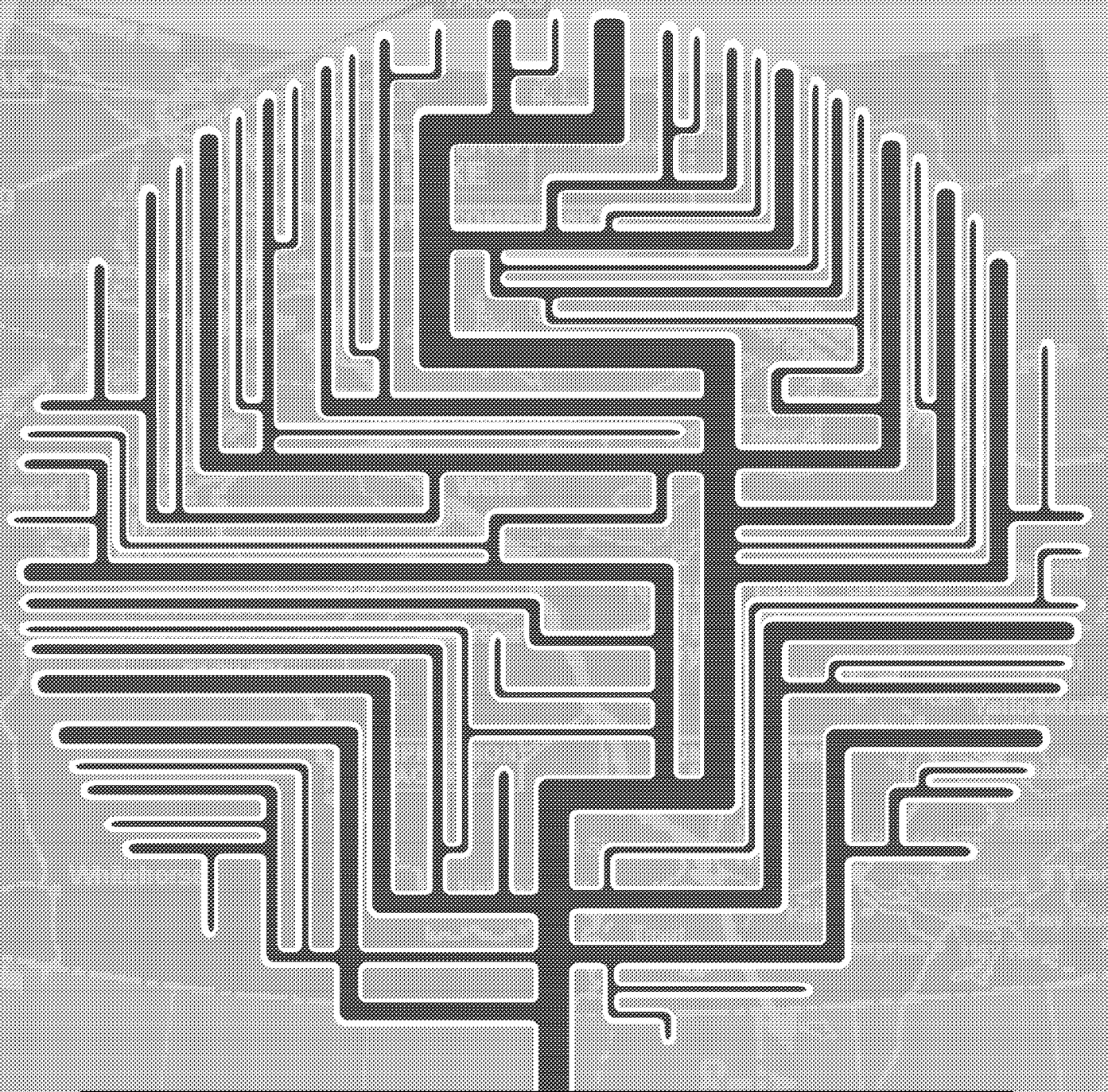

Alberta Benefits: Economic Impacts of Northern Gas Pipeline Construction

Alberta
ECONOMIC DEVELOPMENT

Alberta Benefits: Northern Gas Pipeline Development
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ALBERTA BENEFITS:
NORTHERN GAS PIPELINE DEVELOPMENT

Prepared by the Western Centre for Economic Research
School of Business, University of Alberta

for
Alberta Economic Development

November 2003

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- AGE – Ancillary Government Expenditures
- AGP – Alaska Gas Producers
- AHP – Alaska Highway Pipeline
- Alberta – AB
- ANGTA – Alaska Natural Gas Transportation Act
- ANGTS – Alaska Natural Gas Transportation System
- APG – Aboriginal Pipeline Group
- BC – British Columbia
- CERI – Canadian Energy Research Institute, Calgary, Alberta
- CERI study – Canadian Energy Research Institute. "A Comparison of Natural Gas Pipeline Options for the North," October 2000
- GNWT – Government of Northwest Territories
- GTL – Gas to Liquids
- Informetrica – Informetrica Ltd., Ottawa, Ontario
- Informetrica study – Informetrica Ltd. "The Alaska Highway Pipeline Project: Economic Effects on the Yukon and Canada," Report to the Government of Yukon, March 2002
- MGP – Mackenzie Gas Project
- MGP PIP – Imperial Oil, ConocoPhillips, Shell Canada, ExxonMobil Canada, Aboriginal Pipeline Group. "Mackenzie Gas Project: Preliminary Information Package", April 2003
- MVP – Mackenzie Valley Pipeline
- NE – Northern Economics Inc., Anchorage, Alaska
- NGL – Natural Gas Liquids
- Northwest Territories – NWT
- NRRDS – Government of the Northwest Territories. "Towards A Better Tomorrow: A Non-Renewable Resource Development Strategy for the Northwest Territories," October 2000
- Prolog Canada & The Van Horne Institute study – Prolog Canada Inc. and The Van Horne Institute. "Arctic Gas Pipeline Construction Impacts on Northern Transportation", January 2003
- PIP – Preliminary Information Package
- TransCanada – TransCanada PipeLines Ltd.
- WCER – Western Centre for Economic Research, University of Alberta, Edmonton
- WMR – Wright Mansell Research Ltd, University of Calgary, Calgary, Alberta.
- WMR & NE study – Wright Mansell Research Ltd. and Northern Economics Inc. "The Economic Impacts of Northern Gas Development," Report to Foothills Pipelines Ltd., February 3, 2001
- WMR study – Wright Mansell Research Ltd. "An Evaluation of the Economic Impacts Associated with the Mackenzie Valley Gas Pipeline and Mackenzie Delta Gas Development," Report to the Government of the Northwest Territories and TransCanada PipeLines Ltd., May 13, 2002
- WP – working paper number (referred to Informetrica study)

This report takes stock of the potential benefits to Alberta from the proposed development of the Mackenzie Valley Pipeline (MVP) and the Alaska Highway Pipeline (AHP). Alberta Economic Development (AED) contracted the Western Centre for Economic Research at the University of Alberta to prepare a report that summarizes the potential economic impact on Alberta of these pipeline projects. The report supports Alberta Economic Development's mandate of gathering information and analysis that provides a planning framework for business and industry.

The WCER was asked to evaluate each proposed pipeline separately, focusing on the economic impact of their development on the province. Direct and aggregate effects are supplied, as are related developmental impacts. An Addendum to the report provides a detailed listing of Alberta firms that potentially stand to benefit from construction of either or both pipelines.

Principal Findings

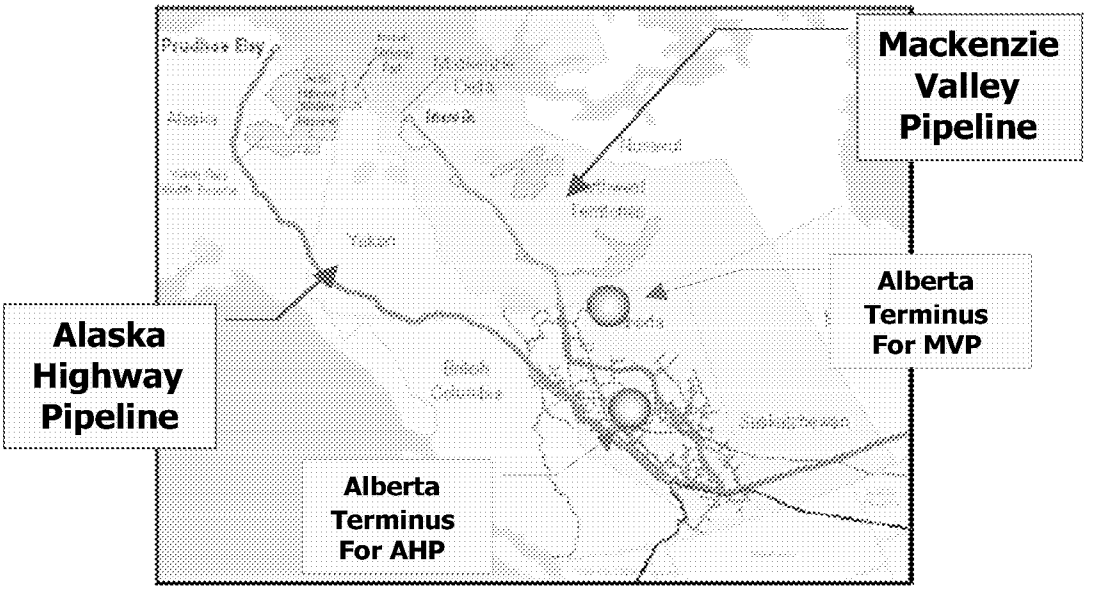
- Northern pipeline development will provide opportunities for Alberta business in design, construction, management, and will have a secondary impact on petrochemical industries and infrastructure.
- The Mackenzie Valley Pipeline will provide an estimated aggregate employment increase of more than 38 thousand person years. Alberta's portion will require a $266 million direct investment and will generate about $1 billion in revenues. This will yield a $3.6 billion GDP increase, a $2.3 billion labor income increase and about $900 million in government revenue.
- The Alaska Highway Pipeline will benefit Alberta employment with an increase of some 25 thousand person years of aggregate employment. A forecast direct investment of $155 million promises Alberta $641 million in revenues. This translates into a $2.5 billion GDP increase, a $1.5 billion labor income increase and a rise in government revenue of $628 million.
- Alberta is well placed -- industrially and geographically -- to take full advantage of these developments as they move forward. The province's sophisticated oil and gas industry will receive value-added opportunities in areas of specialized expertise: natural gas and natural gas liquid (NGL) storage; NGL processing; gas to liquid (GTL) technology projects; power generation and cogeneration.
- There is a wide array of secondary business opportunities beyond those directly dealing with handling upstream production (see Addendum). Alberta will also experience a significant impetus for development of infrastructure. In particular, the northern pipelines are likely to enhance the role of First Nations in economic development.
- Finally, northern pipelines should offer Alberta gas consumers lower prices, less volatility and a more secure supply of gas.

Principal Recommendation

Due to the complexity and multi jurisdictional nature of northern pipeline projects, Alberta would benefit from the preparation of a focused strategy preparing for these projects. Early coordination between stakeholders is necessary to successfully address the effects of these pipelines on the Province.

1
Introduction

Two major pipelines, the Mackenzie Valley Pipeline (MVP) and the Alaska Highway Pipeline (AHP), have been proposed to bring gas from the North American Arctic to southern markets. Both of these pipelines would be connected to terminals of the existing Alberta pipeline system as shown on the map below.



Source: TransCanada PipeLines Ltd. website

Both the MVP and the AHP require developing gas reserves and constructing a pipeline, and both are complex multi-year (phased) projects. Initial feasibility studies lead to project definition, a phase that can take several years, ending with the decision of whether or not to prepare regulatory applications. With approval from regulatory bodies, including environmental and socio-economic impact assessments, construction can commence. The construction phase concludes with start-up operations and gas production. The operational phase can include potential expansion and eventual abandonment and reclamation. All stages of natural gas project development require significant investment, presenting both costs and economic opportunities to various partners and stakeholders of these projects.

Alberta stands to greatly benefit should one or both pipelines be built. This report describes economic impacts of the MVP and the AHP for Alberta's economy. Economic benefits and opportunities to the Alberta pipeline equipment and service providers are specifically highlighted.

A resurgent Alberta interest in the northern pipelines within the past few years has been due to:

- the increase in North American energy demand;
- improved commercial and political viability of developing Arctic natural gas reserves; and

- increased technological readiness of Alberta based firms to capitalize on the new business opportunities.

1.1. North American Energy Demand

North American demand for natural gas is increasing rapidly -- by two to three percent each year. Growth in consumption is expected to continue in the years and decades to come. The most common uses of natural gas are:

- economical residential heating and cooling;
- generation of electricity for residential and industrial use;
- extraction of byproducts:
- natural gas liquids (NGL), serving as a feedstock for petrochemical products; and
- gas-to-liquids technology (GTL) products, used as super-clean transportation fuels.

Gas is a favored fuel particularly among electricity generators, because of its clean-burning attributes. As the cleanest burning fossil fuel, natural gas has significantly lower air emissions than those from coal or oil;

Four key factors have renewed interest in Alaskan and Canadian Arctic natural gas:

- the generation of electricity from natural gas is expected to expand rapidly due to US energy policy that promotes cleaner burning fuels;
- the substantial growth in gas demand in North America and recent winter price shocks for both oil and natural gas;
- US desire to protect and guarantee energy supplies;[1] and
- Canada's commitment to the Kyoto Protocol.

Current gas consumption in North America is about 30 trillion cubic feet per year (tcf).2 Projections of economic growth and continued expansion of gas use in electricity generation would put US consumption at 34 tcf per year by 2010, and call for North American gas consumption to exceed 41 tcf per year by 2020 (US – 34 tcf; Canada – 4 tcf; Mexico – 3tcf).[3]

The most important byproducts of natural gas production are natural gas liquids (NGL). The main uses of NGL are feedstock for petrochemical industry and inputs for the petroleum producing industry to improve oil recovery. Current NGL consumption in Northern America is about 120 million gallons per day. Projected NGL production for 2010 is 154 million gallons per day.

1.2. Potential Supply from the North

There are 31-35 tcf of known natural gas reserves on the Alaska North Slope and estimated potential reserves of up to 100 tcf – enough to supply one-quarter of North America's natural-gas needs for the next 20 years. The Mackenzie Delta/Beaufort Sea

1 Informetrica study, WP 4.4.1.
2 Energy Information Administration (EIA), International Energy Outlook 2002.
3 Energy Information Administration (EIA), International Energy Outlook 2002.

has 9 tcf (6 tcf onshore and 3 tcf offshore) of known marketable reserves and total estimated potential reserves of 64 tcf.[4]

1.3. Opportunities for Alberta Industries and Businesses

Alberta has sophisticated, well-developed oil and gas and power generation industries. These industries are expected to capitalize on the development of the MVP and the AHP through such value-added opportunities as:

- natural gas and NGL storage;
- NGL processing;
- GTL technology projects;
- power generation; and
- cogeneration.

The addition of the natural gas and NGL volumes from the northern pipelines would put Alberta on the threshold of significant expansion.

Alberta's natural gas and liquids storage capacity totals more than 200 billion cubic feet, with daily withdrawal capacity of more than 4 billion cubic feet. Storage capacity is expandable and several storage facilities have been added in recent years. Alberta also has one of the three largest fractionation centres in North America.

Its petrochemical industry is one of the largest in the world and would provide a ready market for NGL and GTL products. Moreover, it is built on natural gas liquids, mainly ethane, which is used as an input to produce ethylene. Ethylene, in turn, is used to manufacture polyethylene (for cord, rope and flexible packaging material) and styrene (for expanded polystyrene cups and many other consumer products). Nylon and plastic are other examples of materials made from petrochemicals. Thus, the viability of the Alberta petrochemical industry greatly depends on access to a long-term secure supply of NGLs at competitive pricing. Access to affordable domestic NGLs sourced from the MVP and the AHP would greatly enhance the prospects for this industry in Alberta.

There are also possible applications of gas-to-liquids technology (GTL) to derive liquid hydrocarbons from the natural gas. Hydrocarbons are ultra-clean transportation fuels, and are sold at premium prices. The benefits from the NGL and GTL products would also include construction necessary processing plants for servicing the northern pipelines, with Alberta companies potentially taking part in these projects.

Natural gas is the fuel of choice for most new, independent power projects in the province. Another value-added opportunity is surplus power fed into the Alberta grid by cogeneration projects combining electricity and steam to industrial plants.

Opportunities for Alberta businesses will be plentiful during natural gas projects development and during pipeline construction and operations. The largest opportunities exist in areas such as:

- engineering design and research;
- logistics, construction and project management;
- operations and maintenance;
- supply of materials, equipment and specialists; and

4 WMR study, p.6.

- infrastructure projects (roads and highways, waste and sewage infrastructure, water supply and treatment infrastructure, transportation infrastructure, etc.).

There will also be many other secondary business opportunities, where Alberta can market and position its products and services. These are identified as:

- increased oil and gas exploration;
- mining;
- natural gas peripheral distribution systems and franchises;
- drilling, completion and well servicing;
- electricity generation contracting;
- industrial and residential construction;
- industrial equipment supply and repair services;
- communications networks and e-commerce;
- geoscience services;
- economic, management, legal and educational consulting;
- transportation and logistics; and
- business, banking, travel and office administration services.

The construction of a MVP will provide a catalyst for increased exploration and production activity throughout the NWT, further increasing the opportunities for Alberta's exploration, production and service industry companies. As the Western Canada Sedimentary Basin matures, Alberta's oil and gas service industry needs to look north to sustain the levels of growth it has enjoyed over the past 50 years.

