it may facilitate discussions about project cost reductions by means of adjustments to resource royalties and permit processes.

6.4.3.2 Other Government Departments

In view of the education and economic development objectives of the Community Construction Approach, it appears logical to include ECE and RWED in the process. The long-term nature of the Mackenzie Highway extension project ensures that there is time to put in place the training and economic development initiatives to promote the key mandate areas of these departments. The project will touch upon the mandate areas of other departments as well, but in a more tangential manner.

The recent experience with the Nunavut Unified Human Resources Development Strategy (NUHRDS) may provide some useful insights. The emerging consensus about what NUHRDS did right includes the following:

- The NUHRDS Committee was a new organizational structure outside the participating groups and departments. This gave it a level of autonomy needed to balance competing viewpoints.

- NUHRDS spend sufficient attention to aligning the visions and operating principles of the co-operating claims organizations, and territorial and federal departments. This gave it the framework within which competing viewpoints could be resolved.

- The members of the NUHRDS committee acted as change agents in their respective organizations in order to align departmental activities with NUHRDS.

These observations suggest the creation of an independent project office or secretariat, which brings together representatives of the participating claims organizations and government departments. These representatives should have sufficient seniority that they will be able to effect action in their respective organizations.

6.4.4 Conclusion

There are a number of compelling reasons to conceptualize the Community Construction Approach to the Mackenzie Highway Extension as an economic development partnership initiative as compared to a standard DOT-led highway construction project: These reasons include:

- the need to emphasize the economic impacts of the road as compared to the road's ability to stimulate new economic growth;
- the ensuing need to maximize the economic impacts of employment creation and business income stimulation;
- the organizational capacity constrains of DOT to deal with non-road benefits; and
- the political landscape in the NWT and the Mackenzie Valley.

The following section outlines the range of activities that could be undertaken as part of the Community Construction Approach. All of these activities could be undertaken assuming the "DOT as Lead Agency" approach. However, they will likely be more efficiently and effectively undertaken under a partnership approach.

6.5 COMMUNITY CONSTRUCTION APPROACH PROGRAM DESCRIPTION.

6.5.1 Program Elements

This section describes the Community Construction Approach model. It does this using a logic model, making explicit the program's objectives, inputs, outputs, and impacts. A logic model also is helpful in determining if the inputs, outputs, impacts, and objectives are logically related. Following are the constituent parts or elements of the program design:

- Activities: what does the program do and what inputs does it use? (e.g. road building);
- Outputs: What is the result of these activities? (e.g. length of road completed). Outputs are the most

common type of measure of a government program, but do not address the linkage to the program objective. (e.g. a college has graduates - the output - but are those graduates finding jobs, one of the objectives of college training?);

- Outcomes: A measure of results. In what way do the outputs contribute to the objectives (e.g. two communities connected by a road, graduates finding jobs);

- Impacts: intended and unintended consequences of the program activities (e.g. increased self esteem as a consequence of participation in a training program or increased number of accidents due to year-round traffic as compared to seasonal traffic on winter roads);

- Objectives: what is it that we try to accomplish (e.g. safe transportation of people and goods).

The Community Construction Program has multiple objectives. This can be accommodated by conceptualizing different logic models for the different objectives. The final task is then to define a broad overarching objective that can capture all sub-objectives. This overarching objective can be formulated as "promoting sustainable regional economic development".

Table 15 provides on overview of the different program elements. The information provided in the table can be considered in several ways. First, the activities, outputs, outcomes, and objectives for each of the four shown general areas are designed to be internally consistent. The Activities can be expected to yield the stated Outputs, which in turn will lead to the results specified under Outcomes. If these results are indeed accomplished, the program will have contributed in a meaningful way to the stated objectives.

In addition, there appears little conflict between the program elements for each of the program areas. The program outline does imply that the non-transportation objectives can be attained only at the cost of delaying the transportation objective. This is a fundamental aspect of the Community Construction Approach.

