MACKENZIE VALLEY ALL-WEATHER ROAD OPPORTUNITY ASSESSMENT

PREPARED FOR

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1. EXECUTIVE SUMMARY

For almost 70 years, there has been discussion among public policy makers, industry representatives, residents of Canada's Northern communities and others about the opportunities presented by construction of an all-weather road in the Arctic, and more specifically in the Mackenzie Valley region. Initially, it was felt that the primary opportunity was the ability to link remote communities in the region. However, interest in establishing an all-weather road in the region has recently resurfaced, to act as a catalyst to support the exploration and production of natural resources, to support other economic development initiatives in the region and to support the assertion of Canadian Arctic Sovereignty.

Meyers Norris Penny (MNP) was engaged to provide an independent assessment of the economic impacts associated with an all-weather road in the region. Information used to prepare the assessment was gathered from oil and gas exploration and production firms currently conducting exploration activities in the Mackenzie Valley. The impact and opportunities relative to these organizations was felt to be a relevant proxy for the potential impact and opportunities for the broader regional and territorial economy.

Our economic impact estimates are based on the fundamental assumption that a distribution system will be present in the region to allow gas resources to be shipped from the region. Our findings support the assertion that the presence of an all-weather road in the region makes further investment in resource exploration and production more attractive, which in turn will improve the viability of the distribution system.

The primary economic impact of all-weather road access to oil and gas exploration and production firms in the region are the substantial reduction of exploration and production cost premiums currently being borne by the industry, and the extension of the drilling season made possible by eliminating the need for the annual construction of a temporary regional access road each winter.

The seasonal extension is the more significant, as it is a permanent outcome. The extension of the drilling season from 90 to 129 days allows for a fundamental and permanent increase in the rate at which the natural resource base may be developed, relative to the current state, thereby allowing for the release of the full economic benefit associated with the development of the resource base over a shorter period of time.

The estimated rate of increase in the release of the economic benefit is approximately 43%, relative to the current situation where an all-weather road is not present in the region. With an all-weather road present, the economic benefit associated with the drilling and subsequent production from 500 wells expected over a 25 year period would accrue in approximately 17.5 years.

The impact of this permanent increase in the rate of release of economic benefit due to the presence of an all-weather road in the region yields a potential additional gain of $3.4 Billion to government at the end of 25 years. This net gain has the present value equivalent of approximately $1 Billion at 5% annual growth.

In addition to this significant increase in the rate at which economic benefit will flow with an all-weather road in place, the following additional economic impacts are also expected:

- An estimated reduction of 15% on the per unit cost of exploration and production well drilling, resulting in an average $2.25M reduction in costs per well drilled. The total estimated cost savings to industry are $1.25 Billion, predicated on the drilling of 500 new wells.
- The permanent extension of the exploration season will allow an additional $70 Million in wages to be released into the regional economy, driven by the ability of industry to drill these 500 wells in the time it previously took to drill 350 and the consequential need for incremental labor hours to do so.

The estimation of impacts and benefits cited are based on currently available cost information and cost structures for exploration wells in the Mackenzie Valley. Although not specifically within the scope of this report, it is anticipated that the presence of an all-weather road in the region would also have positive beneficial impacts on other economic development initiatives and communities in the region.

Commodity prices and worldwide demand for natural resources have increased substantially over the past ten years giving rise to new levels of opportunity to nations and organizations with the ability to supply these resources. With respect to natural resource exploration and development in Northern Canada, the inherent economic cost premiums in time and money for development and exploration activities is a central issue. The presence of an all-weather road in the Mackenzie Valley region would serve to materially reduce these premiums, thereby stimulating investment in

the region and generating significant positive financial and other benefits for the region and for Canadians.

2. INTRODUCTION AND BACKGROUND

2.1 CANADA'S NORTHWEST TERRITORIES

More than 1.3 million square kilometers in size and home to approximately 42,000 Canadians[1], the Northwest Territories (NWT) is a vast, remote and sparsely populated region. Largely due to the severity of regional climatic and geophysical conditions and its distance to markets, the NWT's natural resource development potential remains minimally explored and largely untapped. That being said, there are natural resource types that have been significantly assessed and exploited; during the period of 2002 to 2006, an estimated $4.5 billion was invested in mining and oil and gas extraction in the NWT.[2] During approximately the same period, mineral and oil shipments were valued at $10.6 billion, 75% [$8.0 billion] of which were the shipment of diamonds.[3]

NWT's natural gas proven reserves are approximately 313 billion cubic feet, with an estimated 75 trillion cubic feet cited in literature as being ultimately recoverable.[4] Recoverable oil sources are estimated at 12 billion barrels.[5] Significant potential also exists for development of copper, zinc and other mineral extraction.[6]

Appendix C provides an overview of the geographical relationship between these types of resources in the NWT and specifically the Mackenzie Valley region

A number of factors have limited the NWT from further developing these types of natural resources. A key limiting factor has been the high cost of developing the necessary infrastructure needed to economically support exploration and production of gas and oil resources. Driven by the region's remoteness and climatic extremes, the investment required to develop roads, ports, power grids and fuel delivery systems has not had a corresponding return that satisfies the requirements of those entities able to do so.

A second factor that impeded development up to the mid-90's was the Federally mandated moratorium on the issuance of exploration rights for oil and gas from 1977 to 1994, pending the settlement of Aboriginal land claims. This moratorium hindered exploration in the region, serving to limit understanding of the existing geology and to impede the estimation of the extent of region's natural resource potential during that period.

In general, there exist inherent cost inefficiencies in the development of the natural resource base in the NWT. Some are a result of the process by which development is supported and undertaken, with many legislative and regulatory checks and balances built in. Others are a function of the isolated location of the NWT, far from markets and the major population centers and infrastructure of the South. Any initiatives or activities that serve to reduce or mitigate these cost inefficiencies should have a positive impact on the value of the resource in a competitive environment and will therefore serve to stimulate investment and development in the region.

2.2 ACCESS TO THE MACKENZIE VALLEY REGION

Alternatives exist in the Mackenzie Valley Region other than all-weather road access. Firms do obtain access for exploration to varying degrees in the region. That being said, current access to and within the Mackenzie Valley region for the movement of materials and labour typically requires a multi-modal approach. Current modes of transportation in the region include rail, barge, air and truck. The freight weight and size, seasonal availability, urgency of transport, and cost are all factors which influence the selection of transport. Making a decision on which mode of transportation to use requires due consideration of four key factors of access, timing, price and speed, as summarized in Exhibit 2-1 below:

EXHIBIT 2-1: Transport Modes - Considerations

	Access	Timing	Price	Speed
Rail	Limited to terminus at Hay River	Year round- potential intermodal off loading delay	Low	Slow/Medium
Barge	Seasonal to barge landing sites only	Seasonal limitation	Low	Slow
Air (Aircraft, Helicopter)	Year round - fixed wing limited to landing strip	Year round	High	High
Truck	Limited in valley to Wrigley	Limited seasonal access	Medium	Medium/High

As noted above, there is no one "most viable, efficient or effective" transportation mode in the region; combinations of modes are required and these significantly increase the overall cost of transportation for all but the simplest of items.

RAIL

Rail transportation is available via the CN-owned Mackenzie Northern Railway, which has its terminus in Hay River. Mostly carrying fuel stock, goods are off-loaded at the terminus onto barges or trucks for travel to the final destination. Compared to the other modes, rail is relatively inexpensive but this benefit is offset by the very limited penetration of the mode in the region, a slower relative delivery time, terminal congestion and if the material is required beyond Hay River, the timing constraints of the associated barging or trucking mode.

BARGE

The main southern barge terminal is located in Hay River, NWT. Mackenzie River barges operate from Hay River and Fort Simpson. Barging is the most cost-efficient mode of transport, however it is restricted to summer operations from June until October, and it can take 10-14 days for goods to travel up the Mackenzie River.

Adding to the challenge of barging from a timing perspective, a recent report entitled *Northern Transportation Impacts of the Mackenzie Gas Project* concluded "the combination of baseline and project traffic may exceed historical tug and barge fleet capacity of a third of a million tonnes per season and that pending strategic adjustments, the barge system cannot assure completion of all project material movements and still meet baseline community re-supply requirements".

The report also suggested several contingency plans for organizations involved in the region, such as, "reduce barging where all-weather trucking alternatives are available along the Mackenzie Highway to Wrigley and via the Dempster Highway to the Mackenzie Delta."

AIR

Several commercial and charter airlines service the NWT. Fixed wing aircraft service the communities and industry as required, and helicopters are used to transport materials to remote areas lacking sufficient landing areas. Air transport is by far the most expensive mode of transportation, yet for certain types of cargo provides the quickest delivery. However, flights are often delayed due to extreme weather and to date there has not been a mode of air transport

effective at delivering the extreme payloads associated with exploration and resource development equipment.

TRUCK

Trucking is often the final delivery mode to the communities and project areas, as goods may be transported by rail or barge and then transferred to truck for final delivery. Direct shipments by truck are available from Alberta to the southern portion of the NWT or the Dempster Highway through the Yukon for the Mackenzie Delta.

EXHIBIT 2-2: Current State of Highway System in Northwest Territories

Currently there is all-weather road access to Wrigley, but access is dependent on ferry crossings. Vehicle access beyond Wrigley is dependent on winter ice roads. The construction of ice roads

and winter roads connect communities North of Wrigley from January to March. At present, the communities of Norman Wells, Deline, Tulita, and Fort Good Hope must rely upon a winter ice road to transport goods, equipment and supplies for a very limited time each year. For the remainder of the year, the only access to the area is by air or barge via the Mackenzie River. Further downstream, the communities of Tsiigehtchic and Inuvik can be accessed by an all-weather road, however the Dempster Highway through the Yukon is the most direct route. Aklavik and Tuktoyuktuk are accessed by winter road and air. This climate -dependent infrastructure leads to significantly higher prices for both residents and industry.

Trucking costs are moderate compared to the other modes and speed for delivery is medium/high depending on weather and road conditions. Timing associated with trucking is actually quite good, but as has been noted, there are distinct periods during the year (spring thaw and fall freeze up) when ground transportation simply cannot pass rivers and streams without fixed bridging, no matter if there is a road available on either side to utilize.

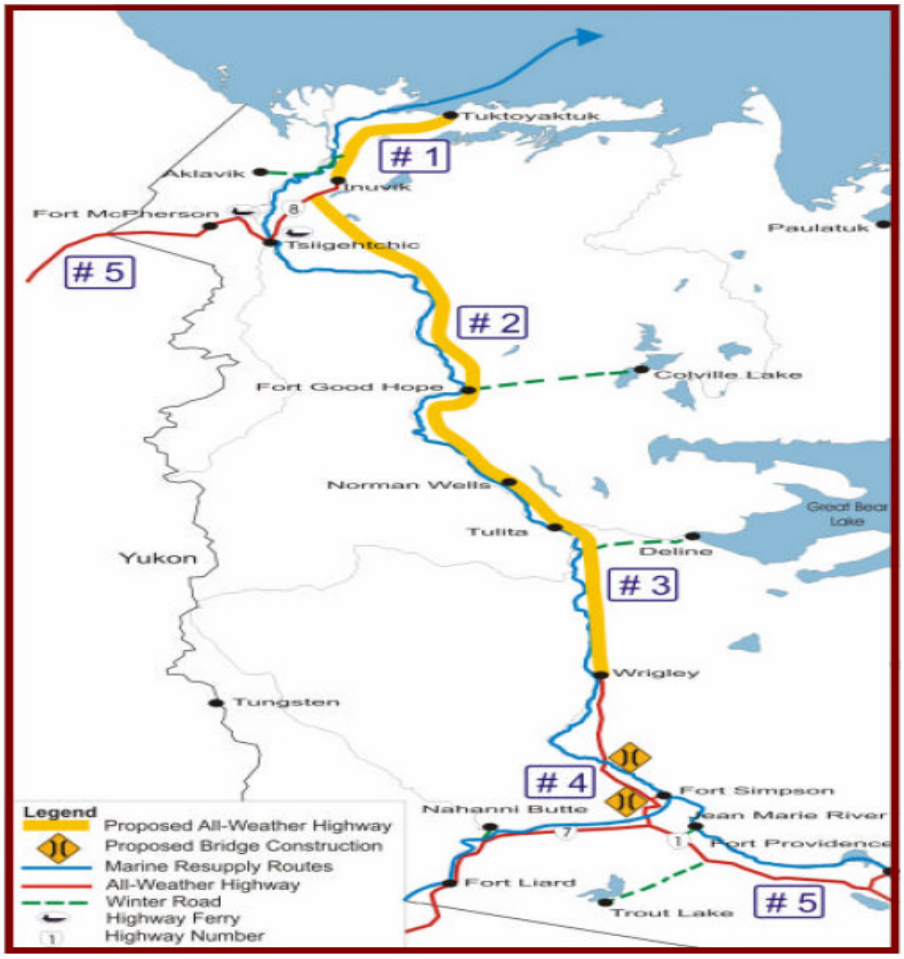
Technological improvements have improved ice road construction techniques and have moderated the influence of climate, however climate change will still have an impact. Over the past forty years, average temperature within the Mackenzie River basin has increased by 1.5 ℃, and scientists predict that temperatures within the region will increase by at least 5 ℃ by the end of this century.[7] This fluctuation in average temperature serves to increase the uncertainty with respect to the length of the drilling season in any given year, contributing to the sustainment of exploration cost premiums in the region.

