THE CASE FOR THE NUNAVUT-MANITOBA HIGHWAY

(NUNAVUT-MANITOBA ALL-WEATHER ROAD BUSINESS CASE)

BUILDING LASTING INFRASTRUCTURE

Submitted to:

Nunavut Department of Economic Development and Transportation &
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MANITOBA INFRASTRUCTURE AND TRANSPORTATION

PROJECT: **THE CASE FOR THE NUNAVUT-MANITOBA HIGHWAY (NUNAVUT-MANITOBA ALL-WEATHER ROAD BUSINESS CASE STUDY)**

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1.0 INTRODUCTION

1.1 Background

In 2005, the Kivalliq Inuit Association (KIA), together with the governments of Nunavut (NU) and Manitoba (MB), commissioned Nishi-Khon/SNC-Lavalin (NKSL) to carry out a two-year multidisciplinary study to determine the best location for a road route linking the community of Rankin Inlet to the Port of Churchill and the existing all-weather road transportation network in Manitoba, and thence to Canada's National Highway System. The study was completed in November 2007 with the recommendation of a preferred route connecting Rankin Inlet to Manitoba PR 290 at Sundance. Links from the main stem of the preferred route provide connections with Whale Cove and Arviat in Nunavut, and Churchill in Manitoba (see Figure 1.1).

The preferred route will have a total length of 1,100 km, to be constructed initially to an all-weather two-lane pioneer arterial gravel road standard. The study concluded that the all-weather road (AWR) could reasonably be completed in 20 years, including five years of road development from feasibility study, environmental assessment, functional and detailed engineering, financial modelling, and land assembly, to permit application. Key study conclusions include:

- The preferred route will provide the most effective, safe and reliable route from Rankin Inlet, Whale Cove, Arviat, Churchill to Manitoba's all-weather road network in light of its length, terrain, lowest construction and maintenance costs, and ease of staging.
- The new road can bring significant social and economic benefits to the northern communities in Manitoba and Nunavut. Because considerable efforts have been made in the routing to avoid where possible parks, protected areas and wetlands, and to cross rivers where they are narrow, the natural environmental impacts of an AWR can be minimized and mitigated. Construction activities associated with a new road would respect requirements of the caribou protection area.
- The range of construction and maintenance costs, although high (approximately $1.2 billion in 2009 Dollars) have been kept within reasonable limits by minimizing the length of the river crossings, locating the route where possible on a sound foundation, and close to aggregate sources needed to build the roadbed.
- The preferred route is considered the best, taking into account engineering, the natural and social environment, the regional economy and national interests including northern sovereignty and security.
- The business case for building a road along the preferred route, its staging and timing will rest on a number of factors including national highway policy, economic development of renewable and non-renewable resources, and the improvement of community vitality, health and safety.

In 2008, NKSL was retained by the Governments of Nunavut and Manitoba to conduct a Business Case Study for the proposed Nunavut-Manitoba AWR to provide decision makers and stakeholders with a clear understanding of the value, risks and priority of the AWR development. This Business Case Report documents the findings from this study.

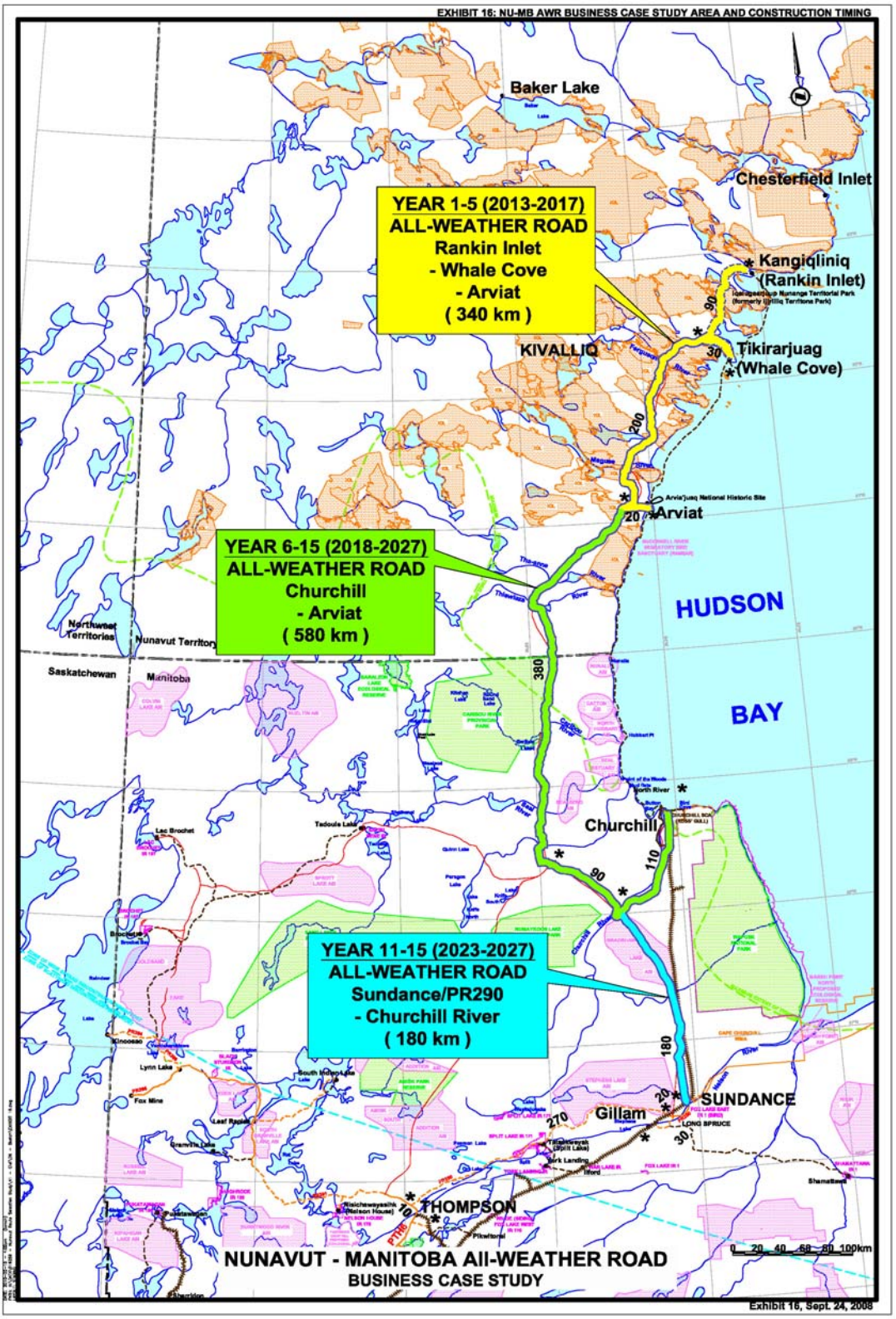
1.2 Study Objectives

As outlined in the Study Terms of Reference, the objective of the study is a high level business case providing a first order indication of social-economic benefits and costs attributable to the construction and operation of the Nunavut-Manitoba AWR; and the determination of resulting gains to respective beneficiaries. The Business Case is to provide decision makers and stakeholders with a clear understanding of the value, risks and priority of the development of the AWR. To meet these objectives, the following questions will need to be answered in this assignment:

- What is the base case scenario in terms of long term economic effects in the study area with no AWR development?
- What are the low and high development scenarios for economic activities in the study area as a result of the AWR development?
- What are the social-economic benefits and costs attributable to the construction and operation of AWR (i.e. incremental differences between the base case and the low and high development scenarios)?[1]
- What other values will be provided by the AWR under the low and high development scenarios that cannot be quantified in the social-economic analysis (e.g. strengthening Canada's sovereignty and national interest in the Arctic)?
- Who are the beneficiaries of this AWR and what are the resulting gains in their respective jurisdictions?
- What are the risks of not proceeding with the AWR development?

[1] Environmental costs and benefits are important concerns for the development of the AWR. An overview environmental assessment has been provided for each of the route alternatives for the Nunavut-Manitoba road in the Route Selection Study. Further environmental analysis is not included in the scope of this Business Case Study.

Figure 1.1: Nunavut-Manitoba All-Weather Road - Preferred Route and Timing



1.3 Study Methodology

As illustrated in Figure 1.2 in the following page, the study methodology consists of the following major phases and tasks:

Phase 1: Data Collection

- Task A: Literature Review
- Task B: Stakeholder and Industry Interviews

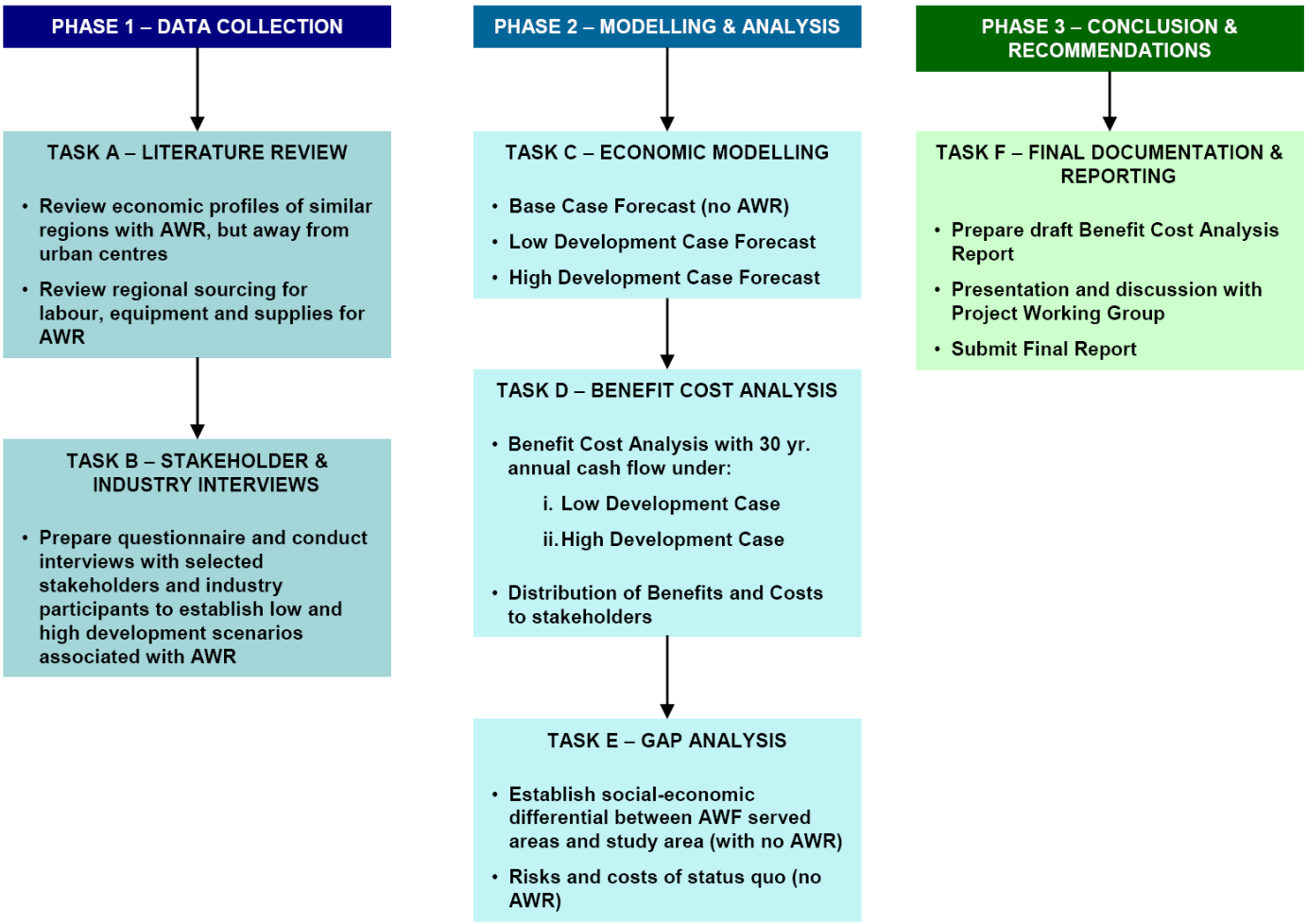
Phase 2: Modelling and Analysis

- Task C: Economic Modelling
- Task D: Benefit Cost Analysis
- Task E: Gap Analysis

Phase 3: Conclusion and Recommendations

- Task F: Documentation and Final Reporting

Figure 1.2: Study Flowchart and Milestones



2.0 PROBLEM DEFINITION

The existing transportation network in the study area is characterized by a severely constrained system serving a small population. Low population density, vast distances between communities and extreme climate have resulted in high costs of goods, materials and labour compared to the rest of Canada. In Kivalliq, in the absence of public roads between the communities and connecting to the rest of Canada, the region is almost wholly dependent on air and seasonal marine services for goods transport and passenger travel. Some goods are moved between Churchill and the Kivalliq communities in the winter via a private operation that moves tractor-drawn sleds over sea ice along the western shore of Hudson Bay. In northern Manitoba, the existing all-weather road network ends at PR 290 near Sundance. The Port of Churchill is connected by the Hudson Bay Railway to Sundance and the south. A summary of the population and existing transportation services in selected communities in the Nunavut Kivalliq Region and northern Manitoba is shown in Table 2.1 below.

Table 2.1: Existing Public Transportation Services - Selected Manitoba and Nunavut Communities

Community	Population[2]	Transportation Service				
		Air	Marine	Rail	Public Winter Road	All-weather Road
Rankin Inlet, NU	2,500	✓	✓			
Whale Cove, NU	400	✓	✓			
Arviat, NU	2,000	✓	✓			
Chesterfield Inlet, NU	400	✓	✓			
Baker Lake, NU	1,800	✓	✓			
Gillam/Bird, MB	1,400	✓		✓		✓
Churchill, MB	1,000	✓	✓	✓		

Note: Population in the Manitoba First Nation communities is based on "First Nations Community Profiles Manitoba Region 2007"; population in other Manitoba and Nunavut communities is based on Canada Census 2006, cross-referenced with information provided by the Government of Nunavut for this study.

Specific transportation issues and challenges in the context of a road link between Nunavut and northern Manitoba can be summarized as:

- remote communities with no or limited road infrastructure
- low population density and small markets
- high construction and maintenance costs
- long distances between communities
- extreme climate and difficult terrain

[2] Population in the Manitoba First Nation communities is based on "First Nations Community Profiles Manitoba Region 2007"; population in other Manitoba and Nunavut communities is based on Canada Census 2006, cross-referenced with information provided by the Government of Nunavut for this study.

3.0 MULTIPLE ACCOUNT EVALUATION (MAE): ROUTE ALTERNATIVES

As summarized in the Final Report of the Nunavut-Manitoba Route Selection Study, a MAE was conducted where each of the three route alternatives (eastern, central and western) were evaluated under five accounts:

I) Financial Account
This is the present value of the capital, maintenance and rehabilitation costs and salvage values over a 25-year project life at a discount rate of 6% for each route alternative.

II) Transportation Benefits Account
This includes project benefits (in time and vehicle operating costs) in passenger travel and freight transport, as well as safety benefits calculated as a present value over a 25-year project life for each option.