TABLE 15

Community Construction Program Outline

	Transportation	Education	Economic Development	Social Development
Objective	• Safe transportation of people and goods.	• Certified transferable skills.	• The establishment and expansion of viable northern businesses.	• Healthy families
Impact	• Increased mobility. • Increased likelihood of accidents. • Decreased cost of living. • Decreased cost of economic oil and gas development. • Increased number of visitors. • Increased access to hunting and trapping opportunities. • changes in hunting and trapping success rates.	• Increased wage and business income in the communities. • Increased self-esteem in trained workers. • Increased mobility in community workforces. • Additional stress on social fabric of communities.	• Increased wage and business income in the communities. • Increased tourism and construction and business services industry development in the communities.	• Decreased social disruption. • Increased community wellness.
Outcome	• increased travel between communities. • increased movement of goods between communities. • reduced cost of travel.	• Local people taking up and keeping jobs in highway construction and maintenance.	• Local people taking up jobs in tourism, environmental mitigation, and land use management. • Local company involvement in the construction, maintenance, tourism and other areas. • Increased organizational strength in land claims organizations.	• Increased ability of individuals and families to cope with change.
Output	• all-weather road	• Training plans. • Trained highway construction and maintenance workers.	• Training plans. • Trained tourism industry and business services workers. • Appropriate tendering process.	• Social development activity plan. • Social development workshops • Lifeskills training.

TABLE 15

Community Construction Program Outline (cont'd.)

	Transportation	Education	Economic Development	Social Development
Activity	• Design highway. • Build highway.	• Develop training plans by community for highway construction and maintenance skills (engineers, engineering technicians, surveyors, heavy equipment operators, truck drivers, drillers/blasters, labourers, etc.). • Deliver skills training. • Deliver life skill training. • Deliver Training-on-the-Job. • Develop local hire policies and set local hire targets by type of position.	• Develop training plan for entrepreneurial, tourism industry, land use management, and environmental mitigation training. • Deliver entrepreneurial and tourism industry land use management, and environmental mitigation training • Prepare tendering procedures that is sensitive to small community-based businesses. • Develop local hire policies and set local hire targets by type of position.	• Develop plan for delivery of educational activities that coincides with road building activities. • Deliver healthy family and other social development workshops. • Deliver life skill training.

All other program elements reinforce rather than conflict with each other. In this way, the Community Construction approach reflects lessons from, for example, the Investing in People training initiative that the integration of training, on-the-job work experience, and broad personal and community support systems contributes to program success.

7. CONCLUSION

The Mackenzie Highway Extension can be a tool for regional economic development. It provides significant income and employment benefits to the region during both the construction and maintenance of the road.

The project would increase the appeal of the area as a tourism destination by providing a road loop to the Dempster Highway. Importantly, diverting traffic from the Dempster Highway to the Mackenzie Highway for at least one leg of a holiday to Canada's north or Alaska will extend the period visitors stay in the NWT, providing further stimulus to the tourism industry.

The project is not attractive from a strict economic point of view because the total economic costs exceed the anticipated benefits by a wide margin. The project, if built, will not generate new wealth for the Northwest Territories.

The Mackenzie Highway Extension, using a Community Construction Approach, extends far beyond building a road. It provides a focus for ongoing infrastructure, training, business support, wellness, and other government initiatives in the region. It is a way to provide an economic stimulus to the communities in the Mackenzie Valley, using community resources and providing the tools for the communities to deal with all aspects the increased level of economic activity.

It follows, in the view of the study team, that the Community Construction Approach to the Mackenzie Highway Extension cannot just be a Department of Transportation initiative. It will require substantial inputs from other departments and a broad buy-in from the communities and their political representatives.

APPENDIX A

TECHNICAL APPENDIX

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APPENDICES

1. DERIVATION OF BENEFITS

This section provides further detail about the derivation of the benefit estimates presented in the main report.

1.1 REDUCED COST OF LIVING

If connected by all-weather road, the cost of living in the Mackenzie Valley communities is expected to decrease. The elements behind this decline are:

- reduced freight costs;
- reduced cost of inventory; and
- increased competition.

The main driver of this reduction is the cost of freight. When the winter road is not open, perishable and frozen foods are trucked from Winnipeg to Edmonton and flown from Edmonton to Tuktoyaktuk for an average cost of $1.00/lb. or more. The mode of supply shifts to all truck transport if the winter road is open, resulting in a reduction of freight cost of more than 60%. Similar savings are expected to be realized year-round, with the exception of the periods when the ferry crossings are closed to traffic during freeze-up and break-up.