The interaction between the high resource potential and low infrastructure development is problematic for many companies in the E&P industry. While the NWT was ranked 4th out of 64 locations worldwide surveyed by the Fraser Institute (2004/2005 Survey of Mining Companies) in terms of mineral potential, it was ranked last in terms of quality of infrastructure; 41% of mining companies indicated the quality of infrastructure was a strong deterrent to investment, with 4% indicating they would not pursue exploration due to this factor.[8]

The Mackenzie Valley remains one of the most remote areas in Canada. The region has experienced limited exploration, yet estimates of proven and potential natural resources are significant. Realization of the full potential of the region has been limited due to legislated access constraints, severe environmental conditions and the lack of cost effective methods of

transportation. A potential solution proposed to offset the exploration and production cost premiums associated with access and climatic constraints is to construct an all-weather road from Wrigley to Tuktoyuktuk.

EXHIBIT 2-3: Proposed Highway System in the Mackenzie Valley Region, Northwest Territories



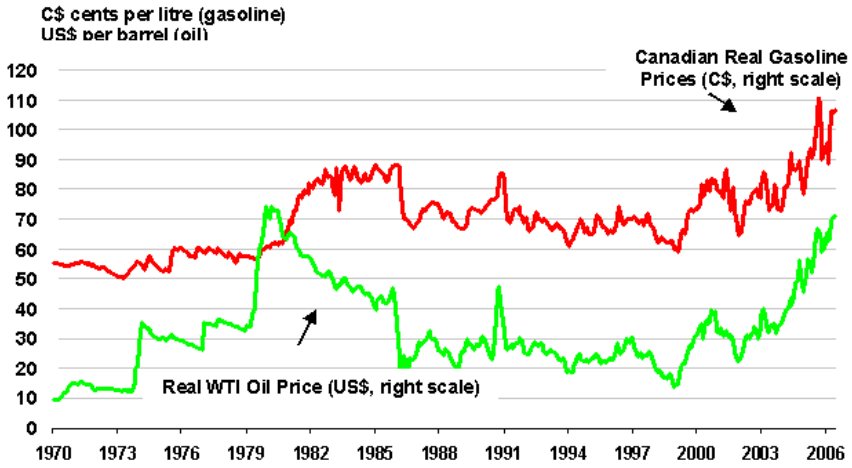
The proposed all-weather road would connect Wrigley to Tuktoyuktuk through the communities of Tulita, Norman Wells, Fort Good Hope and Inuvik. The purpose of the remainder of this report is to:

- Assess the opportunity costs that a of lack of all-season access to the Mackenzie Valley Region has had on regional natural resource development, and to
- Estimate development opportunities which could result from potential access to remote exploration and production sites in the Mackenzie Valley Region.

3. DEVELOPMENT POTENTIAL OF THE MACKENZIE VALLEY

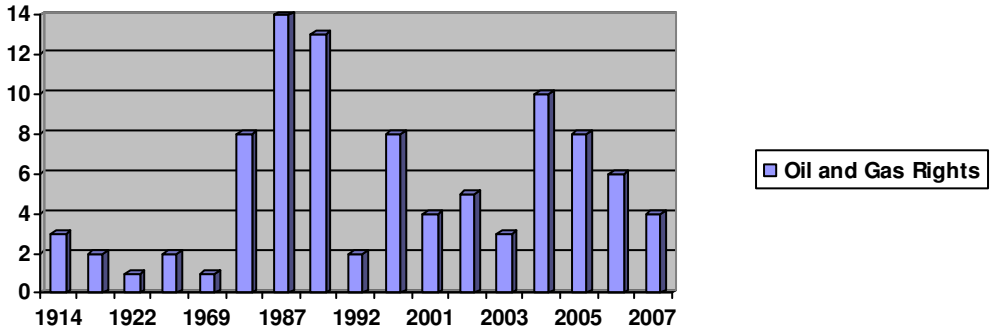
Over the past several years, inflation-adjusted commodity prices and the worldwide demand for energy and mineral resources have significantly increased. The IMF estimates that worldwide demand for oil grew by 1.5% annually from 1993 to 2001 and 2.2% annually for the period of 2002-2005. Prices for oil and gas also rose rapidly in this period (Exhibit 3.1).

EXHIBIT 3-1: Gasoline and Oil Prices (Adjusted for Inflation)[9]



With this twin increase in price and demand, the economics of global oil and gas development changed and enhanced interest in increasing capacity. The rise of gas prices since the late 1990's encouraged the exploration cycle, and stimulated renewed interest in resource exploration throughout the North. The resource-rich fields within the NWT present opportunities for the production of oil and gas in several areas. However, the acquisition of oil and gas rights held within the Mackenzie Valley region has been sporadic, and has decreased during times of regulatory uncertainty (Exhibit 3-2).

EXHIBIT 3-2: Exploration Activity in the Northwest Territories



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Historical data on rights acquisition depicts upward trends in the period following the announcement, development and pursuit of regulatory approval for the Mackenzie Gas Pipeline. Industry appears to have been preparing for the eventual construction of a pipeline in the Mackenzie Valley. In 2000 when the project was being proposed, exploration activity substantially increased. However uncertainty in the regulatory process and the economic models proposed served to stall any further expansion of exploration activity.

Historical exploration activity within the Northwest Territories, with the pattern of ramping up in expectation of access to market and ramping down upon increasing uncertainty over market access, is depicted in Exhibit 3-3:

EXHIBIT 3-3: Exploration Activity – Number of Wells Drilled, Northwest Territories[11]

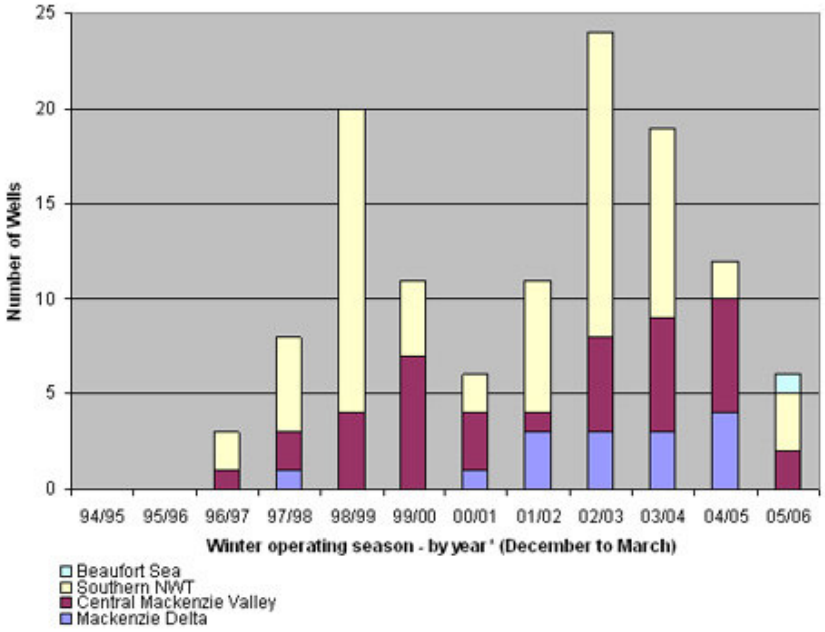


Exhibit 3-4 details the pattern of activity with well completions for the period of 1997 to 2006.

EXHIBIT 3-4: Exploration Activity – Number of Wells Drilled, Northwest Territories

Selected Statistics, Northwest Territories

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Well Completions January - July											
Oil	0	0	0	0	0	3	0	0	0	0	0
Gas	0	2	2	1	2	2	5	2	0	3	0
Dry	2	3	3	8	2	3	3	1	1	0	0
Total Well Completions	2	5	5	9	4	8	8	3	1	3	0
Horizontal Wells Drilled January - July	1	3	0	0	0	0	0	0	0	0	0
Directional Wells Drilled January - July	0	0	3	4	2	0	1	0	0	0	0

Selected Statistics, Northern Canada (Territories)

	1999	2000	2001	2002	2003	2004	2005	2006
Crude Oil and Equivalent Production, Thousand Cubic Meters Per Day	4.2	3.9	3.9	4.0	3.8	3.6	3.2	3.2
Well Licenses	28.0	16.0	12.0	18.0	32.0	15.0	15.0	5.0
Surveys of Active Geophysical Crews In Canada, Average	3.0	4.0	8.0	8.0	2.0	1.0	2.0	1.0
Active Drilling Rigs, Average	3.0	1.0	1.0	1.0	3.0	3.0	2.0	0.0
Service Rig Activity Surveys, Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Source: "Oil & Gas Statistics Quarterly, Second Quarter 2007", Nickle's Energy Group

All the exhibits above illustrate the same pattern; the acquisition of mineral rights or the drilling of exploratory wells for natural resources in the North has been significant to date, but has tailed off over the past several years. Uncertainty over the availability of a production delivery system (i.e.,

pipeline) may be one reason for this decline in activity; a second relates to the inherent cost inefficiencies of exploration in the region due to limited development infrastructure.

The Mackenzie Valley region contains significant non-renewable resource potential, including oil, gas, copper and zinc. A resource map has been included for reference in Appendix C. An estimate of current resource potential and associated government royalty and tax rates (in $billions) is provided in Exhibit 3-5:

EXHIBIT 3-5: Potential Resources and Revenues, NWT[12]

Commodity	Projected Resources	Gross Revenue	Federal Royalties	Federal Taxes	Northwest Territories Taxes
Existing Projects					
Natural Gas	1 Tcf	$2.70	$0.60	$0.50	$0.20
Oil	0.107 Billion bbls	$3.40	$0.80	$0.30	$0.10
New Projects					
Natural Gas	14.9 Tcf	$33.80	$6.10	$5.40	$2.50
Possible Projects					
Natural Gas	47.4 Tcf	$107.50	$19.40	$17.50	$8.00
Oil	1.65 billion barrels	$39.40	$9.50	$7.60	$3.70
Totals		**$186.80**	**$36.40**	**$31.30**	**$14.50**

A number of natural gas fields have been discovered in the Mackenzie Valley, including fields at Taglu, Parsons Lake, Niglintgak and other locations. While relatively small in total volume to date, further exploration is expected to significantly increase proven resources in the area. Based on the above, it would appear that at least 15 Tcf and up to 60 Tcf of natural gas resources are present for future development in the region.

It would seem that organizations present in the region are now waiting for the delivery infrastructure necessary to convert these investments into a return. However, as will be discussed in Section 4, further exploration and development within the Mackenzie Valley may be limited due to substantial, inherent cost premiums associated with environmental uncertainty and timely and consistent access. Simply put, investment dollars flow to where the return is expected to be greatest, and as will be demonstrated, organizations who are investing in the region have concerns about the region's viability, given these cost inefficiencies.

4. INTERVIEW FINDINGS & OBSERVATIONS

Respondents participating in this study were identified by analyzing the organizations holding oil and gas dispositions in the Central Region of the Mackenzie Valley, as well by identifying other oil and gas and mineral exploration and production firms operating in the Northwest Territories. Appendix A provides an overview of the approach taken to capture and summarize the feedback from respondents. Perspectives among respondents varied regarding the attractiveness of strategic investment as well as immediate to shorter term exploration and development programs in the Mackenzie Valley.

Overall, respondents described exploration investment criteria which are dependent upon a realistic and realizable potential for an exploration well to become a production site. This precedent condition includes the ability to move the product to market. As discussed throughout the interview process, exploration in the Arctic is costly. Several respondents stressed the cyclical nature of exploration investment, noting that investment in exploration is driven by market conditions, and in turn, specific investment decisions are further assessed in view of the likelihood and timing for delivering production from producing wells to the market.

For many respondents representing organizations with multi-national operations, the portfolio of global development potential was noted. For these respondents, prospects in the Mackenzie Valley Region and the NWT represent only a part of their operations. These representatives indicated that all exploration and development projects and strategic investment decisions are carefully weighed against other projects from around the world. Respondent remarks bear out these differences in perspectives and operating mandates. A selection of respondent comments with respect to strategic investment and/or exploration and production in the region includes:

- *"The opportunity is significant: There is one well for every 425 square kilometres in the Northwest Territories. One for every 2.5 square kilometres in Alberta."*
- *"[We are] in Canada because of its lower political risk portfolio."*
- *"[We] are aggressive and optimistic, but really frustrated [by no pipeline certainty]."*
- *"Huge potential in the longer term."*
- *"We've been very aggressive [in this region]."*

While the development prospects in the Mackenzie Valley Region are compelling to many firms, the rising cost of exploring and evaluating those prospects is a concern. A few of the respondents

noted that anticipated operating costs in the Mackenzie Valley Region have increased; one respondent estimating the increase to be by factors of 2 and 3 respectively in as many years. Another respondent noted that with many regions in Canada, North America and elsewhere demonstrating similar subsurface potential, it is the costs to be borne for exploration or development that "are everything" in making Canada's Northwest Territories competitive for exploration and development investment. In the opinion of most respondents, anything done to reduce or mitigate the development cost premiums, including the lack of infrastructure in the Mackenzie Valley would improve the attractiveness of the region to ongoing investment.

4.1 HISTORICAL COST OF LIMITED ACCESS

When asked about the potential impacts of the lack of access in the area, a few respondents commented on how the lack of all-weather road access has impacted past undertakings in the region, and in turn, how this retrospective analysis could impact assessment of future exploration programs in the Region.

- *"We will not a approach a project with higher than 25% contingency. This contingency will sometimes necessitate lowering the scope of a project. An all-weather road would lower contingency to 15% … priorities would shift."*
- *"There is a large resource in the North, but no major finds similar in size to original anchor fields . . . could have drilled more, assessed resources more if cost structure was lower."*
- *"Had there been an all-weather road in place, a lot more companies would be up there. It would attract their interest."*

In the Section 5, we have estimated the cost premiums these organizations have paid over the past 10 years, as a function of having limited, seasonal and very expensive access to the Mackenzie Valley region.