III) Social/Community Account
This documents the external effects of the proposed Nunavut-Manitoba road on the communities and their social values as perceived by the communities. Evaluation criteria include the impacts of the all-weather road access to communities (positive and negative); impacts in terms of employment, costs of living, quality of life, health care, education and land use; and impacts on water quality and wildlife;[3] and the protection of archaeological and cultural artifacts.

IV) Natural Environment Account
This account is intended to provide an overview assessment of the project impacts on the natural environment. Criteria under this account include habitat protection, wildlife populations, watershed values, fish populations, heritage values and protected areas.

V) Economy/National Interest Account
This is intended to evaluate the route alternatives in meeting the strategic functions of the proposed Nunavut-Manitoba road. Criteria under this account include regional economy/resource use, sovereignty and security, staging, regional network (population served), reliability, Port of Churchill and enhanced inter-jurisdictional trade.

The general approach of the MAE was to establish weights for each account and scores for each route alternative. The sum of weighted scores for each alternative was used to rank the alternatives such that a preferred route could be identified. Based on the technical analysis and consultation findings of the route alternatives, the Working Group and Consultant Team agreed on the definition and relative weights for each account and criteria within each account, and scored each route alternative against the defined criteria in terms of how each alternative met the project goals (see Section 2.0 of Milestone Report B for a fuller account of the MAE of the three route alternatives).

[3] It is noted that typically with aboriginal populations, there is considerable overlap between social, economic and natural environment issues, since the livelihood of a considerable portion of the population directly depends on harvesting wildlife and fisheries resources.

The results of the MAE are shown in Table 3.1 and described qualitatively in Table 3.2 in the following pages. Based on the overall ranking of the three route alternatives, the Eastern Alternative (NRA+ERA) is considered the preferred route for the proposed Nunavut-Manitoba road. The rationale for selecting the Eastern Alternative (NRA+ERA) as the preferred route can be summarized as follows:

- Most effective, safe and reliable route from Rankin Inlet, Whale Cove and Arviat to Churchill and Thompson in light of its length, the terrain, the lowest construction and maintenance costs and ease of staging
- Strong support from directly affected communities along the route
- Moderate environmental impact due to shortest length of new road construction and avoidance of all protected areas except the Bradshaw Lake ASI (the width of the Great Beach on which the route is located through this protected area appears to be sufficient to allow for adequate mitigation of impacts along this feature).
- Greatest potential for early extension of the National Highway System to Churchill and Nunavut and in so doing, to address inter-jurisdictional trade opportunities, national sovereignty and security needs.

Table 3.1: Multiple Account Evaluation – Nunavut-Manitoba Route Selection

Weights A	Weights B	ACCOUNT	NRA+WRA	NRA+CRA	NRA+ERA
		Winnipeg to Rankin Inlet (km)	*2,278*	*1,768*	*1,978*
A Account	B Sub-Account	***FINANCIAL ($millions)***	**Quantitative Accounts**		
		Construction + Engrg.	$1,619	$1,390	$1,180
		Property	$10	$10	$10
		Maintenance	$80	$81	$70
		Salvage	($212)	($182)	($154)
		Total Costs ($millions)	$1,498	$1,300	$1,106
		TRANSPORTATION BENEFIT ($millions)			
		Kivalliq Freight	$328.9	$365.1	$346.8
		Manitoba Freight	$37.8	$0.0	$0.0
		Kivalliq Passenger	$8.0	$28.5	$15.7
		Manitoba Passenger	$7.5	$1.0	$1.0
		Accident Cost Savings	($6.7)	($5.9)	($5.9)
		Total Benefit ($millions)	$375.4	$388.7	$357.6
40%		Benefit/Cost Ratio	0.25	0.30	0.32
		A x Benefit Cost Ratio	**0.10**	**0.12**	**0.13**
20%		***SOCIAL/COMMUNITY***	**Qualitative Accounts**		
	15%	Tadoule Lake, MB	0	0	0
	15%	Lac Brochet, MB	0	0	0
	6%	Brochet, MB	1	0	0
	4%	Lynn Lake	2	0	0
	0%	Thompson, MB	1	1	1
	4%	Gillam/Bird, MB	0	0	2
	11%	Churchill, MB	2	2	2
	15%	Arviat, NU	1	2	2
	10%	Whale Cove, NU	0	0	0
	20%	Rankin Inlet/Chesterfield/Baker, NU	1	2	2
	100%	Sum (A x B x Score)	**0.14**	**0.18**	**0.20**
20%		***NATURAL ENVIRONMENT***			
	20%	Habitat Protection	-2	-2	-2
	20%	Wildlife Populations	-1	-1	-1
	15%	Watershed Values	-2	-1	-1
	10%	Fish Populations	-1	-1	-1
	10%	Heritage Values	-1	-1	-1
	20%	Protected Areas	0	-2	-1
	5%	Emmissions	-2	-1	-2
	100%	Sum (A x B x Score)	**-0.24**	**-0.28**	**-0.25**
20%		***ECONOMY/NATIONAL INTEREST***			
	20%	Regional Economy/Resource Use	1.0	0.8	0.8
	10%	Sovereignty and Security	1	2	1
	10%	Staging	1	0	2
	20%	Regional Network (population served)	2	0	2
	5%	Reliability	1	1	2
	15%	Churchill	0	1	2
	20%	Enhanced Interjurisdictional Trade (Natl Hwy System Connection)	0	1	2
	100%	Sum (A x B x Score)	**0.17**	**0.15**	**0.33**
100%		***OVERALL RANKING***	**0.17**	**0.18**	**0.41**

Note: In the Route Selection Study, all costs and benefits were calculated in Present Value 2006 Dollars at 6% discount rate over a 25 year planning period.

Table 3.2: MAE – Account Description and Route Evaluation

Evaluation Account	Evaluation Criteria	Western Alignment (NRA/WRA)	Central Alignment (NRA/CRA)	Eastern Alignment (NRA/ERA)
Financial Cost	• Life-cycle costs over 25 years of road construction (including structures), maintenance, rehabilitation and salvage values	Longest construction length and rugged terrain for new road west of Common Point A (i.e. WRA); highest cost	Shorter construction length, rugged terrain for new road south of Common Point A (i.e. CRA); higher cost than ERA	Shortest construction length, gentle terrain south of Common Point A (i.e. ERA); lowest cost
Transportation Savings	• Savings in freight and passenger transport costs to affected communities • Travel benefits to the road users	WRA serves 3 communities that now have only winter road land access, but is longest route from Rankin Inlet to Winnipeg	Shortest distance between Rankin Inlet and Winnipeg but rugged terrain will reduce travel speed	Less communities served than WRA but shorter distance from Rankin Inlet to Winnipeg
Social/ Community	• External effects of the new road on the communities', culture and social values including livelihoods, standard of living, education, use of drugs and/or alcohol	Mixed reaction to all-weather road from 3 MB communities that now have only winter road land access	Least number of communities connected by new road	Significant support from affected communities
Natural Environment	• Nature, degree and mitigation of the impacts to the natural environment (e.g. habitat protection, wildlife populations, watershed/fish values and protected areas)	In same corridor as winter road in MB, but crosses 2 ASIs; concern with impacts on wildlife habitat, especially caribou	Impacts on park, park reserves and 2 ASIs	Subject to acceptable mitigation through Bradshaw Lake ASI, modest environmental impact due to shortest length of new road construction
Economy/ National Interest	• Strategic interests served by the new road (e.g. national connectivity; benefits to resource use and inter-jurisdictional trade, Port of Churchill, and sovereignty/security issues)	Indirect connection (1070 km) between Churchill and NHS at Thompson; indirect connection (1530 km) between Rankin Inlet and Thompson	Direct connection (560 km) between Churchill and NHS at Thompson but terrain is rugged; direct connection (1020 km) between Rankin Inlet and Thompson	Direct connection (590 km) between Churchill and NHS at Thompson, gentle terrain; fairly direct connection (1230 km) between Rankin Inlet and Thompson; direct access to north from Nelson River hydro stations; completes reliable multi-modal surface access (road and rail) to Churchill at least cost of all options; shortest length (290 km) of construction from Churchill to Manitoba's all-weather road system
Overall				

Legend: ● = More Favourable; ◎ = Favourable; ○ = Less Favourable

ASI = Area of Special Interest; NHS = National Highway System

4.0 SOCIAL AND ECONOMIC IMPACTS

As documented in the earlier studies for the Nunavut-Manitoba road link, the Governments of Canada, Nunavut and Manitoba see implementation of the new road as a means of supporting the objectives of healthy communities, simplicity and unity, self-reliance and continued learning[4]. The proposed road is expected to enhance opportunities for resource development such as mining and tourism; benefit employment, small business development and standard of living; and reduce the cost of transporting people and goods between the Kivalliq Region and urban centres in Manitoba.[5]

In the earlier Route Selection Study, direct benefit cost analysis was conducted for each of the route alternatives (the Western, Central and Eastern Alternatives, all in combination with the Northern Common Route from Rankin Inlet to Churchill). This benefit cost analysis compared the life-cycle cost of the proposed road (including engineering, construction, maintenance and salvage value over a 25-year project life) to the direct user benefits in the terms of cost, time and safety benefits associated with the various modes of freight and passenger travel along the corridor. The benefits to cost ratios were determined to be 0.32, 0.30 and 0.25 for the Eastern, Central and Western Alternatives, respectively. For the preferred Eastern Alternative, the total project benefit in net present value over a 25-year project life was $358 million, compared to a total project cost of $1,106 million. This result is consistent with earlier assessments of the economics of the Nunavut-Manitoba road link.

Although the direct benefit/cost ratio of the preferred route is less than one, i.e. break even, it is noted that many public investments in infrastructure and programs are made on the basis of social and public policy imperatives, rather than solely on economic considerations. The proposed Nunavut-Manitoba road would deliver significant benefits from a sovereignty and national interest perspective. It is considered essential to public service in the Kivalliq communities, to address the isolation, unemployment, and high costs of goods and services associated with the lack of reliable public road infrastructure connecting the local communities to one another and to the rest of Canada. The proposed road is critical to the further development of the Port of Churchill as a trade and possible naval support base for the Canadian Arctic region, and to provide improved access to world trade markets from Nunavut and northern Manitoba. The social and economic benefits of the proposed road are further discussed in the following sections, as well as opportunities for project funding and procurement among the public and private sectors.

4.1 Spin-off Economic Benefits

In addition to the direct and immediate benefits of the proposed Nunavut-Manitoba road in reduced freight and passenger transport costs (included in the benefit cost analysis for the Route Selection Study), the project will generate other social and economic benefits to the region associated with the construction of the new road. The phased $1.2 billion construction expenditure will create “spin-off” benefits to the provincial, territorial and Canadian economies in the form of increased employment, income and Gross Domestic Product (GDP). The potential employment and training opportunities provided to the aboriginal communities in Kivalliq and northern Manitoba, in particular, will need to be understood in the regional context. Unemployment rates in Kivalliq currently range

[4] These are priorities specified in the Bathurst Mandate, on which the Nunavut Transportation Strategy 2001 is based.
[5] See “Manitoba Nunavut Transportation Assessment” (Prolog, 2000) and “Nunavut Transportation Strategy 2001”.

from 14% in Rankin Inlet to 36% in Arviat[6], while 49% of the population in Nunavut is under the age of 19[7]. Without access to gainful employment, these people and communities are supported by transfer payments from the federal government. The social dependency rate in the remote communities in northern Manitoba ranges from 30 to 80 percent.[8] Education, training and employment benefits to the youth are cited as the single, largest concern expressed by the communities during the two rounds of public consultations conducted in this current study.

The "spin-off" economic benefits associated with the construction of the Nunavut-Manitoba road will have significant impacts to the regional economy in the following ways:

- Local hiring of construction workers and project spending on wages, materials and equipment during construction (direct impacts)
- Local hiring of maintenance workers and spending on wages, materials and equipment for the operational period of a winter road and eventually the all-weather road (direct impacts)
- Additional economic activities generated as a result of the construction-related purchases of goods and services from local and non-local suppliers (indirect impacts)
- Additional economic activities associated with the purchase of consumer goods and services incurred by the construction and maintenance employees within the region (induced impacts)

By extending the design and development of the road over 20 years, a greater opportunity is afforded to maximize the use of locally available labour, materials, and equipment, than would be the case if the project was undertaken in a much shorter time, requiring importation of workers and the necessary materials and equipment from sources beyond Nunavut and Manitoba. The new road will provide improvements in essential services to the local communities (e.g. medical and emergency services). In the financial year 1999/2000, a total cost of $22 million was estimated for Medevac travel (emergency evacuation of patients from remote communities to regional health facilities) and Medical travel (travel by patients and families on a non-emergency basis) in Nunavut. It can be expected that substantial savings can be achieved with the provision of an all-weather road and more advanced medical facilities in Rankin Inlet, Churchill and other regional centres in northern Manitoba.

Furthermore, the proposed new road will bring about business and economic development opportunities in the region as a result of the improved access to labour, attraction of investment capital for resource development, reduction of supply and servicing costs, and greater recreational and tourism activities between and within the local communities. Given the size and scale of the project, the proposed road will likely be constructed as a long-term regional development initiative. Notable economic development opportunities associated with the proposed Nunavut-Manitoba road are discussed under the following headings: mineral exploration and development, tourism, commercial fishing, hydro-electric and utilities development, and the Port of Churchill.

[6] Source: Sakku Investments Corp., an investment organization owned by the KIA.
[7] Government of Nunavut, 2006.
[8] "All-Weather Road – East Side of Lake Winnipeg Justification and Scoping Study", Manitoba Highways and Government Services, August 28, 2000.