Goods other than frozen and perishable goods will be subject to lesser freight cost savings. Key respondents indicate that fuel will likely continue to rely on the barge service, while other goods may or may not shift between the barge and truck transportation depending on size, weight, and other factors, such as the user's ability to plan ahead.

Inventory costs, associated with the need to stock goods for extended periods, will go down if year-round truck supply is available. Currently, inventory costs increase prices by up to 2% or more of the retail price of consumer goods (Nichols Applied Management, 1990). Some stockpiling will remain even if an all-weather road is constructed, because the Mackenzie Highway is closed at freeze-up and break-up and the cost advantage of barging bulk fuel and other heavy materials.

This study estimates the cost of living reduction in the Mackenzie Valley communities is based on:

- an analysis of Federal Isolated Post Living Costs Differentials, by Community, as published in the GNWT Bureau of Statistics, Statistics Quarterly; and

- key respondent interviews.

These three independent estimates of the reduction the retail prices in are presented in table 1. They range between 3.2% and 8.5%. These results are in line with an analysis of the impacts on Fort Chipewyan if it were connected by all-weather road as compared to the current barge/winter road/fly-in connection. (Nichols Applied Management, 1990). That study estimates the cost of living reduction to be around 6%.

TABLE 1
CHANGE IN COST OF LIVING ESTIMATES

Estimating Procedure	Change in Cost of Living	Comment/Calculation	
Federal Isolated Post Living Costs Differentials (1)	5.5%-8.5%	Index (base Edmonton)(1)	
		Wrigley:	150-155
		Deline:	160-165
		Fort Good Hope:	160-165
		Norman Wells:	155-160
		Tulita:	160-165
		Differential (base Wrigley):	5.5%
Key Respondent Interviews	3.2%	Average 10% price decline over average 10 month period, due to shift from air to road on about 30% of total goods (2.5%-2.7%), plus roughly 1% decline in trucking costs due to better road.	
Freight Rate (2)	6.2%		

Notes:

1. GNWT Bureau of Statistics, Statistics Quarterly, March 1998.
2. Personal communications and Nick Dale, *Hovercraft for the Mackenzie Valley* (1999) and Nexus Group, *Alternatives for Resupplying the Mackenzie Valley, Delta, and Arctic Coast Communities* (1997)

The total retail trade sales in the affected communities are estimated at $19.7 million. This estimate is based on taking the simple average of the following two independent estimates:

- a pro-rating of the 1997 Estimated Retail Sales (excluding sales by recreational and motor vehicle dealers and gasoline service stations) on the basis of population (source: GNWT Bureau of Statistics, Statistics Quarterly, December 1998);

- an analysis of the family food expenditure, adjusted by the weighting of food in the NWT spacial price index for food, clothing, personal care products, and tobacco (source: GNWT Bureau of Statistics, Statistics Quarterly, March 1998); and

1.2 INCREASED TOURISM SPENDING

Current visitor levels on the Mackenzie Highway are very low. This may change however, if the Mackenzie Highway project builds a loop road to the Dempster Highway. It then becomes reasonable to assume that a fair percentage of the vehicle traffic that now goes up and down the Dempster will use the Mackenzie Highway for at least one leg of the trip. It should be noted that the Liard Highway, which connects to the Mackenzie Highway, is only about 170 km from the Alaska Highway at Fort Nelson.

It follows that the Mackenzie Highway-Dempster Highway loop will attract visitors now going to Inuvik. Table 2 shows the visitor number scenarios used for the analysis. The scenarios are based on historical visitor number in Inuvik and assume a 2% average annual growth rate without the Mackenzie Highway, and a 4% average annual growth rate with the Mackenzie Highway. The two scenarios start to diverge at the end of the 10-year construction period,

Current tourism spending in the region is estimated at $13.42 million in 1994 or $190 per day per visitor.[1] These estimates are influence by a small number of visitors who come for extensive adventure travel whose expenditures are very high.

[1] Derived by Nichols Applied Management from Government of Northwest Territories, Economic Development and Tourism.. *1994 NWT Exit Survey, General Report on Visitors to the Northwest Territories* (March 1995).