4.2 FUTURE COST IMPLICATIONS

With respect to future development prospects, one respondent explained that infrastructure, such as all-weather road access, can "make a big difference" when seeking to compete for a share of a limited pool of international investment funds for exploration and development. This respondent explained that the presence and quality of infrastructure is one of four key decision-criteria for their organization when assessing projects, along with the quality of the prospects, stability of the political regime as well as the reasonableness of the regulatory regime. Given the long-term

timelines required to move from prospect to exploration to development to market, one respondent emphasized what a 'big hurdle' it is to achieve development and production of an asset:

- *"You have to put out a lot of money to get it out of the ground."*

For several respondents, where the all-weather road infrastructure could make a difference for the Northwest Territories is in demonstrating a greater likelihood that the region is 'development ready'.

- *"Once infrastructure is there, more looking will start and it will become more attractive to do work up there. . . Just the hope [of better access] makes things more interesting. It could give you an edge and increase your chance of more money being spent."*

Respondents identified where an all-weather road could directly affect areas of their operations, encourage further activity in the Mackenzie Valley, or alternatively, ease efforts currently underway. For respondents who believed all-weather road access could impact their firm's exploration and development priorities or programs, their comments concentrated on three primary impacts:

- **Reduction of exploration expenditures**: All-weather road access could contribute to lower expenditures on exploration programs.
- **Reduction of production expenditures**: All-weather road access could contribute to lower expenditures associates with the operation of production programs.
- **Extension of the drilling season**: All-weather road access could support a longer season with associated increases in, and extension of employment opportunities.

REDUCTION OF EXPLORATION EXPENDITURES

A consistent theme raised by respondents was the perceived positive impact all-weather road access would have on the cost of exploration. The scale of material and labour transport for exploration activities is significant, and the ability to mobilize these materials in a remote area such as the Mackenzie Valley is complex, time-consuming and expensive. A selection of respondent comments includes:

- *"An all-weather road would lessen the pressure surrounding the transportation of materials"*
- *"Could plan our work better with an all-weather road"*
- *"An all-weather road would lead to a new planning process … [would be] better for companies and contractors"*

For many respondents, the prospect of an all-weather road not only presented the opportunity to reduce cost structures for exploration and to strategically reconsider the exploration and

development prospects within the Northwest Territories. A selection of respondent comments includes:

- *"The lack of an all-weather road affects the cost of doing business."*
- *"An all-weather road would have a huge impact on an exploration basis."*
- *"A developed all-weather road would reduce our dependencies on river barges and also provide opportunities for summer exploration in certain areas. This would be of significant economic benefit to northern citizens and contractors as well."*
- *"If there were an all-weather road, we could cut down on costs for flying in fuel, drills and other supplies . . . Any way we could cut down on expenditures would make a huge difference."*

The relative impact of reducing exploration costs would be felt differently by each organization. Each pursues opportunity with unique strategic and operational objectives, with holdings in geographically unique locations which present different exploration requirements. The proposed route east of the Mackenzie River may present more significant cost saving advantages to those with assets nearby. For those west of the Mackenzie River, the savings may be more moderate. However, the need for the construction of primary ice roads and ice bridges to transport people and equipment to well locations could be eliminated or reduced with improved access to the region. For others, the costs would be more moderately reduced. A selection of respondent comments includes:

- *"An all-weather road would help, but not everything."*
- *"Not having all-weather road access doesn't discourage us. Having a road would, however enhance our ability to carry out exploration and cut down our costs."*
- *"The element of an [all-weather] road would be an enabler. It would reduce the cost of doing business, but would not be the determining factor [in investment]."*
- *"An all-weather road would reduce overall cost structure. Could use the [savings] to drill elsewhere . . .Construction and access costs are very high [in the North]. An all-weather road would lower them."*
- *"With a road up there, the economics would change."*

Exploration costs undertaken in the Mackenzie Valley by respondent firms have been as high as $150 million, and in making these investments, they have gained a keen understanding of the economics of the activity and the associated cost premiums and risks. Due to the highly competitive nature of the exploration and production industry many companies were not prepared

to share detailed costs of their historical expenses. However, most respondents were able and prepared to provide some high level assumptions on the effects of an AWR. For example, logistics costs, including winter/ice construction and drilling, represented between 20% to 70% of respondents' exploration costs. The estimated impact of an all-season road on these expenditures ranged from a marginal reduction to up to a 30% reduction in costs.

We have aggregated the responses and a summary of their estimates of their exploration cost structures is provided in Exhibit 4-1.

EXHIBIT 4-1: Respondents' Estimates of All-weather Road Access on Exploration Cost Structures

Cost components	Estimated exploration costs per project in the Mackenzie Valley	Estimated total investment to date in Northwest Territories	Perceived impact of an all-weather road
Engineering and Planning	6%-30% of exploration costs	respondants not willing/unable to provide	Reduce by up to 50%
Seismic Program	respondants not willing to provide	$8-100 Million dollars	Reduce by 33%
Logistics	25%-70% of exploration costs (38% average)	respondants not willing/unable to provide	Reduce marginally to 33%
Winter ice road construction	up to $10 Million dollars annually	over $30 Million dollars	Reduce by 15%
Drilling	$15-20 Million per well	over $150 Million dollars	Reduce by 20-50%
Labour	respondants not willing/unable to provide	respondants not willing/unable to provide	Reduce by up to 50%
Occupational Health and Safety	respondants not willing/unable to provide	respondants not willing/unable to provide	Reduce by 50%
Insurance	respondants not willing/unable to provide	respondants not willing/unable to provide	Reduce incrementally
Total cost of exploration	respondants not willing/unable to provide	$3.5- 150 Million dollars	Reduce by 10-30%

Note: The entries contained in the table are collected from all firms and represent the range of individual firm estimates of costs and potential savings

In Section 5, we have used this information to estimate the exploration cost savings these organizations might realize, as a function of having all-weather road access to the Mackenzie Valley region.

REDUCTION OF PRODUCTION EXPENDITURES

The focus of this project was on the benefits of an AWR on the exploration programs for industry. Based on the similarities of location, equipment used and operations, it can be assumed that there will be similar economic savings associated with the future development, production, operation and maintenance phases of resource development. As the resource fields are defined by initial exploratory drilling there will be a significant increase in the amount of wells required to maintain the volume of gas. This recovery stage often requires a number of infill wells that will improve production from the same pool which allows the oil or gas to travel a shorter distance to reach a wellbore. Our assumptions are that the subsequent phases of the drilling programs will receive the same cost benefit as earlier phases of development. One of our interview respondents noted,

- *"An all-weather road would dramatically lower development costs."*

As there is limited historical data in the region to estimate the cost savings during the development, production and abandonment phases we have conservatively estimated the benefits will remain constant and consistent with those anticipated during the exploration phase.

EXTENSION OF THE DRILLING SEASON

The most commonly cited impact that could be derived from all-weather road access to the Mackenzie Valley region is the extension of the drilling season. With all-weather road access and less reliance on winter and ice-road construction, drilling can occur earlier in the season and may extend further given that access is not fully dependent on ice road conditions as the weather warms.

Primary ice-road construction generally begins in the Mackenzie Valley on or around December 15, which facilitates the transport of materials beginning January 1. Appendix D illustrates the historical timing of ice road openings in the Mackenzie Valley region. Respondents' estimation of the length of the drilling season extension varied from four to eight weeks, depending on their location within the region and the distance of their holdings from any proposed all-weather roadway. Respondents noted that an all-weather road would allow the transport of many materials to the region whenever required, but that they would still have to bear the cost premiums associated with building ice bridges and spur lines to their holdings. Nevertheless, it was clearly indicated that substantial cost savings would come from having all-weather road access to the region itself.

A selection of respondent comments with respect to the longer drilling season includes:

- *"An all-weather road would save 4 to 6 weeks of winter road construction … and add about two months to the working season."*
- *"The whole season would change dramatically."*
- *"An all-weather road would extend work by 30 to 60 days, making more things [i.e., exploration] more economical."*
- *"An all-weather road would easily lead to a month, almost two months extra work."*
- *"Currently, our biggest risk is driven by the short seasonal window in the winter time. We have not quantified the costs to our organization but development of the road would greatly reduce our risks by providing more options to demobilize in the spring. A developed road would give us the option to take a rig out after April 1 if required rather than being trapped over the summer and autumn seasons."*
- *"An all-weather road [would allow us] to start the drilling season earlier … for an additional 60 to 90 days of drilling."*

In addition, a longer season could require less "over-designing", engineering for redundancy or for managing risk. One respondent noted that the longer season provided by an all-weather road might allow their company to use more expensive, more efficient equipment due to the improved access to the region and lower risk of stranding the equipment through the winter months. With all-weather, year-round access, significant advantages were also seen for several organization's safety and emergency response provisions.

In summary, the majority of respondents agreed that all-weather road access to the region would substantially reduce the cost premium associated with reliable and consistent access. They also noted that there are two primary precedent conditions impacting their interest and willingness to further exploration and production in the Mackenzie Valley.

The first condition relates to the cost premiums associated with operating in the North, relative to other national and international locations. Weather, seasonal and environmental issues place enormous operating constraints, and subsequent cost premiums on exploration companies. These constraints include but are not limited to:

- Equipment design, engineering and manufacturing specifically for the conditions of the North,
- Availability of equipment due to limited transportation facilities and capabilities,
- Delivery of equipment and manpower to the exploration site due to limited capabilities, and

- Shortened exploration season due to accessibility.

The second condition is the undetermined timeframe related to the development and construction of production delivery infrastructure such as the Mackenzie Valley Pipeline. For many respondents, all-weather road access improves the scenario for exploration programs, however does not address the need to move product to market and their subsequent ability to transform investment into return.

- *"An all-weather road is more important for exploration in the North now than will be in 10 years, because there will be a number of facilities up and running. There will be less motivation to build the road post-pipeline."*

Our assumption in estimating the potential future cost savings to oil and gas organizations operating in the Mackenzie Valley region with an all-weather road present is that the issue of a lack of delivery infrastructure has been resolved, thereby providing the stimulus necessary for these organizations to renew their exploration activities AND to transform their exploratory holdings into production holdings.

5. ESTIMATING FINANCIAL IMPACTS & BENEFITS

Based on the findings received from our respondents and on our observations developed after reviewing secondary research undertaken during the project, the project team has estimated the financial impacts that a lack of all-weather road access has had on the Mackenzie Valley Region up to this time, and to estimate the financial impacts of same on future exploration and production.

This estimate is based on the hypothesis that organizations exploring in the Mackenzie Valley region have paid a cost premium to date that can be attributed to the lack of an all-weather road and that in the future these same cost premiums will be present. In addition, the lack of an all-weather road has resulted in a less than optimal drilling season in the region and there have been, and will continue to be employment opportunities lost as a result. Finally, the lack of an all-weather road will retard the rate of future development in the region, thereby sub-optimizing the rate at which investments made in the region will generate a return to both private and public entities.

5.1 EXPLORATION WELL DRILLING COST PREMIUM

In general, the majority of costs of an exploration program are accounted for by the drilling of exploratory wells. A number of factors characterize and impact well costs:

- When particularly difficult weather or other extreme or adverse environmental conditions are present, costs are significantly higher. Waiting for the safe construction of, and travelling on an ice road can be considered adverse conditions.
- The hire of the drilling rig alone can represent between 20% and 35% of the total drilling costs. The daily cost depends on the size of rig, which in turn depends on the depth of the well. Costs will of course also depend on the current availability of drilling rigs on the market. Rigs used in the North must be particulalry robust, to withstand the extreme environmental and operating conditions.
- The cost of hiring a rig in the NWT varies between $20,000 and $30,000 per day for onshore equipment. Costs of mobilizing and demobilizing the dripping equipment can vary between $500,000 and $1,500,000. These costs therefore weigh heavily in the case of drilling program of short duration. Actual costs will be dependant on the initial location of the drilling rig, the other equipment and materials required and the final destination of the exploration lease.
- The main well cost driver is days-to-complete. Drilling duration is difficult to predict due to geological uncertainties regarding the properties of the rock, the interstitial pressures of the formation fluids, the depths, etc. Difficulties and unanticipated setbacks such as mud loss, jamming of the drill bit, etc. can cause delays of several days. In the Northwest Territories, these delays can be compounded by the delay for transporting needed parts or equipment that was not part of the initial mobilization.

On average, respondents estimated that the presence of an all-weather road in the region could result in a reduction of the current cost premium of up to 15 - 20% per unit well for a given exploration program. Unfortunately, none of companies interviewed had specifically estimated costs or potential cost premium reductions assuming the presence of all-weather road access to the region.