4.2 Mining Exploration and Development in Study Area

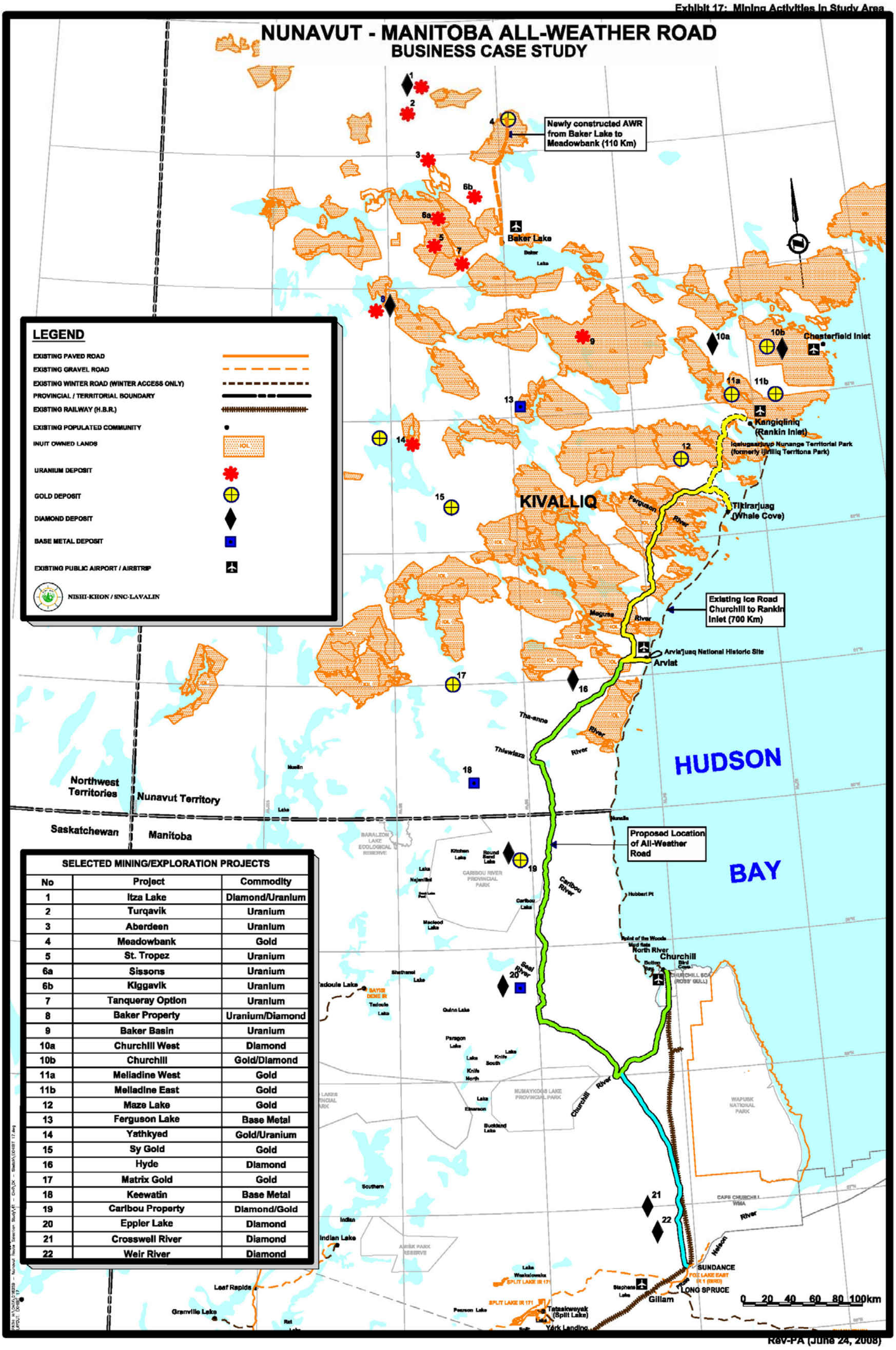
4.2.1 Mining Update

A literature review was conducted to update the mining and mineral exploration activities in the Kivalliq Region and Northern Manitoba. Upon our initial review, we have selected a total of 22 mining / exploration projects for more detailed analysis in the Business Case Study (see Figure 4.1 and Table 4.1). The rationale for selecting these mining projects can be summarized as follows:

- Mining projects in relatively advanced exploration stages, having completed a significant degree of geological mapping, geochemical and geophysical survey and drilling;
- Possession of mining license and development permit; type of mineral claims and area of land indicating the potential scale of mining operations;
- Located in the region that potentially could be influenced by the development of the AWR. The region was considered as a 500 km band centred on the AWR alignment;
- Located within 500 km band centred from the community of Baker Lake. These potential mine sites were selected because of the high number of mineral sites in the Baker Lake region, their proximity to Rankin Inlet, the northern terminus of the proposed AWR route, and to account for the possibility of extending the AWR from Rankin Inlet to Baker Lake, as indicated in an earlier route selection study.[9]

[9] "*Route Selection, Terrain Mapping and Estimation of Construction Quantities and Costs of Two Road Route Alternatives from Rankin Inlet to Chesterfield Inlet, Whale Cove and Baker Lake Communities*", J.D. Mollard & Associates, 2003.

Figure 4.1: Selected Mining / Exploration Projects in Kivalliq and Northern Manitoba



LEGEND

- EXISTING PAVED ROAD
- EXISTING GRAVEL ROAD
- EXISTING WINTER ROAD (WINTER ACCESS ONLY)
- PROVINCIAL / TERRITORIAL BOUNDARY
- EXISTING RAILWAY (H.B.R.)
- EXISTING POPULATED COMMUNITY
- INUIT OWNED LANDS (IOL)
- URANIUM DEPOSIT
- GOLD DEPOSIT
- DIAMOND DEPOSIT
- BASE METAL DEPOSIT
- EXISTING PUBLIC AIRPORT / AIRSTRIP

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SELECTED MINING/EXPLORATION PROJECTS

No	Project	Commodity
1	Itza Lake	Diamond/Uranium
2	Turqavik	Uranium
3	Aberdeen	Uranium
4	Meadowbank	Gold
5	St. Tropez	Uranium
6a	Sissons	Uranium
6b	Kiggavik	Uranium
7	Tanqueray Option	Uranium
8	Baker Property	Uranium/Diamond
9	Baker Basin	Uranium
10a	Churchill West	Diamond
10b	Churchill	Gold/Diamond
11a	Meliadine West	Gold
11b	Meliadine East	Gold
12	Maze Lake	Gold
13	Ferguson Lake	Base Metal
14	Yathkyed	Gold/Uranium
15	Sy Gold	Gold
16	Hyde	Diamond
17	Matrix Gold	Gold
18	Keewatin	Base Metal
19	Caribou Property	Diamond/Gold
20	Eppler Lake	Diamond
21	Crosswell River	Diamond
22	Weir River	Diamond

Table 4.1: Selected Mining / Exploration Projects in Study Area

No	Region	Project	Operator	Location	Commodity
1	Kivalliq	Itza Lake	Stornoway Diamond and Bayswater Uranium	130 km northwest of Baker Lake	Diamond, Uranium
2	Kivalliq	Turqavik	Cameco Corporation	85 km northwest of Baker Lake	Uranium
3	Kivalliq	Aberdeen	Cameco Corporation and De Beers Canada Inc.	120 km northwest of Baker Lake	Uranium
4	Kivalliq	Meadowbank	Agnico-Eagle Mines Ltd. and Cumberland Resources Ltd	75 km north of Baker Lake	Gold
5	Kivalliq	St. Tropez	AREVA Canada Resources Inc.	70 km west of Baker Lake	Uranium
6a	Kivalliq	Sissons	AREVA Resources, DaeWoo International, JCU Canada.	75 km west of Baker Lake	Uranium
6b	Kivalliq	Kiggavik	AREVA Resources, DaeWoo International, JCU Canada.	75 km west of Baker Lake	Uranium
7	Kivalliq	Tanqueray Option	Tanqueray Resources	40 km west of Baker Lake	Uranium
8	Kivalliq	Baker Property	Uranium World Energy, Majescor Resources, De Beers Canada Inc	140 km west of Baker Lake	Uranium, Diamond
9	Kivalliq	Baker Basin	Pacific Ridge Exploration and Kaminak Gold Corporation	60 km southeast of Baker Lake	Uranium
10a	Kivalliq	Churchill West	Shear Minerals, Stornoway Diamond, Int'l Samuel Exploration, Kaminak	60 km southeast of Baker Lake	Diamond
10b	Kivalliq	Churchill	Shear Minerals, Stornoway Diamond, Int'l Samuel Exploration, Kaminak	70 km north of Rankin Inlet	Gold, Diamond
11a	Kivalliq	Meliadine West	Comaplex Minerals Corp and Cumberland Resources Ltd	25 km northeast of Rankin Inlet	Gold
11b	Kivalliq	Meliadine East	Comaplex Minerals Corp and Cumberland Resources Ltd	25 km northeast of Rankin Inlet	Gold
12	Kivalliq	Maze Lake	Terrane Metals Corp and Laurentian Goldfields Ltd	45 km northwest of Whale Cove	Gold
13	Kivalliq	Ferguson Lake	Starfield Resources Inc	160 km south of Baker Lake	Base Metal
14	Kivalliq	Yathkyed	Kaminak Gold Corporation	230 km south of Baker Lake	Gold, Uranium
15	Kivalliq	Sy Gold	Kaminak Gold Corporation, Hunter Exploration Group and Corsa Capital Ltd.	250 km west of Whale Cove	Gold
16	Kivalliq	Hyde	Stornoway Diamond	70 km southwest of Arviat	Diamond
17	Kivalliq	Matrix Gold	Kaminak Gold Corporation	175 km west of Arviat	Gold
18	Kivalliq	Keewatin	Tri Origin Exploration and BHP Billiton	120 km southwest of Arviat	Base Metal
19	Northern Manitoba	Caribou Property	Western Warrior Resources	200 km northeast of Churchill	Diamond, Gold
20	Northern Manitoba	Eppler Lake	Western Warrior Resources, De Beers Canada Inc	150 km west of Churchill	Diamond, Base Metal
21	Northern Manitoba	Crosswell River	Peregrine Diamonds	175 km south of Churchill	Diamond
22	Northern Manitoba	Weir River	Peregrine Diamonds	185 km south of Churchill	Diamond

See Technical Memo 1 in Appendix 1 of this report for more details on the mining update in the Study Area

4.3 Tourism, Commercial Fishing and Hydro Development

Tourism

It is likely that the new road would stimulate tourism and recreation activities in the region by providing land access to the parks, lakes and communities along the road. In the study area, the combination of large lakes and wilderness areas would provide measurable benefits to local businesses providing goods and services such as food, fuel and accommodation, to the road travellers and tourists. Net tourism benefits would result in additional employment within the region and capital investments in lodges, restaurants and other recreational facilities. These benefits could be significantly enhanced if the road development were conducted in conjunction with a regional tourism development plan in Kivalliq and northern Manitoba.

Commercial Fishing

The proposed all-weather road would provide access to more commercial fishing quotas in northern Manitoba and Kivalliq. The Kivalliq region is home to large populations of fresh and saltwater fish which are currently harvested for subsistence use in the local communities. The new road would enable development of larger-scale commercial fishing in the region and generate an increase in the economic value to the industry.

Hydro-electric and Utilities Development

The proposed Nunavut-Manitoba road could provide significant benefits to hydro-electric, utilities, and other land-based communications development in the region. The road corridor would offer a natural transmission line route interconnecting potential hydro-electric generating sites to the various load centres along and beyond the road limits. The supply of hydro-electricity to the northern communities as well as to new mines could displace remote diesel generated electricity with its attendant concerns, such as dependence on non-renewable fossil fuel, as well as air quality and greenhouse gas implications. Dam structures would provide crossing opportunities for the NU-MB road. In fact, river crossings along the preferred route were selected at or near potential hydro sites.

4.4 Port of Churchill

The Port of Churchill is a strategic connection point for the Nunavut-Manitoba road for a number of reasons. It is Canada's foremost international arctic port and is key to the northern regions' integration into the world economy. With the existing rail and port system, the port supports a network of northern communities and industries, and is the principal staging and supply centre for the Kivalliq communities. To date, the port contributes $26 million to the national GDP and employs over 359 person-years annually.[10] The new road is expected to provide significant economic benefits to the port in terms of increased north-south imports and exports through the port. It will reinforce Manitoba as the service centre for the Kivalliq Region in the provision of efficient, cost-effective and reliable supply of dry goods, perishables and fuel to the Kivalliq communities, and increase Manitoba's competitiveness with other regional gateways in Quebec, Ontario and

[10] "Manitoba's Northern Transportation Partnerships", Presentation to Northern Transportation Conference, November 14, 2005, Manitoba Transportation & Government Services.

Saskatchewan. At the national level, the Port of Churchill is Canada's gateway to the arctic region and the proposed terminal of the Marine Arctic Bridge from Russia, Europe and Asia. All these developments would hinge, to a large degree, on the provision of an all-weather road linking Churchill to the rest of Canada and North America.

In summary, construction of the new road will provide direct economic "spin-off" benefits to the region and to local communities in terms of employment, income and GDP. Indirect and induced benefits will also be realized in the form of increased travel, education and business opportunities when the road is in place. To estimate and quantify these "spin-off" benefits of the Nunavut-Manitoba road, a multiplier analysis was conducted. Regional and national versions of Statistics Canada's Interprovincial Input-Output Model were used to capture the direct, indirect and induced impacts from the road construction upon employment, income and GDP in Manitoba, Nunavut and Canada, respectively. This analysis was not in the scope of the Route Selection Study, but was conducted on a stand-alone basis to support funding decisions before proceeding to the next phase of the project. The Manitoba Bureau of Statistics has developed their own models for highway construction and maintenance in their jurisdiction and was approached to run the models for the Manitoba portion of the Nunavut-Manitoba road. See Section 4.7 for details of this analysis.

4.5 Stakeholder Consultation

As part of this Business Case Study, a number of government agencies, stakeholders and industry representatives were consulted in July to September 2008 in order to establish a range of development scenarios associated with the Nunavut–Manitoba AWR. The schedule, attendees and a summary of consultation issues for these meetings are listed in Table 4.2 below. Summaries of individual meetings are provided in Appendix 2 at the end of this report.

Table 4.2: Stakeholder Consultation Schedule and Agenda

Date/time	Location	Organization	Name	Title	Consult On
A. Mining/Exploration Companies					
July 7, 2008	Vancouver	Agnico-Eagle Mines Ltd (Meadowbank Gold)	Larry Connell	Regional Manager	Status of mining exploration; economic activities associated with the project; impacts of AWR on mining / exploration; other activities and opportunities by AWR in Study Area.
July 7, 2008	Teleconference	Shear Minerals Ltd (Churchill Diamond)	Pamela Strand	President	
July 7, 2008	Vancouver	Laurentian Goldfields Ltd (Maze Lake Gold)	Andrew Brown	President and CEO	
July 10, 2008	Vancouver	Comaplex Minerals Corp (Meliadine Gold)	Tom Morrison	Vice President - Project Development	
July 16, 2008	Teleconference	Starfield Resources Ltd. (Ferguson Lake Base Metal)	Fred Mason	Vice President - Operation	
July 22, 2008	Teleconference	Areva Resources (St Tropez, Kiggavik and Sissons)	Nicola Banton	Senior Project Engineer	
B. Nunavut Agencies/Government Organizations					
July 11, 2008	Rankin Inlet	Kivalliq Chamber of Commerce	Ellie Cansfield	President	Economic activities and opportunities by AWR (mining, tourism, commercial fishing, crafts and other trading); key agencies and organizations to consult in the Business Case Study.
September 26, 2009	Baker Lake (teleconference)	Qulliq Energy Corporation	Mike Yarena	Operations Mgmt	Qulliq Energy's plans and initiatives in study area; economic activities and opportunities by the proposed AWR.