TABLE 2

Visitor Number Scenario

	Without Mackenzie Highway	With Mackenzie Highway
1999	6,538	6,538
2000	6,669	6,669
2001	6,802	6,802
2002	6,938	6,938
2003	7,077	7,077
2004	7,218	7,218
2005	7,363	7,363
2006	7,510	7,510
2007	7,660	7,660
2008	7,813	7,813
2009	7,970	7,970
2010	8,129	8,129
2011	8,292	8,292
2012	8,458	8,623
2013	8,627	8,968
2014	8,799	9,327
2015	8,975	9,700
2016	9,155	10,088
2017	9,338	10,492
2018	9,525	10,911
2019	9,715	11,348
2020	9,909	11,802
2021	10,108	12,274
2022	10,310	12,765
2023	10,516	13,275
2024	10,726	13,806
2025	10,941	14,359
2026	11,160	14,933
2027	11,383	15,530
2028	11,610	16,151

The average expenditure per day per visitor is estimated at $125 if these extremes are taken out of the analysis. The $125 per person per day expenditure estimate is deemed to be representative of the expenditure by tourists who arrive in the region by road and who would constitute the largest share of the tourism users of the Mackenzie Highway loop.

Table 3 shows the breakdown of this expenditure by category.

TABLE 3

Visitor Expenditure by Category

	$/day
Accommodation	17.14
Groceries	11.63
Restaurant Meals	15.54
Recreation	14.86
Equipment Rental	10.25
Clothing	7.09
Arts/Crafts	12.14
Souvenirs	7.57
Package Tours	10.40
Gas/fuel/Air	18.85
Total	125.00

Source: Derived from 1994 Exit Survey by Nichols Applied Management.

The increased tourism spending associated with the Mackenzie Valley loop can be calculated by taking the increased number of visitor for each of the three visitor growth scenarios and multiplying it by the average expenditure. This calculation takes into account the additional days that visitors stay in the NWT if they take the Mackenzie Highway as compared to the Dempster Highway.

1.3 INCREASED ACCESS

The isolation of the Mackenzie Highway communities makes it hard to operate a public or private sector organization at peak efficiency. Loss of efficiency can take on many forms, including:

- delays in travel of people for business reasons;
- use of aircraft charters to avoid restrictions in work scheduling due to limited availability of scheduled air service;
- downtime of machinery due to the lack of available parts; and
- others

This study makes a very preliminary estimate of the cost of delays and the use of charters to avoid delays to provide an order-of-magnitude estimate of these operational efficiency costs. The analysis is based on a detailed assessment of the number of organizations active in Tuktoyaktuk (Nichols Applied Management, *Benefit-Cost Analysis and Regional Economic Impact Analysis, Inuvik to Tuktoyaktuk Road,* 1999). The results of this study have been prorated for the Mackenzie Valley communities on the basis of population.

1.4 INCREASED ACCESS TO RESOURCES

There are a number of ways in which an all-weather road extending north from Wrigley could, in theory, impact on oil and gas exploration and development. Potential impacts considered in the analysis were:

- decreased costs of operation at Norman Wells oil field;
- the possibility that a road would give rise to increased levels of oil and gas exploration in the Sahtu, which, in turn, would have economic impact implications for the area as well as implications for total cost savings;
- reduction in opportunity costs of equipment;
- decreased transportation costs associated with exploration; and,
- decreased costs associated with future development.

After consideration of current and projected levels of activity, and discussions with industry experts, it was decided that only reductions in opportunity and transportation costs associated with oil and gas exploration could reasonably be included in the analysis. It is unlikely that the highway will be completed in time to have a significant impact on operating costs at the existing Norman Wells field, given that production is expected to decline over the period to 2020 when reserves will be depleted. Industry experts indicated that the two critical decision factors in exploration decisions are geology and resource prices. These will not be impacted by a road. And finally, the timing and extent of future oil and gas development in the Sahtu is far too speculative to allow for reliable estimates of cost savings.

Opportunity and transportation costs associated with exploration in the area are considerable, primarily because of the need to move equipment up by barge long before field work can begin. The associated "stand-by" costs include interest costs as well as foregone productivity of the equipment elsewhere. These, combined with the actual costs of transportation, result in "equipment movement and set-up" costs which are about 20% of total exploration costs. Further south, these costs comprise only about 10% of total costs. Thus, building a highway could result in cost savings to companies engaged in oil and gas exploration in the area of as much as 10%.