Using an estimated total per unit well cost reduction of 15%, the allocation of this cost reduction by activity was done on the basis of five categories of costs, with estimated cost premium reductions by category as noted:

- **Petroleum Services** – Includes mud, cement, casing, tubing, drilling supervision, insurance, equipment rental, mud logging etc. On average this represent 35% of the total cost of a unit well drilled. We estimate that with all-weather road access, there will be a nominal reduction in cost premiums related to improved ease of transportation of materials and labour - 1-2% overal cost saving per well assumed. (See Exhibit 5.1)
- **Consumables** — includes wellhead, piping, drilling bits, mud and cement products, accessories, energy, and water, etc. on average representing 30% of the cost of a unit well drilled. We estimate that with all-weather road access, there will be a minimal reduction in cost premiums related to improved ease of transportation of these materials - 1% overal cost saving per well assumed. (See Exhibit 5.1)
- **Logistics** -- Includes non-rig trucking, share of ice road construction, aircraft services, civil engineering, planning, etc. On average, logistics represent 15% of the cost of a unit well drilled, however, these costs fluctuate substantially in the NWT due to site location. This is the main area where we estimate reductions in cost premiums – we estimate 6% overall cost saving per well. (See Exhibit 5.1)
- **Management and Supervision** — Includes studies and project management, preparation of site, and supervisory arrangements, geology and reservoir monitoring, etc. On average, management and supervision represent approximately 5% of the cost of a unit well drilled. We estimate there will be a nominal reduction in cost premiums related to improved ease of transportation of labour - 1% overal cost saving per well assumed. (See Exhibit 5.1)
- **Hiring of Drilling Rig** - Includes hiring of drilling rigs and crews, drilling contract fees and administration, mobilization and demobilization.etc. Rig costs are estimated to represent 15% of the cost of a unit well drilled. Rig moves, standby charges are costly and highly dependent on the type and quality of driving surface - we estimate 5% overall cost savings per well in this category. (See Exhibit 5.1)

Based on respondent feedback and an analysis of the drilling program costs incurred over the past 10 years, we have assumed an average cost to drill an exploration well in the Mackenzie Valley of $15M. This baseline cost represents the midpoint of our respondent's estimates of their typical well

costs and other industry averages and estimates. Given these assumptions and key inputs, it is estimated that the cost premium paid on exploration wells in the Mackenzie Valley, due to the lack of all-weather road access to the region has been in the order of $2.25M per well drilled (Exhibit 5-1):

EXHIBIT 5-1: Cost Savings from All-weather Road – Exploration Well Drilling (15% Savings)[13]

	Average Current Cost/well		Cost/well with AWR	
Drilling Component	**% of Drilling cost**	**Cost**	**% of Drilling Cost**	**Cost**
Petroleum Services	35%	5,250,000.00	39%	4,950,000.00
Consumables	30%	4,500,000.00	34%	4,350,000.00
Logistics	15%	2,250,000.00	11%	1,350,000.00
Management and Supervision	5%	750,000.00	5%	600,000.00
Hire of drilling rig	15%	2,250,000.00	12%	1,500,000.00
Total	**100%**	**15,000,000.00**	**100%**	**12,750,000.00**

5.2 PRODUCTION WELL DRILLING COST PREMIUM

In general, the process and categories of costs associated with drilling a production well are consistent with drilling and exploration well. That being said, given that exploration wells are typically much further apart (in essence, they establish the "edges" of the production area) than production wells and that there are some economies of scale when transporting petroleum service products and consumables to a holding that is "in production", it can be presumed that the cost premium per well for a production well may be somewhat less than that of an exploration well. However, many E&P companies are implementing an exploration and production "factory approach" which may increase efficiencies further. As production of resources in the Mackenzie Valley has not yet started no historical information exists to assess the impact of an AWR on the ongoing operation, maintenance and decommissioning of the wells in the region. Our assumption relative to production wells is that the cost premium due to the lack of all-weather road access remains at 15% per well drilled.

5.3 FORECAST WELL REQUIREMENTS

Estimates of the number of exploration and production wells required in the Mackenzie Valley to achieve certain specific production levels vary quite dramatically, as noted in Exhibit 5-2 below.

EXHIBIT 5-2: Estimated Exploration and Production Levels (Mackenzie Gas Pipeline, Joint Review Panel)[14]

Quantitative Summary of Scenarios
2009 – 2053/59

	0.8 BCFD	1.2 BCFD	1.8 BCFD	*1.8 BCFD (MGP)*	2.5-3.0 BCFD	4.0 BCFD
Total Sales Gas (BCF)	12,812.9 (Calculated)	16,694.9 (GLJ)	22,810.0 (Sproule)	***16,803.1 (GLJ)***	35,579.0 (Sproule)	67,984.1 (Sproule)
Number of Discovered Fields	44 (Sproule)	44 (Sproule)	44 (Sproule)	***31 (GLJ)***	44 (Sproule)	44 (Sproule)
Expected Number of New Producing Fields	51	111	192	***51***	348	1,060
Expected Number of Exploration Wells Required to Find Resource	373	811	1,198	***308***	2,177	6,854
Total Linear Km of New Seismic	93,088	201,472	348,630	***Approx. 25,094***	633,884	1,278,273
Total Linear Km of New Winter Road	3,187	4,421	5,147	***n/a***	6,727	23,962
Total Linear Km of New Pipelines	1,926	2,620	3,656	***2,590***	4,647	12,843

In order to estimate the overall number of wells required, we reviewed the estimates of activity submitted to the Joint Review Panel for the Mackenzie Gas Pipeline and took the average of the estimated wells required for 0.8 BCFD and 1.2 BCFD, including the MGP's estimate. Consequently, for the purposes of our analysis, we have assumed that 500 new wells will be required, and that these 500 wells will be drilled as soon as practical to do so.

5.4 EMPLOYMENT IMPACTS

Specific estimates of incremental job creation or employment extension associated with an all-weather road were not provided by respondents, although several comments were made related to this theme (See Section 4). Our approach to estimating employment impact associated with the presence of an all-weather road in the region was to determine the labor component of a unit well drilled, multiply this by an estimate of the extension of the drilling season and further multiply this value by the incremental number of estimated future wells drilled in the region. With all-weather road access, the drilling season is estimated to be extended from an average of 90 days to 129 days, an increase of 39 days or 43% (Exhibit 5-3):

EXHIBIT 5-3: Estimated Impact to the Duration of the Drilling Season

Average Schedule: Current Drilling Season*	November	December	January	February	March	April
	Possible Ice Road Construction	Ice Road Construction	31 days	28 days	31 days	n/a
Average Days of Vehicle Access	90					
*Data based on historical averages contained in Appendix						
Potential Drilling Season with All-weather Road**	November 24-Decmber 7	December	January	February	March	April
	Ice road consturction on spur lines	24 days	31 days	28 days	31 days	15 days
Average Days of Vehicle Access	129					
** Assumptions based on interview report estimates, and are dependent upon the distance of resources from the AWR						

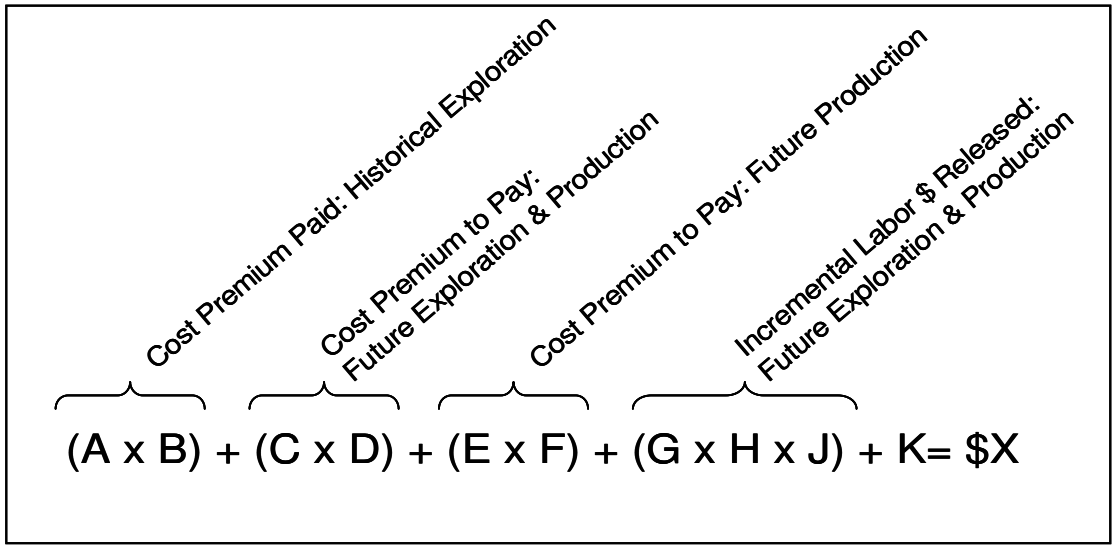
Over the current 90 day drilling season and assuming 40 days per well drilled, 1 rig can drill 2.25 wells. During this period, the average number of labor hours required is estimated at 27,000, assuming a 25 man crew and a steady state operation. This approximate $1M in labor cost represents approximately 7% of the drilling cost per well. With a seasonal extension of 43% possible due to all-weather road access into the region, 1 rig would now be capable of drilling 3.2 wells, the estimated labor hours required is 38,700 and the associated labor cost is approx. $1.45M.

The extension of the drilling season by 43% allows for 500 wells to be drilled in a period where only 350 could have previously been drilled (assuming the productivity per drill rig remains constant), an incremental increase of 150 wells over the same time period. Extrapolating these labor hours and cost figures over these 150 incremental wells drilled suggests that the availability of an all-weather road in the region could result in the release of $70.2M in incremental compensation over the drilling period, or the equivalent of approximately 1000 new or extended jobs.

The employment impact estimates are limited solely to oil and gas exploration firms and the unit well drilled concept. Drilling rig operations are assumed to be 2 shift, 24-hour operations. No adjustments are made for downtime. It can be presumed that drilling season extension due to the presence of all-weather road access in the region may well have other indirect employment benefits.

In summary, we have estimated the past and future financial impact of an all-weather road in the region as per Exhibit 5-4 below:

EXHIBIT 5-4: Estimating Financial Impact



A = Cost premium per well drilled in region last 10 years – no AWR in place
B = # of exploration wells drilled in period
C = Cost premium per well drilled in region next 20 years – no AWR in place
D = # of exploration and production wells drilled in period
E = O&M cost premium per production well in region next 20 years – no AWR in place
F = # of production wells drilled in period
G = incremental labor hours available per rig due to extension of season
H = average labor cost per hour
J = incremental # of wells that can be drilled due to extension of season – AWR in place
K = Time value of future production taxes and royalties

Working through the equations we estimate the benefit to be approximately:

($2.25M x 48) + ($2.25M x 500) + (E x 500) + (11,700 x $40 x 150) + K = $1.3B

The value of the cost premium associated with operations and maintenance (O&M) on production wells (E x 500) has not been included in the overall savings calculation. However, it is a valid component of the overall cost savings and can be assumed to be a positive increment to the estimate cost savings.

A significant incremental benefit associated with the presence of an all-weather road in the Mackenzie Valley region would be the release of (K) direct government revenues (production royalties, taxes, etc.) at a rate faster than could be anticipated without this access. This faster rate of release can be attributed to (a) the extension of the drilling season and the associated number of additional production wells that could be completed in a given period of time and (b) to the fact that

the reduction in the cost premium per well drilled would act to stimulate further exploration and resource production at a rate faster than if the cost premium stayed constant.

These direct government revenues were also estimated (see Appendix E for details). Exhibit 5.5 illustrates the impact of this increased rate or release of direct government revenues:

EXHIBIT 5-5: Estimated Annual Accumulation of Direct Government Revenue

Annual Accumulation of Direct Government Revenues ($millions)

		(FV of $588/y in year_)
AWR*	Year 1	588
	Year 5	3250
	Year 10	7399
	Year 15	12693
	Year 17	15200
	Year 20	17596
	Year 25	22458

		(FV of $400/y in year_)
No AWR*	Year 1	400
	Year 5	2210
	Year 10	5031
	Year 15	8631
	Year 17	10336
	Year 20	13226
	Year 25	19091

Year 25- AWR	22458
Year 25- No AWR	19091
Difference in future value of direct government revenues	**3367**

Present Value @5%	**994**

*Assumptions

Direct government revenues estimated of 10 Billion over 25 years
Assumes straight line revenues
Renvested yearly at 5%

The estimated rate of increase in the release of the economic benefit is approximately 43%, relative to the current situation where an all-weather road is not present in the region. With an all-weather road present, the economic benefit associated with the drilling and subsequent production from 500 wells expected over a 25 year period would accrue in approximately 17.5 years.

The impact of this permanent increase in the rate of release of economic benefit due to the presence of an all-weather road in the region yields a potential additional gain of $3.4 Billion to government at the end of 25 years. This net gain has the present value equivalent of approximately $1 Billion at 5% annual growth.

5.5 OTHER INCREMENTAL BENEFITS

Many of our respondents commented that the uncertainty risk related to mobility of equipment as a significant built-in cost premium for conducting work in the region. This was due to the high stand-by cost, rental cost and capital expense for many pieces of equipment that are used such as seismic equipment and drilling rigs. Maximum utilization of this equipment is imperative as they are expensive to acquire and to lease. An all-weather road and the associated 365 day access through the region was noted as a key mitigator of this risk, allowing for greater equipment mobility and a decreased chance of having equipment over the summer months.

Finally, it is recognized that enhanced access would create a host of both direct and indirect benefits to the region, including decreased prices for material goods; lower transportation costs for local residents and substantial other socio-economic benefits resulting from better integration and mobility of people and goods to other parts of Canada and the rest of the world.