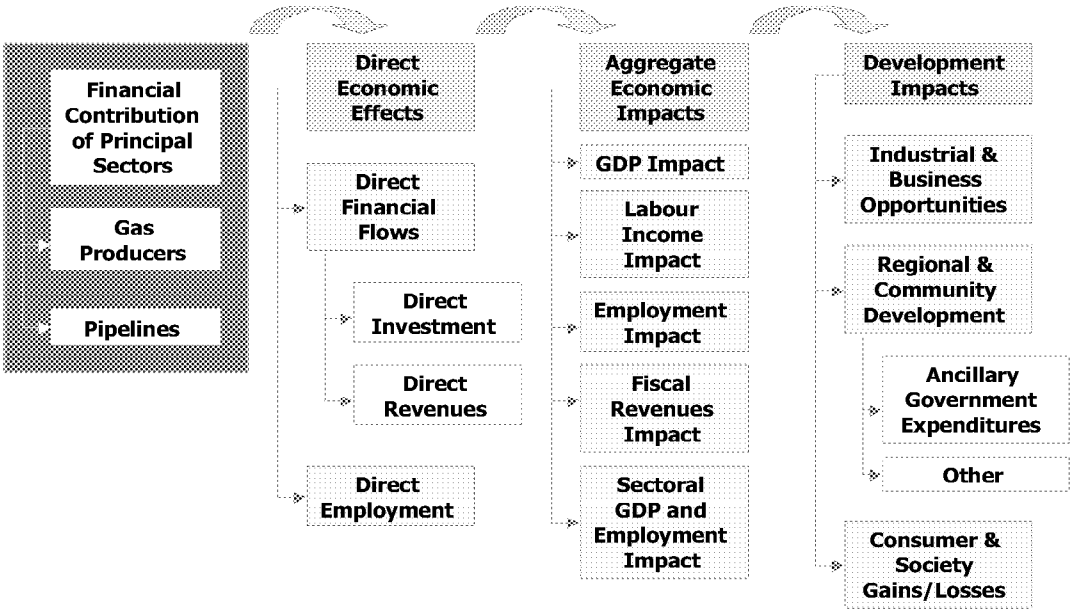
This report contains, as an Addendum, a detailed listing of the many Alberta businesses that could potentially benefit from construction of either or both pipelines. Firms in Alberta appear capable of supplying most materials, manufacture, equipment and services required. In cases where needed equipment is manufactured outside the province, Alberta businesses are well placed as local partners in the installation and final assembly. It is, therefore, important to be aware of the entire supply chain early on to enable proactive steps for forming such partnerships.

2
A Conceptual Overview of the Economic Impact of Natural Gas Pipeline Projects on Alberta, Canada

An analysis of the economic impact of the Mackenzie Valley Pipeline (MVP) and Alaska Highway Pipeline (AHP) projects in this report is conducted within the conceptual framework described below.

Development of the natural gas pipeline projects typically involves two large contributors: gas producers and pipeline operators. The financial contribution of gas producers and pipelines operators causes a multiplier effect on the affected economies as shown in Figure 2.1. The initial direct investment of gas producers and pipeline operators will generate direct employment in the respective sectors. The associated direct revenues will be distributed between the gas producers, pipeline operators, and various levels of government. Direct financial flows and employment will bring significant increases in the areas outlined in Figure 2.1 under aggregate economic impacts, and growth in sectors other than those directly affected.

Figure 2.1. Multiplier Effect of the Northern Gas Pipeline Projects on the Economy



Direct investment arises from the capital requirements for both gas production and operation and pipeline construction and operations as shown in Figure 2.2. There are four major groups of capital expenditures for gas producers:

- plants and facilities construction;
- anchor field development;

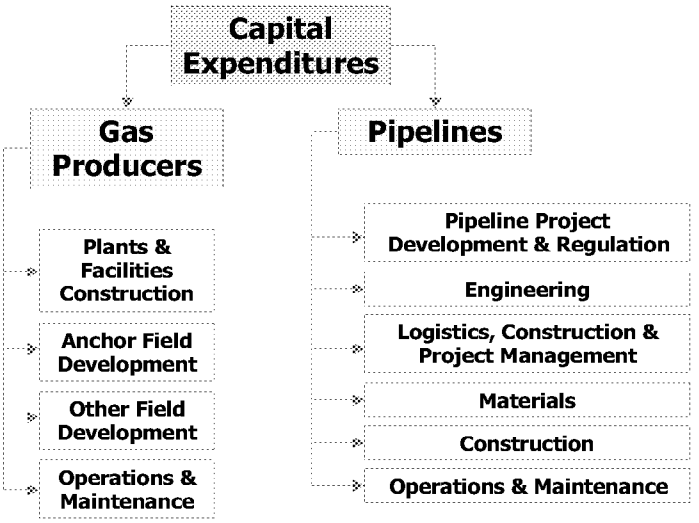
- other gas field development, and
- operations and maintenance of the gas production.

These capital expenditures are usually tied to the owners of the gas fields, in this case Alaska gas producers and Mackenzie Delta gas producers.

There are six major **capital expenditures** categories for the pipelines operators, all of which represent opportunities for Albertan companies to provide their services:

- ***Project development and regulation*** – project development and regulatory approvals, socio-economic studies, research, and obtaining of land rights;
- ***Engineering*** – gathering environmental and geo-technical data, and engineering design;
- ***Logistics, construction & project management*** – acquisition, installation and operation of the electronic system of the pipeline and upstream infrastructure including supervisory control and data acquisition, communications, logistics, and materials transportation, administration, legal support services, and business development;
- ***Materials*** – pipe, compression, chilling, cooling and metering stations materials and equipment;
- ***Construction*** – labor required to install pipe, compressor stations, cooling and metering stations, as well as the monitoring of construction and metering sites; and
- ***Operations and maintenance*** – of personnel, commissioning, facilities, spare parts and inventories.

Figure 2.2. Major Groups of Capital Expenditures for Gas Project Developers



Direct revenues are based on the value of output from gas field production and operations (producer netback) and pipeline operations (cost of service). They are distributed to cover production and operating costs, pay provincial and federal taxes and royalties, and retain the profits (gas producers and pipeline operators returns).

Direct employment is generated from the labor requirements of the natural gas projects, and is usually allocated to the region within which the specific activity is occurring.

Aggregate economic impacts arise from the multiplier effect caused by direct investment, revenues and employment. There are five major groups of aggregate economic impacts:

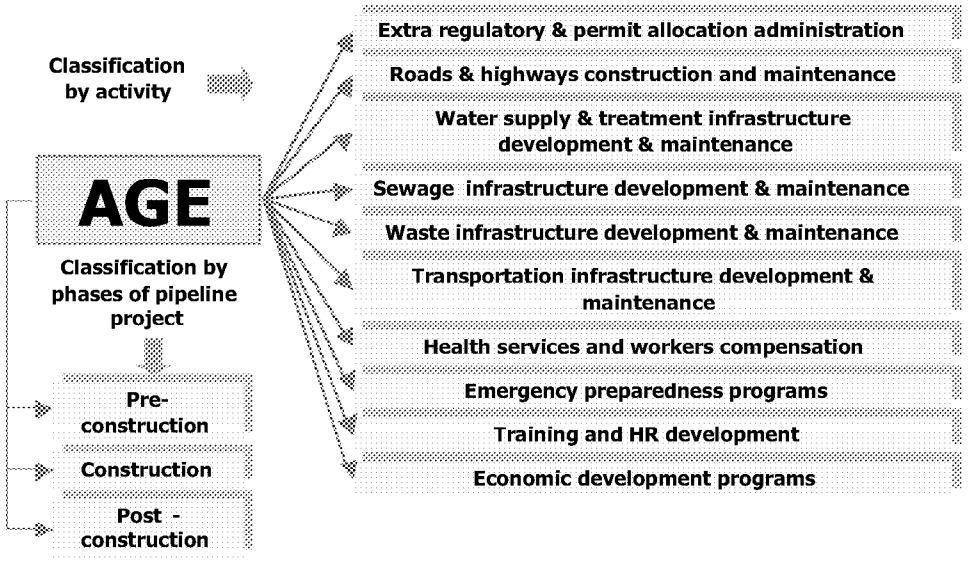
- Gross Domestic Product (GDP) impact for Canada and Gross State Product (GSP) impact for Alaska;
- labor income impacts;
- employment impacts;
- fiscal revenues impacts; and
- sectoral economic impacts.

These impacts represent an increase in the levels of GDP/GSP, labor income, employment, fiscal revenue and sectoral GDP/GSP and employment. Specifically, fiscal revenue impacts include increases in the provincial/state government revenues and federal government revenues. Sectoral increases in GDP/GSP and employment are the result of the indirect influence of the AHP and the MVP on sectors other than oil and gas facility construction, natural gas pipeline transportation, and oil and gas production.

Aggregate economic impacts, in turn, generate a large group of the **development impacts**. Major categories of the development impacts can be classified into: 1) industrial and business opportunities; 2) regional and community development; and 3) consumer and society gains and losses. As a rule, direct economic effects and aggregate economic impacts vary by the phases of gas project development, mainly the construction and operations phases.

The MVP and the AHP projects are expected to generate a multitude of **industrial and business opportunities** including attractive valued-added opportunities for Alberta. **Regional and community development** spurred by the MVP and the AHP will significantly influence Ancillary Government Expenditures (AGE) in the affected economies (see Figure 2.3), as well as northern communities and Aboriginal/First Nations economic development.

Figure 2.3. Major Groups of Ancillary Government Expenditures (AGE) Associated with Pipeline Construction and Operations



*Ancillary Government Expenditures (AGE) are defined as government investment required to facilitate pipeline construction, but is not directly related to the pipeline.***5** *It to impacts directed towards the development and improvement of the infrastructure and towards the initiation of various regional and community growth programs, so as to properly utilize benefits of the pipelines construction and to mitigate their socio-economic and environmental effects. AGE can be grouped into ten types activity and by three phases of the pipeline project, as shown in the Figure 2.3.*

The final class of development impacts, the **consumer and society gains** and losses has three major groups of impacts: local access to natural gas; decrease of natural gas price levels and volatility in North America; and socio-economic and environmental impacts.

5Informetrica study, WP 3.2.1, p.1

3
Economic Impact of the Mackenzie Valley Gas Pipeline and the Mackenzie Gas Project

3.1. A Description of the Mackenzie Valley Pipeline and the Mackenzie Gas Project

What And Where?

The Mackenzie Valley Pipeline (MVP) is an integral part of the Mackenzie Gas Project (MGP), which consists of the following elements:[6]

- natural gas field development facilities at Taglu, Parsons Lake and Niglintgak, NWT;
- a gathering system to collect natural gas and associated NGLs from these three fields and ship them to the natural gas compression and NGL facilities in the Inuvik area, NWT;
- a 500 km, 10 inch NGL pipeline from the Inuvik area, NWT to Norman Wells, NWT;
- a 1,300 km transmission pipeline system – the Mackenzie Valley Pipeline (MVP) – from the Inuvik area along the Mackenzie Valley Corridor via Norman Wells to connect with the existing natural gas pipeline system in Northwestern Alberta at its southern terminus (following the existing Enbridge oil pipeline route).

In addition, there will be ancillary undertakings such as: access roads, barge landing sites, airstrips and related facilities, stockpile and staging sites, borrow sites, construction camps, communications and power supply facilities, waste management facilities, including sewage treatment systems.[7]

The pipeline would be anchored by nearly 6 tcf[8] of natural gas at the Taglu, Parsons Lake and Niglintgak gas fields in Northwest Territories, and would be accessible to other existing and future natural gas discoveries in the Mackenzie Delta and Mackenzie Valley regions. The exact route of the MVP is still under study.[9] At this stage, it's uncertain what design would be preferred for the pipeline portion from Inuvik to Norman Wells: either a single-phase design, which includes a separate natural gas transmission pipeline and NGL pipeline, or a two-phase design, which includes a two-phase transmission pipeline.[10] It is likely that the natural gas will be transported to markets utilizing spare capacity in the TransCanada PipeLines gas pipeline system from northwestern Alberta. However, it is uncertain which option for the connection between the MVP and the existing Alberta pipeline system will be chosen: extending the Alberta system to the NWT boundary or constructing the Alberta segment of the MVP down to the Alberta terminus.

6 MGP PIP, p.1-7.
7 MGP PIP, p.11-10.
8 WMR study, p. 6.
9 www.mackenziegasproject.com.
10 *Ibid.*

Who?

The Government of the Northwest Territories and TransCanada PipeLines Limited signed a Memorandum of Understanding in July 1999 identifying "an alignment of interests and a mutual desire to encourage the timely development of the natural gas reserves of the NWT and the construction of an economic, competitively priced, natural gas transmission infrastructure."[11]

The Mackenzie Delta producers, who include Imperial Oil Resources Ventures Ltd., ConocoPhillips Canada (North) Ltd., Shell Canada Ltd., and ExxonMobil Canada Properties, and the Aboriginal Pipeline Group (APG) are the developers of the Mackenzie Gas Project and will be the owners of the Mackenzie Valley Pipeline. More specifically, Imperial Oil Resources Ventures Ltd. owns and operates the Taglu gas field, and will be a designated operator of the gas gathering and pipeline systems for the project. ConocoPhillips Canada (North) Ltd. and ExxonMobil Canada Properties jointly hold the Parsons Lake gas field, and have ownership shares in the gathering system and the MVP. Shell Canada Ltd. owns and operates Niglintgak gas field and has an interest in a gathering system and in the MVP. APG represents the interests of aboriginal groups of the NWT in the Mackenzie Gas Project and has a share in the MVP. The MVP is the unincorporated joint venture with the ownership distributed as following.[12]

- Imperial Oil Resources Ventures Ltd.- 34.4%;
- APG – 33.3%;
- ConocoPhillips Canada (North) Ltd. – 15.7%;
- Shell Canada Ltd. – 11.4%; and
- ExxonMobil Canada Properties – 5.2%.

When and What Throughput?

Gas field development and the MVP construction is proposed to commence during 2004-2005 period with the transmission pipeline operational in late 2009. By 2010 gas would flow at a rate of 0.8bcf/d to 1.9 bcf/d. According to the Wright Mansell Report, throughputs will range from 0.8bcf/day to a maximum of 1.2 bcf/day. More recently the Delta producers announced that they anticipate from 1.2 – 1.9 bcf/day. This will significantly increase the magnitude of some of the economic impacts. Greater capital investment will be required (3 to 4 addition compressor stations) and the producers and the federal government will see an increase in their positive economic impacts as their revenues are directly related to the price of gas and the volume transported.[13]

How Much?

The preliminary estimated capital costs or total investment required for the gas field development and the pipeline construction and operation is approximately $7.6 billion. Overall direct revenues are estimated in the amount of $53.2 billion under the $4US/mcf natural gas price scenario.

11 "Memorandum of Understanding between the Government of the Northwest Territories and TransCanada PipeLines Limited", July 28, 1999
12 MGP PIP, p.1-15
13 Correspondence from Dr. Robert Mansell.

Project Phasing andSchedule

The Mackenzie Gas Project (MGP) forsees a four-phase process:[14]

- feasibility study;
- project definition;
- design and construction; and
- operation.

Phase 1: Feasibility Study

During the 2000-2001 period the project developers have undertaken a feasibility study. The study confirmed the technical and commercial viability of the MGP.

Phase 2: Project Definition

The MGP is currently in the project definition phase,[15] which started in January 2002 with the expectation of completion in 3 to 4 years. This phase involves conducting public consultation, technical engineering studies, and environmental field work. Further, it involves gathering traditional knowledge of aboriginal people, assessment of the effects of the project on local communities, developing northern benefits plans (education, training, employment and business opportunities), and preparation of regulatory applications. The project developers expect to file applications for regulatory approvals in 2004, which will then be followed by a regulatory review of the project by northern and federal authorities, as well as a reassessment of the project with respect to new factors and conditions. "An estimated 130 jobs are expected to be created to support this phase of the project."[16]

Phase 3: Construction

This phase includes detailed design of facilities, the drilling of wells, the purchase of goods and services and the construction of the pipeline and field facilities. It is estimated to take 3 to 4 years. "The construction seasons are planned for the first four months of 2008 and 2009, with pre-construction activities taking place in 2006 and 2007. Construction will include: the three natural gas fields; the gathering system and main the MVP system; the compressor stations and natural gas liquids facilities; and other sites associated with the Project such as construction camps, barge landing sites, airstrips, temporary and permanent roads, sand and gravel sources and stockpile sites."[17] According to the MGP PIP, it is estimated that 540 jobs will be created during the preparatory activities in order to provide the infrastructure requirements such as material supply, access road construction, camps and catering, and there will be approximately 2,300 jobs for the pipeline construction. About 250 jobs are required for facilities construction, which involves preparing sites and installing compressor stations and related facilities, whether constructed at the site or prefabricated elsewhere and shipped to the site.[18]

14 MGP PIP, pp.1-9.
15 www.mackenziegasproject.com/theProject/overview/project Phases/projectPhases.html
16 MGP PIP, pp 7-4.
17 www.mackensiegasproject.com/theProject/constructionOperation/index.html
18 MGP PIP, pp.7-4 and 7-5.

Phase 4: Operations

"After the natural gas field facilities, pipelines and facilities have been constructed and tested, approval to operate them will be requested from the regulators."[19] The gas flows through the gathering and transmission pipeline system could start in late 2008. As indicated earlier, the gas throughput may be as high as 1.9bcf/day (with infill compression) over a 25 year operating period. In addition there would be the NGL volumes (ethane, butane, propane and pentane). As well, the throughput might include gas from existing small fields and fields yet to be discovered. Options for expansion, abandonment and reclamation are also part of this phase which is estimated to require 50 full time employees to ensure operation of the pipeline and related facilities, not counting maintenance, surveillance and anchor field operations[20]

It should be understood that the expected economic benefits are based on a throughput of only 0.8 – 1.2bcf/day and, therefore, represent a very conservative estimate of the future benefits.