Actual exploration expenditures in the region are not readily available. However, intended annual spending by companies awarded exploration licenses in the Sahtu in 1995, 1996 and 1997 (the last year in which licenses were awarded), range from a low of $1 million to a high of $12 million over the 6 year period from the 1995/96 season to the 2000/01 season. Intended expenditures fall after the 1998/99 season due to the fact that, due to a review of the licensing system, no new licenses have been awarded since 1997. If it is assumed that bid prices would have been similar to those in 1995 and 1996, the average spending on oil and gas exploration over the 6-year period to 2000/01 can be calculated as $10 million per year.

Assuming this level of activity, and assuming that a highway would have the effect of reducing the transportation component of costs from 20% to 10% of the total, the total savings would be $1 million per year. Much of the exploration for oil and gas taking place currently in the Sahtu is located close to or south of Norman Wells. This is likely to remain the case as long as there is excess capacity in the oil pipeline from Norman Wells to Zama. Thus, it is assumed that benefits will start to be realized once the highway is built to Norman Wells.

2. COSTS

2.1 TOURISM INDUSTRY OPERATING AND MAINTENANCE COSTS

The cost of providing the services that tourists buy must be recognized in the benefit-cost analysis. It has been estimated as a percentage of the visitor expenditure by category.

The study team allocated the expenditures by type to the following categories to allow for a determination of what economic costs are implied by the increased visitor spending. The categories are:

- wages, which need to be adjusted by the use of a shadow price to reflect the high levels of unemployment in the region;
- cost of goods, most of which is true economic cost borne by the tourism industry in the form of purchases of for example food and fuel. Some exceptions include the use of country foods or found materials used in the production of arts and crafts;
- capital, which is a reflection of the need for infrastructure, such as campsites for recreational vehicles and equipment for outfitters; and
- profit.

Based on the breakdown of the expenditure, the study team calculates that about two-thirds of increased visitor spending is offset by increased cost for the tourism industry. This cost must be recognized in the benefit-cost analysis.

The methodology used to estimate the benefits and costs of the tourism spending uses average expenditures by category, implying that the necessary infrastructure is in place. This avoids the need to specify a particular tourism facility development scenario. It is recognized, however, that there will be a need to develop facilities for the rubber-tire visitors, including a recreational vehicle park. It is furthermore recognized that the air passenger companies will likely see a reduction in revenue. These costs are captured in the operating costs.

2.2 COST OF ACCESS

Traffic on the Mackenzie Highway is related to:

- business traffic of persons and goods that now travels by aeroplane if the winter road is not open;
- medical travel;
- personal traffic of persons for shopping and visiting; and
- tourism.

The analysis assumes similar volumes as are now experienced on the winter road on a year-round basis if an all-weather road is constructed.[2] Additional traffic volumes are anticipated during the summer tourist season.

The cost of personal travel on the Mackenzie Highway has not been included in the analysis as a separate item. The study makes the following assumptions:

- the Mackenzie Highway will increase the mobility of community residents;
- the cost per trip is less for road as compared to air transportation;
- the total cost of the higher volume of travel at a lower cost using the road is roughly equal to current cost of the lower volume of resident travel by air and winter road.

Taken together, these assumptions support the conclusion that there will be no increase in the total personal spending on travel with or without the road. This conclusion is supported by the observation that the disposable income in Mackenzie Valley communities is limited. The shift in the transportation mode does shift business income from the air

[2] Between 1993 and 1996, the Inuvik to Tuktoyaktuk ice road had an average daily traffic count of between 30 and 100 vehicles. Government of the Northwest Territories, Department of Transport. *Northwest Territories Highway Traffic, 1996.* (January 1998).

transportation industry to the automotive industry. It is likely that car ownership will increase and that car usage will go up. These costs are captured in the cost per trip used in the analysis.

The cost of accidents, however, is a significant cost associated with the increased mobility. Currently, the winter road has an average of 0.4 accidents involving property damage alone and 0.6 injury accident per operating season. Year-round access by all-weather road will likely see an increase in the number of accidents in line with the increased lengths of the operating season. The resulting number is estimated at 2.5 property damage accidents and 3.2 injury accidents. Using cost estimates from the literature and adjusting these for inflation, the cost of an injury accident is estimated at $305,000 and the cost of a property damage accident at $29,700.[3]

Tourism spending on transportation is included in the costs discussed in the previous section.