5.6 BRITISH COLUMBIA'S SIERRA-YOYO-DESAN ROAD

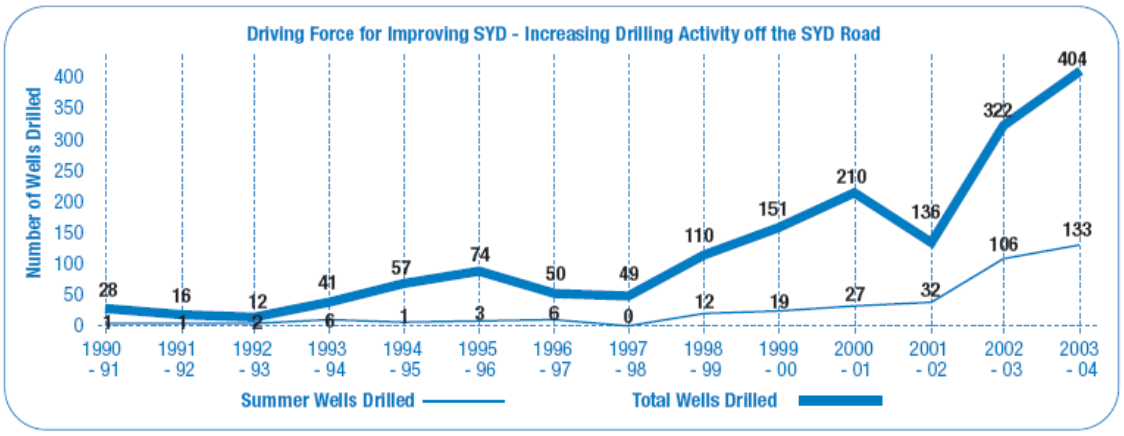
The establishment of an all-weather road in the Mackenzie Valley region is required in order to meaningfully reduce the cost premium being paid by organizations involved in the development of the natural resource base of the region. As has been estimated, over $1.3B in cost savings could be released over the next 20 years as the industry installs the necessary production infrastructure to deliver the natural resources to global markets. Several assumptions have been made in developing this cost savings estimate, one of the most basic being that if the access to the region was improved by means of an all-weather road, investment in the region would occur at a rate faster than if the road was not present, and this investment would be beneficial to both the investors and the people of the region and of Canada. The recent construction of the Sierra – Yoyo-Desan (SYD) road in British Columbia is an example where this assumption has been proven true.

The SYD road in British Columbia may be used as an example of the increased activity that may come because of improved infrastructure. The SYD road was constructed and improved as an industry road only as there are only a few full-time residents in the area. SYD runs 173 kilometers from Fort Nelson, British Columbia eastward to the South Helmet Airstrip in Northeastern British Columbia, and provides necessary infrastructure for oil and gas companies to transport goods for industrial activities.

Prior to the improvements to the road, access to the region was difficult. Between 1993 and 1997, only about 50 wells per year were drilled (largely in winter) due to environmental conditions very similar to the Mackenzie Valley region. It has been estimated that the Province lost up to $25M per year in royalty revenues because of the difficulty in accessing the region. Cost premiums associated with this access challenge were high and they were perceived to retard investment in the region.

Measuring the impact of the road on the E&P industry in Northeast British Columbia in 2004 can be carried out in part by examining the historical drilling activities in the region. The number of wells has increased since the development of the road, as illustrated in the Exhibit 5-6.

EXHIBIT 5-6: Exploration Activity after the Sierra-Yoyo-Desan Road[15]



This increase in the number of wells drilled in the region has led to a sustained increase in annual oil and gas royalties paid to the BC provincial government of $50-60 million dollars per year. The addition of technological improvements in rig mat technology has allowed a greater number of wells to be drilled in the summer months, an example of a situation where the impact of technological improvements is enhanced due to the presence of infrastructure fundamental to industry sustainability.

The establishment of a public-private partnership (P3) for infrastructure development and investment has been a successful model throughout Canada and may be considered a potential model for the development of the Mackenzie Valley all-weather road. The creation of the SYD road in 2004 was made possible through an agreement between the BC Ministry of Energy, Mines and Petroleum Resources and Ledcor Projects Incorporated. The positive and beneficial impact of the

SYD in BC does provide a valuable and proven operating model for such a project in the Northwest Territories.

APPENDICES

APPENDIX A – PROJECT BACKGROUND

PROJECT BACKGROUND

Mackenzie Aboriginal Corporation (MAC), an Aboriginal-owned company, was formed to provide unique construction solutions to major projects in the North. The ownership group is comprised of the Gwich'in Development Corporation, the Denendeh Development Corporation, Flint Energy Services Ltd., Kiewit Corporation, Ledcor Group, Midwest Management Ltd., and North American Construction Group. MAC engaged Meyers Norris Penny (MNP) to provide an independent assessment of the opportunities that may be lost given the lack of an all-weather road in the Mackenzie Valley Region.

PROJECT OBJECTIVES

Evaluating the potential socio-economic impacts of transportation infrastructure can require a comprehensive analysis of the particular benefits and costs that could be generated with a specific all-season road and related infrastructure. This study comprises a first phase in the analysis and is primarily exploratory. This study's specific objectives are to:

- Assess the opportunity costs that a of lack of all-season access to the Mackenzie Valley Region has had on regional natural resource development, and to
- Estimate development opportunities which could result from potential access to remote exploration and production sites in the Mackenzie Valley Region.

The purpose of this study is not to summarize previously conducted research. Rather, we have engaged with regional industry stakeholders to assess current and future investment in the Mackenzie Valley Region and its relationship to the all-weather road. Existing research is referenced in the Appendices for further background information on current issues within the area.

PROJECT APPROACH

FOCUS ON EXPLORATION AND PRODUCTION FIRMS

Achieving successful implementation of any proposed infrastructure project would require stakeholder consultation with economic development agencies, First Nation Governments and communities, the Government of the Northwest Territories, the Government of Canada and others. Given the specific objectives of this project, the focus of this analysis was to consult with senior decision-makers within the exploration and production firms that currently have interests in the Mackenzie Valley. These firms were selected as the most representative parties with knowledge of the potential investment and development opportunities within the region.

CONSULTATION AND DATA COLLECTION

Consultation formed a key part of this analysis. Our approach was based upon a systematic process and included the collection of perspectives on the development issues and prospects within the Mackenzie Valley and application of reasonableness testing of all information collected. Senior executives and their representatives with detailed knowledge of their respective organization's exploration and production investment decision-making were interviewed for this analysis. The interview protocol and other data collection materials are provided in Appendix A. The project analysis process involved:

- Finalizing the analytical approach with the MAC project lead,
- Reviewing relevant MAC organizational documents,
- Conducting a literature review of Mackenzie Valley development issues,
- Consulting with exploration and production firms through surveys and personal interviews,
- Synthesizing results and findings of the analysis, and
- Presenting the final report.

In an effort to attain an accurate picture of the exploration and development decisions made within the region, MNP contacted current license holders. Our final interview participants collectively hold licenses for 2,327,764 hectares of land within the region.

PROJECT LIMITATIONS AND QUALIFICATIONS

While this study specifically addresses the impact of all-weather road infrastructure development within the Northwest Territories, many interviewees and stakeholders repeatedly spoke of the

Mackenzie Gas Project, the development of the pipeline and potential socio-economic impacts to the Region. However, the scope of this project is strictly limited to exploring the potential impacts from the construction of an all-weather road.

CONFIDENTIALITY AND NOTATION

Given the sensitivity of this project and the competitive nature of much of the discussion surrounding investment criteria, cost structures and investment priorities, MNP conducted the interviews with agreed-to terms for confidentiality. Extensive stakeholder interviews were carried out as a key part of MNP's project approach. Where possible, verbatim participant comments are provided, placed within quotation marks and italicized. Comments placed within [brackets] are the interviewer's completion of participant references to other points in conversation. Comments are cited without direct attribution to individuals to preserve the confidentiality of participating organizations. MNP maintained participant confidentiality throughout this engagement as dictated by the Confidentiality Agreement attached in Appendix B.

CONSULTATION WITH E&P FIRMS

Consultation is a key component of this analysis. Its main purpose is to collection information, comments and insights from representatives from exploration and production firms that are directly or indirectly involved in evaluating exploration and production opportunities within the Mackenzie Valley. The consultation includes both the design and review of the interview protocols with MAC, and conducting the interviews with the identified parties. The purpose of this chapter is to highlight the results of the consultation.

INTERVIEW RESPONDENTS

Exploration and production firms considered for desired participation in this study were identified from total oil and gas dispositions in hectares held in the Central Region of the Mackenzie Valley as well by identifying other oil and gas and mineral exploration and production firms operating in the Northwest Territories. These organizations were then pre-screened to determine whether they maintained assets or operations within the Mackenzie Valley. The target group of participants in the study were at the senior executive level. Participation was obtained from company presidents to senior management with experience in the NWT. Twenty organizations were approached from June to September 2007 representing all of the exploration lease holdings within the Mackenzie Valley for participation in the study. , MNP completed interviews with firms with holdings of

2,327,764 hectares or 49% percent of the total area licensed for exploration or development. Several mineral companies were also included in the participant list and provided feedback mainly on logistic costs to their respective exploration programs.

REGULATORY PROCESS A SIGNIFICANT CONCERN

While the focus of this study is the assessment of perceived impacts of the lack of all-weather road access in the Mackenzie Valley on resource industry development, often stakeholder comments strayed to observations or experiences regarding the Mackenzie Valley Pipeline regulatory process. Of particular concern was the duration of the process to date and the anticipated completion date for the pipeline and related infrastructure if the application is successful. Many participants indicated that the regulatory process is one of, if not the most, significant obstacles for consideration when evaluating a prospective undertaking in the region. The speed at which an organization can pursue appropriate approvals affects both the cost of successfully achieving the objectives of a project as well as the estimation of the returns from exploration or development projects. Both of these factors contribute to the overall assessment of an opportunity in the region. A selection of participant comments with respect to the regulatory process includes:

- *"A pipeline to Norman Wells will be the single biggest issue."*
- *"We need to discover more oil and gas before we can consider more development. Uncertainty over the Mackenzie Gas Pipeline also is a huge factor in limiting development in the region."*

APPENDIX B: DATA COLLECTION MATERIALS

Participant Letter

RE: Mackenzie Valley Infrastructure Study – Interview Request

Further to our conversation regarding the Mackenzie Valley Infrastructure Study, we would like to outline our approach and commitment to confidentiality and aggregation of data collected.

> Meyers Norris Penny LLP (MNP) has been engaged by Mackenzie Aboriginal Corporation (MAC) to determine the economic impact of not having an all-weather road and fibre-optic cable between Wrigley and Tuktoyuktuk. Impacts may include jobs not being created and capital investment that is not occurring. This study is being carried out to determine what additional regional development may result from additional and appropriate infrastructure investment of an all-weather road and fibre optic cable between Wrigley and Tuktoyuktuk, Northwest Territories.

In July 2007, the MNP team will be in Calgary and Edmonton to conduct a series of interviews with key industry decision-makers able to provide informed opinion on potential development scenarios

in this region. We would appreciate the opportunity to meet with you to discuss the current and potential future needs of your company, which could be supported by the development of such infrastructure.

MNP will be using these interviews as one means of gathering information on the potential development opportunities that might be created as a result of road and access infrastructure to the region. The interviews are anticipated to last between 60 and 120 minutes. Once our interviews and analysis are completed, MNP will be submitting our opinion to MAC and all participants in order to build a case for federal government investment in the region.

> Due to the nature of this data, we will provide confidentiality agreements to ensure the protection of privacy. All data collected will be aggregated; companies will not be identified through their investments or potential future opportunities. We have attached this confidentiality agreement for your information and preparation.

Based on the data collected and aggregated, the conclusion could result in infrastructure investment being promoted to the federal government, expanding infrastructure in the Northwest Territories, and the ability for many companies to release or expand operations or investments in the region.

> We greatly appreciate your participation. If you believe materials may be of assistance in understanding your organization's perspectives on potential investment in the region, please forward them to Clayton.Norris@mnp.ca in advance, or bring copies to our meeting. Additionally, please feel free to invite any additional representatives from your company that would be of benefit.

Should you have any questions about this project, the interview process or the attached confidentiality agreement, please contact any of the team members:

Clayton Norris
Director, MNP Aboriginal Services
(403) 537-7606
clayton.norris@mnp.ca

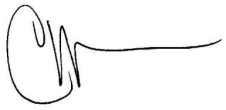
Robert Baldauf
MNP Engagement Partner
(403) 537-7604
robert.baldauf@mnp.ca

Andrea Mondor
MNP Project Manager
(780) 451-4406
andrea.mondor@mnp.ca

We are endeavoring to schedule all participant interviews as soon as possible in recognition of approaching summer vacation schedules. A member of our project team will contact you to formally schedule your interview.

We thank you for your participation and look forward to the opportunity to meet with you.

Sincerely,
MEYERS NORRIS PENNY LLP



Clayton Norris, MBA, CAFM, Director, MNP Aboriginal Services Practice

CONFIDENTIALITY AGREEMENT

This agreement is made between Meyers Norris Penny LLP and [company] regarding the information shared during interviews while completing a study on behalf of Mackenzie Aboriginal Corporation. Meyers Norris Penny LLP and [company] may be referred to as "Party" or collectively "Parties".

The Parties will or already have had discussions and exchanged information. The Parties agree as follows:

"CONFIDENTIAL INFORMATION" is defined as any information that is disclosed in connection with the discussions and is furnished by a Party to the other Party in one or more of the following forms:

a. Written information, including reports, assessments, drawings, documents, financial statements and projections, product and product cycle plans and any other written information or data, or any information provided in electronic form
b. Information, including presentations, which is provided orally by a Party

NON DISCLOSURE

The receiving Party shall maintain the confidentiality of Confidential Information and will limit its disclosure of such to its directors, employees, agents, advisors or subsidiaries as have a need to know such Confidential Information in order to achieve the objectives of the discussions. The receiving Party shall be responsible for the compliance by such directors, employees, agents, advisors or subsidiaries with the provisions of this Agreement.

OWNERSHIP OF CONFIDENTIAL INFORMATION

Confidential information shall remain the exclusive property of the disclosing Party. The receiving Party agrees that Confidential Information disclosed hereunder is being received subject to the disclosing Party's ownership rights in such Confidential Information, and, further, subject to all relevant intellectual and/or proprietary property rights of the disclosing Party, including relevant laws governing patents, trademarks, copyrights, semiconductor chip protection, trade secrets and unfair competition.