The Current State of Play

The MGP is moving forward as a result of recent successful funding and participation agreements between the producers, the Aboriginal Pipeline Group (APG) and TransCanada Pipelines Ltd. The most important agreement was reached regarding the financing and equity rights of the APG in the MGP, including TransCanada's $80 million funding of the APG during the project definition phase. Furthermore, the Government of Northwest Territories budgeted $1.7 million to fund APG equity participation in the MGP.[21]

The MGP is proceeding towards regulatory approval. In June 2003 the Mackenzie Gas Project Preliminary Information Package[22] was submitted by project developers for a review by the Canadian Environmental Assessment Agency, National Energy Board, Government of the Northwest Territories, Gwich'in Land and Water Board, Indian and Northern Affairs Canada, Inuvialuit Land Administration, Inuvialuit Settlement Region Joint Secretariat, Mackenzie Valley Environment Impact Review Board, Mackenzie Valley Land and Water Board, Northwest Territories Water Board, and Sahtu Land and Water Board. This PIP includes preliminary information on a description for the field facilities, gas gathering and transmission facilities, pipeline design, compression, proposed routing, project construction plans, environmental and socio-economic features, communications and public consultation, industrial benefits, commercial project matters, etc.[23]

Also, the MGP proponents are currently involved in an active public consultation process, which includes formal presentations, workshops, open houses and informal discussions on the topics of project information, pipeline routes, facilities location, natural gas fields and the associated facility development, land access for pipeline

19 www.mackensiegasproject.com/theProject/constructionOperation/operations/index.html
20 MGP PIP, pp.7-5.
21 GNWT NRRDS, p. 53-55
22 www.imperialoil.ca. "Funding Agreements Reached & Preliminary Information Package to be Submitted, Mackenzie Delta Producer Group Confirms", News Release, June 18, 2003.
23 Imperial Oil Reserves. "Mackenzie Gas Project Backgrounder"

construction and related activities, effects of the project on the northern way of life and economy, benefits agreements and related arrangements, gathering of traditional knowledge, environmental studies and assessments, employment and business opportunities, and training and education needs.[24]

3.2. Summary of the Major Economic Impacts of the MGP

Table 3.1 below summarizes the major economic impacts from the MGP for Canada, the Rest of Canada and Alberta. The project will draw a total private direct investment in the amount of $7.6 billion. During the first 25 years of project life, the MGP will bring $53.2 billion in direct revenues and 22,024 person years of direct employment. Further, the MGP is expected to generate a $57.1 billion increase in GDP, a labor income increase of $7.7 billion, 157,215 person years of additional employment, and a $23.4 billion increase in provincial and federal government revenues.

Since the project is located primarily in the Mackenzie Delta and Mackenzie Valley areas, most of the economic benefits will accrue to the Northwest Territories. The economic impact on Alberta would be the largest among the provinces, other than then the NWT, due to its specialized expertise in oil and gas production and services industry, proximity, developed pipelines system, and historically close ties to the western Arctic. The opportunities would include a portion of the Mackenzie Valley Pipeline located in Alberta, as well as the expansion of the existing pipeline infrastructure within the province necessary to accommodate the increased volumes. The overall quantifiable benefits for Alberta are significant as illustrated by the shares of the province in the total economic impacts from the MGP in Table 3.1.

Table 3.1. MGP: Summary of Major Economic Impacts

	Alberta	Rest of Canada	Canada	Alberta's share
Direct economic effects				
Direct investment, millions $	266	7,347	7,613	3.6%
Direct revenues, millions $	1,047	52,166	53,213	2.0%
Direct employment, person years	8,058	13,966	22,024	36.6%
Aggregate economic impacts				
GDP increase, millions $	3,644	53,498	57,142	6.3%
Labor income increase, millions $	2,258	5,483	7,741	29.1%
Employment increase, person years	38,233	118,982	157,215	24.3%
Provincial government revenue increase, millions $	325	1,314	1,639	19.8%
Federal government revenue increase, millions $	589	21,146	21,735	2.7%

Source: WMR study

Most of the gains for Alberta will come from employment at the MGP works, which will constitute 8,058 person years of direct involvement in the project and an estimated aggregate employment increase of more than 38,000person years. Alberta's portion for the pipeline will require $266 million direct investment, and will generate about $1 billion in direct revenues. This will yield a $3.6 billion GDP increase, a $2.3 billion labor income increase and a $914 million government revenue increase.

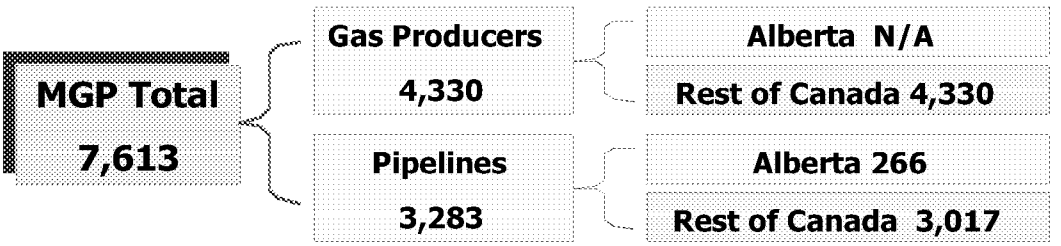
24 www.mackenziegasproject.com/ourCommitment/communityInvolvement/index.html

3.3. Direct Financial Flows and Employment

Direct Investment

Figure 3.1 below shows the direct investment estimates for the MGP by sector and region. A total of $7.6 billion direct investment is necessary for the MGP, shared between gas producers and pipelines sectors. About $3.3 billion is required for pipeline construction and operations, while a $4.3 billion investment is necessary for the gas field development and production operations.

Figure 3.1. MGP: Direct Investment Estimates, (millions $)



Source: WMR study

Most of the pipeline length and all of the gas field development will be in the NWT, thus almost $3.1 billion (91.9%) of the pipelines' direct investment is assumed to take place there. As mentioned above, Alberta's portion will require approximately $266 million (8.1%) of the pipeline's direct investment.

Table 3.2 reports the distribution of the gas producers capital expenditures by major elements. The anchor field development will require at least $1.5 billion, while the development of minor gas fields is estimated to absorb $730 million.$2.1billion is allocated for the operation and maintenance of gas production.

It has also been estimated, that of the $266 million allocated to Alberta's direct pipelines investment approximately $150 million will be undertaken by the TransCanada Alberta system in order to accommodate the volume of natural gas coming from the MVP.

Table 3.2. MGP: Gas Producers Capital Expenditures, (millions $)

	millions $
Anchor field development	1,500
Other field development	730
Operations & maintenance	2,100
Total gas producers capital expenditures	**4,330**

Source: WMR study

Table 3.3 indicates the amounts of capital expenditures required for the MVP pipeline construction and operations. It gives some indication of the business opportunities for Alberta based suppliers.

Table 3.3. MVP: Pipeline Construction and Operations Capital Expenditures, (millions $)25

	millions $	%
Project development and regulation	**16.4**	**0.5**
Engineering	**49.2**	**1.5**
Logistics, construction & project management	**984.9**	**30.0**
Materials	**1,116.2**	**34.0**
Pipe	715.7	21.8
Compression, chilling & cooling	384.1	11.7
Meter stations	16.4	0.5
Construction	**1,050.6**	**32.0**
Pipeline	807.6	24.6
Compression stations	242.9	7.4
Operations and maintenance	**65.7**	**2.0**
Personnel incl. commissioning	19.7	0.6
Facilities	23.0	0.7
Spare parts & inventory	23.0	0.7
Total pipeline construction and operations capital expenditures	**3,283**	**100.0**

Source: WMR study, CERI study

25 The estimates for major capital expenditures groups are derived from WMR study estimate of total direct investment for pipeline construction and operation with the application of CERI study rules of thumb regarding the approximate share of each group of capital expenditures in the total capital costs, as well as pipeline project specifications (see Appendix 1). The estimates should be interpreted with caution.

Direct Revenues

Table 3.4 outlines total direct revenues from gas field production and operation (producer netback) and pipeline operation (cost of service) for the MGP under $4US/mcf natural gas price scenario. Direct revenues from the MGP will constitute $53.2 billion. Gas production will contribute 78% or $41.5 billion. The pipeline transportation is expected to generate 22% or $11.7 billion in direct revenues. Alberta's expected share of the pipeline operation revenues with the MVP is 3%, the remaining 97% going to the NWT, so Alberta will directly benefit from servicing the operating phase.

Under $4US/mcf natural gas price scenario gas producers will receive 25.1% or $13.4 billion of the MGP direct revenues as indicated in Table 3.5. Pipeline operators will receive 3.4% or $1.8 billion. Resource costs such as gas production and pipeline operating costs and depreciation will consume 32.8% or $17.4 billion.

Table 3.4. MGP: Distribution of Direct Revenues by Region and Sector, (millions $)

	Alberta	Rest of Canada	Total
Gas producer sector (producer netback)	-	41,499	41,499
Pipeline sector (cost of service)	1,047	10,667	11,714
Total direct revenues	**1,047**	**52,166**	**53,213**

Source: WMR study

The remainder of direct revenues, 38.8% or $20.6 billion, will be paid to the provincial and federal governments in the form of taxes, royalties and territorial grant reductions. TransCanada Pipelines has also estimated that it will require approximately $26 million in annual revenues associated with the capital expenditures necessary to accommodate the MGP gas volumes in its pipeline system.[26]

Table 3.5. MGP: Distribution of Direct Revenues by Components

	millions $	%
Gas producer returns	13,373	25.1
Pipeline operators returns	1,790	3.4
Gas production costs	9,348	17.6
Pipeline operating costs & depreciation	8,072	15.2
Taxes, royalties and grant reductions	20,629	38.8
Total direct revenues	**53,213**	**100**

Source: WMR study

Under the $4US/mcf natural gas price scenario, total direct government revenues will amount to $20.6 billion for the MGP, as reported in Table 3.5. Provincial governments stand to gain substantial benefits from property and income taxes in the

26 WMR study, p.27

total amount of $952 million. The federal government will receive significant amounts from income tax, royalties and grant reductions in the sum of $19.7 billion (Table 3.6). It is possible that tax incentive programs could be instituted to encourage pipeline construction in which case taxes would be less than estimated.

Table 3.6. MGP: Direct Provincial and Federal Government Revenues, (millions $)

	Direct provincial government revenues			Direct federal government revenues
	Alberta	Rest of Canada[27]	Total	Total
Property tax	76	87	163	-
Income tax	29	760	789	7,894
Royalties	-	-	-	8,394
Grant reductions	-	-	-	3,389
Total direct government revenues	**105**	**847**	**952**	**19,667**

Source: WMR study

With the MGP, Alberta would have a significant share—11% ($105 million) in provincial government revenues, generated through $76 million in property tax and $29 million in income tax. The NWT would receive the rest of the provincial government revenue—89% ($847 million), adjusted for federal grant reductions, of which 90% or $760 million will be collected through income taxes and $87 million through property taxes.

Government revenue in the Northwest Territories generated by the MGP may affect the Formula Financing Grant from the federal government. The distribution is 20% to 80%, so the grant reduction will amount to $3.4 billion, and will constitute 17.2% of the direct federal revenue from the MGP. Income taxes and royalties will contribute 40% and 42.7% respectively to direct federal revenues.

Direct Employment

Direct employment to be generated by the MGP is shown in Table 3.7. Aside from creating significant job opportunities for the local areas in the NWT, it is expected that the MGP will also attract a large number of workers from other parts of Canada. The total number of person years of employment created by the MGP would be 22,024. In the pipelines sector 6,254 person years (28.4%) of total direct employment would be created. The gas producers sector would create 15,770 person years (71.6%).

Table 3.7. MGP: Direct Employment By Sector and Region, Person Years

	Alberta	Rest of Canada	Total
Pipeline sector	2,613	3,641	6,254
Gas producer sector	5,445	10,325	15,770
Total direct employment	**8,058**	**13,966**	**22,024**

Source: WMR study

27 Adjusted for federal grant reductions.

The pipeline construction and gas field development stage is estimated to generate 7,934 (36%) person years. During the operations phase 14,090 person years (64%) would be created. 13,996 person years (63.4%) would be generated in the Rest of Canada (the NWT predominantly). Alberta would gain 8,058 person years (36.6%) of total direct employment. The majority of this new employment would occur during the operations stage. Approximately 2,200 person years are required for pipeline operation on Alberta's portion of the pipeline. Albertans are expected to contribute 5,445 of person years in the gas production operations. Specialists from Alberta will spend approximately 413 person years during pipeline construction.

Table 3.8. MGP: Personnel Requirements by Season During the Peak Construction Years

Region	Winter Year 1	Summer Year 1	Winter Year 2	Summer Year 2	Winter Year 3	Summer Year 3
Alberta	82	28	367	68	327	27
Rest of Canada	1784	355	4488	579	3418	352
Total personnel	**1866**	**383**	**4855**	**647**	**3745**	**379**

Source: WMR study

Employment during the peak construction years of the MGP is outlined in Table 3.8. Since winters are more suitable for construction, 90% of the construction labor requirements are allotted to the winter periods.

3.4. Aggregate Economic Impacts

GDP Impacts

Table 3.9 summarizes the expected increase in GDP by region, sector and project phase for the MGP under $4US/mcf natural gas price scenario.[28]

The estimated total increase in GDP is $57.1 billion. Alberta is estimated to gain 6.4% ($3.6 billion). The remaining $53.5 billion will be shared amongst the Canadian provinces, with the NWT and BC having the largest gains. The construction-to-operations ratio in the GDP impact distribution is 42% to 58% for Alberta and 7% to 93% for the Rest of Canada.

Table 3.9. MGP: Expected Increase in GDP by Region, Sector, and Project Phase, (millions $)

	Alberta	Rest of Canada	Total
Gas producer sector	**1,641**	**41,933**	**43,574**
Gas field development	794	2,445	3,239
Gas field production	847	39,488	40,335
Pipelines sector	**2,003**	**11,565**	**13,568**
Pipeline construction	751	1,376	2,127
Pipeline operations	1,252	10,189	11,441
Construction phase	**1,545**	**3,821**	**5,366**
Operations phase	**2,099**	**49,677**	**51,776**
Total increase in GDP	**3,644**	**53,498**	**57,142**

Source: WMR study

28 Adjusted for leakages from NWT.

In the regional distribution of the GDP increase during the construction phase, Alberta will gain 28.8% ($1.5 billion) of the total Canadian GDP impact. During the operations phase, Alberta will receive 4% ($2.1 billion) of the total Canadian increase in GDP.

Labor Income Impacts

Overall labor income impacts for the MGP under the 4 $US/mcf natural gas price scenario are summarized in Table 3.10.

Table 3.10. MGP: Expected Labor Income Increase by Region, Sector and Project Phase, (millions $)

	Alberta	Rest of Canada	Total
Gas producer sector	**1,382**	**3,886**	**5,268**
Gas field development	681	1,579	2,260
Gas field production	701	2,307	3,008
Pipelines sector	**876**	**1,597**	**2,473**
Pipeline construction	549	895	1,444
Pipeline operations	327	702	1,029
Construction phase	**1,230**	**2,474**	**3,704**
Operations phase	**1,028**	**3,009**	**4,037**
Total increase in labor income	**2,258**	**5,483**	**7,741**

Source: WMR study

The MGP is expected to increase significantly the labor income, $7.7 billion. Alberta's share of the expected total increase in Canadian labor income with the MVP is $2.3 billion (29.2%).

In Alberta, $1.2 billion or 55% of the extra labor income for the province will be generated during the construction phase. The distribution of the labor income between gas producer and pipeline sectors will be 61% to 39% for Alberta.

For the Rest of Canada the contribution to the labor income impacts is almost equal between the construction and operations phases, and will constitute $3.7 billion and $4.0 billion respectively. However, the share of the gas producer sector will be twice as high as that of the pipeline sector ($5.3 billion to $2.5 billion).

Employment Impacts

Overall employment impacts for the MGP are summarized in Table 3.11. The MGP is expected to create 157,215 person years of employment, with Alberta gaining 38,233 person years (24.3%).

Table 3.11. MGP: Expected Employment Increase by Region, Sector and Project Phase, Person Years

	Alberta	Rest of Canada	Total
Gas producer sector	**23,931**	**83,411**	**107,342**
Gas field development	12,814	34,540	47,354
Gas field production	11,117	48,871	59,988
Pipelines sector	**14,302**	**35,571**	**49,873**
Pipeline construction	9,457	19,325	28,782
Pipeline operations	4,845	16,246	21,091
Construction phase	**22,271**	**53,865**	**76,136**
Operations phase	**15,962**	**65,117**	**81,079**
Total increase in employment	**38,233**	**118,982**	**157,215**

Source: WMR study

Most of the jobs for Albertans will be created in the gas producer sector with a total of 23,931 (62.6%) person years of employment. The pipeline sector will generate another 14,302 person years for the Alberta portion of the pipeline. In the Rest of Canada the distribution of person years between gas producer and the pipeline sectors is 68% to 32%.

During the construction period, Alberta will gain 22,271 person years of employment. The Rest of Canada will benefit greatly from the MGP gas field and pipeline construction, adding 53,865 person years of employment. The operations phase will generate 15,962 person years of employment for Albertans, while the Rest of Canada will gain 65,117 person years.

Fiscal Revenue Impacts

Fiscal revenue impacts include increases in provincial and federal government revenues. The MGP is expected to bring a total increase of $1.6 billion in provincial government revenues, of which Alberta should receive $325 million (20%). The federal government is expected to collect a total of $21.7 billion from income tax, royalties and territorial grant reductions. Appendix 4 contains detailed estimates of expected fiscal revenues for the MGP.

Sectoral Economic Impacts

The MGP will induce large economic impacts in many sectors other than oil and gas facility construction, natural gas pipeline transportation, and oil and gas production.

WMR study provides the following approximate estimates of the employment impacts in selected sectors:

- services incidental to mining – 23,500 person years;
- manufacturing – 16,000 person years;
- construction – 12,200 person years;
- transportation, communication and utilities – 16,500 person years;
- trade – 20,000 person years;
- business services – 28,500 person years;
- other – 26,500 person years.

In provinces other than the Northwest Territories there are expected to be approximately 99,000 person years of employment generated by the MGP. About 22% of this impact will be attributed to the business services and 15% to manufacturing. Alberta is expected to have the largest employment increases from the MGP in business services, trade, transportation, communication and utilities.

3.5. The Development Impacts

3.5.1. Industrial and Business Opportunities

Existing studies suggest the development of the MGP and the construction of the MVP will lead to significant industrial and business opportunities and associated employment in the sectors outlined below. Alberta firms will have increased opportunities to participate in competitive contracting.

Oil and gas exploration and production

Increased oil and natural gas exploration in southern and central NWT should also result from the pipeline's existence and would involve companies other than the MGP developers. Specifically, through the Open Season Expression of Interest process the MGP developers have received estimates from at least 20 gas exploration companies with regard to the potential capacity and infrastructure needs to accommodate the shipments of natural gas through the MVP system.29 As the MVP traverses six major petroleum basins in addition to the Western Canada Sedimentary Basin, which extends well into the NWT, it might well become a catalyst for exploration and production throughout the NWT, with the associated expansions of the backbone pipeline system and new laterals.

Natural gas peripheral distribution systems and franchises

Since the MVP will provide valve access points to enable regional communities to purchase natural gas, many community and private natural gas peripheral distribution systems will emerge in the NWT.

Provision of gas to support oil/tar sands development

Gas for tar sands producers is becoming a critical issue as illustrated by recent curtailment of gas production in the region.