[3] Alberta Transportation & Utilities, Benefit-Cost Analysis Guide (1992).

3. ECONOMIC EVALUATION

3.1 THE SOCIAL DISCOUNT RATE

The rationale for discounting future benefits and costs is rooted in the fact that a dollar now is worth more than a dollar at some time in the future. This is not only true because inflation erodes the purchasing power of money, but also because future net benefits, normally expressed in money terms, are not available for current consumption or immediate reinvestment.

This study follows the common practice of working with inflation-adjusted or real dollars to deal with the issue of inflation. After adjusting for inflation, however, there remains the need to further discount to present values before costs that are incurred and benefits that accrue over a period of years can be added together to determine the overall net benefits.

The following discussion focuses on the question of which discount rate is appropriate for a public investment such as a road.

First of all there is a need to distinguish between the discount rate that is appropriate for public expenditures (the social discount rate) and discount rates used for the evaluation of commercial investment decisions. The former has a broad perspective and includes the societal interests, such as the optimal allocation of societal resources and the maximization of the totality of society's production and consumption opportunities in the future, which are not included in the latter.

The choice of social discount rate is the subject of much debate. Although there are different approaches to the derivation of the social discount rate, much of the debate in Canada has centered on the social opportunity cost of public funds, which is defined as the weighted average of the return on investment in the private sector, the consumption rate of interest or the premium that consumer require to postpone consumption, and the cost of foreign borrowing. The weighting of the different component that make up the social discount rate is to reflect the proportion of public funds drawn from each source. Estimates of the social discount rate using this general methodology range between 7.5% and 10% in real terms.

Another way of deriving the social discount rate, although one that has not been prevalent in the Canadian context, is captured under the name of social time preference approach. This method combines an estimate of the consumption rate of interest to discount future costs and benefits with an estimation of a shadow price for capital to estimate the value of the original investment. This shadow price of the original investment equals the present value of the consumption opportunities that that volume of investment would have generated elsewhere in the economy. The consumption rate of interest has been estimated at 4% to 5%, while the estimate of the shadow price of $1 in capital in the U.S. ranges from $2.90 to $5.40.

Finally, one may approach the social discount rate not from an economic but from an ethical perspective. This approach argues that future benefits and costs should not be discounted at all or at a very low rate because discounting reduces the value of future benefits and costs and we are not in a position to make decisions for future generations. The ethical argument has been developed mainly in the context of thinking about the valuation of activities that have a profound impact on the future, such as environmental degradation or nuclear waste storage, but may be applicable where actions now influence the lifestyles and options open to future generation.

Turning now to the practice of using a social discount rate in Canada and, to a lesser extent, the United States, the study team's inquiries reveal a range of rates from 5% real to 10% real. As shown in Table 10, 7% real seems to be the choice of the majority of respondents, with 5% and 10% as the outliers.

Based on the evidence presented in the table and the short overview of the theoretical background, it seems that using a social discount rate of 7.5% with sensitivity analyses at 5% and 10% is both theoretical defensible and in line with the current practice in Canada.

TABLE 4

Summary of Discount Rates

Agency/Organization	Social Discount Rate (Real)	Sensitivity Analysis	Comment
Canada			
Treasury Board (1)	10.0%	5%/15%	Has not changed since mid-70s, restated in: Treasury Board, 1989, Program Evaluation Methods
Inland Waters Directorate (2) Environment Canada	10.0%	5%/15%	Has not been faced with the need to use social discount rate in last 2/3 years. There is some concern that Treasury Board guidelines are high.
National Energy Board (3)	8.0%	6%/10%	NEB does NOT have an official position on the discount rate; the organization is no longer involved in B/C analysis.
Manitoba Hydro (4)	7.0%	6%/8%	Same rates are used by Ontario Hydro, Quebec Hydro, and Saskatchewan Power.
Energy, Mines, andResources (5)	7.0%		
PFRA (6)	5.0%		PFRA argues that the social aspects of irrigation and the traditionally lower returns in agriculture as compared to other industries warrants a low discount rate estimate.
US			
World Bank (7)	10.0%		Used for projects in developing countries.
Other			
Kenneth Watson (8)	10.0%		Conclusion of a 1992 article reviewing mainly Canadian research.
Burness et al. (9)	0% to 5%		Discussion in the context of US legal implications of Indian water rights.