EXCEPTIONS TO CONFIDENTIALITY OBLIGATIONS.

The confidentiality and limited use obligations of this Agreement will not apply to information received pursuant to this Agreement, which:

- Is or becomes publicly known other than through a breach of this Agreement by the receiving Party; or
- Is already known to the receiving Party at the time of disclosure as evidenced by the receiving Party's written documentation; or
- Is lawfully received by the receiving Party from a third party without breach of this Agreement or breach of any other agreement between the disclosing Party and such third party; or
- Is independently developed by employees of the receiving Party who have not had access to or received any Confidential Information under this Agreement; or

- Is furnished to a third party by the disclosing Party without restriction on the third party's right to disclose;
- Is authorized in writing by the disclosing Party to be released from the confidentiality obligations herein, or
- Is ordered to be produced by a Court, regulator, body, quasi-judicial or governmental body having appropriate authority to so order.

Specific information shall not be deemed to be within the foregoing exceptions merely because it is included within general information, which is within the exceptions, nor will a combination of features be deemed to be within such exceptions merely because the individual features of the combination are separately included within such exceptions.

The Party relying on any of the foregoing exceptions to the confidentiality obligations herein shall bear the burden of proving the acceptability of the exception.

RETURN OF CERTAIN CONFIDENTIAL INFORMATION
Upon the expiration or termination of the discussions, or upon the earlier request of the disclosing Party, the receiving Party shall, at its own expense, either promptly return to the disclosing Party all originals and copies of the writing and hardware in its possession which contain Confidential Information or by written notice, executed by the receiving Party, certify that such writings or hardware have been destroyed.

USE OF CONFIDENTIAL INFORMATION
Confidential Information will not be copied or used by the receiving Party for any purpose other than in connection with the discussions. With regard to Confidential Information, which is covered by copyrights belonging to the disclosing Party, it is agreed that the disclosing Party reserves all rights therein.

Meyers Norris Penny LLP	[company]
Signed	Signed I have the authority to bind Company
Name	Name
Title	Title
Date	Date

INTERVIEW PROTOCOL

1. Does the lack of all-weather road access to the Mackenzie Valley, specifically the corridor between Wrigley and Tuktoyuktuk, prevent, limit or discourage your organization from pursuing development in this region? If yes, how so?

2. If not, what are the other factors/issues preventing, limiting or discouraging development at this time?

3. What is lacking in this geographic area and preventing development by your organization? What is required? Which route(s)? What supporting infrastructure is required?

4. If these conditions were in place, what is the most likely development scenario? What would be built, when?

5. By order of magnitude, can you estimate the approximate investment (spend) that would be made? Over what period of time?

6. What has been the opportunity cost or additional risk premium for working in the region? How would development in this area affect your risk premium?

7. As a potential user of this road, is there any other information you would like to provide us to help quantify the economic impact of this infrastructure development?

8. Should the names of participating companies be listed in the final report, would you like your company name to be included?

APPENDIX C: MACKENZIE VALLEY

Indian and Northern Affairs Canada | Affaires indiennes et du Nord Canada

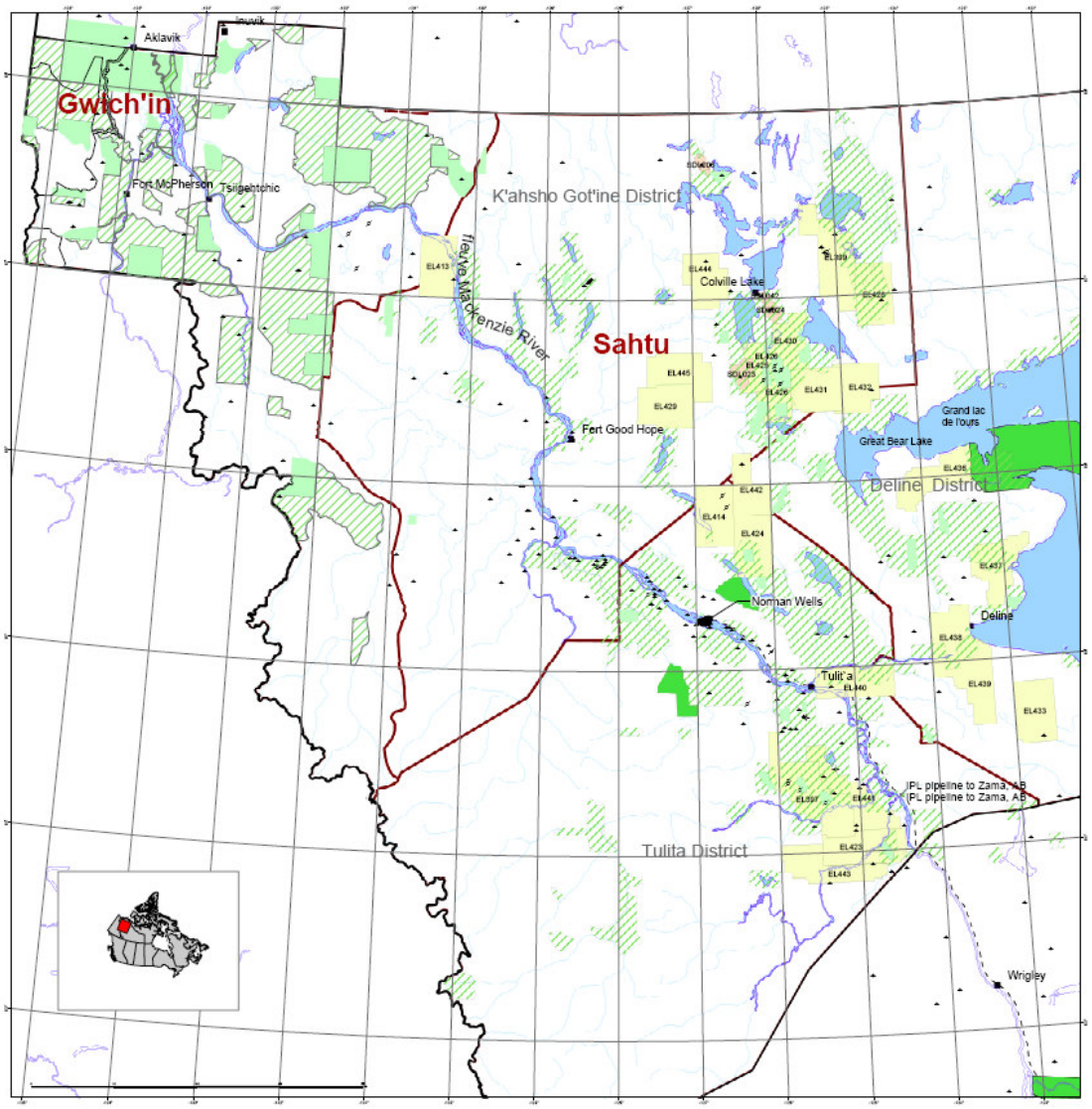
Northern Oil and Gas Directorate | **Direction du pétrole et du gaz Nord**
OIL AND GAS DISPOSITIONS | DISPOSITIONS DE DROITS PÉTROLIERS ET GAZIERS
Mackenzie Valley -- Central Region | Vallée du Mackenzie -- région centrale
August 2007 | Août 2007

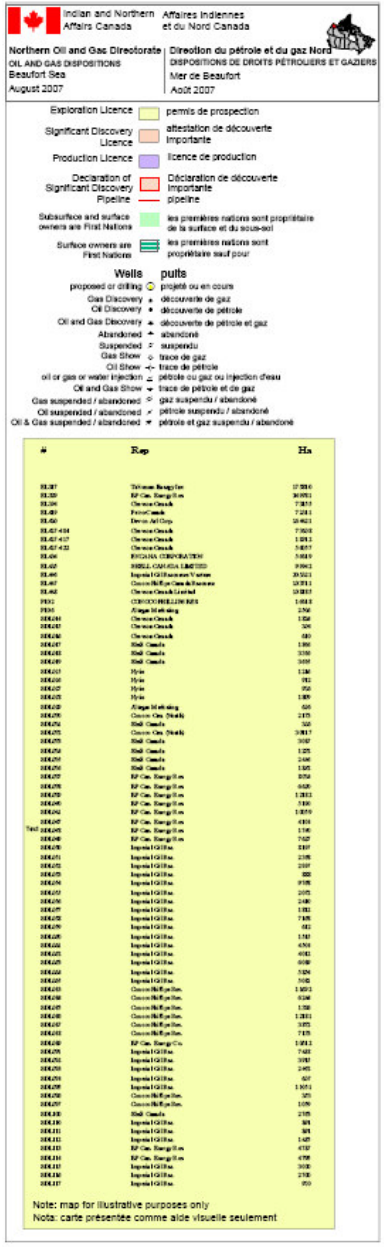
Exploration Licence	permis de prospection
Significant Discovery Licence	attestation de découverte importante
Production Licence	licence de production
Areas subject to specific environmental conditions	zones d'exclusion pour raisons environnementales
Surface owners are First Nations	les Premières Nations sont propriétaires du sous-sol
Subsurface and surface owners are First Nations	les premières nations sont propriétaire de la surface et du sous-sol
Pipeline	pipeline

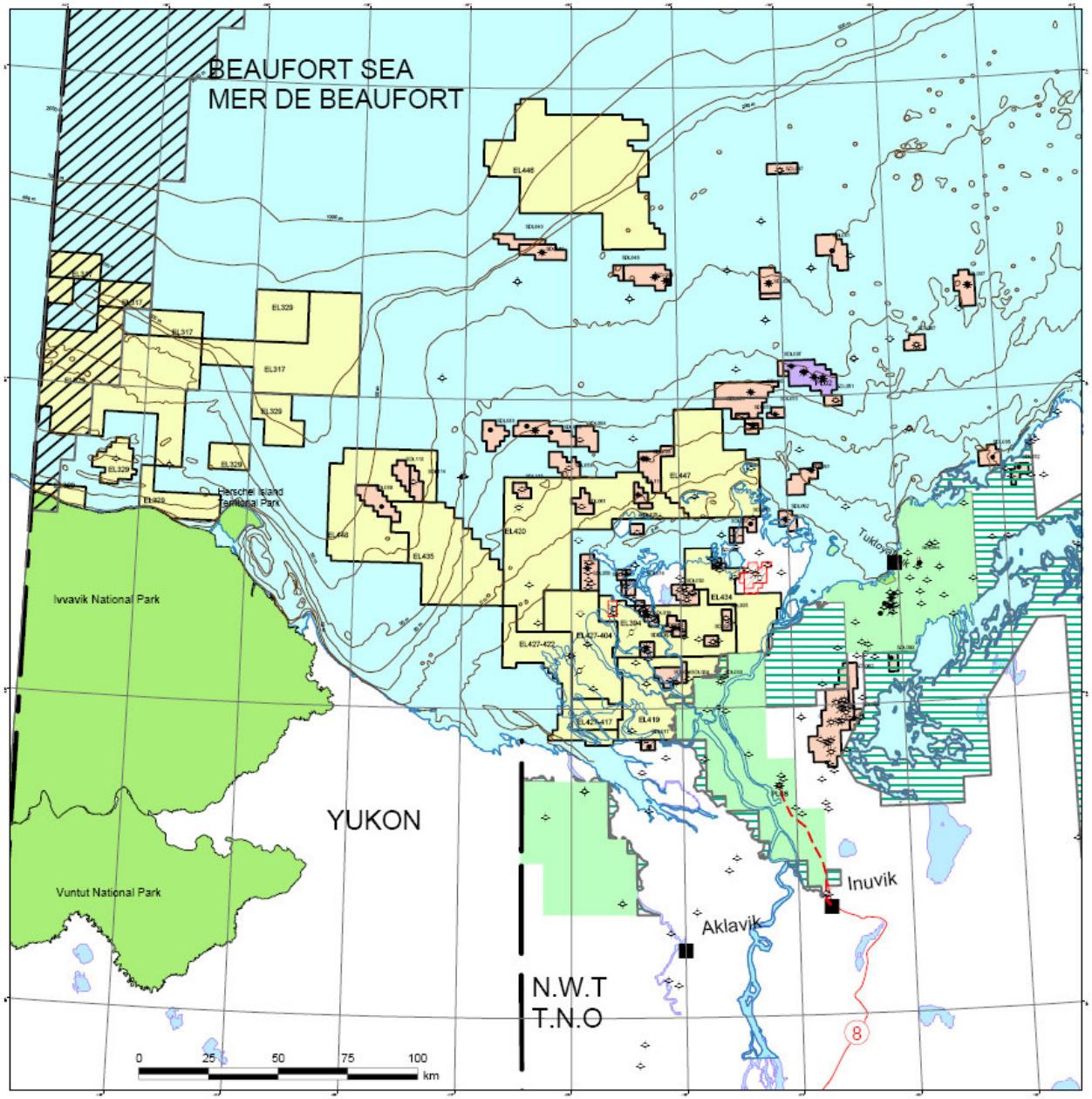
Wells	puits
proposed or drilling	projete ou en cours
Gas Discovery	découverte de gaz
Oil Discovery	découverte de pétrole
Oil and Gas Discovery	découverte de pétrole et gaz
Abandoned	abandoné
Suspended	suspendu
Gas Show	trace de gaz
Oil Show	trace de pétrole
oil or gas or water injection	pétrole ou gaz ou injection d'eau
Oil and Gas Show	trace de pétrole et de gaz
Gas suspended / abandoned	gaz suspendu / abandoné
Oil suspended / abandoned	pétrole suspendu / abandoné
Oil & Gas suspended / abandoned	pétrole et gaz suspendu / abandoné