Table 4.2: Stakeholder Consultation Schedule and Agenda (cont'd)

C. Manitoba Agencies/Government Organizations

Date/time	Location	Organization	Name	Title	Consult On
July 08, 2008	Teleconference	Manitoba Hydro; Manitoba Chamber of Commerce	Jack Wilson	Vice-President, MCC Capital Regions	Economic activities and opportunities impacted/presented by AWR (mining, hydro development, tourism, forestry, fishing, etc); key industry agencies and organizations to consult in Business Case Study
July 18, 2008	Teleconference	Mining Association of Manitoba (Caribou Property, Eppler Lake, Crosswell River and Weir River Projects)	Ed Huebert	Executive Vice-President	Status of mining exploration; economic activities associated with the project; Impacts of AWR on mining / exploration
July 21, 2008	Teleconference	Port of Churchill	Bill Drew	Executive Director	Planned capital projects and initiatives at Port of Churchill in the short and long terms; economic impacts of AWR to the Port of Churchill; other impacts of AWR (tourism, fuel/energy supply, etc)
July 22, 2008	Teleconference	NorMan Regional Development Council	Angela Enright	General Manager	Social-economic impacts and opportunities by AWR; value of AWR development to respective beneficiaries in Northern Manitoba

4.6 Gap Analysis

To understand the social-economic differentials, or gaps, that exist between AWR-served communities and the Nunavut-Manitoba AWR study area (currently not served by any AWR), a literature review was conducted on the social-economic profiles of the following regions and communities:

- Selected AWR-served communities in Northwest Territories (Inuvik, Hay River and Fort Smith)[11]
- Selected communities not currently served by AWR in Northwest Territories (Sahtu Region)[12]
- Selected communities not currently served by AWR in Kivalliq Region of Nunavut (Rankin Inlet, Whale Cove and Arviat)

The Northwest Territories (NWT) communities are used as a reference region to the NU study region due to the similarity they share in history, culture and population, as well as their states of economic and social development. The regions, communities and road network in NWT are shown in Figure 4.2 below, while social-economic indicators for the three types of selected communities are summarized in Table 4.3. The social-economic differentials between AWR-served communities and those without an AWR (in both NWT communities and the Kivalliq communities within the study area) are used to provide an indication of the gaps that could potentially be bridged with the development of the NU-MB AWR.

As shown in Table 4.3, considerable gaps can be identified in communities with and without an AWR. In the Northwest Territories, education level (percentage of population with high school certificate or above) is considerably higher in the AWR-served communities (72.3% in Inuvik, Hay River and Fort Smith) than the ones without an AWR (52.1% in the Sahtu Region). In the Kivalliq communities in Nunavut, this number is even lower (48% in Rankin Inlet, Whale Cove and Arviat). The same trend can be observed in labour participation rate, unemployment rate, average personal income and average employment income. Cost of living can be measured by price indices and it is evident that the AWR-served communities in NWT have much lower price indices than the ones without an AWR (the same indicator is not available in the Kivalliq communities).

In Manitoba, analysis is focused on the Port of Churchill since this is the only community currently not served by an AWR in the Manitoba portion of the study area.

[11] These three communities are classified by NWT Bureau of Statistics as regional centres where social-economic conditions are considered different from Yellowknife, the capital of NWT, and the rest of the communities in NWT.
[12] The Sahtu Region is the selected region in NWT where communities are not served by an All-Weather Road. Sahtu region is selected to be compared with the AWR-served regions in NWT (Sahtu communities include Colville Lake, Deline, Fort Good Hope, Norman Wells and Tulita).

Figure 4.2: Regions and Road Network in Northwest Territories

Table 4.3: Social-economic Indicators in Selected NWT and NU Communities

Social-economic Indicators		AWR-Served Communities in NWT (Inuvik, Hay River and Fort Smith)	Communities without AWR in NWT (Sahtu Region)	Communities without AWR in NU (Rankin Inlet, Whale Cove and Arviat)
Population	Population – Aboriginal	5,130	1,975	4,170
	Population – Non-aboriginal	4,300	654	580
	Total	9,430	2,629	4,750
Education	High School Certificate or Above (%)	72.3	52.1	48.0
Labour Force	Participation Rate (%)[13]	76.2	72.0	60.4
	Unemployment Rate (%)[14]	8.6	13.8	11.7
	Employment Rate (%)[15]	69.6	62.1	53.6
Average Income	Median Earning[16]	$42,252	$30,212	$30,075
	Median Earning – Full Time[17]	$60,038	$56,650	$53,475
	Average Personal Income[18]	$44,870	$40,859	$29,086
	Average Employment Income[19]	$44,249	$39,983	$20,439
	Tax-filers More Than $50,000 (%)	37.9%	30.9%	N/A
Crime	Violent Crime Rate (per 1,000 persons)	74	83	51
Price Indices	2005 Living Cost Difference (Edmonton = 100)	134.6	158.6	N/A
	2004 Food Price Index (Yukon = 100)	122.8	189.4	N/A

Sources:

1. *Summary of NWT Community Statistics*, Northwest Territory Bureau of Statistics, August 2007.
2. *Nunavut 2006 Community Profiles*, Statistics Canada Catalogue no. 92-591-XWE. Ottawa. Released March 13, 2007.

[13] Participation rate is the percentage of persons 15 years of age and over who are in the labour force, either employed or unemployed during the week prior to the survey.
[14] Unemployment rate is the percentage of the labour force that was unemployed during the week prior to the survey.
[15] Employment rate is the percentage of persons 15 years of age and over who were employed during the week prior to the survey.
[16] Median earning is calculated based on individuals who are at least 15 years of age and have an earning.
[17] Median earning – Full time is calculated based on individuals who are at least 15 years of age and have an earning for full time employment in a one full year.
[18] Average personal income is the average money received from all sources.
[19] Employment income refers to total income received by persons 15 years of age and over for any employment.

4.7 Economic Impact Assessment

Based on the literature review and stakeholder/industry interviews discussed above, an Economic Impact Assessment (EIA) was conducted to forecast the economic impacts of the Nunavut-Manitoba AWR for a 30-year study horizon, including 15 years of AWR construction from 2013 to 2027, and 15 years of post-construction from 2028 to 2042.[20] The economic impacts were estimated using two models, one for the Manitoba portion of the AWR and one for the analysis of the Nunavut portion. The Manitoba analysis was performed with Statistics Canada's Interprovincial Input-Output Model, the latest version of which was estimated using data from 2004 for the all ten provinces and three territories. The Nunavut analysis utilized the Arctic Impact Model (AIM), a 44-equation macroeconometric simulation model of the economy of the Canadian Arctic. The current version of the model was estimated in 2008, using over a quarter-century of data (1981 to 2007). Details of the EIA methodology and the use of the two models are provided in Appendix 3: *The Economic Impact of the Nunavut-Manitoba All-Weather Road by Professor Eric Howe.*

As a result of the construction and maintenance activities of the proposed AWR over the 30-year study horizon, economic "spin-off" benefits were forecast for each of the Nunavut and Manitoba portions of the AWR. These benefits were expressed in terms of Real Gross Domestic Product (GDP), Personal Income and Employment, by industry and by province/territory in Canada (see Tables 1 to 12 of Appendix 3).

In addition, the economic impacts on local area residents in the three Hamlets of Rankin Inlet, Whale Cove and Arviat were estimated based on the gap analysis discussed in Section 4.6 above. It was concluded that an AWR would bring significant benefits to area residents – increasing average income by $4,636 (2009 dollars) per year[21], increasing the employment rate by 7.6%, and lowering the cost of living by 24%. The impacts on the income of the hamlet residents from the three sources are shown in the Table 4.4 on the next page.

In addition, the impact of the above increases on the economy of Nunavut, estimated using the Arctic Impact Model (AIM) model, is shown in Table 4.5 in terms of Real GDP component for Nunavut.

[20] It is assumed that five years of road development would be required (from the study year 2008) for detailed engineering, environmental assessment, permit application and land assembly before road construction.
[21] Increased earning for local residents were calculated by Howe in 2005 Dollars and adjusted to 2009 Dollars by the Consumer Price Index.

Table 4.4: Impact on Local Residents of the Three Hamlets 2027 through 2043

Date	The increase in the income brought about by the increase in employment rates Millions of 2007 dollars	The increase in the income brought about by the increase in wage rates Millions of 2007 dollars	The increase in real income brought about by a 24% decrease in the cost of living Millions of 2007 dollars	Total Millions of 2007 dollars
2027	$71.1307	$10.8907	$48.0850	$130.1064
2028	$71.9656	$11.0185	$48.1913	$131.1753
2029	$72.7968	$11.1458	$48.2938	$132.2363
2030	$73.6233	$11.2723	$48.3934	$133.2891
2031	$74.4465	$11.3984	$48.4900	$134.3350
2032	$75.2645	$11.5236	$48.5840	$135.3721
2033	$76.0785	$11.6482	$48.6753	$136.4020
2034	$76.8868	$11.7720	$48.7640	$137.4228
2035	$77.6912	$11.8952	$48.8497	$138.4361
2036	$78.4878	$12.0171	$48.9331	$139.4380
2037	$79.2815	$12.1386	$49.0142	$140.4343
2038	$79.9912	$12.2473	$49.0441	$141.2826
2039	$80.7581	$12.3647	$49.0741	$142.1968
2040	$81.5195	$12.4813	$49.1040	$143.1049
2041	$82.2764	$12.5972	$49.1340	$144.0076
2042	$83.0275	$12.7122	$49.1641	$144.9037
2043	$83.7722	$12.8262	$49.1941	$145.7925

Table 4.5: Impact on Real GDP by Component for Nunavut measured in Millions of 2007 Dollars

	2027	2028	2029	2030	2031	2032	2033	2034	2035
Personal Expenditure	60.4	63.2	64.4	65.3	66.2	67.1	67.9	68.7	69.5
Government Current Expenditure	0.8	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5
Gross Fixed Capital Formation	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Inventory Investment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Imports	23.8	25.1	25.7	26.0	26.4	26.7	27.1	27.3	27.7
Statistical Discrepancy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Domestic Product	37.6	39.7	40.5	41.2	41.6	42.2	42.7	43.3	43.7
	2036	2037	2038	2039	2040	2041	2042	2043	TOT
Personal Expenditure	70.4	71.2	71.9	72.6	73.3	74.0	74.8	75.5	1176.3
Government Current Expenditure	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	24.4
Gross Fixed Capital Formation	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	6.7
Inventory Investment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Imports	28.0	28.3	28.6	28.8	29.2	29.4	29.7	30.0	467.8
Statistical Discrepancy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Domestic Product	44.2	44.7	45.1	45.6	46.1	46.5	47.0	47.4	739.1

5.0 LOW AND HIGH DEVELOPMENT SCENARIOS AND BENEFIT-COST ANALYSIS

5.1 Low and High Development Scenarios

Two scenarios are evaluated to reflect alternate futures for resource development. The greatest potentials in the region include mining, gas and hydro development. Future resource development scenarios could include any one of these resources but with 45 active exploration properties and the Meadowbank Gold mine starting production in 2010, most of the current activity is focused around mining. Assessing the economic viability of individual resource developments is beyond scope but for analysis purposes a low and a high mining scenario are assumed in order to calculate a range of potential benefits and their linkage to a new AWR.

Low Scenario

The low scenario uses Eric Howe's conclusion that the road would have negligible impact on mining operations[22]. This scenario assumes no incremental mining activity follows from construction of the AWR and that benefits to existing mines would be negligible. In this scenario the economic viability of existing mines is premised on the existing transportation system which generally involves passenger transport by air and bulk transport by water and winter road. Road transport is concerned only with access to the nearest water body. Ore bodies located a long distance from navigable waters are not economical.

High Scenario

The economic benefits are based on the premise that a new AWR would open up a larger area for exploration as well as increase the economically viable catchment area for mines or other resources.

For analysis purposes, a total of three unspecified new resource developments (mines, oil and gas, hydro etc.) are assumed, including two in Nunavut and one in Manitoba. Resource developments are assumed to be of the scale of the Meadowbank mine development north of Baker Lake which might typically include $1.9 billion in exploration, development, production and reclamation over about 20 years or about $90 million/year for one resource development.

[22] Howe, E. "The Economic Impact of the Nunavut-Manitoba All Weather Road", prepared for SNC-Lavalin, Ocotoer, 2008

5.2 Benefit-Cost Analysis

5.2.1 General Approach

The benefit cost analysis uses a low and a high development scenario and attempts to quantify real benefits to the economy rather than economic impacts which are transfers. In this context, new wages or employment, for example are benefits only to the extent that they reduce social dependence. Jobs or wages which are transferred from elsewhere in the economy are not considered as benefits in this analysis.

Transportation network assumptions include:

- Completion of an all-weather road (AWR) between Rankin Inlet, NU and Sundance (near Gillam), MB, with connections to the communities of Whale Cove, NU, Arviat, NU and Churchill, MB. The selection of the best route to provide these linkages was the subject of the Nunavut-Manitoba Route Selection Study completed in 2007. The route length including community connections is 1100 km.

- Extension of the all-weather road from Rankin Inlet, NU to Baker Lake, NU. The approximate location and length of this 270 km long route is based on previous work done by J.D. Mollard & Associates for Nunavut. This extension, which will bring all-weather road service to the heart of a mineral rich area, is included as a proposed route in the National Highway System.[23]

Economic assumptions include:

- 10% discount rate with sensitivity tests at 7% and 6%
- Costs and benefits are expressed in $2009
- 30 year planning period
- Year 1 is 2013
- Year 30 is 2042
- Benefits are split between Manitoba and Nunavut

Timelines:
Discounted cash flows (Appendix 4) are used to assess costs and benefits with the timelines correlating to the proposed construction schedules[24].

- Rankin Inlet to Arviat: Year 2013 to 2017
- Arviat to Churchill: Year 2018-2027
- Sundance to Churchill: Year 2023 – 2027
- Rankin Inlet to Baker Lake: Year 2013 to 2017
- Horizon Year: 2042

[23] "Looking to the Future, A Plan for Investing in Canada's Transportation System", The Council of the Federation, December 2005.

[24] The previous analysis in the Route Selection Study assumed all construction costs occurred in year 1 and all benefits started in year 2. A 6% discount rate and a 25 year planning period were used.

Benefits assessed include:

- Incremental employment wages during construction and maintenance
- Increased employment and wages in Nunavut after road completion in 2027
- Incremental employment wages from new resource development related to the new road (high scenario only)
- Reduced transportation costs

5.2.2 Cost Assumptions

The costs used for analysis were taken from the 2007 work by NKSL and are inflated from $2006 to $2009 using the CPI. Unit and total cost used for analysis are presented in Table 5.1. The costs include:

- Engineering at 7% of construction costs
- Construction at $448,000/km Rankin Inlet to Baker Lake, and $1.105 million/km for all other sections
- Maintenance at $5,000/km/yr
- Salvage at 80% of the value of construction and is assigned as a recoverable in year 30 to reflect the continuing value of the asset beyond the end of the planning period.

The total cost over 30 years is $1.472 billion including $1.336 billion to build and $136 million to maintain the road. The cash flow is presented in Appendix 4. Normal practice in benefit cost analysis is to discount future cash flows to a single present value using a specified discount rate. Using the 10% discount rate specified by the Federal Treasury Board, the 30 year cash flow discounted to a single present value in year 1 totals $704 million.

Table 5.1: Unit and Total Cost Assumptions

Construction Unit Cost ($2009 Millions/km)	Rankin - Arviat	Rankin - Baker	Churchill - Arviat	Sundance - Churchill	All
Length (km)	340	270	580	180	1,370
Construction	$1.016	$0.404	$1.016	$1.016	
Engineering	$0.08	0.0404	$0.08	$0.08	
Property	$0.01	$0.004	$0.01	$0.01	
Total Unit Cost ($million/km)	$1.105	$0.448	$1.105	$1.105	
Total Cost ($2009 millions)	$375.7	$121.1	$640.8	$198.9	$1,336

Annual Maintenance ($2009 Millions/km)	Rankin - Arviat	Rankin Baker	Churchill Arviat	Sundance Churchill	All
Length (km)	340	270	580	180	1,370
Maintenance ($millions/km/year)	$0.005	$0.005	$0.005	$0.005	
Total Cost ($2009 millions/yr)	$1.7	$1.4	$3.0	$0.9	$7.0

Table 5.2 presents the distribution of life cycle costs between Nunavut and Manitoba over the 30 year planning period.