Notes:

1. Treasury Board, Benefit-Cost Analysis Guide, Ottawa, 1976.
2. Mr. Bob Haliday, Director Inland Waters Directorate, personal communication.
3. Mr. Peter Miles, Director General, Energy Regulation, personal communication. Economics Branch Staff Paper, The Social Discount Rate: Is 10 percent too High? National Energy Board, 1985.
4. Mr. E. Omyebuchi, Financial and Economic Evaluation Division, Manitoba Hydro, personal communication.
5. Mr. N. McIlvren, personal communication.
6. Messrs. B. Lukey and Boyle, personal communicaiton.
7. Consultant's experience in working for the World Bank; World Bank, Evaluation Results 1978-1988, Washington 1990, quoted in Kenneth Watson, The Social Discount Rate, in Canadian Journal of Program Evaluation, Vol 7, no 1, 1992.
8. Kenneth Watson, The Social Discount Rate, in Canadian Journal of Program Evaluation, Vol 7, no 1, 1992 and personal communication.
9. H.S. Burness et al., Practicable Irrigable Acreage and Economic Feasibility, The Role, Time, Ethics, and discounting in: Natural Resources Journal, vol. 23, April 1983.

3.2 SENSIVITY ANALYSIS

Currently, there is some exploration activity in the Norman Wells area. It is driven by the promising geology of the area and the fact that the existing Norman Wells pipeline has spare capacity. This study does not predict if, when, and how much new oil will be found. It does built a number of plausible scenarios for oil finds and investigates the impact on the economic evaluation. This approach has two aspects:

- the volume of oil and the timing of the production; and
- the cost savings that can be ascribed to the road.

The analysis links volumes of new oil to the spare capacity of the existing pipeline. This reflects that the current capacity is one of the motivators of exploration activity and avoids the need to include new pipeline construction in the cost. The latter would extend the analysis well beyond a sensitivity analysis of a road project and constitutes a separate project. Currently, the 50,000 barrels/day pipeline has a spare capacity of about 20,000 barrels per day. This is expected to increase as the production of the Norman Wells field declines. For the purposes of this analysis, the spare capacity is assumed to increase by an average 4% per year, reaching 40,000 barrels/day in 2025. This spare capacity calculation reflects the view that current production of the Norman Wells Field will make the operation of the pipeline uneconomical by the year 2020 or 2025.

New oil production in quantities sufficient to absorb 10% of the spare capacity is assumed to start in 2002. Production is assumed to ramp up, filling the pipeline in 2012 and keeping it full over the balance of the period under consideration.

The analysis links the cost implication of the road to those elements of production costs that are sensitive to transportation costs. It applies a percentage cost reduction to these elements. An estimated 53% of the cost of a production well is sensitive to transportation costs and the average cost savings on those cost is roughly 6%, in line with the estimate of cost-of-living reduction due to the road. It follows that the estimated cost reduction is about 3%. This cost saving is applied to the average Canadian on-shore finding costs of $10 per barrel for a cost saving of $0.32 per barrel.

Table 5 provides the volumes of new oil and the estimated cost savings that can be ascribed to the road. The net present value of the cost savings, discounted at 7.5%, is $24.4 million.

TABLE 5

New Oil Scenario

	Spare Capacity Bbld/day	New Oil	Cost Saving ($'000)
1999	20,000	0	-
2000	21,200	0	-
2001	22,350	0	-
2002	23,460	2,350	280
2003	24,520	4,900	570
2004	25,540	7,660	890
2005	26,520	10,610	1,230
2006	27,460	13,730	1,590
2007	28,360	17,020	1,970
2008	29,220	20,460	2,370
2009	30,060	24,040	2,780
2010	30,850	27,770	3,220
2011	31,620	31,620	3,660
2012	32,350	32,350	3,750
2013	33,060	33,060	3,830
2014	33,740	33,740	3,910
2015	34,390	34,390	3,980
2016	35,010	35,010	4,050
2017	35,610	35,610	4,120
2018	36,190	36,190	4,190
2019	36,740	36,740	4,250
2020	37,270	37,270	4,320
2021	37,780	37,780	4,380
2022	38,270	38,270	4,430
2023	38,740	38,740	4,490
2024	39,190	39,190	4,540
2025	39,620	39,620	4,590
2026	40,040	40,040	4,640
2027	40,430	40,430	4,680
2028	40,820	40,820	4,730