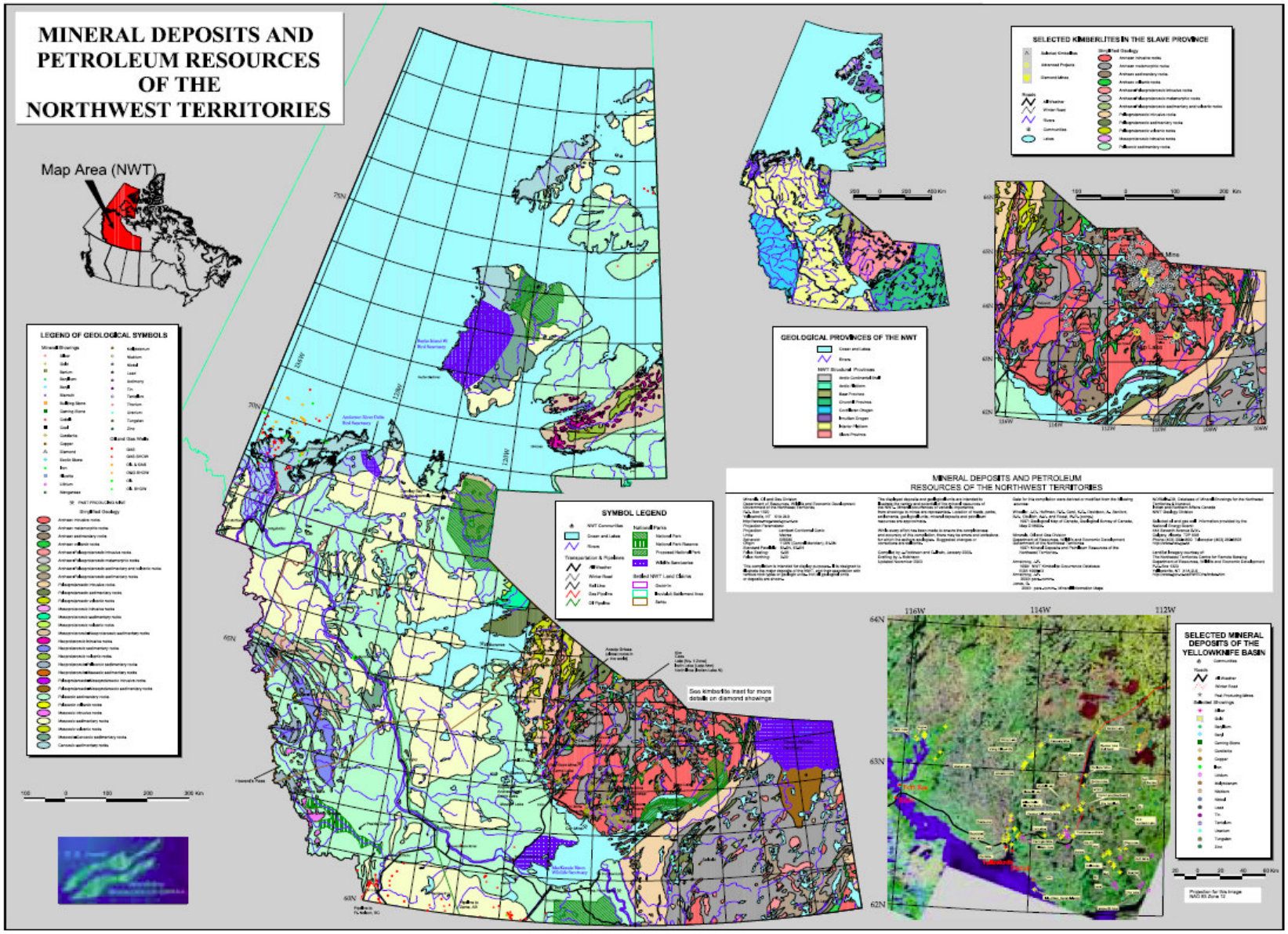
Note: map for illustrative purposes only
Nota: carte présentée comme aide visuelle seulement

#	Rep	Ha
EL397	Husky Oil Operations	134964
EL399	Apache Oil	120496
EL413	Kodiak Energy Inc	60464
EL414	Apache Oil	84880
EL423	Husky Oil Operations	90632
EL424	Paramount	60608
EL425	Petro-Canada	27230
EL426	Paramount	36726
EL428	Apache Oil	61008
EL429	BG Canada Exploration and Prod	62880
EL430	Paramount	51637
EL431	Petro-Canada	78516
EL432	BG Canada Exploration and Prod	64048
EL433	Petro-Canada	68004
EL436	TALISMAN ENERGY INC.	84353
EL437	Talisman Energy Inc	85993
EL438	TALISMAN ENERGY INC.	87183
EL439	Talisman Energy Inc	82820
EL440	Paramount	87872
EL441	HUSKY OIL OPERATIONS LIMITED	88452
EL442	MGM Energy Corp	63312
EL443	Husky Oil Operations Limited	91116
EL444	BG International Limited	74604
EL445	BG International Limited	81292
PAA	IMPERIAL OIL RES.	3603
SDL006	BP Can. Energy Res.	7367
SDL023	Petro-Canada	18267
SDL024	Petro-Canada	11420
SDL042	BP Can. Energy Res.	2024




Indian and Northern Affairs Canada
Affaires Indiennes et du Nord Canada
Northern Oil and Gas Directorate
OIL AND GAS DISPOSITIONS
Beaufort Sea
August 2007
Direction du pétrole et du gaz Nord
DISPOSITIONS DE DROITS PÉTROLIERS ET GAZIERS
Mer de Beaufort
Août 2007
Exploration Licence
permis de prospection
Significant Discovery Licence
attestation de découverte importante
Production Licence
licence de production
Declaration of Significant Discovery
Déclaration de découverte importante
Pipeline
pipeline
Subsurface and surface owners are First Nations
les premières nations sont propriétaire de la surface et du sous-sol
Surface owners are First Nations
les premières nations sont propriétaire seuf pour
Wells
puits
proposed or drilling
projeté ou en cours
Gas Discovery
découverte de gaz
Oil Discovery
découverte de pétrole
Oil and Gas Discovery
découverte de pétrole et gaz
Abandoned
abandonné
Suspended
suspendu
Gas Show
trace de gaz
Oil Show
trace de pétrole
oil or gas or water injection
pétrole ou gaz ou injection d'eau
Oil and Gas Show
trace de pétrole et de gaz
Gas suspended / abandoned
gaz suspendu / abandonné
Oil suspended / abandoned
pétrole suspendu / abandonné
Oil & Gas suspended / abandoned
pétrole et gaz suspendu / abandonné
#
Rep
Ha
Note: map for illustrative purposes only
Nota: carte présentée comme aide visuelle seulement


BEAUFORT SEA
MER DE BEAUFORT
EL446
EL329
EL317
EL447
EL420
EL435
EL434
EL427-404
EL427-422
EL419
EL427-417
Herschel Island Territorial Park
Ivvavik National Park
Vuntut National Park
YUKON
N.W.T
T.N.O
Tuktoyaktuk
Inuvik
Aklavik
8
0
25
50
75
100
km


MINERAL DEPOSITS AND PETROLEUM RESOURCES OF THE NORTHWEST TERRITORIES
Map Area (NWT)
LEGEND OF GEOLOGICAL SYMBOLS
SYMBOL LEGEND
GEOLOGICAL PROVINCES OF THE NWT
SELECTED KIMBERLITES IN THE SLAVE PROVINCE
MINERAL DEPOSITS AND PETROLEUM RESOURCES OF THE NORTHWEST TERRITORIES
SELECTED MINERAL DEPOSITS OF THE YELLOWKNIFE BASIN

APPENDIX D: ICE ROAD HISTORICAL DATA

MACKENZIE DELTA ICE ROADS (Inuvik area)

YEAR	Inuvik to Tuktoyaktuk (187 km)		Junction (km 34) to Aklavik (86 km)	
	Opened	Closed	Opened	Closed
1980 / 1981	Feb 02/81	Apr 25/81	Feb 02/81	Apr 25/81
1981 / 1982	Jan 21/82	Apr 30/82	Jan 20/82	Apr 30/82
1982 / 1983	Dec 23/82	Apr 26/83	Dec 20/82	Apr 26/83
1983 / 1984	Jan 16/84	May 02/84	Dec 22/83	May 02/84
1984 / 1985	Dec 11/84	May 01/85	Dec 24/84	May 04/85
1985 / 1986	Dec 12/85	May 02/86	Dec 12/85	May 02/86
1986 / 1987	Jan 05/87	May 08/87	Jan 05/87	May 07/87
1987 / 1988	Feb 15/88	Apr 19/88	Feb 17/88	Apr 19/88
1988 / 1989	Feb 07/89	May 03/89	Jan 18/89	May 03/89
1989 / 1990	Jan 03/90	May 07/90	Dec 23/89	May 07/90
1990 / 1991	Dec 23/90	Apr 25/91	Dec 21/90	Apr 25/91
1991 / 1992	Dec 05/91	Apr 26/92	Dec 09/91	Apr 27/92
1992 / 1993	Dec 18/92	Apr 30/93	Dec 15/92	May 02/93
1993 / 1994	Jan 05/94	Apr 28/94	Jan 18/94	Apr 28/94
1994 / 1995	Dec 22/94	Apr 24/95	Dec 23/94	Apr 24/95
1995 / 1996	Dec 19/95	Apr 19/96	Dec 19/95	Apr 26/96
1996 / 1997	Dec 20/96	Apr 25/97	Jan 12/97	Apr 25/97
1997 / 1998	Jan 02/98	Apr 15/98	Jan 26/98	Apr 16/98
1998 / 1999	Dec 16/98	Apr 20/99	Dec 14/98	Apr 21/99
1999 / 2000	Dec 14/99	Apr 17/00	Jan 17/00	Apr 17/00
2000 / 2001	Dec 20/00	May 09/01	Jan 24/01	May 08/01
2001 / 2002	Dec 02/01	May 02/02	Dec 31/01	May 02/02
2002 / 2003	Dec 17/02	Apr 26/03	Jan 17/03	Apr 27/03
2003 / 2004	Dec 17/03	Apr 27/04	Dec 23/03	Apr 26/04
2004 / 2005	Dec 07/04	Apr 27/05	Dec 06/04	Apr 25/05
2005 / 2006	Jan 09/06	May 09/06	Jan 13/06	May 08/06
2006 / 2007	Dec 05/06		Dec 06/06	

	Ice Road to TUKTOYAKTUK (Opened)		**Ice Road to AKLAVIK (Opened)**	
	Earliest	Dec 02/01	**Earliest**	Dec 06/04 & 06
	Latest	Feb 15/88	**Latest**	Feb 17/88
	Last 5 Years Avg.	Dec 17	**Last 5 Years Avg.**	Dec 25
	Last 10 Years Avg.	Dec 17	**Last 10 Years Avg.**	26
	Last 15 Years Avg.	Dec 19	**Last 15 Years Avg.**	Jan 01
	Last 20 Years Avg.	Dec 25	**Last 20 Years Avg.**	Jan 02
	Last 25 Years Avg.	Dec 25	**Last 25 Years Avg.**	Dec 31
	Ice Road to TUKTOYAKTUK (Closed)		**Ice Road to AKLAVIK (Closed)**	
	Earliest	Apr 15/98	**Earliest**	Apr 16/98
	Latest	May 09/01 & 06	**Latest**	May 08/01
	Last 5 Years Avg.	Apr 30	**Last 5 Years Avg.**	Apr 30
	Last 10 Years Avg.	Apr 27	**Last 10 Years Avg.**	Apr 26
	Last 15 Years Avg.	Apr 26	**Last 15 Years Avg.**	Apr 27
	Last 20 Years Avg.	Apr 27	**Last 20 Years Avg.**	Apr 28
	Last 25 Years Avg.	Apr 28	**Last 25 Years Avg.**	Apr 28

MACKENZIE VALLEY WINTER ROADS (Wrigley (km 690) to Fort Good Hope (km 1172). Includes Tulita to Deline 105 km and Fort Good Hope to Colville Lake (165 km))