Table 5.2 Construction and Maintenance Life Cycle Costs (2009 Dollars)

	Rankin Arviat	Rankin Baker	Churchill Arviat	Sundance Churchill	All	Present Worth in 2013 @ 10% discount	%
Total	$419.0	$155.5	$685.2	$212.7	$1,472	$704	100%
Nunavut Portion	100%	100%	33%	0%			
$ millions	$419.0	$155.5	$226.1	$0.0	$801	$477	68%
Manitoba Portion	0%	0%	66%	100%			
$ millions	$0.0	$0.0	$452.2	$212.7	$665	$225	32%

5.2.3 Benefits

Employment from Road Construction and Maintenance

Road construction and maintenance generate benefits in the form of reduced social dependence resulting from new employment opportunities in an under-employed economy. The benefit calculations are presented in Appendix 4 and summarised here.

Of the $801 million construction and maintenance expenditures in Nunavut, 5% to 18% (depending on the section) or a total $137 million is estimated to contribute to incremental Nunavut wages over the 30 year planning period (see Table 5.3). The present value of this benefit in 2013 is calculated to be $83 million ($2009). In Manitoba 3% to 10% of expenditures contribute to incremental wages of $75 million with a present value of $27 million. The lower estimate for Manitoba reflects the lower unemployment rate and increased labour force mobility. New employment is more likely to be a transfer from other employment rather than a reduction in social dependency.

Table 5.3: Portion of Road Expenditures Contributing to New Employment

Road Section	Rankin Arviat	Rankin Baker	Churchill Arviat	Sundance Churchill
	Nunavut Labour Content Assumptions			
Portion of Road Expenditure in Nunavut	100%	100%	33%	0%
x Typical Labour Content of Road Construction	50%	50%	50%	n/a
x % Going to Local Wages	60%	60%	60%	n/a
x % Social Dependency Rate	60%	60%	50%	n/a
= Incremental Wage Benefit as % of Const. & Mtce. Costs	18%	18%	5%	n/a
	Manitoba Labour Content Assumptions			
Portion of Road Expenditure in Manitoba	0%	0%	67%	100%
x Typical Labour Content of Road Construction	n/a	n/a	50%	50%
x % Going to Local Wages	n/a	n/a	60%	60%
x % Social Dependency Rate	n/a	n/a	50 %	10%
= Incremental Wage Benefit as % of Const. & Mtce. Costs	n/a	n/a	10%	3%

Incremental Wages and Employment in Nunavut After 2027

After the road connection to the south is completed in 2027, there is likely to be a change in cost of living, wages and employment in Nunavut. These were previously quantified by Howe[25] and the wage and benefits are repeated here but quantified using a 10% discount rate instead of 7%. The lower cost of living benefit estimated by Howe stems mainly from, and is similar to, the transportation benefits previously estimated by Apex Engineering in the original transportation benefit cost analysis. This benefit is quantified separately in section 5.2.4.

In Howe's analysis, wage and employment benefits related to completion of the AWR linking Nunavut to the National Highway System start in 2027 with about $112 million/year and total $1.8 billion from 2027 to the end of the planning period in 2042. The present value of this benefit in 2013 is calculated to be $227 million ($2009). The present value calculations are shown in Appendix 4.

[25] Howe, Eric, "The Economic Impact of the Nunavut-Manitoba All Weather Road" Prepared for SNC-Lavalin, October 2008

New Resource Development Expenditures

The low scenario assumes no new resource development stemming from the AWR. The high scenario assumes there will be two new resource developments in Nunavut and one in Manitoba. The benefit assessment is not specific as to what the developments are but assumes they are each of the scale of a mining development costing $1.9 billion over 20 years including exploration, development, production and reclamation. The majority of expenditures and benefits occur after completion of the road in 2027.

Table 5.4 estimates 4.2% of Nunavut expenditures and 1.1% of Manitoba expenditures on resource development would go towards new wages or a reduction in social dependency. With these assumptions, Nunavut wage benefits would total $158 million with a present value of $20 million in 2013 ($2009) and Manitoba would total $19.8 million with a present value of $2.5 million. The derivation of present values is presented in Appendix 4.

Table 5.4: Portion of Resource Development Expenditures Going to New Wage Benefits

	Nunavut	Manitoba
New Resource Development Expenditure	100%	100%
x Wage Content	35%	35%
x % Going to Local Wages	20%	30%
x % Social Dependency Rate	60%	10.0%
= Incremental Wage Benefit as % of Resource Expenditures	4.2%	1.1%
Total Benefits ($2009 millions)	$158	$20
Present Value of Benefits ($2009 millions)	$20	$2.5

Transportation Cost Savings

Time and vehicle operating cost savings were estimated by Apex Engineering in 2007 for the all weather road. These were factored up to 2027 when the road is complete and the largest freight and passenger savings would be realized. The annual savings and growth assumptions are presented in Table 5.5. The total benefits and present values are calculated in Appendix 4. Manitoba Freight is excluded from the analysis since most of the existing demand is from Churchill which is already served by rail.

Table 5.5: Transportation Cost Savings Assumptions

	Nunavut Freight	Nunavut Passengers	Manitoba Passengers
2007 Estimated Savings ($2006 million/yr)	$20.7	$1.2	$0.06
Annual Growth	2.4%	2.4%	2.4%
2027 Estimated Savings ($2006 million/yr)	$33.2	$1.96	$0.10
2027 Estimated Savings ($2009 million/yr)	$33.9	$2.00	$0.10
Total Benefits	$652	$38.5	$1.9
Present Value of Benefits	$80	$4.7	$0.2

Safety Performance

One of the negative impacts of a new AWR is the increase in accident costs associated with road travel. This was previously calculated by Apex Engineering and is summarised in Table 5.6

Table 5.6: Accident Cost Assumptions

	Nunavut	Manitoba
2007 Estimated Savings ($2006 million/yr)	-$0.3	-$0.05
Annual Growth	2.4%	2.4%
2027 Estimated Savings ($2006 million/yr)	-$0.5	-$0.08
2027 Estimated Savings ($2009 million/yr)	-$0.5	-$0.08
Total Benefits ($2009 millions)	-$10.0	-$1.5
Present Value of Benefits ($2009 millions)	-$1.2	-$0.2

5.2.4 Benefit Cost Analysis

The benefit cost analysis brings all the discounted cash flows together in one table (**Table 5.7**) to calculate a benefit cost ratio using present values. A low and a high scenario are presented to reflect the increased wage benefits from new resource activity induced by the AWR. In the high scenario, there is also some spin-off to other benefit accounts modelled based on the increased GDP from mining activity.

The project returns an estimated B/C ratio = 0.66 to 0.69 at a 10% discount rate and 1.13 to 1.20 at a 6% discount rate. This reflects the higher weight given to future benefits when a lower discount rate is used. By comparison with other rural highway projects, the AWR returns

benefits similar to other projects with AADT in the 3,000 to 5,000 range even though AADT would be less than 1,000. This reflects the impact of social benefits not normally seen in other mature highway systems.

While the project does not return a positive B/C ratio (>1.0) at the federal 10% discount rate, the reasons for undertaking it are more broad than direct return on investment criteria. Eventually, a road link to the north will be needed, but like the railroad or the National Highway System, both of which shaped this country enormously, the true benefits cannot always be foreseen. Similarly the cost of not doing so is also uncertain.

Table 5.7: Benefit Cost Analysis Nunavut-Manitoba AWR[26]
(including Rankin Inlet-Baker Lake Segment)

ACCOUNT	Scenario	
	Low	***High***
FINANCIAL ($millions)	*Present Values $2009*	
Construction + Engrg.	$679	$679
Maintenance	$25	$25
Salvage	$61	$61
Present Value ($millions)	$643	$643
BENEFITS ($millions)	Nunavut	
Freight	$80.1	$80.1
Passenger	$4.7	$4.7
Accident Cost Savings	($1.2)	($1.2)
Reduced Social Dependency due to increased employment in:		
Road Const. & Mtce	$83	$83
Mining Activity	$0	$20
Increased Wages and Employment after 2027 completion	$227	$227
Nunavut Total	$394	$413
	Manitoba	
Freight	$0.0	$0.0
Passenger	$0.2	$0.2
Accident Cost Savings	($0.2)	($0.2)
Reduced Social Dependency from:		
Road Const. & Mtce	$27.0	$27.0
Mining Activity	$0.0	$2.5
Manitoba Total	$27.0	$29.5
	Total	
Present Value of Benefits ($millions)	$421	$443
Benefit/Cost Ratio at Discount Rate		
10%	**0.65**	**0.69**
7%	0.97	1.02
6%	1.13	1.20
NPV at 10%	-222	-199
NPV at 6%	96	142

[26] All costs and benefits expressed in Present Value 2009 Dollars at 10% discount rate over 30 years from 2013 to 2042.

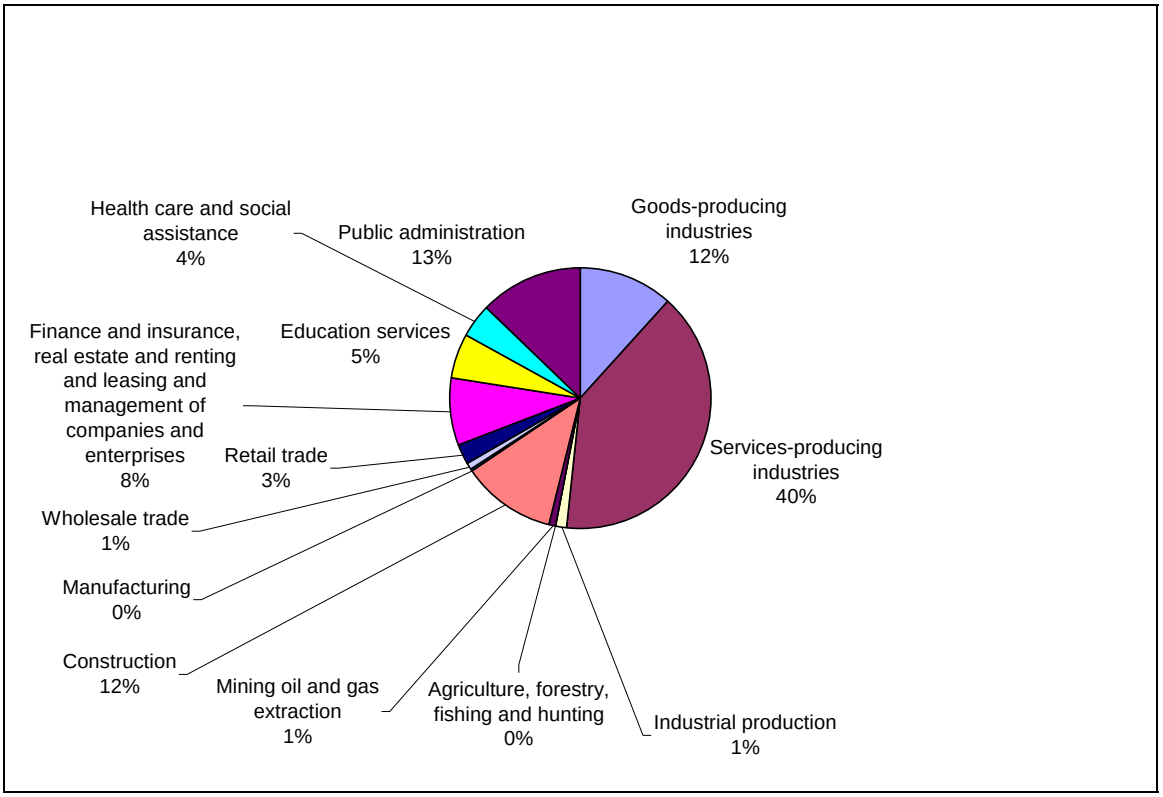
5.2.5 GDP Effects

This is the measure of the total output of a region's economy. In Nunavut, where many of the economy's inputs are imported, the net contribution to the GDP is about 1/3 of the expenditures (see Figure 5.1). Nunavut GDP is currently about $1.2 billion annually and mining now contributes in the order of 1%, mostly due to exploration. The addition of two major resource developments at factor cost of $180 million per year for example would generate $60 million/yr of Nunavut GDP or about a 6% increase in GDP.

In Manitoba, import intensity is lower and the net contribution to the economy is about 55% of expenditures. A $90 million/yr resource project would generate $50 million of GDP or about 0.2% of Manitoba's annual GDP of $43 billion.

Other GDP impacts were also identified by Howe. Road construction and maintenance increases Nunavut GDP by $267 million ($2007) and Manitoba GDP by $183 million ($2007) respectively for the NU and MB portions of the AWR over 30 years. Increased wages, employment and cost of living were estimated to increase Nunavut GDP by $739 million ($2007) starting at road completion in 2027.

Figure 5.1: Nunavut GDP



Source: Statistics Canada, Provincial and Territorial Economic Accounts Review, catalogue number 13-016-X.

5.2.6 Corporate Taxes

Taxes are a transfer, not a benefit but are still of interest to different levels of government. Federal taxes on mining are 19.5% of income and will be reduced to 12% by 2012. Provincial/territorial taxes are 12% in Nunavut and 13% in Manitoba[27]. The high development scenario assumes two resource developments in Nunavut and one in Manitoba each with expenditures of $1.9 billion over the life of the project. The present value of these expenditures and corporate taxes over the 30 year planning period is derived in Appendix 4 and summarised below in Table 5.8 and Figure 5.2 for Nunavut, Manitoba and the Federal position.

Table 5.8 Corporate Taxes

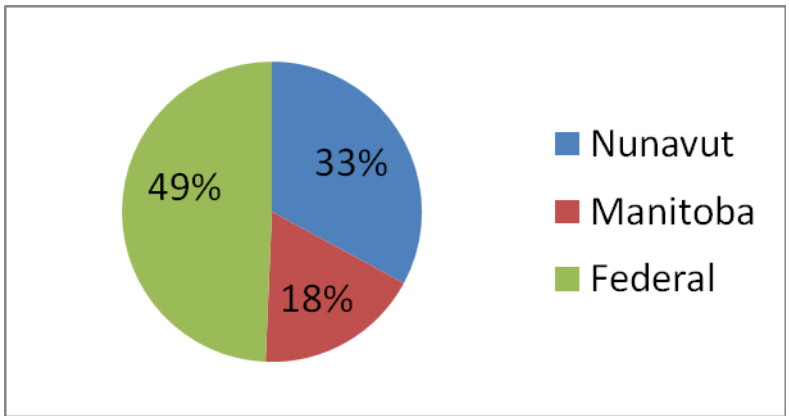
Present Worth in 2009$ (10% discount rate)				
	Nunavut	Manitoba	Federal	Total
Resource Revenue				
%	100%	100%	100%	
$millions	$731	$366	$1,097	
Resource Expenditures				
%	65%	65%	65%	
$millions	$475	$238	$713	
Net Revenue				
%	35%	35%	35%	
$millions	$256	$128	$384	
Corporate Taxes				
%	12%	13%	12%	24%
$millions	$30.71	$16.63	$46.06	$93.40

These taxes reflect the high scenario. The low scenario assumes no incremental resource development activity takes place as a result of the new road.