Drilling, completions and well servicing

The MGP proponents ascertain significant need in contracting such products and services as drilling, service rig, coiled tubing, well testing, water filtration, well-site trailers and pressure trucks, etc.[30]

Mining

Significant expansion in the mining of smaller pools and mineral deposits is anticipated in the NWT's Inuvialuit and Gwich'in settlement areas due to the construction of roads and an infrastructure for the MGP.[31]

29 MGP PIP, p.2-5
30 MGP PIP, pp.7-8.

Electricity generation

The MGP proponents identified the need to contract electrical power generation services[32]. It is expected that there will be expansion or construction of electricity generation facilities in the NWT and along the MVP route, either based on diesel fuels or natural gas. Also, many communities along the MVP route will be able to switch from diesel-generated electricity to electricity generated from natural gas.[33.]

Industrial construction

The MGP proponents have determined the need to contract for a number of services and to purchase large amounts of goods related to construction of the facilities and the pipeline. These include: surveying, building supplies; hardware, paint, lumber and plywood; electrical contracting and supplies; plumbing contracting and supplies; carpentry and finishing; heating, ventilation and air conditioning supply, installation and maintenance; concrete, crushed rock, sand and ready-mix products supply; forms, rebar, cribbing, cement finishing and masonry products; timber for pipeline skids and survey laths, and welding services and supplies.[34]

Industrial equipment supply and repair services

There is potentially a high requirement for the rental of heavy-duty and drilling equipment and related repair services, small engine repairs, small equipment supply and rental, equipment for production of steam and high-pressure water, and various types of industrial supplies.[35]

Petroleum industries development

The NWT government is budgeting for studies to assess the feasibility of establishing an industry for refining petroleum products, as well as an industry for the processing of gas liquids[36]

Development of secondary and value-added industries

Due to the availability of cheaper gas from the MVP, enabling gas-fired equipment, the local forestry industry in NWT could develop more value-added products.[37]

Land development and residential construction

Significant land development is expected in the municipal centers servicing the MVP pipeline construction and operations such as Ford Liard and Inuvik, and Sahtu, Deh Cho and the Beafort Delta regions[38.] Also, NWT government predicts a significant increase in residential construction due to the lack of available housing to service the MGP infrastructure. There is an opportunity for residential construction

31 GNWT NRRDS, pp.19-20.
32 MGP PIP, pp.7-8.
33 WMR study, p.72.
34 MGP PIP, pp.7-8.
35 MGP PIP, pp.7-8.
36 GNWT NRRDS, p.50.
37 GNWT NRRDS, pp.49-50.
38 GNWT NRRDS, pp.42-44.

firms to create more than 2,000 homes in the areas designated as service centers to the MVP, which will be needed for the estimated 25 years of pipeline operation.

Communications networks and e-commerce

The NWT government also predicts an increase in small business and aboriginal business opportunities with a large demand for communications networks and e-commerce consulting[39]. The MGP proponents also foresee a demand for the installation of new telecommunications equipment and facilities, and a greater demand for cellular phones, high-speed Internet and cable TV.[40]

Geoscience services

The MGP is expected to create significant long-term government and private demand for geological consulting firms in the production of geoscience surveys and databases.[41]

Community services

Significant growth opportunities exist in the NWT with the MGP in the areas of community services, especially childcare, family counseling, addiction counseling, and health care[42.]

Medical services

Another benefit of the MVP construction and operation will be the emergence or improvement of the NWT's medical facilities, supplies and ambulance services, growth in dentistry and optometry fields, as well as supply ofprescription drugs in order to service the personnel and affected communities. There will also be an in the demand for safety equipment, supplies and training.[43]

Economic, management and legal consulting

The government of Northwest Territories, and especially Aboriginal self-governments, including the APG, will require consultants for topics of devolution and resource revenue sharing, tax and royalties policies, self-government concepts and practices, partnership agreement practices, marketing and promotion practices, equity participation, e-commerce and large database creation, organization of public consultation processes, etc.[44]

Educational and career consulting

Due to the benefits agreements under the MGP and the territorial government plans to develop a skilled workforce to facilitate non-renewable resource projects in the NWT, there will be a significant demand for the services of firms able to offer competitive and comprehensive industry specific and career oriented training.[45] It

39 GNWT NRRDS, pp. 47-48.
40 MGP PIP, pp.7-8.
41 GNWT NRRDS, p. 20.
42 GNWT NRRDS, pp.41-42.
43 MGP PIP, pp.7-8.
44 GNWT NRRDS, pp.1-13.
45 GNWT NRRDS, pp.15-17.

will be necessary to upgrade programs in the Territories' colleges, requiring creative educational consulting.

Transportation and logistics

The MGP proponents identified that there would be significant needs in local and out-of-NWT services related to materials handling, expediting, freight transport, air transportation, charters and maintenance, vehicles dealerships and maintenance, as well as charter of boats and barges.[46] Also, the NWT government has planned construction of extensive road, highway and transportation facilities, in which local companies will be involved.[47]

Business, banking, travel, and office administration services

Since the MGP requires new offices, facilities and related personnel, there will be a substantial demand for security and janitorial services, materials and supplies purchasing, secretarial, clerical, word processing, accounting, and computer network services. Substantial development is also expected to occur in the banking and travel service industries to facilitate management of the MGP infrastructure.[48]

Accommodation, catering and utilities services

The MGP proponents forecast the need for additional apartment and hotel rooms, as well as camps. Growth is expected in the complementary catering industries, such as restaurants and cafes, taxi, laundry, dry-cleaning, grocery stores, utilities etc.[49]

Fuel products supply and storage

The MGP proponents have expressed the need to contract or purchase propane and fuel storage tanks, oil and diesel fuel tanks, fuel delivery and storage facilities. Large quantities of bulk fuel, propane, diesel fuel, aircraft fuel, gasoline, fuel and lubricating oil, glycol and chemicals are required.[50]

Value-added opportunities for Alberta

Alberta as a natural gas hub can capitalize on such value-added opportunities as NGL processing and power generation from gas fired facilities. According to the WMR study: "It is anticipated that condensate from Mackenzie Delta gas fields would be extracted from the Mackenzie Valley pipeline fluid stream at Norman Wells. However, other NGLs such as ethane, propane and butane would remain entrained in the stream that would head south from Norman Wells and eventually into the TransCanada Alberta System. At some point these liquids could be extracted at either Cochrane or Empress and this could provide opportunities to add value to the NGLs." [51]

Also, according to the WMR report, over the last few years Alberta has significantly expanded its gas fired electricity generation capacity. The inflow of the

46 MGP PIP, pp.7-8.
47 GNWT NRRDS, pp.41.
48 MGP PIP, p.7-8
49 MGP PIP, p.7-8
50 MGP PIP, p.7-8
51 WMR study, p.66

MGP natural gas would further support the development of cleaner gas fired power generation systems in the province.

3.5.2. Regional and Community Economic Development

Ancillary Expenditures of the Government of the NWT

The NWT are expected to benefit the most from the MGP. As a result, the NWT will also contribute funds in the form of Ancillary Government Expenditures (AGE). In anticipation of the MGP and other non-renewable resource projects, the Government of the NWT issued The Non-Renewable Resources Development Strategy (NRRDS) in 2000, where potential AGE can be identified according to the activity principle (see Appendix 5 for more details). The commitment of the NWT government to support the MGP and related projects was also reiterated in its 2002 NWT Energy Strategy.

The NRDDS provides four-year estimates of the required $340.1 million investment, funded by revenues from non-renewable resource projects (see Table 3.12). The total NWT government commitment is only $104.7 million or 30% of the required funds. The rest can be financed with the help of the federal government, strategic investments with other provinces, and business and community groups. However, "the federal government investment has been far less than what was anticipated and the GNWT has been responsible for the majority of the investments made."[52]

The NRDDS allows identification of the ancillary government expenditures groups related to the impact of the MGP and other non-renewable resources projects in the NWT as shown in Table 3.12. The top five-ranked AGE in the Northwest Territories are:

- land access and transportation infrastructure;
- support to small business;
- incentive programs for mineral exploration;
- human resources development for mining, oil and gas industries; and
- monitoring of biophysical and socio-economic environments.

52 GNWT. "NWT Energy Strategy", 2002, p.16.

Table 3.12. NWT Government Estimates of NRRDS Investment Related to the MGP and Other Non-Renewable Resource Projects, (millions $)

	Total four-year estimates
Land access and transportation infrastructure	170.0
Support to small business	50.0
Incentive programs for mineral exploration	24.1
Human resources development for mining, oil and gas industries	17.9
Monitoring of biophysical and socio-economic environments	17.0
Promotion of value-added industries	10.0
Mitigation of the social impacts to development	8.0
Clarification of policy direction and northern benefits expectations	5.8
Support of the balanced economic growth	3.3
Promotion of the employment of northerners	4.8
Support and facilitation of an Intergovernmental Forum	4.4
Development of the pipeline hosting areas	4.0
Devolution of resource management (gas royalties)	3.9
Water supply, storage and treatment facilities	3.2
Marketing and promotion of the MVP	3.2
Sewage facilities	3.0
Environmental protection	2.4
Equity participation of Aboriginal Pipeline Group (AGP) in the MVP	1.7
Land development	1.0
Industrial waste storage facilities	0.8
Feasibility study of natural gas conversion for NWT communities	0.6
Municipal road upgrades	0.6
Leveraging of infrastructure investment throughout partnerships	0.5
Total required investment	**340.1**

Source: GNWT NRRDS

Significant funds will go towards the development and maintenance of water, sewage, industrial storage and waste infrastructure.

Northern Communities and Aboriginal/First Nations Economic Development

The MGP will significantly benefit economic development of the First Nations in the NWT and Alberta. Specifically, the following First Nations stand to gain: Inuvialuit, Gwich'in, Sahtu and Deh Cho First Nations in the NWT, and Dene Tha' First Nation (communities in Chateh, Meander River and Bushe River) in Alberta.

Opportunities exist with the MGP on the basis of land and benefits agreements. The MGP proponents are currently actively working with First Nations and Aboriginal Pipeline Group (APG) to define benefits plans to be submitted with regulatory applications and finalized during the project definition stage. These benefit agreements typically specify education, training and job opportunities for aboriginal citizens in the MGP. In the case of the APG, they also specify revenue implications from almost one third of the APG's ownership of the MVP.[53] As per the

53 http://www.mackenziegasproject.com/opportunities/benefits/index.html

APG's website, they see employment and business opportunities in all phases of the MGP development.

The MGP proponents also plan to bring such northern and First Nations business development initiatives as:[54]

- Identification of the potential aboriginal suppliers of goods and services for the MGP early in the project, and subsequent procurement for the project from these businesses;
- Contracting aboriginal businesses that are internationally cost competitive and able to meet project standards and schedules;
- Working with First Nations businesses and communities on awareness about the business opportunities, pre-qualification processes, safety requirements, bidding procedures and business processes, etc.

3.5.3. Potential Gains/Risks to Consumers and Society

The most widely recognized benefits and risks of the MGP to the consumers and society in general are local access to natural gas; decrease of natural gas price volatility in North America; and socio-economic and environmental impacts.

Local Access To Natural Gas

Under the MGP, " proponents plan to provide valve access points on the transmission pipeline system to enable regional communities to purchase natural gas. The communities or local developers will be responsible for providing any transportation, distribution, metering, processing or other facilities needed to bring natural gas from the transmission pipeline system to users in the communities."[55]

Local access to natural gas in the Mackenzie Delta and along the MVP route provides a range of alternatives for energy consumption from household appliances to district energy. Local energy options include communities switching from diesel heating and diesel-generated electricity to natural gas heating and power generation, which would allow substantial household and community savings. Typical household heating savings from switching from diesel to natural gas will be in the range of $350-$650 per year per household, and would constitute only 25%-35% of the current heating costs[56]. Commercial property owners would also experience substantial savings by converting to gas. This switch would also induce employment opportunities on the various projects involving construction of the community peripheral pipeline systems, metering stations and related facilities.

Decrease of Natural Gas Price Levels and Volatility in North America

Natural gas prices are affected by many factors including changes in overall demand, supply costs, swings in inventory levels and changes in pipeline capacity. Incremental MGP gas supply is expected to stabilize the North American natural gas supply-demand gap and to reduce the size of expected significant natural gas price increases in Canada and the United States over the next decade. According to the National Energy Board, without the introduction of the MVP volumes of natural gas,

54 MGP PIP, p.7-7.
55 MGP PIP, pp.3-1.
56 WMR study, pp.70.

the Alberta natural gas plant-gate price could rise by $0.05/mcf to $0.10/mcf before 2010. If the MVP becomes operational this would save Canadian gas consumers $350 million per year.[57]

Socio-Economic and Environmental Impacts

The MGP will generate a range of socio-economic and environmental impacts. These impacts are currently being evaluated under the Environmental Impact Assessment (EIA) and Socio-Economic Impact Assessment (SEIA) studies, as well as studies for the implications of the MGP for land and water use. "EIAs include changes the Project may have on the plants, fish, soil or air of an area. SEIAs include activities that could affect lifestyle or create a change in a community's social or financial well-being."[58]

Environmental impacts in the production and pipeline EIA study areas include air quality, noise, aquatic features (hydrogeology, hydrology, fisheries), and terrestrial features (geology, permafrost, soils, vegetation, wildlife). Other effects of the project on the biophysical environment are: potential project incidents and malfunctions, effects on the environment (such as permafrost) on engineering, and the cumulative effects of past, present and future human activities.[59]

A number of EAI studies are currently underway. Upon completion of these studies, the MGP proponents will develop and implement an Environmental Management Plan, key elements of which include: description of the environmental setting, environmental protection plans, environmental alignment sheets, engineering and construction standards, and a contingency and emergency response plan. It is expected that mitigation of the potential MGP effects on the biophysical environment might involve changing the location of project facilities, infrastructure, activities, timing of the activities and operations, construction methods, and operational processes.[60]

One of the major positive environmental impacts of the MGP and the MVP would be a decrease in greenhouse gas emissions (GHG) in North America. This would happen due to the fact that the projects support the prevailing trend of substituting coal-fired electricity generation by natural gas-fired electricity generation, the latter being a much cleaner fuel with respect to GHG levels. In terms of the value of preventing GHG emissions in the context of an emission permit trading system under the Kyoto Protocol, it translates into an estimate that the entire the MVP volume of natural gas if used to substitute coal-based electricity generation, would give an annual benefit in the range of $250 million to $2.1 billion due to the decrease in GHG emissions.[61]

57 WMR study, p.71.
58 www.mackenziegas project.com/ourCommitment/sharingInfromation/studies/index.html
59 MGP PIP, pp.11-4.
60 MGP PIP, pp.10-8.
61 WMR study, p.73.

As regards major types of socio-economic impacts identified for the MGP, these are:

- effects on traditional resource use, lifestyle and culture;
- effects on land and resource use;
- socio-economic effects;
- effects on human health; and
- effects on heritage resources.

Completion of the current and planned SEIA studies will allow the MGP proponents to develop a plan that mitigates these socio-economic repercussions. The Socio-Economic Mitigation plan will include: a public consultation program; an employment, training and capacity development program; a northern procurement program; a worker orientation and training program; a traditional harvest compensation program; a community service plan; a community infrastructure plan; a communication and transportation plan; socio-economic monitoring program[62], and benefits plans.

62 MGP PIP, p.10-4.

4
Economic Impact of the Alaska Highway Pipeline (AHP)

4.1. A Description of the Alaska Highway Pipeline (AHP)

What and Where?

The most recent specifications[63] of the Alaska Highway Pipeline (AHP), also referred to as the Alaska North Slope Gas Project64 or Alaska Natural Gas Transportation System (ANGTS)[65], describe it as a 42-inch pipeline system through the Alaska Highway Corridor from Prudhoe Bay, Alaska to Gordondale, Alberta with a total length of 2,810 kilometers. The extent of the pipeline in each state/province is

- 1,199 km in Alaska;
- 832 km the Yukon;
- 720 km in BC; and
- 65 km in Alberta portion.

The AHP will connect with the existing Alberta pipeline system at a point on the Alberta-BC border at Boundary Lake. "At this junction, the project would tie-in with the Prebuild near Caroline, Alberta; or some of the gas could be transported through existing facilities that may have surplus capacity; or through the expansion of those systems – all consistent with the Northern Pipeline Act and the Alaska Natural Gas Transportation Act."[66]

The goal of the AHP is to deliver natural gas from the Alaska North Slope to the multiple southern markets. By virtue of the long history of oil production in Alaska and the existing investment in the Alaska North Slope infrastructure (seismic information, personnel, roads, etc.), the Alaska gas development is more advanced than in most other northern areas in North America. Also, the AHP gas production is relatively rich in natural gas liquids (NGL). To give some idea of its significance, the flow from the AHP of 4 bcf/d of gas and 10 million gallons per day of NGL would account for 5% and 7% of total North American gas NGL sales respectively.

Who?

The Alaska Highway Route (or Alcan Highway Route) is only one of the proposed pipeline routes to bring Alaska North Slope natural gas to the southern markets. There are also two other major options: the Over-the-Top Route, and the All-Alaskan Route, as well as their various combinations and plans of constructing multiple spur lines. The governor of Alaska currently favors the Alaska Highway Route, and the Alaska state government is devoting significant time and money to promote it.[67]

63 See in detail in Appendix 2
64 www.exxonmobil.com -- Exxon Mobil news release, March 28, 2003
65 State of Alaska. "State Financial Participation in an Alaska Natural Gas Pipeline", Alaska Department of Revenue, January 31, 2002., p.3-4
66 http://www.foothillspipe.com/ahpp/index.html
67 State of Alaska. "State Financial Participation in an Alaska Natural Gas Pipeline", Alaska Department of Revenue, January 31, 2002., p. 3-1.

In all cases, the major pipeline from the Alaska North Slope will be connected with the Alberta terminus of the already existing North American pipeline system. After more than 30 years of discussions and proposals regarding the commercialization of the Alaska North Slope gas reserves via construction of the AHP, two proposals have now been identified as the most politically and economically feasible:

- the proposal of the Alaska Gas Producers (AGP); and
- the proposal of Canadian gas pipeline corporation Foothills Pipe Lines Ltd.

However, at this point it is uncertain which proposal will be given a preference.