YEAR	Wrigley (km 690) to Tulita (km 938) - 248 km		Tulita (km 938) to Norman Wells (km 1023) - 85 km		Norman Wells (km 1023) to Ft. Good Hope (km 1172) - 149 km		Tulita (km 914) to Deline - 105 km		Fort Good Hope to Colville Lake - 165 km	
	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed	Opened	Closed
1982 / 1983	Jan 27/83	Mar 31/83	Jan 27/83	Mar 31/83			Jan 27/83	Mar 31/83		
1983 / 1984	Jan 13/84	Apr 04/84	Jan 13/84	Apr 04/84			Jan 16/84	Apr 04/84		
1984 / 1985	Jan 15/85	Mar 20/85	Jan 15/85	Mar 20/85			Jan 15/85	Mar 20/85		
1985 / 1986	Jan 25/86	Apr 03/86	Dec 23/85	Apr 03/86			Jan 17/86	Apr 03/86		
1986 / 1987	Jan 13/87	Mar 25/87	Jan 19/87	Mar 26/87			Jan 09/87	Mar 26/87		
1987 / 1988	Jan 11/88	Mar 28/88	Jan 08/88	Apr 05/88			Jan 13/88	Apr 05/88		
1988 / 1989	Jan 16/89	Apr 05/89	Jan 16/89	Apr 10/89	Feb 27/89	Apr 10/89	Jan 27/89	Apr 10/89		
1989 / 1990	Jan 15/90	Mar 30/90	Dec 16/89	Apr 05/90	Jan 15/90	Apr 05/90	Jan 12/90	Apr 04/90		
1990 / 1991	Jan 08/91	Mar 31/91	Jan 08/91	Apr 08/91	Jan 02/91	Apr 08/91	Feb 07/91	Apr 04/91		
1991 / 1992	Dec 20/91	Mar 25/92	Dec 20/91	Apr 04/92	Dec 20/91	Mar 25/92	Jan 24/92	Mar 31/92		
1992 / 1993	Jan 11/93	Mar 26/93	Jan 11/93	Mar 29/93	Jan 14/93	Mar 29/93	Jan 18/93	Mar 29/93		
1993 / 1994	Dec 23/93	Mar 29/94	Dec 29/93	Mar 30/94	Dec 29/93	Mar 31/94	Jan 25/94	Mar 30/94		
1994 / 1995	Jan 12/95	Mar 19/95	Jan 18/95	Mar 26/95	Jan 19/95	Mar 26/95	Jan 20/95	Mar 26/95		
1995 / 1996	Jan 26/96	Mar 20/96	Jan 08/96	Mar 20/96	Jan 08/96	Mar 20/96	Jan 18/96	Mar 20/96		
1996 / 1997	Feb 14/97	Mar 17/97	Jan 14/97	Mar 17/97	Jan 14/97	Mar 17/97	Feb 04/97	Mar 17/97		
1997 / 1998	Feb 06/98	Mar 16/98	Jan 23/98	Mar 13/98	Jan 14/98	Mar 16/98	Feb 03/98	Mar 16/98		
1998 / 1999	Feb 01/99	Mar 16/99	Dec 31/98	Mar 16/99	Jan 07/99	Mar 16/99	Jan 21/99	Mar 16/99		
1999 / 2000	Feb 03/00	Mar 15/00	Jan 11/00	Mar 15/00	Dec 24/99	Mar 15/00	Jan 28/00	Mar 15/00		
2000 / 2001	Jan 19/01	Mar 15/01	Jan 15/01	Apr 05/01	Jan 08/01	Apr 05/01	Jan 20/01	Apr 05/01	Feb 23/01	Apr 05/01
2001 / 2002	Dec 20/01	Mar 18/02	Jan 10/02	Mar 18/02	Jan 11/02	Mar 18/02	Jan 18/02	Mar 18/02	Jan 09/02	Mar 18/02
2002/2003	Jan 22/03	Mar 18/03	Jan 22/03	Apr 10/03	Jan 20/03	Apr 10/03	Jan 27/03	Apr 10/03	Jan 20/03	Apr 10/03
2003/2004	Dec 19/03	Mar 16/04	Dec 29/03	Mar 16/04	Dec 19/03	Mar 31/04	Jan 23/04	Mar 16/04	Dec 19/03	Mar 31/04
2004/2005	Dec 13/04	Apr 01/05	Jan 04/05	Apr 01/05	Dec 13/04	Apr 01/05	Jan 21/05	Apr 01/05	Dec 13/04	Apr 01/05
2005/2006	Dec 19/05	Apr 07/06	Dec 19/05	Apr 07/06	Dec 29/05	Apr 07/06	Jan 25/06	Mar 22/06	Jan 13/06	Mar 22/06
2006/2007	Dec 22/06		Dec 20/06		Dec 21/06		Jan 19/07		Jan 04/07	

	Winter Road to TULITA (Opened)		Winter Road to NORMAN WELLS (Opened)		Winter Road to FT GOOD HOPE (Opened)		Winter Road to DELINE (Opened)		Winter Road to COLVILLE LAKE (Opened)	
	Earliest	Dec 13/04	Earliest	Dec 16/89	Earliest	Dec 13/04	Earliest	Jan 09/87	Earliest	Dec 13/04
	Latest	Feb 14/97	Latest	Jan 27/83	Latest	Feb 27/89	Latest	Feb 07/91	Latest	Feb 23/01
	Last 5 Years Avg.	Dec 25	Last 5 Years Avg.	Dec 31	Last 5 Years Avg.	Dec 27	Last 5 Years Avg.	Jan 23	Last 5 Years Avg.	Jan 01
	Last 10 Years Avg.	Jan 08	Last 10 Years Avg.	Jan 06	Last 10 Years Avg.	Jan 01	Last 10 Years Avg.	Jan 24	Last 10 Years Avg.	N/A
	Last 15 Years Avg.	Jan 11	Last 15 Years Avg.	Jan 07	Last 15 Years Avg.	Jan 04	Last 15 Years Avg.	Jan 23	Last 15 Years Avg.	N/A
	Last 20 Years Avg.	Jan 10	Last 20 Years Avg.	Jan 06	Last 20 Years Avg.	N/A	Last 20 Years Avg.	Jan 23		
	Last 25 Years Avg.	Jan 12	Last 25 Years Avg.	Jan 07			Last 25 Years Avg.	Jan 22		
	Winter Road to TULITA (Closed)		Winter Road to NORMAN WELLS (Closed)		Winter Road to FT GOOD HOPE (Closed)		Winter Road to DELINE (Closed)		Winter Road to COLVILLE LAKE (Closed)	
	Earliest	Mar 15	Earliest	Mar 13/98	Earliest	Mar 15/00	Earliest	Mar 15/00	Earliest	Mar 18/02
	Latest	Apr 05/89	Latest	Apr 10/89&03	Latest	Apr 10/89&03	Latest	Apr 10/89&03	Latest	Apr 10/03
	Last 5 Years Avg.	Mar 24	Last 5 Years Avg.	Mar 29	Last 5 Years Avg.	Apr 01	Last 5 Years Avg.	Mar 26	Last 5 Years Avg.	Mar 29
	Last 10 Years Avg.	Mar 20	Last 10 Years Avg.	Mar 24	Last 10 Years Avg.	Mar 26	Last 10 Years Avg.	Mar 23	Last 10 Years Avg.	N/A
	Last 15 Years Avg.	Mar 21	Last 15 Years Avg.	Mar 25	Last 15 Years Avg.	Mar 26	Last 15 Years Avg.	Mar 24	Last 15 Years Avg.	N/A
	Last 20 Years Avg.	Mar 23	Last 20 Years Avg.	Mar 28	Last 20 Years Avg.	N/A	Last 20 Years Avg.	Mar 27	Last 20 Years Avg.	N/A

APPENDIX E - ESTIMATE OF DIRECT GOVERNMENT REVENUES

The project team has used several sources to estimate the potential revenues that would accrue to federal, territorial and provincial governments. All of these studies have used different methodologies to estimate potential direct government revenues driven from the Mackenzie Gas Project. We have assumed a base case number of 500 new wells to be drilled in estimating the potential benefit of saving for an all weather road. This number of new wells is based on the number of wells estimated to be required to maintain the 1.2Bcf required to keep consistent volume in the pipeline. Exhibit 5-2.

The report "An Evaluation of the Economic Impacts Associated with the Mackenzie Valley Gas Pipeline and Mackenzie Delta Gas Development" Wright Mansell Research, 2004, has estimated the potential direct government revenues using different scenarios ranging from $5-11 Billion dollars. Exhibit 3-5 estimates 16.5 billion dollars of direct government revenues from existing and new projects. With an all weather road the time to realize these revenues may be decreased due to cost savings and increased drilling season

We considered the different government revenue projections from these reports and feel that the estimates should be based upon the scenarios of existing or new projects. Our assumptions are based upon a round number split between Case scenarios 2 and 3 from the Wright Mansell report and from the existing and new projects projected in the NWT study. Our baseline assumption is $10 Billion dollars of direct government revenues over 25 years. We have not considered long term or possible future discoveries that may significantly increase the potential resources and associated direct government revenues. Depending on commodity prices, the time to realize these revenues could also be decreased with increased activity.

EXHIBIT 3-5: Projected Resources and Associated Revenues, Northwest Territories

Commodity	Projected Resources	Gross Revenue	Federal Royalties	Federal Taxes	Northwest Territories Taxes
Existing Projects					
Natural Gas	1 Tcf	$2.70	$0.60	$0.50	$0.20
Oil	0.107 Billion bbls	$3.40	$0.80	$0.30	$0.10
New Projects					
Natural Gas	14.9 Tcf	$33.80	$6.10	$5.40	$2.50
Possible Projects					
Natural Gas	47.4 Tcf	$107.50	$19.40	$17.50	$8.00
Oil	1.65 billion barrels	$39.40	$9.50	$7.60	$3.70
Totals		**$186.80**	**$36.40**	**$31.30**	**$14.50**

Projected Resources and Associated Revenues, Northwest Territories

TABLE A.5: DISTRIBUTION OF DIRECT GOVERNMENT REVENUES – $4US GAS PRICE : 2010-2035*
(millions of 2004 Cdn $)

CASE 1	Property Tax	Income Tax	Royalties	Total
Federal		2391	939	3330
Alberta	33	28		61
NWT	291	1429		1720
- Grant Reduction	233	1143		1376
Adjusted NWT	58	286		344
Adjusted Federal	233	3534	939	4706
Total	**324**	**3848**	**939**	**5111**

CASE 2	Property Tax	Income Tax	Royalties	Total
Federal		3769	3009	6778
Alberta	41	34		75
NWT	389	2276		2665
- Grant Reduction	311	1821		2132
Adjusted NWT	78	455		533
Adjusted Federal	311	5590	3009	8910
Total	**430**	**6079**	**3009**	**9518**

CASE 3	Property Tax	Income Tax	Royalties	Total
Federal		4168	3867	8035
Alberta	41	34		75
NWT	396	2529		2925
- Grant Reduction	317	2023		2340
Adjusted NWT	79	506		585
Adjusted Federal	317	6191	3867	10375
Total	**437**	**6731**	**3867**	**11035**

* Personal income taxes on direct labour income not included

Source: "An Evaluation of the Economic Impacts Associated with the Mackenzie Valley Gas Pipeline and Mackenzie Delta Gas Development" Wright Mansell Research, 2004

EXHIBIT 5-5: Estimated Annual accumulation of Direct Government revenue

Annual Accumulation of Direct Government Revenues ($millions)

		(FV of $588/y in year_)
AWR*	Year 1	588
	Year 5	3250
	Year 10	7399
	Year 15	12693
	Year 17	15200
	Year 20	17596
	Year 25	22458

		(FV of $400/y in year_)
No AWR*	Year 1	400
	Year 5	2210
	Year 10	5031
	Year 15	8631
	Year 17	10336
	Year 20	13226
	Year 25	19091

Year 25- AWR	22458
Year 25- No AWR	19091
Difference in future value of direct government revenues	**3367**

Present Value @5%	**994**

*Assumptions

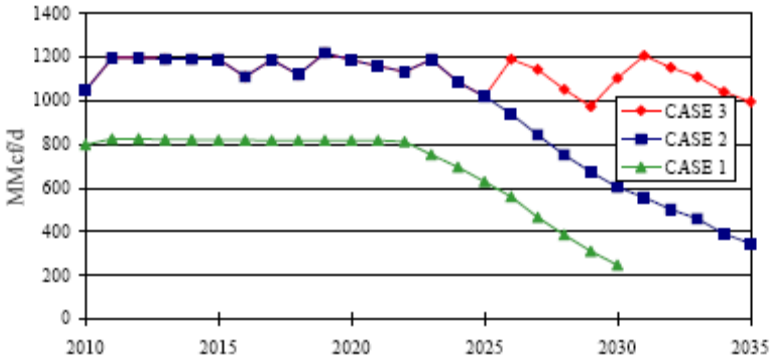
Direct government revenues estimated of 10 Billion over 25 years
Assumes straight line revenues
Renvested yearly at 5%

The estimated rate of increase in the release of the economic benefit is approximately 43%, relative to the current situation where an all-weather road is not present in the region. With an all-weather road present, the economic benefit associated with the drilling and subsequent production from 500 wells expected over a 25 year period would accrue in approximately 17.5 years.

The impact of this permanent increase in the rate of release of economic benefit due to the presence of an all-weather road in the region yields a potential additional gain of $3.4 Billion to government at the end of 25 years. This net gain has the present value equivalent of approximately $1 Billion at 5% annual growth.

In addition, an all weather road may change some of the projections of gas production profiles Projections on the gas production profiles may be impacted as exploration expands due to extended drilling seasons and cost savings. Additional exploration may lead to Case 3 from the chart below as the more likely scenario as volume levels can be maintained due to increase proven resources.

FIGURE 2.1: GAS PRODUCTION PROFILES UNDER THE THREE VOLUME CASES



Source: "An Evaluation of the Economic Impacts Associated with the Mackenzie Valley Gas Pipeline and Mackenzie Delta Gas Development" Wright Mansell Research, 2004

APPENDIX F: RECOMMENDED READING

The GNWT has commissioned several studies and reports to examine the effects of the construction of an all- weather road from Wrigley to Tuktoyuktuk. MNP reviewed and referenced a number of these studies during the preparation of this report, including:

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- Flint Energy Services
- International Frontier Resources Corporation
- Kodiak Petroleum ULC
- MGM Energy Corporation
- Paramount Resources Ltd.
- Shetah Nabors
- Talisman Energy Inc.

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[4] Energy for the Future: An Energy Plan for the Northwest Territories, Energy, Tourism and Investment, Government of the Northwest Territories, pg 11, March 2007.

[5] Energy for the Future: An Energy Plan for the Northwest Territories, Energy, Tourism and Investment, Government of the Northwest Territories, pg 11, March 2007.

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[7] Natural Resources Canada. Taking the Chill Off: Climate Change in the Yukon and Northwest Territories. Sourced at: http://adaptation.nrcan.gc.ca/posters/wa/wa_01_e.php

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