APPENDIX B

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APPENDIX C

INTERVIEW CONTACTS

INTERVIEW CONTACTS

NAME	TITLE	ORGANIZATION
Andrew, Frank	Chief	Tulita Dene Band
Andrews, Glen		Alberta Energy Company
Blake, Grace	Chief	Ch. Comm'y of Arctic Red River (a.k.a. Tsiigehtcuik)
Brackman, Cal	Senior Resource Economist	Government of the Northwest Territories Resources Wildlife and Economic Development
Dale, Nick	Economic Development Officer	Town of Norman Wells
Erutse, Edwin	President	Yamoga Land Corp.
	Vice Chair	Sahtu Secretariat
	President	District Land Corp.
Gambin, Peter	Manager	Northern Stores (Norman Wells)
Given, George		Canadian Energy Research Institute
Gull, Andrew	President	Fort Simpson Chamber of Commerce
Higgins, Pat	Manager	Northern Stores (Fort Good Hope)
Hunter, Vivian (for George Roach, Mayor)	Town Council	Town of Inuvik
Kijerski, Ken		Ranger Oil
Kochon, Wilbert	President	Ayoni Keh land Corp.
Lennie, Bertha	Mayor	Hamlet of Tulita
McPherson, Jr., Eddie	President	Fort Norman Metis Local #60 Land Corp.
Nelner, Dennis	Executive Assistant to Grand Chief	Deh Cho First Nation
Nielsen, Margaret		A&N Petroleum Consulting Inc.
Ottenbreit, Randy		Imperial Oil Resources Ltd.
Pellissey, Stella	Band Manager	Pehdzeh Ki First Nation
Sheaves, Ron	General Manager	Co-op (Deline)
Smythe, Al		NWT Trucking Association
Sohl, Werner		Imperial Oil Resources Ltd.
Taniton, Raymond		Ch. Comm'y of Deline, Deline Dene Band Council, Deline Land Corp.
	Freight Payables Department	Northwest Company
		MATCO Transportation Systems
		Grimshaw Trucking
	Manager	Northern Stores (Tulita)

APPENDIX D

INTERVIEW GUIDE

MACKENZIE VALLEY HIGHWAY EXTENSION
INTERVIEW GUIDE

Respondent:	
Organization:	
Interviewed by:	
Date:	

Part A: What are the benefits of the project?

1. Supply costs:

   (a) How are the communities supplied now?

   (b) How would road supply affect current infrastructure?

   (c) Is the cost of goods lower when winter road is open? By how much? For what types of goods? When do prices change and for how long?

2. Tourism:

   (a) Is there much tourism there now and would a road increase it?

   (b) What is currently available for tourists?

3. Training:

   (a) Is there a need for heavy equipment operators/mechanics in the region?

   (b) What is the preferred way (mainly location) of training new operators/mechanics?

4. Easier access to friends and relatives?

5. Increased access to hunting and trapping opportunities? Is this good or bad?

6. Other benefits to your community or region?

7. is there likely to be more oil and gas development as a result of the road? Where?

8. Is there gravel available in the region for general construction? Where? How much?

9. Will other types of economic development take place as a result of the road?

Part B: What are the costs of the project (besides construction and operating costs)?

10. Increased access to hunting and trapping? What kind of costs will this entail?

11. Tourist facility development?

12. Social impacts?

13. Are there business activities that will decline as a result of the road? e.g., barging as more stuff is supplied by truck? Air travel as more travel is done by road?

14. Other costs? e.g., do you think prices of barged goods will increase as volumes decrease?

15. How will the delivery of government services change as a result of the road? Will they be delivered from further away? Road versus air evacuation of patients? Other?

Part C: Local Capability

16. What is the local capacity for road building:

    (a) # of contractors

    (b) # of trained operators

17. How would road building by local companies affect other building/construction activities?

    (a) residential construction

    (b) other

18. What time frame do you feel is appropriate for building the road? Should it be done with local contractors or with contractors from elsewhere?

Part D: Other

19. Suggestions regarding project financing given limited budgets in GNWT and limited or no interest on the part of the Federal Government? How about resource royalties? Other ideas?