The Alaska Gas Producers are Exxon Mobil, Conoco Phillips and BP Amoco -- large, established energy producers with access to financial capital and expertise. They "hold the working interest in most of the discovered natural gas reserves on the North Slope."[68] The AGP propose both gas field development and construction of the pipeline. It is unknown at this stage of project assessment, whether AGP will share the ownership, and thus pipeline construction and operation, with Foothills Pipe Lines Ltd. or with the Alaska Natural Gas Development Authority.

The prospective Canadian pipeline operator -- Foothills Pipelines and its subsidiaries (jointly owned by TransCanada Pipelines Ltd. and Duke Energy) -- have been approved for the construction and operation of the Canadian portion of the AHP since 1977 under the auspices of Alaska Natural Gas Transportation System (ANGTS) agreements, and as one of the 16 original partners. "The ANGTS project jointly approved by the U.S. and Canadian governments in 1977 included a 4,800-mile international pipeline system from the North Slope to California and to Midwest markets. While passing through Alaska, the pipeline would distribute gas for instate use. The 1,700-mile northern potion of ANGTS would follow the Alcan Highway Route to central Alberta. From there, the southern portion of ANGTS (known as the "prebuilt section" – a network of pipe in southern Alberta, British Columbia and across the lower 48 states) would distribute Alaskan and Canadian gas to U.S. markets. The southern portion of ANGTS was completed in 1982 and currently carries Canadian gas to Lower 48 markets. The northern portion of ANGTS, as it was originally proposed, is still being pursued by Foothills and the reconstituted partnership."[69]

When?

The AHP project definition work will begin in the case of AGP, or resume in the case of Foothills Pipe Lines Ltd., as soon as the U.S. senate and other regulatory authorities approve the principal route and the project developers. An interview with the press secretary of the Governor of Alaska, Mr. Manley, in late October 2003, revealed that the decision would be known at the beginning of 2004.

68 State of Alaska. "State Financial Participation in an Alaska Natural Gas Pipeline", Alaska Department of Revenue, January 31, 2002, p. 3-3.
69 State of Alaska. "State Financial Participation in an Alaska Natural Gas Pipeline", Alaska Department of Revenue, January 31, 2002, pp. 3-4.

How Much?

The estimates for the total direct investment requirement range from US$16.3[70] billion in the case of Foothills Pipe Lines Ltd. to US$20[71] billion – for the Alaska Gas Producers group. The overall direct revenues are estimated as $155.2 billion under the $4US/mmBTU natural gas price scenario.[72]

Phasing and Schedule

As in the case with most natural gas field development and pipeline construction projects, the AHP is expected to undergo a four-phase process: 1) feasibility study, 2) project definition, 3) construction and 4) operations.

Phase 1.Feasibility Study

The AHP is currently being assessed by the U.S. senate, by the State of Alaska and by competing project proponents. In 2002, Alaska Gas Producers completed several feasibility studies on the Alaska Highway Route, comparing it to other proposed routes. Although these feasibility studies were never published, it is known that they have established the economic and technical superiority of the Alaska Highway Route. Technical, commercial and environmental analyses by Foothills Pipe Lines Ltd., Duke Energy and TransCanada Pipelines Ltd. have also been completed. Foothills Pipe Lines Ltd. and Informetrica Ltd. have also conducted economic impact studies, proving commercial viability of the AHP under various scenarios. Most studies suggest that with a minimum price of US$3/mmBTU, the AHP will be commercially viable. However, the project proponents continue to evaluate the costs of the project and to lobby for government incentives.

Phase 2. Project Definition

"Following the establishment of a commercial arrangement with Alaska Gas Producers, Foothills will update environmental studies, finalize the engineering and design of the pipeline system and commence procurement of long-lead time materials. Regulatory submission will be ongoing during this phase."[73] The project definition stage is planned to take two years.

Phase 3. Construction

Much of the natural gas field development in Alaska was done in the 1970s and 1980s. However, there are several new small gas fields, which have been discovered that require investment. Also, the construction of a gas conditioning plant and of natural gas liquids (NGL) facilities are necessary to prepare the North Slope gas for transport by pipeline. With respect to the pipeline itself, as mentioned earlier, Foothills Pipe Lines Ltd. has completed the first phase of the initial ANGTS construction program by delivering the east and west legs of the AHP (Prebuild) or southern portions of the AHP in 1982.[74] The Prebuild currently delivers approximately one-third of Canadian gas exports to U.S. markets. The construction

70 WMR & NE study.
71 www.exxonmobil.com News release, March 28, 2003.
72 This report is globally using the WMR & NE study for Foothills Pipe Lines Ltd. as a reference for AHP, since AGP estimates are not publicly available. This is appropriate since the route chosen by both project proponent groups is the same.
73 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Project Phases", January 2002.
74 WMR & NE study, p. 20.

of the northern portions is assumed to require 3-4 years.[75] The preliminary construction plan envisions the simultaneous construction of two geographic sections of the pipeline (spreads) during the winter and summer seasons. The average length of a winter spread is approximately 120 kilometers and the summer spreads average 160 kilometers. Pre-construction activities include construction of access roads, temporary bridges, work camps and the clearing of facility and pipe stockpile sites. Gravel processing and stock piling are also included in this phase of preparation. In the year preceding actual construction, surveying and clearing of brush and trees on the right-of-way will be performed. This stage of construction could take a couple of years and will move along ahead of the full construction. Construction of the pipeline will take two full years to complete and that means year round work will be required."[76]

Phase 4. Operations

The flow of natural gas and NGLs is expected to commence five years after the beginning of construction. The preliminary estimates with respect to the natural gas throughput are in the range of 2.5-4.5 bcf/d. "Final clean-up and revegetation will continue in the first year of operation."[77]

The Current State of Play

The project currently stands in an advanced state of readiness.[78] The two issues holding back the AHP are 1) structuring of the political agreement and 2) the economic and regulatory complexity of the project.

There are a number of positive developments affecting the political will of the United States to bring gas from the Alaska North Slope reserves. In a letter from the Secretary of Energy, Spencer Abraham, to the United States Senate, Abraham endorsed the construction of a commercially viable AHP[79] as important to U.S. long-term energy security. Furthermore, the U.S. Energy Administration strongly supports:[80]

- the United States House and Senate provisions streamlining the permit process for the AHP;
- an appropriately structured 80 percent loan guarantee, accelerated depreciation, and an enhanced oil recovery tax credit to support construction of the AHP.

Most importantly, it opposes the price-floor tax credit provision in the Senate bill and any similar provision due to their potentially distorting effects on energy markets, fiscal discipline and Canada-U.S. bilateral energy integration.

Due to the projections of significant benefits of the AHP to Alaska, the state is enthusiastically lobbying the U.S. Congress to pass a federal legislation enabling the AHP. Alaska is also preparing legislation for the AHP. Currently, the Alaska State

75 WMR & NE study, p. 106.
76 http://www.foothillspipe.com/newsroom/publications/html/pipeconstruction.html
77 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Project Phases", January 2002.
78 http://www.foothillspipe.com/ahpp/index.html
79 Letter of the U.S. Secretary of Energy to Chairman of U.S. Senate P.V. Domenici, September 10, 2003.
80 Letter of the U.S. Secretary of Energy to Chairman of U.S. Senate P.V. Domenici, September 10, 2003.

Senate is considering reauthorization of the Alaska Stranded Gas Development Act, or House Bill 16.[81]

According to ExxonMobil,[82] gas producers recently met with the Governor of Alaska and his staff "to discuss plans for entering into negotiations regarding state fiscal certainty, as well as ways to reduce project cost and improve project viability," as well as to outline "the activities and plans between the producers and the State of Alaska." Gas producers are expecting to receive approval of the contract terms by the Alaska State Legislature in 2004.

The AHP involves considerable economic and regulatory complexity, not least because it is a multi-jurisdictional project, requiring Canada-U.S. cooperation and the respective governments surveillance. "To move gas from Alaska, multiple jurisdictions would exercise regulatory authority, however, the primary regulatory authorities would probably be the Federal Energy Regulatory Commission (FERC) jurisdiction within Alaska, the National Energy Board (NEB) jurisdiction within Canada, and the FERC jurisdiction again downstream to ultimate markets in the Untied States. To construct a multi-jurisdictional pipeline and get it financed in a timely manner requires regulatory approvals, a known and agreed-upon tariff structure, an approved pipeline route and set of initial rates, and transportation agreements that have terms and volume to allow financing, and that mirror each other by jurisdiction, and in receipt and delivery points."[83]

The Alaska Natural Gas Transportation Act (ANGTA) and related documents have to be augmented with respect to open access provisions, open season processes, tariffs, environmental mitigation plans, certificates and permits, etc., which means that the AHP developers will need to obtain many other, or new U.S. and Canadian permits. Foothills Pipe Lines has an advantage with respect to this, since it holds both American and Canadian certificates of public convenience and necessity, the most important permits so far, as well as many other permits that are still valid in both countries.

4.2. Summary Of Major Economic Impacts of the AHP

Table 4.1 below summarizes the major economic impacts from the AHP project for Alberta, Rest of Canada, Canada and Alaska. The AHP project will attract a total private direct investment of $16.3 billion. Twenty-five-year projections for the AHP foresee $155.2 billion in direct revenues and 27,919 person years of direct employment. The AHP will generate a $160.9 billion increase in GDP, a $7.2 billion labor income increase, 98,749 additional person years of employment increase, and a $61 billion increase in provincial and federal government revenues.

81 www.exxonmobil.com News release, March 28, 2003.
82 www.exxonmobil.com News release, March 28, 2003.
83 State of Alaska. "State Financial Participation in an Alaska Natural Gas Pipeline", Alaska Department of Revenue, January 31, 2002, pp. 6-10.

Table 4.1. AHP: Summary of Major Economic Impacts

	Alberta	Rest of Canada	Canada	Alaska	Alberta's share
Direct economic effects					
Direct investment, millions $	155	5,298	5,453	10,868	0.9%
Direct revenues, millions $	641	24,083	24,724	130,450	0.4%
Direct employment, person years	6,061	8,949	15,010	12,909	21.7%
Aggregate economic impacts					
GDP/GSP increase, millions $	2,551	25,909	28,460	132,422	1.6%
Labor income increase, millions $	1,550	2,290	3,840	3,390	21.4%
Employment increase, person years	25,340	47,024	72,364	26,385	25.7%
Provincial government revenue increase, millions $	220	2,584	2,804	30,245	0.7%
Federal government revenue increase, millions $	408	4,584	4,992	22,989	1.5%

Source: WMR & NE study

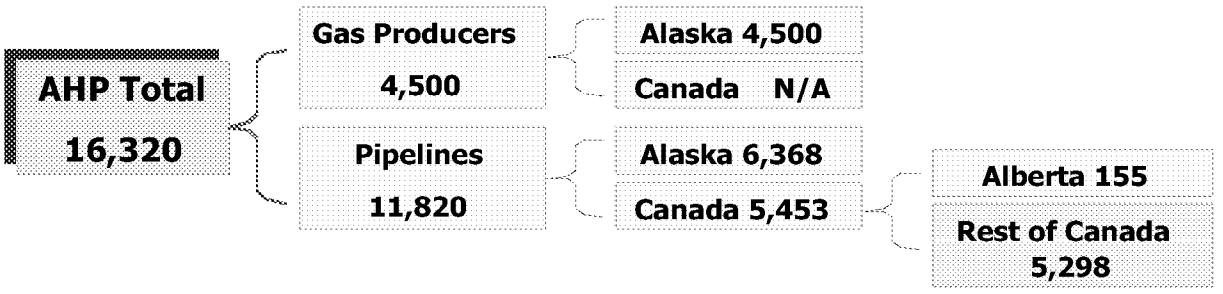
Table 4.1 shows that although the portion of the AHP in Alberta is very small, the province stands to receive a substantial share of the economic impacts. The AHP project promises Alberta $641 million in direct revenue, as a result of the $155 million direct investment. The provincial economy would enjoy a $2.5 billion GDP increase, a $1.5 billion labor income increase and a $628 million government revenue increase. Alberta will benefit most from the AHP-generated employment, estimated as 6,061 person years of direct employment and an increase of at least 25,000 person years of aggregate employment.

4.3.Direct Financial Flows and Employment

Direct Investment

Figure 4.1 below shows the direct investment estimates for the AHP by sector and region. Of the $16.3 billion direct investment required for the AHP, at least $4.5 billion will be contributed by the gas producers towards gas field development and production operations. The pipelines sector will contribute $11.8 billion for pipeline construction and operations.

Figure 4.1. AHP: Direct Investment Estimates



Source: WMR & NE study

Canada is not expected to invest in the Alaskan gas field development. In the pipelines sector, approximately $5.4 billion (45%) is allocated for the Canadian portion of the pipeline. The Alberta portion of the pipeline will require $155 million (1.3%); the majority of the Canadian portion of the AHP is attributed to the Yukon and British Columbia. A major part of the gas producers' capital expenditures will be allocated to construction of the plants and facilities construction ($2.25 billion), and the rest will be distributed between expenditures on the development of other gas fields ($2.1 billion), and operations & maintenance of the gas production ($150 million), as shown in Table 4.2.

Table 4.2. AHP: Gas Producers Capital Expenditures, (millions $)

	millions $
Plants & facilities construction	2,250
Other field development	2,100
Operations & maintenance	150
Total gas producers capital expenditures	**4,500**

Source: WMR & NE study

Table 4.3 below reports estimates of the capital expenditures required for the AHP pipeline construction and operations. The estimates for six major groups of capital expenditures are the following:

- project development and regulation will require an investment of approximately $650 million;
- engineering costs will be around $212 million;
- logistics, construction and project management will require $567 million;
- capital expenditures on materials (pipe, compression, chilling and cooling, and metering stations) is expected to be around $5 billion;
- construction of the pipeline and compression stations will require approximately $5.1 billion;
- operations and maintenance capital expenditures are estimated around $236 million.

Table 4.3. AHP: Pipeline Construction and Operation Capital Expenditures[84]

	millions $	%
Project development and regulation	**650.1**	**5.5**
Engineering	**212.8**	**1.8**
Logistics, construction & project management	**567.4**	**4.8**
Materials	**5,023.5**	**42.5**
Pipe	2,576.8	21.8
Compression, chilling & cooling	2,423.1	20.5
Meter stations	23.6	0.2
Construction	**5,129.9**	**43.4**
Pipeline	3,877.0	32.8
Compression stations	1,252.9	10.6
Operations and maintenance	**236.4**	**2.0**
Personnel (inc. commissioning)	47.3	0.4
Facilities	11.8	0.1
Spare parts & inventory	177.3	1.5
Total pipeline construction and operation capital expenditures	**11,820**	**100.0**

Source: WMR & NE study, Informetrica study

If Foothills Ltd. will be an AHP project developer, then the highest shares[85] of the project development and regulation costs, engineering costs, and logistics, construction and project management costs are estimated to occur in the Alberta portion of the pipeline, and will constitute respectively 57.4%, 57.5% and 29.1% of the total. However, the Alberta portion of capital expenditures on materials, construction, and operations and maintenance will be only 1.1%, 1.1% and 2.3% of the total. The majority of materials, construction, and operations and maintenance costs will be allocated to the Yukon, British Columbia and Alaska. Overall, Alberta's share of the AHP pipeline construction and operation capital expenditures is estimated around 6.6%. Alaska and the rest of Canada will account for 48.8% and 54.6% of these costs respectively.

Direct Revenues

Table 4.4 reports total direct revenues from the AHP gas field production and operation (producer netback) and pipeline operation (cost of service). Direct revenues from the AHP are estimated to be $155 billion. Gas production will generate 67.3% or almost $105 billion in direct revenues. Pipeline transportation (cost of service) is expected to generate 32.7% or about $51 billion in direct revenues. Of the cost of

84 The approach used to arrive at these estimates was the application of Informetrica study percentages of the AHP pipeline construction and operations capital expenditures groups to the total WMR & NE estimate. Both the Informetrica and WMR & NE studies use AHP capital expenditures data from Foothills Pipe Lines Ltd. The described groups of capital expenditures are derived from the pipeline project specifications, summarizing the estimates of the total length of the pipelines, gas transmission capacity, number of compressors, metering stations, operations and maintenance stations, number of conventional pipeline spreads, number of operators involved, required workforce and duration of the construction period, etc. (see Appendix 2). The estimates should be interpreted with caution.

85 Shares for Alberta and other regions are estimated on the basis of the Informetrica study, which uses the Foothills Pipe Lines Ltd. data on AHP capital expenditures.

service revenues to be received during the operations phase, Alberta and the Rest of Canada (Yukon and BC) are expected to get 1.3% and 47.5% respectively.

Table 4.4. AHP: Distribution of Direct Revenues By Region and Sector, (millions $)

	Alberta	Rest of Canada	Alaska	Total
Gas producer sector (producer netback)	-	-	104,480	104,480
Pipeline sector (cost of service)	641	24,083	25,970	50,694
Total direct revenues	641	24,083	130,450	155,174

Source: WMR & NE study

These revenues will be distributed among the gas producers, the pipelines sector and the provincial and federal governments. Private Alaskan gas producers' returns are expected to be at least 33.5% or approximately $52 billion of the revenues with the AHP, as indicated in Table 4.5. Approximately $6 billion will be allocated to cover gas production costs (3.9% of direct revenues). Pipeline operators' returns are estimated at $9.8 billion or 6.3% of direct revenue. Pipeline operating costs and depreciation will consume almost $29 billion or 18.7% of the AHP direct revenues.

Table 4.5 AHP: Distribution of Direct Revenues by Components

	Millions $	**%**
Gas production costs	6,044	3.9
Taxes and royalties	58,325	37.6
Gas producer returns	51,963	33.5
Pipeline operating costs & depreciation	28,994	18.7
Pipeline operators returns	9,848	6.3
Total direct revenues	**155,174**	**100.0**

Source: WMR & NE study

As reported in Table 4.5, total direct state, provincial and federal revenues are predicted to be $58.3 billion, collected from property taxes, income taxes and royalties. Alberta will collect only 0.2% of the total direct provincial/state government revenues: $30 million in property tax and $35 million in income tax. Almost $30 billion or 92.8% of state/provincial government revenues will go to Alaska, mostly due to the royalties. The Rest of Canada (Yukon and BC) will receive $2.2 billion or 6.9% of the direct provincial/state government revenue taking into account federal grant reductions in Yukon.