Personal income tax will also increase commensurate with the increase in personal income but is minor in comparison to the corporate taxes.

At a 6% discount rate the comparable corporate taxes over 30 years would be Nunavut $67.5, Manitoba $36.6 and Federal $101.3.

Figure 5.2: Corporate Tax Contribution



[27] www.nrcan-rncan.gc.ca/mms-smm/busi-indu/mtr-rdm/tsr-tsp-eng.htm

6.0 RISKS AND OPPORTUNITIES ANALYSIS

In Section 5 of this report we have estimated, for low as well as high development scenarios, the financial benefits that could accrue over a 30 year planning period to 2042, if construction of the highway commences in 2013 and is completed by 2027. We have also estimated for the high development scenario, the present value in 2013, of corporate taxes that could be paid to the Nunavut, Manitoba and Federal Governments during the 30 year life of the project. Over and above the monetary costs and benefits inherent in proceeding with the project, there are a number of qualitative risks and opportunities associated with either (i) not proceeding with the project or (ii) building the highway and achieving either the low or the high development scenarios.

In the spreadsheets that follow (Table 6.1) we have endeavoured to identify the risks, opportunities and qualitative values associated with a total of three scenarios as follows:

Scenario A: No All-Weather Road: Do–Nothing Scenario.

Scenario B: With All Weather Road: Low Development Scenario.

Scenario C: With All-Weather Road: High Development Scenario.

We have then segregated the areas of potential risks and opportunities under each scenario as follows:

- Transportation risks and opportunities
- Risks and opportunities associated with development (or non-development) of natural resources
- Social and economic equity risks and opportunities
- Natural environment risks and opportunities
- Political and sovereignty risks and opportunities

Furthermore, where appropriate, we have, under each scenario, distinguished the risks, opportunities, values and potential benefits for Nunavut, Churchill and other northern Manitoba communities.

Table 6.1

Type of Risk or Opportunity	SCENARIO A: No All-Weather Road: Do-Nothing Scenario	SCENARIO B: With All-Weather Road: Low Development Scenario	SCENARIO C: With All-Weather Road: High Development Scenario
1. Transportation Risks and Opportunities – cont'd	Nunavut: • Continued reliance on moving bulk goods by sea or by ice road from Churchill. • Seasonal sealift constrained to summer/early fall due to ice in Hudson Bay. • Ice road along west shore of Hudson Bay has short operating period in late winter and can be hazardous where larger rivers e.g. Seal, Caribou, Thlewiaza, Tha-anne, Maguse & Ferguson Rivers enter Hudson Bay. • Continued reliance on air service for transporting people and perishable goods between Nunavut communities and to/from points outside Nunavut. • High cost of moving people and goods. • Reliability and frequency of travel and trade very dependent on weather and season. • Substantial investment needed for improved marine facilities and docks at Rankin Inlet, Whale Cove and Arviat. Inability to meet recommendations in February 2008. • Inability to meet recommendations in, "A Multi-modal Transportation Blueprint for the North", published in February 2008 by Yukon, Northwest Territories and Nunavut Governments for a proposed strategic National Highway Network route linking Baker Lake and Rankin Inlet to Manitoba; also recommendations in a December 2005 publication,"Looking to the Future: A Plan for investing in Canada's Transportation System", prepared by The Council of the Federation for a proposed Strategic National Highway Network route linking Baker Lake, Rankin Inlet and Churchill to Thompson, Manitoba. Note this same plan identifies Rankin Inlet and Churchill as Strategic National Marine Ports; Rankin Inlet, Churchill and Thompson as Strategic National Airports, and Churchill as the northern terminus of a Strategic National Rail Network Short Line/Regional Carrier.	Nunavut: • A significant proportion of bulk goods can now be transported by road, through the year, on a "when, as needed" basis. Bulk fuel can still be brought in by sea in the summer/early fall and stored. Depending on available bulk fuel storage capacity and demand (dependent on population growth, harshness of winter etc) road tankers from Manitoba can top up supplies before end of winter/spring and prior to summer/ fall resupply by sea, thus delaying the need for increased storage facilities. The need to increase storage for bulk goods other than fuel will also be reduced. • Although all-weather road may be staged over several years, it could be done so along a generally land based winter road route, where permanent bridges will be installed over major rivers. This will be much safer for drivers than the coastal ice road, and should reduce the risk of widespread environmental damage in the use of spills of fuel or other hazardous goods. • The cost of moving goods will reduce significantly and as a consequence, demand may increase. • Although long distance business and urgent medical travel will likely continue by air, other trips, including intercommunity trips for business, education or recreation, can be made by road, at significantly less cost than by air. As a consequence travel demand may significantly increase. • Since travel by road is not as safe as by air, a greater proportion of the population will likely suffer from road injuries and fatalities, compared with the "No All-Weather Road" scenario; however the hazards of driving the shore line ice road should be a thing of the past. • Completion of an all-weather road from Rankin Inlet to Churchill and Sundance near Gillam, Manitoba and then on to Thompson, Manitoba via Provincial Roads 290, 280 and 391, will meet the 2008 recommendations of the Ministers responsible for transportation in Yukon, Northwest Territories and Nunavut, as well as those of the Council of the Federation in 2005.	Nunavut: • In this scenario more traffic will use the road than in the Low Development Scenario. The 8 m wide gravel topped road proposed should be well able to carry the extra traffic. • The increased traffic will result in greater savings in the cost of moving freight compared with air travel, thus increasing the benefit/cost ratio for the project. • The increased traffic will generate marginally higher annual maintenance costs and also result in a higher number of Traffic accidents compared with the Low Development Scenario. • The High Development Scenario is more likely to result as a consequence of building the road compared with the "No All-Weather Road: Do-Nothing" scenario, because the road will facilitate the exploration for and economic extraction of renewable and non-renewable resources e.g. mining, fishing, hydro-electric production, caribou harvesting. • A modest improvement in the marine port facilities at Rankin Inlet coupled with provision of the all-weather road would increase the importance of Rankin Inlet as a distribution hub for Western Nunavut. This increased distribution role is more likely with the High Development Scenario.

Table 6.1

Type of Risk or Opportunity	SCENARIO A: No All-Weather Road: Do-Nothing Scenario	SCENARIO B: With All-Weather Road: Low Development Scenario	SCENARIO C: With All-Weather Road: High Development Scenario
	Churchill: • Continued reliance on moving bulk goods by sea and rail, as well as north from Churchill to Nunavut by ice road or barge (the latter requires intermodal handling from rail to sled, or rail to barge). • Seasonal sea lift into Churchill constrained to summer/early fall due to ice in Hudson Bay (Season could be extended by employment of an ice breaker ship). • Continued reliance mainly on air service for transporting people and perishable goods between Churchill, other Manitoba communities and Nunavut communities. • Although the railway to Churchill mainly carries grain for export, some rail cars are dedicated to passengers, liquids including fuel, general freight and the piggy back of road transport trailers. • The railway generally provides reliable all-season freight and passenger service to Churchill but requires extensive on-going maintenance due to the presence of permafrost under the rail bed. • Delivery time of perishable goods between Winnipeg and Churchill by rail will likely be considerably longer than it would be with an all-weather road. • The cost of moving people and goods although not as high overall as in Nunavut, will remain high without viable competition to the rail and air service.	Churchill: • Grain exports and nitrogen fertilizer imports as well as other bulk commodities will likely continue to be transported by rail. • Perishable and other goods requiring rapid, just-in-time delivery, will likely be transported by road. • Some bulk goods headed to Nunavut communities serviced by the new road will likely bypass Churchill if coming by road from south of Churchill. The new road to Churchill may improve the opportunities for diversification of imports and exports through the port, since comparable ports, e.g. Vancouver, Montreal and Halifax, with road as well as rail links to Canada's national transportation system, typically have significant proportions of imports and exports carried by both modes of transportation. • Since the marine route from Churchill to Murmansk in the Russian Federation (an ice free port with rail and road links to St. Petersburg, the Scandinavian countries as well as to the European Economic Union) through the Arctic Ocean is much shorter than the Atlantic route from North America, a significant increase in trade through Churchill is a real possibility. "By shipping directly from the two northern ports – Murmansk to Churchill – ships could reduce the trip from Russia to North America from seventeen to eight days, revolutionizing ocean navigation and transportation across the Arctic water". Quotation from "Arctic Front, Defending Canada in the Far North," page 150: Coates, Lackenbauer, Morrison & Poelzer, 2008. • Inter community trips for business, education, recreation and non-emergency medical purposes can be made by road at less cost than by air: as such, demand may increase. • Since Churchill has excellent infrastructure in place for a much larger population than currently resides there, it many become a more attractive location for start-up businesses, business expansion, education, medical services and tourism. • The new road may not be as safe as the railway or air services for personal travel. • Completion of an all-weather road to Churchill will address the recommendations of the territorial Ministers and the Council of the Federation, who have identified Churchill as being a nationally strategic marine port; the terminus of a nationally strategic short line railway; the location of a nationally strategic airport; and so fully worthy of direct linkage into a proposed strategic national highway route extending north from Thompson to Rankin Inlet and Baker Lake.	Churchill: • The increase in traffic will likely increase the viability of providing highway commercial services (food, fuel accommodation) at the junction of the spur road to Churchill with the road to Nunavut. Services here would likely be resourced from Churchill, 110 km distant. • The High Development Scenario would likely see an increase in the role of Churchill in servicing Western Nunavut – freight arriving at Churchill by rail could be transshipped by road to communities, mines and hydro-electric sites west of Hudson Bay. • Similarly, because Churchill has excellent marine port facilities, freight arriving by sea could be transshipped by road to areas not currently served by the railway line. • An increased transshipment role for Churchill is more likely with the High Development Scenario especially with respect to trade between Canada, Russia and Europe via the "Arctic Bridge" sea route connecting Churchill to Murmansk.

Table 6.1

Type of Risk or Opportunity	SCENARIO A: No All-Weather Road: Do-Nothing Scenario	SCENARIO B: With All-Weather Road: Low Development Scenario	SCENARIO C: With All-Weather Road: High Development Scenario
1. Transportation Risks and Opportunities – cont'd	Other Northern Manitoba Communities: • Provincial Road 391 through Thompson as well as Provincial Roads 391, 280 and 290 from Thompson to Gillam and Sundance will experience no increase in road traffic due to transport of people and goods by road to Churchill and Nunavut. This will reduce priority for upgrading these roads to National Highway System guidelines and should also mean no increase over "business as usual" for annual maintenance.	Other Northern Manitoba Communities: • Provincial Roads 391, 280 and 290 will experience greater than usual growth in traffic. Spin-off highway commercial services (food, fuel and accommodation) opportunities will be greater, as a consequence, in Thompson, Split Lake and Gillam. Maintenance on these roads may also need to be greater. • Thompson, currently at the northern terminus of PTH 6, a key link in the National Highway system, is an important mining city and gateway to resources and recreation in Northern Manitoba. Its northern gateway role will be significantly enhanced by provision of the road to Churchill and Nunavut, placing it within an Asian-Arctic Ocean trade corridor, with attendant commercial and institutional opportunities. • Gillam, Fox Lake First Nation and Split Lake Cree First Nation, all close to the kick-off point for the all-weather road to Churchill and Nunavut are communities with many skill sets learned in the construction and operation of Manitoba Hydro's hydro-electric generation stations already in place, or under development, within the Nelson River/Churchill River systems. Construction of the all-weather road north will provide an opportunity to tap into the existing labour force and skill sets in these communities. When completed the road will enable these skilled people to more easily travel north for employment on developments in Northern Manitoba and in Nunavut.	Other Northern Manitoba Communities: • The larger traffic volumes associated with the High Development Scenario will further increase commercial, institutional and employment opportunities associated with the all-weather road in Thompson & Gillam as well as in the First Nations communities, all located within the Arctic Gateway corridor.
2. Risks and Opportunities Associated with development (or non-development) of natural resources	• In scenarios A and B, the development or non-development of natural resources are assumed to be generally similar, in keeping with Professor Eric Howe's' conclusion that the road would have negligible impact on mining operations. • However, it is noted that provision of the road (Scenario B) could open up new opportunities for mineral exploration, commercial fishing, hydro-electric development (in Nunavut), caribou harvesting (in Nunavut) by providing improved year round all-weather access to existing and potential resource areas. Tourism and eco-tourism opportunities would also likely increase due to the significantly lower cost of travel with more people every year visiting national, provincial and territorial parks more easily accessible from the all-weather road e.g. Wapusk National Park (near Churchill), Namaykoos Lake Provincial Park, Caribou River Provincial Park, the Seal Heritage River, McConnell River Migratory Bird Sanctuary (near Arviat), Iqalugaajuup Nunanga Territorial Park (near Rankin Inlet).		• The opportunity here is that new developments could occur at a greater pace than in the previous two scenarios. Promising exploration at Ferguson Lake (base metals) west of Rankin Inlet and Churchill/Meliadine (gold and diamonds) northeast of Rankin Inlet may, with an all-weather road, lead more quickly into mine development; also uranium extraction may proceed near Baker Lake. • All these potential developments would have an impact on the natural and social environment but would only proceed if financially viable and environmentally sound. An all-weather road to Rankin Inlet from the south, with extension to Baker Lake, should increase the economic viability of these potential projects. • The new Meadowbank gold mine north of Baker Lake is, we understand, experiencing logistical challenges with shipping supplies between Hudson Bay and Baker Lake because of marine navigation difficulties. These challenges would be reduced with provision of an all-weather road to Rankin Inlet.