Total direct federal revenue is estimated at $26.1 billion, of which almost $4 billion (15.2%) will go to the Canadian federal government, and the U.S. federal government will collect $22.1 billion (84.8%). These revenues will be collected primarily from income taxes. In the case of Canada, Yukon's provincial government revenue may affect the Formula Financing Grant from the federal government. This means that $1.7 billion or 75% of the Yukon Government's revenue from income and property taxes may go to the Canadian federal government in the form of grant reductions.

Table 4.6. AHP: Direct Provincial, State And Federal Government Revenues, (millions $)

	Direct provincial/state government revenues				Direct federal government revenues		
	Alberta	Rest of Canada[86]	Alaska	Total	Canada	U.S.	Total
Property tax	30	1,486	2,767	4,283	-	-	-
Income tax	35	732	6,187	6,954	2,286	22,198	24,485
Royalties	-	-	20,896	20,896	-	-	
Grant reductions	-	-	-	-	1,707	-	1,707
Total direct government revenues	**65**	**2,218**	**29,850**	**32,133**	**3,993**	**22,198**	**26,192**

Source: WMR & NE study

Direct Employment

Direct employment generated by the AHP is shown in Table 4.7. Employment is allocated to the region within which the specific activity is occurring, however, employment is expected to attract workers from other parts of Canada. The number of person years of employment created by the AHP would be 27,919. The pipelines sector would create 19,890 person years (71.2%) of direct employment, while the Alaskan gas production sector would create 8,029 person years (28.8%). Alaska's share of direct employment is estimated to be 12,909 person years (46.2%), with the majority of people employed in the gas field development.

Table 4.7. AHP: Direct Employment By Sector And Region, Person Years

	Alberta	Rest of Canada	Alaska	Total
Pipeline sector	6,061	8,949	4,880	19,890
Gas producer sector	-	-	8,029	8,029
Total direct employment	**6,061**	**8,949**	**12,909**	**27,919**

Source: WMR & NE study

Alberta is predicted to gain 6,061 (21.7%) person years of employment from the AHP. Albertans are expected to work only in the pipelines sector during the pipeline construction and operation. 8,949 person years (32%) are likely to be created in the Rest of Canada. Alaskans will benefit from the creation of 4,880 person years of direct employment.

86 Adjusted for federal grant reductions.

Table 4.8. AHP: Personnel Requirements By Season During The Peak Construction Years

Region	Winter Year 1	Summer Year 1	Winter Year 2	Summer Year 2	Winter Year 3	Summer Year 3
Alberta	-	-	-	301	238	480
Rest of Canada	500	1204	2906	3693	2650	3216
Alaska	448	359	2154	1732	2147	1726
Total personnel	**948**	**1563**	**5060**	**5425**	**4797**	**4942**

Source: WMR & NE study

The construction phase of the AHP is estimated to generate 12,419 (44.5%) person years. During the AHP operations phase 15,500 person years (55.5%) will be created. Also, as outlined in Table 4.8, during the peak construction years employment for the AHP project will peak in the summers with levels 20%-25% higher than in the winters.

4.4. Aggregate Economic Impacts

GDP/GSP impacts

Table 4.9 summarizes the expected increase in gross domestic product (GDP) and gross state product (GSP) by region, sector and project phase, generated by the AHP. The estimated total increase in GDP/GSP is $160.9 billion.[87]

Table 4.9. AHP: Expected Increase In GDP/GSP By Region, Sector, And Project Phase, (millions $)

	Alberta	Rest of Canada	Alaska	Total
Gas producer sector	-	-	104,213	104,213
Gas field development	-	-	257	257
Gas field production	-	-	103,956	103,956
Pipelines sector	2,551	25,909	28,209	56,669
Pipeline construction	1,441	2,335	2,556	6,332
Pipeline operations	1,110	23,574	25,653	50,337
Construction phase	1,441	2,335	2,813	6,589
Operations phase	1,110	23,574	129,609	154,293
Total increase in GDP/GSP	2,551	25,909	132,422	160,882

Source: WMR & NE study

The state of Alaska and Canadian provinces will share the increase in GDP/GSP. Alaska will gain $132.4 billion of state revenue increase or 82.3% of the total generated. Alberta's share is 1.5% ($2.5 billion). The Rest of Canada will benefit significantly, receiving $25.9 billion (16.2%) of the projected GDP/GSP increase, with the Yukon enjoying the largest impact among Canadian provinces.

56% ($1.4 billion) of Alberta's gain in GDP will come from the construction phase and 44% ($1.1 billion) from the operations phase. The Rest of Canada will benefit

87 The studies that underlie these estimates seem to assume that a Canadian company will own and operate the pipeline. This may not be the case if the Alaska producers decide to develop their own project, albeit with the major assistance of Canadian supplies of goods and services. Thus, these figures may be overly optimistic.

mostly from operations, which are expected to contribute 91% ($23.6 billion) and only 9% ($2.3 billion) for construction. In Alaska, operations would bring 97.8% ($129.6 billion) of the increase in GDP, and only 2.2% ($2.9 billion) of the gain would occur during the construction phase. In the regional distribution of the total GDP/GSP increase during the construction phase, Alberta, the rest of Canada and Alaska are expected to secure 21.9%, 35.4%, and 42.7% respectively. The GDP impact in the operations phase would constitute only 0.7% for Alberta, while it is 15.3% for the Rest of Canada and 84% for Alaska.

Labor Income Impacts

The overall labor income impacts for the AHP are summarized in Table 4.10. The AHP is expected to generate a total increase of $7.2 billion in labor income. The 53% Canadian share of the extra labor income would come from the pipeline sector, with Alberta and the Rest of Canada gaining $1.6 billion (21%) and $2.3 billion (32%) respectively. Thus, Alberta is expected to benefit significantly from the increase in labor income due to the AHP project.

Table 4.10. AHP: Expected Labor Income Increase By Region, Sector and Project Phase, (millions $)

	Alberta	Rest of Canada	Alaska	Total
Gas producer sector	-	-	1,628	1,628
Gas field development	-	-	191	191
Gas field production	-	-	1,437	1,437
Pipelines sector	1,550	2,290	1,763	5,603
Pipeline construction	1,089	1,578	1,212	3,879
Pipeline operations	461	712	551	1,724
Construction phase	1,089	1,578	1,403	4,070
Operations phase	461	712	1,988	3,161
Total increase in labor income	1,550	2,290	3,390	7,230

Source: WMR & NE study

Almost $1.1 billion or 70% of Alberta's income impact will come from the construction phase. The Rest of Canada has a similar distribution of additional labor income between phases, and is expected to gain 69% of extra labor income in the construction and 31% in the operations phase. In Alaska, however, the operations phase should bring $1.5 billion (41.4%) increase in labor income.

Employment Impacts

The overall employment impact for the AHP is summarized in Table 4.11. There should be a significant indirect economic impact on the creation of jobs. The AHP is expected to create 98,749 person years of employment. Albertans will receive 25,340 person years or 26% of the total employment impact for the project. The distribution of employment between the construction and operation phases of the AHP project is 72% to 28% for Alberta, 68% to 32% for the Rest of Canada, and 44% to 56% for Alaska.

Table 4.11. AHP: Expected Employment Increase By Region, Sector and Project Phase, Person Years

	Alberta	Rest of Canada	Alaska	Total
Total gas producer sector	-	-	12,503	12,503
Gas field development	-	-	1,580	1,580
Gas field production	-	-	10,923	10,923
Total pipeline sector	25,340	47,024	13,882	86,246
Pipeline construction	18,310	31,865	9,953	60,128
Pipeline operations	7,030	15,159	3,929	26,118
Construction phase	18,310	31,865	11,533	61,708
Operations phase	7,030	15,159	14,852	37,041
Total increase in employment	25,340	47,024	26,385	98,749

Source: WMR & NE study

Fiscal revenue impacts

The AHP's fiscal revenue impact includes increases in provincial/state government revenues and in federal government revenues. Appendix 4 contains detailed estimates of fiscal revenues for the AHP.

Sectoral economic impact

The AHP project will also generate a large economic impact in many sectors other than oil and gas facility construction, natural gas pipeline transportation, and oil and gas production.

The WMR & NE study reports the following approximate distribution of the employment impacts between these sectors:

- manufacturing – 8,000 person years;
- construction – 11,200 person years;
- transportation, communication and utilities – 7,800 person years;
- trade – 7,600 person years;
- business services – 22,500 person years;
- other – 10,000 person years.

According to the Informetrica study, Alberta is expected to have the largest employment and GDP increases from the AHP project in such sectors as business services, trade, construction, transportation, communication, and utilities.

4.5. The Development Impact

4.5.1. Industrial And Business Opportunities

Foothills Pipe Lines Ltd. identified that the construction and operations of the AHP will lead to the following general industrial and business opportunities.[88]

- Accommodation, catering and food supply services;
- Administrative, general office, accounting and banking services;
- Building and office supplies, equipment, furniture and maintenance;
- Plumbing and janitorial supplies and services;
- Air transportation charters and leasing;

88 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Northern Business Opportunities", January, 2002

- Civil construction supplies and services;
- Clearing contracting;
- Environmental inspection services;
- Medical services;
- Engineering services;
- Surveying services;
- Utilities (water and sewer services, etc.);
- Fuel, petroleum, oils and lubricants deliveries;
- Road maintenance (road grading, snow removal, re-vegetation services, etc.);
- Security services (patrol, expediting, safety equipment and supplies);
- Welding supplies and services;
- Logistics and transportation (vehicle renting and servicing, trucking services,
- Manufacturing of concrete and wood products;
- Electrical supplies;
- Communication services;
- Construction contracting and equipment rentals;
- Excavation and explosives contracting and related services.

The Informetrica study identifies many additional business and industrial opportunities. These are briefly summarized below.

Development of gas fields in Yukon and BC[89]

Construction of the AHP will spur gas field development in areas such as Liard Plateau, Eagle Plain, Feel Plateua, North Cost, Kandik Basin, Bonnet Plume Basin and Old Crow Basin of the Yukon with the total potential of 8.5 tcf. There are also many unexplored gas fields with an estimated reserve potential of more than 100 tcf in such areas of BC as Nechaco Basin, Bowser Basin, Fernie Basin, Georgia Basin, Queen Charlotte Basin, Tofino Basin, Quesnel Trough and Winona Basin. Development of these fields may be intensified due to the construction of the AHP. BC's developed pipeline system and more than 25 gas plants can capitalize on this development.

Electricity generation and cogeneration services and systems

There will be opportunities to service the pipeline with the electricity generation from power generators, burning the AHP's natural gas or using hydro-electricity from the Whitehorse-Aishihik-Faro (WAF) grid.[90] Also, just as with the MVP, there are opportunities for local communities to convert to electricity generation based on natural gas[91] Opportunities for cogeneration (i.e. generation of both heat and electricity from the same energy source) will allow district and municipal energy systems to switch to more economical and cleaner natural gas fired power and heating systems.[92]

89 Informetrica study, WP 4.1.1, p. 1-4
90 Informetrica study, WP 4.1.1, p. 6.
91 Informetrica study, WP 4.2.1, p. 5.
92 Informetrica study, WP 4.2.1, pp. 7-8.

Mining, smelting and supporting railroad infrastructure

The AHP could lead to the further development of mining and smelting within Alaska and the Yukon, with improved access to inexpensive electrical power through the use of natural gas, hydro or cogeneration facilities, and/or in Alaska's case, with the development of a railroad.[93]

Natural gas distribution and conversion systems and franchises

A number of potential local gas distribution providers with the AHP, including private, First Nations and public utility companies, are interested in natural gas franchise agreements with options to service municipal, residential and commercial customers.[94]

Alternative fuel industries development

The Yukon government envisions possibilities for growth in compressed natural gas (CNG) transportation. Provided that there is local access to the AHP gas, more natural gas vehicles could be introduced.[95]

Development of secondary and niche industries

Yukon and BC businesses can expect new contracts for the coating on the pipe and pipeline-related heavy equipment.[96]

Land and residential areas development

The Yukon government anticipates an increase in migration due to the AHP, and thus in lot demand from 50 to 60 lots per year to a high of 200 lots per year in Whitehorse.[97]

Geoscience consulting and services

The AHP is expected to create a significant long-term government and private demand for geological consulting firms to produce geoscience surveys, databases and related services.

Economic, management and legal consulting

The Yukon government and First Nations self-governments will require consultants for the topics such as devolution and resource revenue sharing, tax and royalties policies, land claims, equity participation in the AHP, etc.[98]

Value-added opportunities for Alberta

The AHP can bring two significant value-added opportunities for the Alberta oil and gas industry: 1) the processing of natural gas liquids (NGL), and 2) the use of gas-to-liquids technology (GTL) to derive liquid hydrocarbons from natural gas. As already discussed in connection with the MVP, NGLs are used as a feedstock for petrochemical plants. Hydrocarbons are ultra-clean transportation fuels which are

93 Informetrica study, WP 4.2.1, pp. 1-3.
94 Informetrica study, WP 4.2.1, p. 4.
95 Informetrica study, WP 4.2.1, p. 9.
96 Informetrica study, WP 4.2.1, p. 8.
97 Informetrica study, WP 4.2.1, p. 9.
98 Informetrica study, WP 7.6, p. 6.

sold at premium prices. The full realization of the benefits from these options would include construction of NGL and GTL processing plants in Alaska or along the AHP route, with Alberta companies potentially taking part in these projects.

4.5.2. Regional and Community Economic Development

Yukon Ancillary Government Expenditures

The Yukon is expected to be the most affected Canadian province as regards Ancillary Government Expenditures due to the AHP. The Yukon Government's enhanced awareness about the potential AGE and its high level of readiness is evident in the comprehensive pipeline preparedness strategy it put in place in 2001. Using AGE classification by phases of the pipeline project, Appendix 6 outlines the Yukon's broad plans for needed infrastructure. The Yukon's five-year estimates of AGE suggest that approximately $50 million is required to mitigate the impact of the AHP in the territory. The key AGE related to the AHP's impact in the Yukon are identified as follows:[99]

- Alaska Highway reconstruction – $30 million;
- road and highways maintenance – $10.2 million;
- bridge strengthening – $5.6 million;
- airport construction and maintenance – $3.3 million;
- signs and permits administration – $1.5 million; and
- construction and operation of water, sewage and solid waste facilities – $1.4 million.

Northern Communities and Aboriginal/First Nations Economic Development

The AHP route crosses the settlements of eight of the fourteen Yukon First Nations: White River, Kluane, Champagne-Aishihik, Ta'an Kwach'an, Kwanlin Dun, Carcross-Tagish, Teslin Tlingit, and Liard First Nations.[100] The AHP's economic impact on First Nations thus will originate from the land agreements provisions and the benefits plans associated with its construction and operations. They are identified as follows:[101]

- employment of First Nations workers;
- First Nation-owner businesses as subcontractors on pipeline construction;
- First Nations employees in other businesses;
- tax revenue;
- availability of natural gas;
- additional services and infrastructure that may be provided.

Specifically, Foothills Pipe Lines Ltd. "made many commitments to plan and implement the project in a manner that would enhance benefits to northern communities and minimize adverse effects."[102] This includes several preliminary northern benefits plans.

99 Government of Yukon. "C&TS—Potential Pipeline Impacts and Preparedness Strategy." Community and Transportation Services internal document, July 2001
100 Informetrica study, WP 7.6, p.1
101 Informetrica study, WP 7.6, p.1
102 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Northern Benefits Planning", January, 2002

The Northern Business Opportunities Plan is designed to maximize northern business involvement in supply of goods and services during the AHP construction and operations.[103] It involves measures such as the:

- establishment of the Yukon Business Registry of local businesses able to supply goods and services on generally competitive terms;
- publication of the opportunities for northern businesses to register with the Company; and
- development of tendering and award procedures.

The Northern Residents Training & Employment Plan is designed "to ensure that Foothills, the contractors and subcontractors all give preference to hiring Northerners first. It also details the training and employment opportunities for northern residents."[104]

The Opportunity Measures Plan is developed to ensure "that women and First Nations people of the north have access to training and employment opportunities and that the appropriate support measures are in place to meet any special needs of women and First Nations people, enabling them to receive maximum advantage of the opportunities."[105]

4.5.3. Potential Gains/Risks to Consumers and Society

A number of issues is addressed in this connection by the studies on the AHP.

Local Access To Natural Gas

Alaskan and Northern Canadian communities, households and commercial property owners along the AHP route could realize significant benefits from local access to natural gas, used for conversion from oil to gas-fired heating and power generation systems. For example, Fairbanks households in Alaska would reduce heating fuel costs in the range of US$500 to US$700 per year.[106] "It is expected that the economics of conversion to natural gas are even stronger in Northern Canadian communities such as Whitehorse that would be closer to a gas pipeline than in the case of Alaska where access to crude oil and refineries is much better and fuel oil is a more competitive alternative."[107]

Decrease Of Natural Gas Price Levels And Volatility In North America

Incremental the AHP gas supply will cause a positive supply augmentation effect in the North American natural gas markets that will significantly reduce the expected natural gas price increases in Canada and the United States over the next few decades. For example, the Energy Information Agency forecasts a rise in U.S. natural gas prices of about US$0.43/mcf over the next 10 years, while the National Energy Board (NEB) projects a rise in Alberta plant-gate prices of CDN$0.05/GJ to CDN$0.40/GJ.[108] Introduction of the AHP volumes would bring annual savings to North American consumers in the sum of at least $6 billion per year[109]

103 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Northern Business Opportunities", January, 2002
104 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Northern Benefits Planning", January, 2002.
105 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Northern Benefits Planning", January, 2002.
106 WMR & NE study, p. 96.
107 WMR & NE study, p. 96.
108 WMR & NE study, pp. 86-87.
109 WMR & NE study, p. 90.

Socio-Economic And Environmental Impacts

With a set of regulatory documents for the AHP, Foothills Pipe Lines Ltd. has developed the Environmental and Socio-Economic Terms and Conditions, as required by the Northern Pipeline Agency (NPA). Once the AHP moves into the planning and project definition stage, the company is expected to work with First Nations, the NPA, the territorial and provincial governments and the public on the detailed specifications and an update of the documents.

Several plans have been designed to prevent and mitigate the adverse socio-economic and environmental impacts of the AHP.[110]

The **Traditional Resource Protection Plan** has as its goal "to avoid disruption to traditional seasonal activities and to ensure the respect of areas which are of cultural importance to the First Nations."[111]

The **Health Plan** focuses on ensuring the implementation of accepted public health standards, provision of the proper health care facilities and adequate medical care arrangements in for all pipeline employees.