Table 6.1

Type of Risk or Opportunity	SCENARIO A: No All-Weather Road: Do-Nothing Scenario	SCENARIO B: With All-Weather Road: Low Development Scenario	SCENARIO C: With All-Weather Road: High Development Scenario
3. Social and Economic Equity Risks and Opportunities	<u>Nunavut:</u> • Based on experience in NWT the Nunavut communities on the west side of Hudson Bay will likely, on average, not have achieved the same level of education as they would have with all-weather road access. • Furthermore, employment rates will likely be lower, average income less and living and food costs significantly higher. • The cost of provision of medical services will also likely be higher because of the need to fly in medical supplies and maintain a minimum level of medical services and staff in all communities, rather than centralizing some services. • Road based employment is relatively small since local road networks within the communities are fairly small in size. • Because of the high cost of travel by air, engaging in competitive sports with other communities is less likely, and family vacations or gatherings outside the community are rare.	<u>Nunavut:</u> • With both these scenarios (B and C) we can expect, over time, a measurable increase in education levels, higher average income, a lower cost of living (lower housing and food costs), centralization of specialist medical services, significant road based employment (capital construction and maintenance), more recreational and family travel and improved ability to share in the many activities enjoyed by the majority of Canadians. • Better access for Inuit hunters and fishers may increase the supply of country food, as well as encouraging growth in commercial fishing operations. The latter may help to fill the void created by the European Union in banning trade in seal products. • Risks associated with provision of the all-weather road in both these scenarios include easier access to drugs and alcohol, easier access for hunters and fishers from elsewhere in North America. Drugs and alcohol can seriously undermine health and the quality of life for an individual as well as being harmful to family life and public safety. • Easier access for non-local hunters can create shortages of country food for local communities. Country food is a significant and economic component of the Inuit diet. • Some loss of employment may occur in the air services and marine services sectors of the economy.	
	<u>Churchill:</u> • Many of the above factors will apply to Churchill, although not to the same degree, because Churchill is a port (Canada's largest on the Arctic Ocean) and is connected to the south by scheduled rail service throughout the year (Hudson Bay Railway and VIA Rail).	<u>Churchill:</u> • The above factors relating to education, income, cost of living, medical services, road employment, recreational and family travel may apply to Churchill but to a lesser degree than in Nunavut. • The major benefits to Churchill brought by an all-weather road will likely be increased business activity and possibly an increase in population, resulting from enhanced inter jurisdictional trade and travel i.e. between Manitoba and Nunavut, between Canada and Asia across the "Arctic Bridge".	
	<u>Other Northern Manitoba Communities:</u> • There will likely be a significant increase in population and traffic, if a decision is made to proceed with the construction of the Conawapa Hydro-Electric Dam on the Nelson River downstream from Gillam, resulting in some stimulus to the local economy and social conditions. However, traffic increase will be less than if there was an all-weather road to Churchill and Nunavut so higher spin-off benefits if there was an all-weather road to Churchill and Nunavut so higher spin-off benefits will not occur.	<u>Other Northern Manitoba Communities:</u> • There will likely be spin-off economic and social benefits from extension of an all-weather road to Churchill and Nunavut. These could include increased opportunities to operate highway commercial services (food, fuel and accommodation) resulting in local employment; providing a labour pool for road construction and maintenance; manufacturing or assembling mining equipment or supplies in Thompson for shipping north via road and so on.	
4. Natural Environment Risks and Opportunities	• This scenario maintains the status quo for the natural environment and it is likely the scenario most preferred by the Beverly Qamanirjuaq Caribou Management Board (BQCMB). However, the status quo may include climatic change. • If global climate change results in significant melting of the permafrost, more maintenance will be required on the Hudson Bay Railway; also the private ice road along the west coast of Hudson Bay will operate for a shorter period and become more dangerous if warming of the Arctic Ocean occurs. • Barge service on Hudson Bay and shipping out of Churchill will experience, if there is less ice, a longer season.	• Some of the environmental risks associated with the all-weather road in both scenarios include: - increased risk of boreal forest and tundra wild fires - increased hunting and fishing as well as loss of human life and wildlife through road collisions - risk of accidental spills of hazardous fuels and materials - disturbance of barren ground caribou calving areas (the selected route avoids currently known areas) and migration routes (these are subject to change). - risk of disturbing archaeological sites, sacred sites and cultural artifacts	

Table 6.1

Type of Risk or Opportunity	SCENARIO A: No All-Weather Road: Do-Nothing Scenario	SCENARIO B: With All-Weather Road: Low Development Scenario	SCENARIO C: With All-Weather Road: High Development Scenario
5. Political and Sovereignty Risks and Opportunities	• The risk here is that southern Canadians (the majority), Americans and other northern countries such as Russia, Denmark (Greenland) and Norway may feel that Canada is not serious about maintaining sovereignty and security in its northern regions viz Yukon, NWT and Nunavut and within its Zone of influence in the Arctic Ocean. • Alaska (Dalton Highway, Fairbanks-Prudhoe Bay, 414 miles), Norway (Mo l Rana – Kirkenes, 900 miles) and Russia (M18 St. Petersburg – Murmansk) all have roads extending north to the Arctic Ocean. • Canada's Dempster Highway No1, Klondike Highway (Yukon) – Inuvik (NWT), 671 km, and its most northerly highway would need extension to Tuktoyaktuk to reach the Arctic Ocean. • Nunavut (established in 1999) is the only territory in Canada that does not have a road or rail link to Canada's National ground based transportation system.	• Building an all-weather road to Churchill alone would provide an indirect connection to the Arctic Ocean via Hudson Bay and further establish Canada's Arctic presence. • An ongoing challenge to Canada's sovereignty is the question of whether international shipping has the right, without Canada's permission, to transit the North West Passage between Canada's Arctic Islands. Although the Nunavut – Manitoba Road would likely only extend, at present, as far as Baker Lake, its completion would, likely help to firmly demonstrate that Nunavut (that encompasses the North West Passage) is a full and equal member of the family of Canadian provinces and territories. • Also in international debate are the rights to exploit undersea mineral deposits between Arctic Nations' northern boundaries and the North Pole. A road to Nunavut would provide a conduit for access to these as yet unproven resources.	

Summarizing the results of the risks and opportunities analysis above, we note, for:

Scenario A: With no all-weather road:

Nunavut: The quality of life in Nunavut will be constrained by continued isolation from the rest of Canada; a high cost of living; high levels of unemployment; high costs for transporting people and perishable goods; high costs for the annual purchase and storage of bulk commodities including fuel oil; an air and marine transportation system whose reliability is very dependent on the weather; and less opportunities for natural resource and tourism development. The recent European Union ban on the import of seal products will reduce the livelihood of fishers, although for now, the controlled hunting and harvesting of caribou can continue, with the associated production and export of caribou meat. Mining and mineral exploration will likely continue at current levels as will the protection and management of the barren ground caribou herds. Economic development of hydro-electric potential at major rivers is less viable with no all-weather road.

Churchill: Trade and business opportunities in Churchill will continue to be constrained by their sole reliance on air service, summer/fall marine service, and the all-weather service provided by the rail connection to Thompson and the rest of Canada. Churchill is quite isolated and has higher costs for transporting people and perishable goods than communities already connected to Manitoba's existing all-weather road system. Opportunities for Churchill to have a greater role as a year round intermodal freight distribution centre are also constrained by the lack of an all-weather road from Churchill north to service Nunavut communities along the west coast of Hudson Bay.

As Canada's major port on the Arctic Ocean serving the Arctic gateway to Europe and northern Russia, Churchill's' lack of road access puts it at a disadvantage compared with other Canadian ports servicing the Pacific and Atlantic trade corridors.

If, due to climate change, Churchill experiences a longer shipping season, this competitive disadvantage will still remain without an all-weather road connection to the rest of Canada.

Other Northern Manitoba Communities: With no all-weather road north from Gillam to Nunavut there will be no significant traffic increase on roads, such as PR 391, 280,and 290 servicing these Northern Manitoba Communities other than short term increases associated with further hydro-electric development along the Nelson and Churchill River Systems.

Business opportunities associated with long term traffic increases, as well as easier access to Nunavut mining development, will not occur if there is no road north.

Scenarios B and C: With all-weather road;

Nunavut: With an all-weather road, under both the low and high development scenarios, Nunavut will likely lose its sense of isolation and become more fully integrated into the Canadian family of provinces and territories. The high cost of living should drop as the costs of transporting people and goods decline.

Increased access for mining, fishing, hunting and tourism, resulting from an all-weather road should lead to increased commercial activity for the Inuit population, with a concomitant increase in employment.

Consolidation of high quality health care facilities; educational institutions; and improved port infrastructure, all linked by an all-weather road, will be possible resulting in significant economy of scale. Intercommunity sports and visitations as well as family vacations away from home will all become more viable with an all-weather road. There will, with a road, be more easy access to drugs and alcohol as well as easier access for southern hunters to deplete wild life.

Churchill: Churchill will likely experience, with an all-weather road connection to the south, many of the same benefits as Nunavut. (i.e. less isolation; a lower cost of living; and increased commercial activity.) If the road is first built north from Churchill the town's importance, as a distribution centre from the rail head, will be enhanced. When the road is completed south to Gillam MB, some traffic may bypass Churchill. However the road south should increase the competitiveness of Churchill vis a vis Canada's eastern and western Seaboard ports by encouraging more diversification in the goods shipped in both directions through Churchill.

Other Northern Manitoba Communities: With an all-weather road north, communities such as Thompson, Split Lake, Gillam and Fox Lake should experience an internal increase in business and commercial opportunities as a result of increased traffic as well as employment opportunities extending north into the Kivalliq region of Nunavut. Thompson's role as a northern distribution centre should also increase.

In Table 6.2 below we have attempted to provide a graphic summary of the qualitative risks and benefits associated with doing nothing versus building an all-weather road. If the decision to proceed with the road is made, the degree of new development, low or high, will depend not only on the presence of the road and its possible extension north from Rankin Inlet to Baker Lake and Chesterfield Inlet, but also on such factors as provincial, territorial and federal economic development initiatives underpinned by appropriate education and training of aboriginal and Inuit populations.

Table 6.2 NU-MB All-Weather Road: Qualitative Risks and Benefits

SCENARIO			
Risks/ Benefits:	**A – Do Nothing: No AWR**	**B – Low Development: with AWR**	**C – High Development: with AWR**
Transportation and Interjurisdictional Trade	🔴	🟡	🟢
Development of Natural Resources	🟡	🟢	🟢
Social and Economic Equity	🔴	🟢	🟢
Natural Environment	🟢	🔴*	🔴*
National Sovereignty	🔴	🟡	🟢

LEGEND	
Higher risk, lower benefits	🔴
Neutral risk, some benefits	🟡
Lower risk, higher benefits	🟢

AWR: All-Weather Road

* Environmental Impact Assessment (EIA) required to identify mitigation needed

Nishi-Khon/SNC-Lavalin believes a decision by the appropriate governments to proceed with the road would be well grounded because, as indicated in Table 6.2, it would likely result in:

- Significant year-round transportation as well as interjurisdictional trade benefits
- Increased support for and stimulation of natural resources development including mining, fisheries and recreation.
- A higher level of social and economic equity for the Inuit people, reducing their isolation and integrating them more fully into the Canadian mosaic.
- Strengthening and solidifying Canadian sovereignty in the north by demonstrating a national and international commitment to more fully invest in the people and resources located within 20% of the Canadian land mass and the hinterland of our third sea coast ("….. from sea to sea to sea!").

Our initial scoping of environmental impacts of a new all-weather road leads us to believe that with careful planning, design, construction and maintenance, along with accompanying regulations and monitoring, the road can be successfully integrated into the existing fragile and unique natural environment.

7.0 PROJECT IMPLEMENTATION

Introduction:
The technical Route Selection Study (RSS) preceding this Business Case Study was funded by a number of partners:

Federal[28]	50%
Nunavut	25%
Manitoba	25%

Administration and financial management of the route study was undertaken by the Kivalliq Inuit Association (KIA) and technical management by Manitoba Infrastructure and Transportation (MIT).

Project Beneficiaries:
In addition to the resident populations in Nunavut and Manitoba, it is evident that the major beneficiaries of the implementation of the highway will be:

- Governments of Canada, Nunavut and Manitoba: Benefits will accrue through the reduced cost of providing support for essential services such as health care, education and employment insurance, as well as increased income and corporate tax revenue resulting from increased employment, higher salaries and a general increase in business activity, travel and trade. The federal government will further benefit from the extension of the National Highway System into the last unconnected region of Canada and the statement this makes regarding Canadian sovereignty in the north.

- Kivalliq Inuit Association: Since the highway needs to cross extensive tracts of Inuit owned land (IOL), revenue should accrue to KIA from access and land use permits, as well as royalties for the extraction of road building aggregates needed for initial construction, as well as on going maintenance of the highway.

- Qulliq Energy and Manitoba Hydro: These electrical generation and transmission agencies could benefit from the highway, since it would provide access to potential hydro-electric generation sites on the Kivalliq river system, as well as providing reliable year round access for building and maintaining a north-south transmission line, if such is proceeded with in the future. Qulliq Energy would also benefit from the highway as a supplementary fuel supply route, since oil for their diesel powered electricity generating systems could also be shipped year round by road, as well as on an annual basis by sea, as is currently the situation. Road haulage and delivery of fuel on an as needed, just in time schedule, would reduce the need to expand storage facilities as the population of Kivalliq, with its electrical demands, increases. It would also eliminate the need for expensive fly-in of fuel, if supplies run out before the shipping season opens on Hudson Bay.

- Mining Companies: Exploration for minerals or access to new mines would be more economical with a highway supply route up the west coast of Hudson Bay. All-weather

[28] 50% of study funding provided by the Indian and Northern Affairs (INAC) through the Kivallig Inuit Association

spur roads from the highway into these areas, connecting to the highway, could be used for re-supply at any time during the year; re-supply not being limited to the summer/fall sea lift on Hudson Bay as at present. Because of the lower transportation costs all-weather road access will likely make the mining of lower grade ores economically feasible. If the highway is extended from Rankin Inlet to Baker Lake, the Meadowbank Gold Mine located north of Baker Lake could benefit since there are navigational challenges on the existing re-supply route through the Baker channel to Hudson Bay.

- Northern Manitoba Aboriginal First Nations: The preferred location of the new highway north from Gillam MB crosses the Split Lake Resource Management Area (Northern Flood Agreement Settlement Lands). It also crosses north of the Churchill River, the Sayesi Dene Land Claim Area (this area extends into Kivalliq, Nunavut, north of the Manitoba border). The First Nations could benefit from the highway in terms of fully participating in its construction and maintenance, as well as possibly in the construction and operation of appropriately located traveller stops along the route for brief rests or for food, fuel and accommodation.

Project Funding:

The construction cost of the new 1100 km highway in 2006 Dollars was estimated at about $1.19 billion. This has now risen to about $1.22 billion in 2009 dollars including property acquisition. A nominal amount of $10 million was provided in the initial cost estimates for acquisition of property. No additional funding has been identified to settle the Sayesi Dene Land Claim through which the AWR route passes.

The cost of annual maintenance is now estimated in 2009 dollars to be about $5100/km/year or, in total, at least $5,600,000 per year for the entire length.

These are large numbers, with the construction cost posing a significant challenge to federal, provincial and territorial treasuries, even if the design, environmental review and construction is extended over a 20 year period.

In Section 5 of this report we estimated that in the High Development Scenario the present worth in 2013 of corporate taxes over the 30 year life of the project would break down in the following percentages:

Canada	49%
Nunavut	33%
Manitoba	18%

This provides one starting point for estimating a cost share for the highway.

In the United States of America the Interstate National System was typically cost shared for construction as follows:[29]

Federal	90%
State	10%

[29] Source: US Department of Transportation Federal Highway Administration:

In Canada, cost shared programs on the provincial sections of the National Highway System have typically been:

Canada	50%
Province	50%

In the Yukon and Northwest Territories the cost sharing has typically been:[30]

Canada	50%
Territory	50%

Public versus Private Funding:

If the proposed highway was to carry significant volumes of passenger and freight traffic, a toll could be used to pay off all or a part of the cost of building and maintaining the highway. However with projected long distance traffic volumes by 2031 in the order of 2,780 trucks per year and 910 passenger vehicles per year, a revenue neutral toll would have to be so high that the benefits of the highway to the regional economy would be lost because of the high price of commodities shipped by road. Even a toll of say $200 per truck would only yield annual revenue of $556,000 in 2031, about 1/10th of the 2009 annual maintenance costs.