The **Work Camp Plan** will also implement high standards of food, accommodation, recreational and sanitation facilities for all the AHP employees.

The **Orientation and Counseling Plan** has two goals: training of the pipelines employees on safety practices; and referral counseling of the employees on family relations, personal finances, alcohol & drug abuse, etc. Orientation of pipeline employees will specifically deal with familiarizing them with the pipeline construction and operation area and sites, working conditions, safety practices, and measures to prevent potential environmental damage.

The **Transportation & Logistics Plan** envisages such measures as the prevention of the disruption of existing transportation services in the northern communities, and construction, maintenance or disposal of any additional transportation infrastructure on the basis of maximization of the long-term benefit to the northern communities.

The **Housing Plan** and the **Communications Plan** deal with the minimizing the disruption of the local housing and telecommunications services disruptions during the AHP construction.

One of the major positive environmental impacts of the AHP is the projected decrease in greenhouse gas emissions in North America due to the replacement of coal with natural gas in electricity generation. Electricity generators that burn natural gas instead of coal have 6-9 times smaller volumes of CO2 emissions. In terms of the value of preventing GHG emissions in the context of an emission permit trading system under Kyoto protocol, the AHP volume of natural gas, if entirely used to substitute coal-based electricity generation, would give an annual environmental benefit between $800 million and $6.4 billion."[112]

110 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Northern Benefits Planning", January, 2002.
111 Foothills Pipe Lines Ltd. "Alaska Highway Pipeline Project: Northern Benefits Planning", January, 2002.
112 WMR & NE study, p, 94.

5
Conclusions and Recommendations

Based on the available studies and information collected by the Western Centre for Economic Research, the construction and operation of both the MVP and the AHP will have a significant impact on Albertan economy, summarized in Table 5.1.

Table 5.1. Summary of Major Economic Impacts from the Construction of Both Pipelines

	Alberta	Total	Alberta's share
Direct economic effects			
Direct investment, millions $	421	23,934	1.8%
Direct revenues, millions $	1,688	208,387	0.8%
Direct employment, person years	14,119	49,943	28.3%
Aggregate economic impacts			
GDP increase, millions $	6,195	218,024	2.8%
Labor income increase, millions $	3,808	14,971	25.4%
Employment increase, person years	63,573	255,964	24.8%
Provincial government revenue increase, millions $	545	34,688	1.6%
Federal government revenue increase, millions $	997	49,716	2.0%

Source: WMR, WMR & NE

Alberta will receive a substantial share of the combined economic impacts from both pipelines in the range of 0.8%-28.3%. The province will experience the greatest impact from employment on the northern pipeline projects. The combined direct employment is estimated around 14,000 person years, with a subsequent employment increase of 63.5 thousand person years over the respective 25-year periods. Proportionally, Alberta is expected to receive 25.4% of the total combined labor income increase, or $3.8 billion. Together, Alberta's portions for the MVP and the AHP pipelines will require $421 million direct investment, and will generate about $1.7 billion in direct revenues. This will induce a $6.2 billion GDP increase, a $3.8 billion labor income increase and a $1.5 billion government revenue increase. In the view of the Western Centre for Economic Research, these estimates are conservative. The methodology likely underestimates Alberta's importance as a supply base.[113]

Many sectors of the province will enjoy increased activity -- in particular, the petrochemical sector, energy generation sector, transportation, trade, insurance and real estate, commercial, business and personal services, communications and utilities, and the construction sector.

The northern pipelines also represent a unique opportunity for Alberta businesses, which will be able to participate competitively in more than 30 identified groups of business opportunities.

The development of the northern pipeline projects also calls for a proactive role of the Alberta government. The Alberta government will have to consider the impact of both the AHP and the MVP projects on its territory in the near future, since both

113 These combined effects imply that the pipelines are built sequentially as otherwise bottlenecks would occur which would render the estimates of costs too conservative.

pipelines will be connected to the southern terminals in Alberta. Although the length of both pipelines in Alberta is limited in comparison to the Yukon, the NWT and BC portions, it is sufficient to impose excess demands on the local and provincial infrastructure and administration systems, warranting potentially significant government expenditures.

On the basis of the Yukon and the NWT analyses of the required government expenditures, the following six Ancillary Government Expenditure (AGE) groups related to the northern pipelines projects are identified as the most probable in Alberta:

- road and highways construction and maintenance;
- waste infrastructure construction and maintenance;
- pipeline materials and equipment storage;
- local gas access and distribution administration programs;
- emergency preparedness programs; and
- signs, permits and other regulatory/administrative measures.

The provincial government departments that will be directly or indirectly involved with northern pipelines regulation and impact mitigation, will have to conduct the following necessary preparatory work:

- Identification of the impacts of northern pipelines in Alberta in liaison with pipeline project proponents or by direct request;
- Identification of provincial AGE requirements, preferably in interdepartmental teams (Alberta Energy, Finance, Infrastructure, Transportation and Community Development) and in liaison with the pipeline project proponents;
- Production of estimates of provincial AGE related to northern pipelines in order to consider their fiscal impact.

These findings suggest a policy initiative to develop an Alberta Northern Pipelines Preparedness Strategy in the spirit of the work already accomplished by the Yukon and NWT governments.

APPENDICES

Appendix 1: Methodology and Assumptions

The economic framework of this report is based on input-output economic theory. It integrates available studies on the economic impact of the Mackenzie Valley Pipeline (MVP) and Alaska Highway Pipeline (AHP) using Statistics Canada's inter-provincial input-output model, and in the case of Alaska – the compatible input-output model IMPLAN. The input-output models simulate the economic impacts by pipeline project stage, sector and province/state. In the case of the MVP, we selected the Wright Mansell Research Ltd. (WMR) report as the reference study. In the case of the AHP, the joint report by WMR and Northern Economics (NE) was used. These reports were selected on the basis of the following criteria:

- the most recent data provided directly by pipeline project developers;
- the smallest difference in year base (2002$ for the MVP and 2000$ for the AHP);
- the same econometric model, methodology, assumptions, and scenarios;
- the most detailed and comprehensive breakdown of estimates, and •
  availability of data for Alberta.

Assumptions for the MVP:

- base year – 2002$;
- Chicago gas prices of US$4/mcf in constant 2002 dollars (real price constant over time);
- an exchange rate of CDN$1.5/US$;
- annual inflation of 2% in Canada and the United States;
- producer netback prices of CDN$3.25/mcf – CDN$4.04/mcf;
- pipeline transportation tariffs or cost of service of 1.39-$0.60/mcf;
- royalty rates – 1% of gross revenue, rising by one percentage point every 18 months to a maximum of 5% of gross revenue until payout;
- tax rates – 29.12% for federal corporate income tax; 0.23% large corporations tax; 14.00% and 13.50% corporate income tax rates in the NWT and Alberta respectively;
- estimation period – 25 years;
- unless otherwise indicated, all figures are in Canadian dollars;
- where applicable, the estimates were adjusted for "leakages" and federal grant reductions.

Assumptions for the AHP:

- base year – 2000$;
- Chicago gas prices of US$4/mmBTU in constant 2000 dollars (real price constant over time);
- an exchange rate of CDN$1.5/US$;
- annual inflation of 2% in Canada and the United States;
- producer netback prices of US$2.06/mmBTU;
- pipeline transportation tariffs or cost of service of US$1.94/mmBTU;

- severance taxes and royalty rates – a maximum of 8.75% for severance tax and 1/8 of gas production volume for the royalty rates;
- corporate income tax – 9.40% for Alaska, 15.00% for the Yukon, 14.00% for the NWT, 16.50% for BC, and 15.50% for AB;
- property taxes – 2.0% for Alaska, 2.0% for the Yukon, 2.3 % for the NWT, 2.0% for BC, and 2.0% for AB;
- capital tax – 0.3% for BC;
- estimation period – 25 years;
- unless otherwise indicated, all figures are in Canadian dollars;
- where applicable, the estimates were adjusted for federal grant reductions.

Standard natural gas conversions[114] were used: 1mmBTU ≅ 1mcf ≅ 1GJ, where mmBTU – Million British thermal units, mcf – Million cubic feet, and GJ – Gigajoules. Complementary economic impact studies used in this report are the Informetrica report on the AHP, the Canadian Energy Research Institute study on the natural gas pipeline options for the North, and the study by Prolog Canada Inc. and The Van Horne Institute on Arctic gas pipeline construction impacts. Other studies/documents were also used including various provincial, Alaska state and federal government publications. In addition, the Western Centre for Economic Research conducted telephone interviews of government officials and consulted with the authors of the economic impacts studies (see Appendix 7).

114 http://www.minnegasco.centerpointenergy.com and http://www.pcf.ca/quick_answers/measurments/gascon.asp

Appendix 2. MVP Specifications

Table A.1. MVP 30" Pipeline Specifications

Pipeline Route	
From	Taglu, NWT
To	Bootis Hill, Alberta
Via	Mackenzie Valley Corridor
Length from Taglu, NWT to Norman Wells, NWT	500 km (312 miles)
Length from Norman Wells to Bootis Hill, AB	785 km (490 miles)
Total length	1,285 km (798 miles)
Pipeline Design	
Initial throughput	1 bcf/day
Expansion potential	1.9 bcf/day
Operating pressure	2050 psi
Compressor stations	4 to 8
Metering stations	N/A
Pipe steel grade	X-80 carbon steel
Pipeline diameter	762 mm (30")
Pipe wall thickness	15.8 mm (0.625")
Construction Strategy	
Pipeline spreads	4 pipeline spread contractors in Canada
Pipeline camps	4 (800-man) camps at 8 campsites in Canada
Peak work force	4,000 construction personnel in Canada
Construction seasons	winter (+/- 50 days) and summer (+/- 60 days)
Operations and maintenance centers	N/A
Construction duration	3 years (1 year for advanced site preparation/logistics)

Source: Prolog Canada & The Van Horne Institute study

Pipeline Design: It is estimated that initial throughput will be 1 bcf/day with the extension potential of 1.9bcf/d and operating pressure of 2,050 psi. There will be 4 compressor stations initially, but 4 more could be added along the route later up to 8. Pipes of steel grade X-80 and diameter of 30″ or 32″ are required.

Construction strategy: Four pipeline-spread contractors will be involved. The project will consist of 8 pipeline spreads. Construction will be carried out at 8 campsites with 4 camps having a capacity of 800 men. The peak work force will constitute 4,000 in construction personnel. Duration of the construction is expected to be 3 years with one year allotted to advanced site preparation and logistics. Winter is a main construction season.

Major construction equipment/materials: Pipes will be sourced in Alberta, Saskatchewan, Ontario and Florida, and shipped by mainline railways to the Mackenzie Northern Railway at Smith, Alberta and then to Hay River or Enterprise, NWT. Further transportation of pipes will occur by barges and trucks. Fuel will be sourced from the Edmonton area refineries. Construction equipment, camp units, compressor and meter station materials and valves, and ancillary materials &

supplies will have to be transported to the project spreads. It is anticipated that four 800-man camps will be required for each pipeline spread and a 100-man camp for the construction of each compressor station. An estimated 1,200 camp units will be required in total or 300 units per camp. Approximately 9,000 tons of consumables are required during the construction period.

Appendix 3. AHP Specifications

Table A.2. AHP 42" Pipeline Specifications

Pipeline Route	
From	Prudhoe Bay, Alaska
To	Gordondale, Alberta
Via	Alaska Highway Corridor
Yukon portion	832 km (517 miles)
British Columbia portion	720 km (448 miles)
Alberta portion	65 km (40 miles)
Alaska portion	1,199 km (745 miles)
Total length	2,816 km (1,750 miles)
Pipeline Design	
Initial throughput	2.5 bcf/day
Expansion potential	4.5 bcf/day
Operating pressure	2050 psi
Compressor stations	40 (16 in Alaska, 10 in Yukon and 14 in BC)
Metering stations	3
Pipe steel grade	X-80 carbon steel
Pipeline diameter	1,067 mm (42")
Pipe wall thickness	19 mm (0.75")
Construction Strategy	
Pipeline spreads	3 pipeline spread contractors in Canada
Pipeline camps	3 (850-1,000 man) camps at 12 campsites in Canada
Peak work force	2,500 construction personnel in Canada
Construction seasons	winter (+/- 50 days) and summer (+/- 60 days)
Operations and maintenance centers	3
Construction duration	3 years (1 year for advanced site preparation/logistics)

Source: Informetrica study, Prolog Canada & The Van Horne Institute study

Pipeline design: Initial throughput is 2.5 bcf/day with expansion potential up to 4.5 bcf/day and with operating pressure of 2,050 psi. 40 compressor stations are required, 24 of which will be in Canada. 3 metering stations will be built. X-80 carbon steel pipe is used with 42″ diameter and pipe wall thickness of 19 mm or 0.75 inches.

Construction strategy: 3 pipeline spread contractors in Canada will be involved. The project will consist of 7 pipeline spreads. There will be 3 camps at 12 campsites in Canada each of 850-1,000 man capacity. During the construction peak 2,500 construction personnel will be working in Canada. Construction will be spread over 3 years, one of which is allotted for the advance site preparation and logistics. Winters and summers are identified as construction seasons.

Major construction equipment/materials: It is assumed that pipes will be purchased from the pipe mills in Alberta, Saskatchewan, Ontario and Florida and shipped by mainline railways. It is anticipated that all fuel will be purchased from the Edmonton refineries subject to the Canadian Government's sulphur content specification for automotive fuel, specifically, diesel grade (50 degree pour point

spec) distillate for pipeline and compressor station construction, camp heating and electrical power generation. Also, small quantities of gasoline and propane will be used. Canadian contractors will use a mix of their existing and new equipment. All equipment will be moved to the various construction spreads by truck alone, direct from storage yards from Edmonton or Vancouver. There will be 49-person dormitories installed made up of 8 modules. Each camp will be comprised of 18 dormitories, kitchen/dining kits, first aid, offices, corridors and chambers, utility skids, gyms and recreational facilities, storage, and power generation stations. Approximately 16,000 tons of consumables are required during the construction phase.

Appendix 4. Detailed Estimates of Fiscal Revenue Impacts for the Mackenzie Gas Project

The overall estimated increase in provincial and federal government revenues (adjusted for grant reduction) for the MGP are summarized in Tables A3 – A4.

Table A3. MGP: Expected Increase In Provincial Government Revenues By Region, Sector And Project Phase, (millions $)[115]

	Alberta	Rest of Canada	Total
Gas producer sector	113	987	1,100
Gas field development	47	95	142
Gas field production	66	892	958
Pipelines sector	212	327	539
Pipeline construction	53	129	182
Pipeline operations	159	198	357
Construction phase	100	224	324
Operations phase	225	1,090	1,315
Total increase in provincial government revenues	325	1,314	1,639

Source: WMR study

The MGP is expected to bring a total increase of $1.6 billion in total provincial government revenues, of which Alberta will receive $325 million (20%), and the Rest of Canada will obtain $1.3 billion (80%). Most of the provincial revenues will be collected during the operations phase of the project. Alberta will collect $100 million (30%) during the construction phase and $225 million (70%) during the operations phase. Other provincial governments will gain only $224 million (17%) from the MGP construction phase, with the rest $1.1 billion (83%) coming from the gas production and pipeline operations.

Table A4. MGP: Expected Increase in Federal Government Revenues by Region, Sector and Project Phase, (Millions $)[116]

	Alberta	Rest of Canada	Total
Gas producer sector	298	19,178	19,476
Gas field development	133	526	659
Gas field production	165	18,652	18,817
Pipelines sector	291	1,968	2,259
Pipeline construction	128	284	412
Pipeline operations	163	1,684	1,847
Construction phase	261	810	1,071
Operations phase	328	20,336	20,664
Total increase in federal government revenues	589	21,146	21,735

Source: WMR study

115 Adjusted for federal grant reductions.
116 Adjusted for federal grant reductions.

With the MGP, the federal government is expected to collect a total of $21.7 billion resulting from income tax, royalties and territorial grant reductions. Alberta will have an increase of only $589 million or 3% in federal government contributions, while the Rest of Canada will assume the majority of this increase – $21.1 billion or 97%.

Appendix 5. Detailed Estimates of Fiscal Revenue Impacts for the Alaska Highway Pipeline

The overall estimated increase in provincial/state revenues (adjusted for federal grant reductions for Yukon) for the AHP are reported in Tables A5 and A6. The AHP is estimated to generate a total of $33 billion increase in provincial and state government revenues. Alberta, the Rest of Canada and Alaska are expected to receive $220 million (0.7%), $2.6 billion (7.8%) and $30.2 billion (91.5%) respectively. For Alaska, $27.3 billion (90.3%) is expected to come from the gas producer sector. Additional Canadian provincial government revenues will be collected from the pipeline sector.

Table 5. AHP: Expected Increase in Provincial/State Government Revenues by Region, Sector and Project Phase, (millions $)

	Alberta	Rest of Canada[117]	Alaska	Total
Total gas producer sector	-	-	27,302	27,302
Gas field development	-	-	20	20
Gas field production	-	-	27,282	27,282
Total pipeline sector	220	2,584	2,943	5,747
Pipeline construction	113	267	240	620
Pipeline operations	107	2,317	2,703	5,127
Construction phase	113	267	260	640
Operations phase	107	2,317	29,985	32,409
Total increase in provincial/state government revenues	220	2,584	30,245	33,049

Source: WMR & NE study

Federal governments are expected to gain almost $28 billion in revenue from the AHP. Alaska will contribute $23 billion revenue increase to the US federal government. Alberta and the Rest of Canada will collect $408 million and $4.6 billion for the Canadian federal treasury respectively. The majority of the AHP's federal government revenue gains will accrue from the gas field production and pipeline operations. During the operations phase, Alberta's contribution to the federal revenues will be only 157 million, while the Rest of Canada will generate $4.1 billion in federal government revenues. Alaska will provide $22.6 billion or 98.5% of its total contributions to the US federal government during the operations phase, with most funds coming from the gas field production. During the construction stage, the Canadian federal treasury will collect $251 million from Alberta and $468 million from the Rest of Canada, adjusted for the grant reductions. All grant reduction increases, almost $1.8 billion, will occur in Yukon.

117 Adjusted for federal grant reductions.

Table A6. AHP: Expected Increase In Federal Government Revenues (Contributions) By Region, Sector And Project Phase, (millions $)

	Alberta	Rest of Canada118	Alaska	Total
Gas producer sector	-	-	19,641	19,641
Gas field development	-	-	44	44
Gas field production	-	-	19,597	19,597
Pipelines sector	408	4,584	3,348	8,340
Pipeline construction	251	468	297	1,016
Pipeline operations	157	4,116	3,051	7,324
Construction phase	251	468	341	1,060
Operations phase	157	4,116	22,648	26,921
Total increase in federal government revenues	408	4,584	22,989	27,981

Source: WMR & NE study

118 Adjusted for federal grant reductions.

The Government of the NWT used the methodology of identifying Ancillary Government Expenditures by the activity principle. The AGE estimates are provided in great detail in the GNWT document "A Non-Renewable Resource Development Strategy for the Northwest Territories," October 2000.

Major AGE Groups and Estimates:

- Land access and transportation infrastructure investment is needed in the amount of at least $170 million for:
  - improvements to the Mackenzie Valley Road Corridor from Wrigley to the Dempster Highway to the Arctic Ocean (1000 km) and the Slave Geologic Province Road Corridor from Yellowknife/North Slave to the Nunavut Border (450 km); and
  - rehabilitation and upgrading of existing highways such as the Yellowknife Highway, Ingraham Trail, Liard Highway, Mackenzie Highway from the Alberta border to Wrigley, Dempster Highway from the Yukon border to Inuvik, all serving Mackenzie Valley oil and gas exploration and pipeline construction.
- **Support to small business** is estimated to cost $50 million with distribution of funds for the start-ups and current Northern businesses through Communities Futures loans programs and Business Development Fund grant programs;
- **Incentive programs for mineral exploration** require approximately $24.1 million to be spent on the development and implementation of an Advanced Mineral Exploration Program (AMEX), production of the modern and integrated Geoscience Database to support exploration investment, enhancement of the existing Prospectors Grubstake Program, and on assistance to Aboriginal groups in delineation of the geological potential of Aboriginal-owned subsurface lands;
- **Human resources development for mining, oil & gas industries** will require about $17.9 million. Funds will be allocated to human resource planning, career development promotion, and industry specific and career oriented training. Mining industry HR development will need $5.6 million over a 4-year period, while oil and gas HR development is estimated to require $12.3 million;
- **Monitoring of biophysical and socio-economic environments** will cost about $17 million. This is related to the efforts to establish legislation, strategies, plans and practices to address the impact of the non-renewable resource development on the northern environment. This relates to the cost of a multi-partner fund for the research in the Deh Cho, Sahtu and Inuvik regions for decision-making, environmental and cumulative impact monitoring. Also investments are required to conduct community surveys and socio-economic monitoring. There is a need to upgrade the NWT air quality legislation and standards and conduct environmental assessments;

- **Promotion of value-added industries** requires $10 million over a four-year period. A significant part of these investments will be directed towards the examination of a potential secondary oil and gas industry in the NWT, and it includes general research on the potential secondary industries, assessment of the feasibility of refining petroleum products and manufacturing of gas liquids, potential development implications of having access to natural gas along the Mackenzie Valley for the development of smaller pools and mineral deposits, and assessment of the feasibility of enhancing the NWT lumber industry through gas-fired kilns to produce competitive forestry products, etc.;
- **Mitigation of the social impacts** of the non-renewable resource development requires $8 million. This refers to the mitigation of the non-renewable resource development impacts on a non-traditional economy when large proportions of residents access employment at the remote resource development sites. It is expected that there will be increased pressure on the NWT social services for daycare needs, spousal assault and marriage counseling, child protection and foster care, money management counseling, mental health service, addictions treatment and counseling;
- **Clarification of policy direction and northern benefits expectations** is expected to cost $5.8 million and is related to consultation and consensus-building, research and policy development, staff wages and benefits, socio-economic agreements, and advisory and monitoring boards;
- **Support of balanced economic growth** requires $3.3 million, including the exploration of alternative economic approaches and development of options to divert a portion of non-renewable resource revenues into long-term saving plans. It is expected to direct the NWT resource revenues into legacy trusts, resulting in identification of new business opportunities, expanded e-commerce to bypass the northern barriers of distance and costs, improved tourism opportunities, establishment of value-added business, and development of alternative energy sources, etc.;
- **Promotion of the employment of northerners** is estimated to cost $4.8 million and refers to providing career and counselling support services in the communities, encouragement of the regional development corporations, compiling labour force statistics, and promotion of employment opportunities;
- **Support and facilitation of an Intergovernmental Forum** will cost approximately $4.4 million. This would result in building partnerships among northern governments, sharing northern benefits, building northern consensus to advance devolution, resource development and revenue sharing, and the creation of a political climate to advance development, especially in relation to the MGP and the MVP;
- **Development of the pipeline hosting areas** in Sahtu, Deh Cho and Beaufort-Delta regions will take $4 million. These areas are designated as service centres during the pipeline construction phase;
- **Devolution of resource management** in order to transfer provincial-type power, programs and responsibilities for land, water and non-renewable

resources from the federal government requires $3.9 million. Funding is necessary to establish royalty and tax regimes, and other regulatory changes with respect to the MGP and the MVP;

- **Water supply, storage and treatment facilities** in Inuvik, Ford Liard, along the Mackenzie River and the **waste heat system** in the NWTPC power plant are expected to cost $3.2 million. **Sewage facilities** will cost $3 million. **Industrial waste storage facilities** in Fort Liard require funds in a sum of $800,000. **Land development** in Fort Liard needs $95,000. **Municipal road upgrades** in Fort Liard are budgeted to cost $550,000;
- **Marketing and promotion of the MVP and other non-renewable resource developments** are estimated to cost $3.2 million. This refers to the proactive and aggressive promotion of the benefits of the NWT resource development, including the MVP, through development and expansion of websites, systems and networks to inform potential investors, and increased participation in trade shows and industry symposia, etc.;
- **Environmental protection** is expected to cost approximately $2.4 million. This will occur through the establishment of a system of environmental protection, and addressing priorities of Aboriginal groups, governments and environmental stakeholders;
- **Equity participation of Aboriginal Pipeline Group (APG) in the MVP** would require $1.7 million. The costs will be allocated to the legal formation of APG, provision of the financial support in the early stages of accessing technical, legal and business advice, research on similar arrangements in other jurisdictions, and examination of innovative tolling and financing arrangements to facilitate Aboriginal equity participation in pipeline infrastructure development, etc.;
- **Feasibility study of natural gas conversion for the NWT communities** in conjunction with the construction of a Mackenzie Valley Pipeline is estimated to cost $640,000. The result of this study will be the full conversion of natural gas for the community of Fort Liard and reduced dependence on imported diesel fuel, significant reduction in greenhouse gas emissions, and preparation of a detailed plan for multi-community natural gas conversions; and
- **Leveraging of infrastructure investment through partnerships** (or the potential sharing of infrastructure expenses among the NWT, Ontario, Alberta, Quebec and BC, as well as federal government organizations such as Transport Canada, and oil and gas and pipeline companies) is budgeted to cost about $50,000. These funds are required for the partnership agreements for upgrading of the existing winter roads and future construction of all-weather roads, maximization of the local and northern business and employment opportunities from infrastructure construction contracts, and promotion of the creation of northern and Aboriginal businesses in the construction, maintenance and servicing of infrastructure development.

The Yukon government's pipeline preparedness strategy used a methodology which identified Ancillary Government Expenditures (AGE) by the phases of the pipeline project, dividing them into pipeline pre-construction, construction and post-construction AGE groups. The AGE estimates for Yukon are provided in detail in the Yukon Government document "C&TS—Potential Pipeline Impacts and Preparedness Strategy", prepared by the department of Community and Transportation Services, July 2001.

Major Estimates

The highest ancillary government expenditure related to the AHP will be the **Alaska Highway reconstruction** from Mendell to Haines Junction, which is expected to require about $30 million in the pre-pipeline construction period. Supplementary to that, $5.6 million is required for the Teslin River bridge strengthening as well as for the other critical bridges on the supply routes. Currently, Alaska Highway reconstruction costs about $1.7 million per year; and this will be accelerated upon the commencement of pipeline construction. Improvements are currently programmed in **the water, sewage and waste disposal infrastructure** such as construction of Burwash sewage treatment facility. Also, $50,000 is currently allocated to work on signs and permit regulations and fee levels and structure.

Roads and highways maintenance costs are expected to be second highest on the list of ancillary expenditures at $10.2 million. Airport construction and upgrading at Whitehorse, Beaver Creek, Burwash, Haines Junction, Silver City, Teslin, and Pine Lake airports is estimated to cost approximately $2.2 million.

Additional regulatory costs attributable to the AHP are access, rights of way, sign, highway construction and commercial vehicle permits, administration at a cost of approximately $1.5 million. Airport operations and maintenance costs. during the pipeline construction years are estimated in the sum of $1.1 million.

With respect to the sewage infrastructure, an estimated cost of $800,000 is allocated to the construction of Burwash sewage facility to be finished before the start of gas pipeline construction. It's anticipated that costs of **operating and maintaining solid waste disposal facilities** along the AHP route will be around $600,000.

Other potential ancillary expenditures in the Yukon identified are:

- construction of the Yukon portion of the Alaskan Railroad;
- restoration of the rail line for the White Pass and Yukon Route;
- development of the ports in Valdez Haines and Skagway;
- provision of the pipeline construction water supply through the camp facilities, wells or community sources; and
- increase in the health care costs and workers compensation during the pipeline construction period, etc.

Labour force development due to the AHP in the fields of trades, transport and equipment operations is expected to be significant not only in the Yukon, but throughout Canada.[119] The growth in demand for human resources during pipeline construction would require government and private expenditures on labour training programs, relocation, and health services.

119 Informetrica study, WP 7.4.1

Major AGE Groups

Pipeline Pre-Construction AGE:

- **Alaska Highway construction –** acceleration of reconstruction and strengthening of bridges;
- **Airport construction** – acceleration of the installation of a second jet way at Whitehorse airport, making runway and taxiway improvements at Watson Lake Airport; evaluation of upgrading needs at smaller airports for the transportation of pipeline project personnel;
- **Highway maintenance** – acceleration of BST rehab work on Alaska Highway, Skagway and Haines Bridges; advancement of other maintenance projects that might be disruptive to pipeline activity; development of the plan to address the impacts of Spring Load Restrictions on pipeline activity; establishment of accurate kilometer posts along the Alaska Highway and other supply routes;
- **Airport maintenance** – liaison with pipeline proponents to determine the increased frequency of flights from all airports; development of a plan for additional runway maintenance in order to deal with extension of Community Aerodrome Radio Station services depending on the projected level of usage ;
- **Water, sewage and waste disposal infrastructure construction** – discussion of pipeline related needs for water, sewage and garbage disposal with proponents, ensure that these are met through the proponents own efforts; review impact on community infrastructure near proposed compressor stations; accelerate construction of the Burwash sewage treatment facility ;
- **Operations and maintenance of water, sewage and solid waste facilities** – consider fees for use of public water, sewage and solid waste facilities for pipeline related purposes;
- **Planning and zoning, public safety and emergency preparedness** – develop a process of confirmation of compressor stations with zoning regimes; processing of large volume of building permits, inspection, permits for community supply pipelines; determine fire prevention sources and conduct upgrades to fire fighting facilities; consider potential increase in the number of dangerous goods spills, mass casualty accidents, forecast fires, etc and ensure community preparedness;
- **Access, Right of Way, Sign, Highway Construction and Commercial Vehicle Permits** – encouragement of pipeline proponents to make applications in advance of construction date; consider higher permit fees for industrial use and fee levels; require applicants to provide traffic safety review, construction & decommissioning certification, in perspective of integrity of road safety and other utilities in ROW, to avoid damaging other utilities; conduct arrangements with BC on access to river sections; research best practices and develop policy to enforce NG pipelines rights of way; consider dealing with temporary directional signs; develop consistent standard for directional signs and sign permits in conjunction with the pipeline proponents and ensure compliance; enforce provision of the

Highways Act to ensure development of the road standards in conjunction with the proponents; liaison with proponents to be aware in advance of shipping plans for pipeline materials, construction camps and equipment and fuel supplies; consider potential ITS applications and costs to reduce weight scales reporting requirements; ensure application of analytical model to review the impacts of overweight loads on bridges, highway geometrics and traffic safety, consider a transportation safety officer assigned to the critical trucking activities; develop cooperative plans with Alaska regarding monitoring of road traffic, and with BC and AB for cross border highway trucking; and

- **Land development, use and administration** – liaison with pipeline proponents, utility companies and communities to determine demand for serviced lots; produce lot development projections and have flexible plan for meeting this projection; provide details on inventory of existing available land to pipeline proponents; assess serviced land availability for temporary housing in communities along the pipeline route; complete planning, permitting and design work before construction; processing of large volumes of applications; consider permit and royalty fees; develop standard conditions for land use and quarry permits; compile database of potential gravel and borrow pits; consider issues related to land use near communities and private land and develop specific procedures, etc.

Pipeline Construction AGE:

Alaska Highway construction – halt of Alaska Highway reconstruction; bridges construction; location and development of long-term gravel sources, and their monitoring along the route;

Airport construction – suspension of airport construction activity; quick upgrading at small airports; introduction of Aircraft Emergency Intervention Service when the number of enplaning/deplaning passengers reaches a certain threshold;

Highway maintenance – additional maintenance due to damage from trucks hauling pipe, gravel and equipment; potential of loss of operators and laborers to higher paying pipeline related jobs; possible higher standard of winter maintenance to facilitate pipe haul;

Airport maintenance – increased summer and winter maintenance at Whitehorse and community airports; potential increased hours of Community Aerodrome Radio Station (CARS);

Water, sewage and waste disposal infrastructure construction – additional development at solid waste disposal sites for pipeline related waste; design work for post-construction projects; loss of staff to pipeline related jobs;

Operations and maintenance of water, sewage and solid waste facilities – increased water delivery service; additional demand on solid waste disposal facilities;

Land development, use and administration – administration related to royalty collection; processing of requests for permits amendments; routine monitoring for compliance of permit conditions;

Planning and zoning, public safety and emergency preparedness – troubleshooting for planning and zoning violations and other community and private concerns related to pipeline activities; mechanical inspections related to natural gas distribution in communities, licensing and testing the high pressure pipeline welders and gasfitters; increased fire safety inspections in construction camps and pipeline construction sites; inspections of above/underground fuel storage tanks; mobilization of all emergency response agencies; campaign to promote safety; maintenance of awareness of the increased demand on local infrastructure and resources; and

Access, Right of Way, Sign, Highway Construction and Commercial Vehicle Permits – access permits for transportation gravel pits for construction materials, routine monitoring by local Maintenance Supervisor or designated inspector; potential for significant traffic disruption in right of way; protection of utilities in the right of way; ensuring that right or way is properly restored; advice to public regarding construction related delays; obligate proponents to ensure that all signs are inspected, maintained, and removed as construction progresses; monitoring certification of construction standards in a timely fashion; possibility to re-open an increased activity of weigh scales to monitor pipeline related traffic in relation to shipping pipe, fuel, camp modules and construction equipment; increased administrative requirements with over weight and over-dimensional permits; increased need for safety and mechanical fitness inspections; monitoring of gravel truck overloads.

Pipeline Post-Construction AGE:

- **Alaska Highway construction** – large "catch up" construction program to help ease transition from pipeline boom; potential recruitment opportunities for engineers and technicians;
- **Airport construction** – Whitehorse airport expansion;
- **Highway maintenance** – dealing with damage caused by pipe haul/construction;
  - Water, sewage and waste disposal infrastructure construction – recruitment of engineers and technicians;
  - Operations and maintenance of water, sewage and solid waste facilities – waste removal costs;
- **Planning and zoning, public safety and emergency preparedness** – large volume of mechanical inspections related to natural gas distribution in communities; training of volunteer fire departments in communities affected by the pipeline to cope with incidents related to natural gas; ongoing review and coordination of emergency planning issues;
- **Access, Right of Way, Sign, Highway Construction and Commercial Vehicle Permits** – routine inspections by local Maintenance Supervisor or designated inspector to monitor removal of temporary accesses; ensuring awareness for the users of ROW regarding safe work practices in the vicinity of NG pipeline crossings (effect on highway maintenance operations,

commercial sign placement and utility companies); monitoring of the decommissioning of the temporary roads and standards for timelines; and

- **Land development, use and administration** – conduct an inventory of expensive lots; routine inspections to ensure the restorations meets requirements of permit; administrative work to close off permits and update information databases.

Appendix 8. List of Persons Contacted for Consultations, Information Requests, and Telephone Interviews

Allison Delaney, Public Affairs Officer, Government of British Columbia Ministry of Energy and Mines, Public Affairs Bureau.

Calvin Brackman, Senior Resource Economist, Government of the NWT, Department of Resources, Wildlife and Economic Development

Charles Saunders, Senior Economist, Informetrica Limited

Collin Carrigy, Acting Director, Gas Utilities and Forecasting, Alberta Energy, Gas Utilities and Forecasting.

Dave Duncan, District Manager, British Columbia Ministry of Transportation, Peace District—Fort St. John.

Doug Matthews, Director, Minerals, Oil and Gas, Government of the NWT, Department of Resources, Wildlife and Economic Development.

Greg Komaromi, Assistant Deputy Minister, Government of Yukon, Ministry of Energy, Mines and Resources, Office of Deputy Minister.

Jane Stothers, Manager, Foothills Pipe Lines Limited.

Jeff Rush, VP, Mackenzie Valley Pipeline Initiative, TransCanada PipeLines Ltd.

John Manley, Press Secretary to the Governor of Alaska.

Leslie Elder, Provincial Approving Officer, British Columbia Ministry of Transportation, Peace District—Fort St. John.

Lynne Normandea , Administrative Assistant, Government of Yukon, Ministry of Energy, Mines and Resources, Oil & Gas Business Development & Pipeline Unit.

Gwendolyn Mansell, Manager, Alberta Energy, Gas Regulation and Policy.

Paul Tsounis, Analyst, Alberta Finance, Budget and Business Planning.

Robert Mansell, Provost and Vice-President Academic; Director of WMR, University of Calgary.

Robert Marshall, Senior Pipeline Advisor, Government of the NWT, Department of Resources, Wildlife and Economic Development.

Robin Walsh, Director of Transportation Engineering, Government of Yukon, Department of Highways and Public Works.

Ronald Schlenker, Instructor; Research Associate at WMR , University of Calgary.

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