Perhaps another way to look at it would be, if the road is built and the High Development Scenario results, the federal, provincial and territorial governments will recoup $93.4 million in corporate taxes (present worth in 2013 at 10% discount rate over the 30 year planning period) compared with the present value of the road construction cost of $643 million, i.e. about 15% of the cost.

The conclusion then is that the new highway will need to be funded 100% by the various levels of government. The return on the investment will come from the increased economic activities and improved living conditions the road can bring to northern residents and businesses, as follows:

- Increased revenue from corporate taxes as a result of increased mining operations and other commercial enterprises
- Increase in revenue from income tax and the goods and services tax (GST), as a result of higher levels of employment coupled with higher average salaries
- Reductions in health costs as well as employment insurance payouts, resulting from the improved employment situation, improved and lower cost housing, and better access to preventative and curative health services

Delivery Mechanisms for the Construction and Maintenance of the New Highway:

These range from fully public, public/private through to private delivery of construction and maintenance:

I) Public delivery: This would entail 100% up front multi-year budgeting from government programs; design mainly by consultants; public tendering and award to the lowest bidder.

[30] Under the current Building Canada Agreement, the split is 75 Federal/25 Provencal or Territorial.

Manitoba Infrastructure and Transportation (MIT) as well as Nunavut Economic Development and Transportation (NEDT) would oversee construction, possibly employing consultants as Owner's Engineer, and also long term maintenance, either by contractor or using their own forces. A contractor hired by MIT would deliver the highway portion in Manitoba, and a contractor hired by NEDT the portion in Nunavut.

Advantages:

- Fully transparent conventional delivery process
- Private sector profits constrained by low bid process
- Extensive on the job training for Aboriginal and Inuit workers
- Government agencies will gain direct valuable corporate experience

Disadvantages:

- NEDT lacks experience in designing , building and maintaining long highway systems
- Big draw down on government budget books
- May be more difficult to avoid scope creep and stay on budget and schedule

II) Private Delivery: This would entail up project financing from the private sector, with pay back from government over the concession period. The respective governments would set project parameters and criteria including local labour equipment and materials participation rates, and call for design-build-finance-operate (DBFO) proposals from the private sector. The DBFO proponent, a private company or consortium, would design, build, finance and maintain the highway over the concession period then, unless the concession is extended, hand the highway back to the government authorities i.e. Nunavut and Manitoba. The private sector proponent could deliver both the Manitoba and Nunavut portions of the project, or the work could be split between two private companies, one for the MB portion and one for the NU portion.

Advantages:

- Proponent will have extensive experience in designing, building and maintaining long highway systems
- Big immediate draw down on government funds avoided
- Experienced proponent can deliver agreed scope within budget and schedule

Disadvantages:

- May be a public perception of a lack of transparency in the procurement process
- May be concern over size of future annual draw downs on government budgets
- Increase in government corporate experience with building and operating highways will be limited

III) Public/Private Delivery: This would involve setting up a public/private partnership (P3) involving the provincial and territorial governments and a private company or consortium. The private sector would pay up front a portion of the construction cost, possibly in the range of 10 – 30% (i.e. $122-366,000,000), with pay back, dependent on meeting certain performance

targets, being made in annual increments over the concession period. The P3 arrangement could cover simply the 15 year construction period, or extend into a longer highway maintenance period. A private consortium in Nunavut could include KIA; in Manitoba it could include a legal Aboriginal, First Nations company or corporation.

The P3 approach may be preferred over the all public, or all private delivery options because it can incur most of the advantages of both systems while minimizing most of the disadvantages, as follows:

- Moderates up front draw down on government budgets and reduces amount of subsequent annual draw downs
- Provides strong motivation to meet scope, schedule and budget as well as complying with performance targets
- Public partnership will improve perception of transparency in the procurement process and more likely insure full utilization of local labour, equipment and materials
- Partnership process will support increased involvement, and hence training and experience of government staff

Nishi-Khon/SNC-Lavalin therefore recommends a P3 model be considered for delivery of the project and possibly also for the subsequent maintenance of the Nunavut portion.

8.0 CONCLUSIONS AND RECOMMENDATIONS

In this, the last section of the report, we recap the questions asked at the beginning, under Study Objectives, and also give in broad brush the answers, where it has been possible to provide them. If there is a will on the part of the respective governments and agencies to bring this nationally important all-weather road (AWR) project to fruition, a number of next steps will be needed before construction can start. These recommended next steps conclude this report.

Question 1: What are the likely long-term economic effects in the study area with no AWR development?

Answer: This is addressed in Section 6 of this report. The economic situation could remain "business as usual" with continued high cost and sometimes weather-related unreliability of transport. The cost of living will likely remain significantly higher than in southern Canada. Mining activity may increase due to an increase in national and world demand for minerals, helping to reduce high levels of unemployment. However, the lack of labour mobility, coupled with the potentially high cost of resupplying mines, may encourage mining companies to look elsewhere in Canada or overseas.

Access to modern health facilities, with a full range of specialist services in curative and preventative medicine, will continue to be time consuming and costly.

Barren ground caribou herds will not be impacted by AWR construction and maintenance activities: However, because mining transport will continue to be restricted to limited periods (e.g. summer sea lift, and winter hauling over frozen tundra), there is a greater likelihood of a clash with caribou movements and migration, if they occur during those periods.

Question 2: What are the low and high development scenarios for economic activities as a result of AWR development?

Answer: *The low development scenario* assumes the road would have, of itself, a negligible impact on mining operations. However, the reduced cost of transportation and increased mobility should have a beneficial effect on the cost of living, the levels of education and employment, as was evident when comparing the Sahtu region in NWT, with no AWR, with the NWT communities of Inuvik, Hay River and Fort Smith, with AWR service. See Section 4 of this report.

With an AWR additional benefits to the quality of life should accrue, such as easier and more affordable access to stores and shops, to specialist health services, for recreation, and for participation in sports events.

Impacts on caribou from AWR construction, maintenance, and traffic can be reduced through application of regulations covering exclusion periods.

AWR access may allow easier access for alcohol, drugs, and southern hunters; all of which can be controlled to a degree by the communities, supported by police patrols along the road.

The high development scenario assumes the road will open up larger areas for exploration, as well as increase the economically viable catchment area for mines and other resources, such as

oil, gas and hydro-electric power. With this scenario, we assumed there would be three unspecified new resource developments: two in Nunavut, and one in Manitoba, on a similar scale to the Meadowbank Gold Mine north of Baker Lake. The value of one such resource development might typically include $1.9 billion over 20 years, or about $90 million per year.

The benefits of the high development scenario would be felt in similar sectors of regional life as in the low development scenario, except to a greater degree (i.e. a lower cost of living and higher employment would likely result). Potential impacts on caribou, access for alcohol, drugs and southern hunters would likely be the same as for the low development scenario, since these are more dependent on having a road versus not having a road, than on the overall level of economic activity.

Question 3: What are the social-economic benefits and costs attributable to the construction and operation of the AWR?

Answer: The economic benefits and costs are addressed in Section 5 of this report. Recapping and summarizing some of the key numbers from Section 5, for an all-weather road from Rankin Inlet to Sundance, MB, and from Rankin Inlet to Baker Lake:

I) Construction, Engineering and Property Costs ($2009):

- Rankin Inlet to Sundance, MB $1,215.3 million (1,100 km)
- Rankin Inlet to Baker Lake $ 121.1 million (270 km)
- Total: Baker Lake to Sundance, MB $1,336.4 million (1,370 km)

II) Annual Maintenance Costs ($2009: based on $5100/km/year):

- Rankin Inlet to Sundance, MB $5.6 million/year
- Rankin Inlet to Baker Lake $1.4 million/year
- Total: Baker Lake to Sundance, MB $7.0 million/year

III) Present Value of Construction, Engineering, Maintenance and Salvage ($2009: based on 10% discount rate, 30 year planning period starting in 2013):

- Total: Baker Lake to Sundance, MB $643 million

IV) Present Value of Benefits ($2009: based on 10% discount rate, 30 year planning period starting in 2013):

- Low Development Scenario $421 million
- High Development Scenario $443 million

V) Benefit/Cost (B/C) Ratios

The following benefit/cost (B/C) ratios result from the low and high development scenarios at the indicated discount rates. These numbers are based on 2009 dollars and a 30 year planning period, from 2013 to 2042:

Low Development Scenario:

Discount Rate	B/C Ratio
10%	0.66
7%	0.97
6%	1.13

High Development Scenario:

Discount Rate	B/C Ratio
10%	0.69
7%	1.02
6%	1.20

While the project does not return a positive B/C ratio at a 10% discount rate, it is estimated to break even (with a B/C of >1.0) at a discount rate of 6% in both low and high development scenarios. Though the project may not be justified based on project economics alone, a number of social and public policy imperatives would need to be considered.

The gap analysis conducted as part of this study indicated the significant social and economic gaps that could be bridged with the development of this AWR. Higher education level, labour participation, employment and income are evident in the AWR-served communities in NWT, compared to the communities not served by an AWR in both NWT and Nunavut (see Section 4 of this report).

Both the Economic Impact Assessment (Section 4.7 and Appendix 3) and the Benefit/Cost Analysis (Section 5) concluded that most of the project benefits would accrue to the area residents in the form of increased education and employment, increased income, and reduced cost of living. These would in turn result in reduced social dependence and, therefore, reduced government spending and subsidies. Considerable increases in GDP and corporate taxes would also provide much stimulus to the economies of both regions as a result of the AWR development.

Social benefits of the project have also been summarized in the answers to Questions 1 and 2 above.

Question 4: What other values will be provided for by the AWR under the low and high development scenarios that cannot easily be quantified?

Answer: The question is addressed in Section 6 of this report and is summarized in Table 6-2. The AWR would likely bring:

- Significant year-round transportation as well as inter-jurisdictional trade benefits.
- Increased support for and stimulation of natural resources development including mining, fisheries and recreation.
- A higher level of social and economic equity for the Inuit people, reducing their isolation and integrating them more fully into the Canadian mosaic.
- Strengthening and solidifying Canadian sovereignty in the north by demonstrating a national and internationally important commitment to more fully invest in the people and resources located within 20% of the Canadian land mass and the hinterland of our third sea coast ("….. from sea to sea to sea!").

Our initial scoping of environmental impacts of a new all-weather road, leads us to believe that with careful planning, design, construction and maintenance, along with accompanying regulations and monitoring, the road can be successfully integrated into the existing fragile and unique natural environment.

Question 5: Who are the beneficiaries of the AWR, and what are the gains in their respective jurisdiction?

Answer: As described in Section 7, the beneficiaries include:

- Governments of Canada, Nunavut and Manitoba: Benefits will accrue through the reduced cost of providing support for essential services, as well as increased income and corporate tax revenue. The federal government will further benefit from the extension of the National Highway system into the last unconnected region of Canada and the statement this makes regarding Canadian sovereignty in the north.

- Kivalliq Inuit Association: Since the highway needs to cross extensive tracts of Inuit owned land (IOL), revenue should accrue to KIA from access and land use permits, as well as royalties for the extraction of road building aggregates.

- Qulliq Energy and Manitoba Hydro: These electrical generation and transmission agencies could benefit from the highway, since it would provide access to potential hydro-electric generation sites, as well as providing reliable year round access for building and maintaining a north-south transmission line. Qulliq Energy would also benefit from the highway as a supplementary fuel supply route.

- Mining Companies: If the highway is extended from Rankin Inlet to Baker Lake the Meadowbank Gold Mine located north of Baker Lake could benefit. Exploration for minerals or access to new mines would be more economical with a highway supply route up the west coast of Hudson Bay. Mine life may become longer, since all-weather road access will likely make the mining of lower grade ores economically feasible.

- Northern Manitoba Aboriginal First Nations: The First Nations could benefit from the highway in terms of fully participating in its construction and maintenance, as well as possibly, in the construction and operation of appropriately located traveller stops along the route for brief rests or for food, fuel and accommodation.

Question 6: What are the risks of not proceeding with the AWR development?

Answer: This has been partially addressed in the answer to Question 1. There is no doubt that a road link to Nunavut will eventually be needed, but like the transcontinental railway and National Highway System, both of which have had a profound impact on the development of Canada, the true benefits cannot always be foreseen or quantified. Similarly, the cost of not proceeding is also uncertain in numerical terms.

The answer to this question is perhaps best provided in the words of the Premier and also the Commissioner of Nunavut.

On September 10, 2009 at a Northern Transportation Conference held in Iqaluit, the Hon. Eva Aariak, Premier of Nunavut, stated, “We have no connection to the National Highway System, no intercommunity roads…we are left at the edges of economic growth. We want to secure a high quality of life, to build our future, to have affordable food, housing and access to land. Our updated Transportation Strategy ‘Let’s Get Moving’ (if fulfilled) will enable full participation in Canadian life…Nation building (was enabled by) the national

railway and highway system. We need roads to access communities and the outside world, to complete the map of Canada from 'sea to sea to sea.'"

In a subsequent address to the conference on September 11, 2009, the Hon. Anne Hansen, Commissioner of Nunavut, echoed many of the sentiments expressed above by the Premier.

Recommended Next Steps (for additional detail, see Study Recommendations in the November 2007 Technical Report):

- Present the findings of the Technical Route Selection Study, as well as the Business Case Study (The Case for the Nunavut Manitoba Highway) to the respective Ministers responsible for transportation in the Nunavut, Manitoba and Federal governments. The presentations will need to be supported by a Cabinet-level White Paper defining the rationale, scope, schedule and budget for the project, along with the preferred delivery mechanism (probably P3).

- Move to protect a broad corridor, containing the preferred route, in government land use policy/transportation strategy documents. This broad corridor protection would need to cover mineral exploration, new mines, quarry access rights, community expansion and development, forestry, hunting and trapping, fishing, and so on.

- Subject to approval in government budgets, proceed with the mapping; geotechnical investigations; engineering design, including hydrology and bridge design at river crossings; as well as conducting more detailed natural and social environmental studies; all of which are needed to define the route as well as its right-of-way requirements. Carry out a formal Environmental Impact Assessment (EIA) for the project.

- Prepare updated construction and maintenance quantities, and cost estimates as well as right-of-way areas and acquisition costs.

- Initiate another round of public and stakeholder consultation, focussing on providing more detailed project information, as well as environmental mitigation opportunities. Update the project website.

- Conduct official consultation with the First Nations communities along and affected by the preferred route.

- If it is agreed by the respective governments to use a P3 delivery model, then proceed to seek out and negotiate with prospective parties, in order to establish and finance a design-build (DB) or design-build-operate (DBO) project delivery mechanism.

If it is decided to proceed with the project, Nishi-Khon/SNC-Lavalin is of the opinion a minimum of 5 years will be needed from the "go" decision, before actual construction can start. This period is the minimum required for the establishing of a delivery model; the engineering design; the EIA; consultation; acquisition of land access for the road and quarries; mobilization and training of construction teams; securing construction equipment; and building as well as provisioning of work camps.

APPENDIX 1

Technical Memo 1: Review of Literature Research and Commencement of Stakeholder Consultation

(NKSL, July 22, 2008)

APPENDIX 2

Summary of Stakeholder Consultation

(NKSL, July to September, 2008)

APPENDIX 3

The Economic Impact of the

Nunavut Manitoba All Weather Road

(Eric Howe, October 2008)

APPENDIX 4

Present Value Calculations