Preliminary Information Package

Volume 1: Project Description

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Submitted to:
Canadian Environmental Assessment Agency
Government of the Northwest Territories, Resources, Wildlife and Economic Development
Gwich'in Land and Water Board
Indian and Northern Affairs Canada
Inuvialuit Land Administration
Inuvialuit Settlement Region Joint Secretariat
Mackenzie Valley Environmental Impact Review Board
Mackenzie Valley Land and Water Board
National Energy Board
Northwest Territories Water Board
Sahtu Land and Water Board

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PURPOSE OF THIS PRELIMINARY INFORMATION PACKAGE

In June 2002, various regulatory agencies with responsibility for assessing and regulating energy developments in the Northwest Territories released a document entitled *Cooperation Plan for the Environmental Impact Assessment and Regulatory Review of a Northern Gas Pipeline Project through the Northwest Territories* (the Cooperation Plan).

The purpose of this Preliminary Information Package (PIP), prepared by the proponents of the Mackenzie Gas Project, is to:

- outline the scope of the proposed project for the regulatory agencies, including identifying the project components, their scale, location and potential socio-economic and environmental issues
- identify the approach to the socio-economic and environmental assessment process and provide a draft scope of the environmental assessment
- enable the regulatory boards and agencies to:
  - identify their roles and obligations in the regulatory assessment and approval processes
  - continue their discussions on a timely review process

SCOPE OF THIS PIP

This PIP outlines the plans for developing sweet natural gas from the three largest discovered onshore natural gas fields in the Mackenzie Delta and transporting it by pipeline to market (see Figure 1-1).

The pipeline would be anchored by the development of about 164 billion m^3 (Gm^3) (5.8 trillion cubic feet [Tcf]) of sweet natural gas from the three natural gas fields. These gas fields, referred to as the anchor fields, are:

- Taglu – containing an estimated 85 Gm^3 (3 Tcf)
- Parsons Lake – containing an estimated 51 Gm^3 (1.8 Tcf)
- Niglintgak – containing an estimated 28 Gm^3 (1 Tcf)

The information is presented in two volumes:

- Volume 1: Project Description
- Volume 2: Project Maps

The five components of the Mackenzie Gas Project, representing each of the three natural gas fields, the gathering pipeline system and the Mackenzie Valley

SCOPE OF THIS PIP (cont'd)

Pipeline system, are being brought forward in a coordinated and timely fashion for the regulators to consider. Although one PIP is being submitted on behalf of the anchor field proponents, the gathering system proponents and the proponents of the Mackenzie Valley Pipeline, the proponents for each development component are planning to submit separate applications for regulatory approval related to their respective development components.

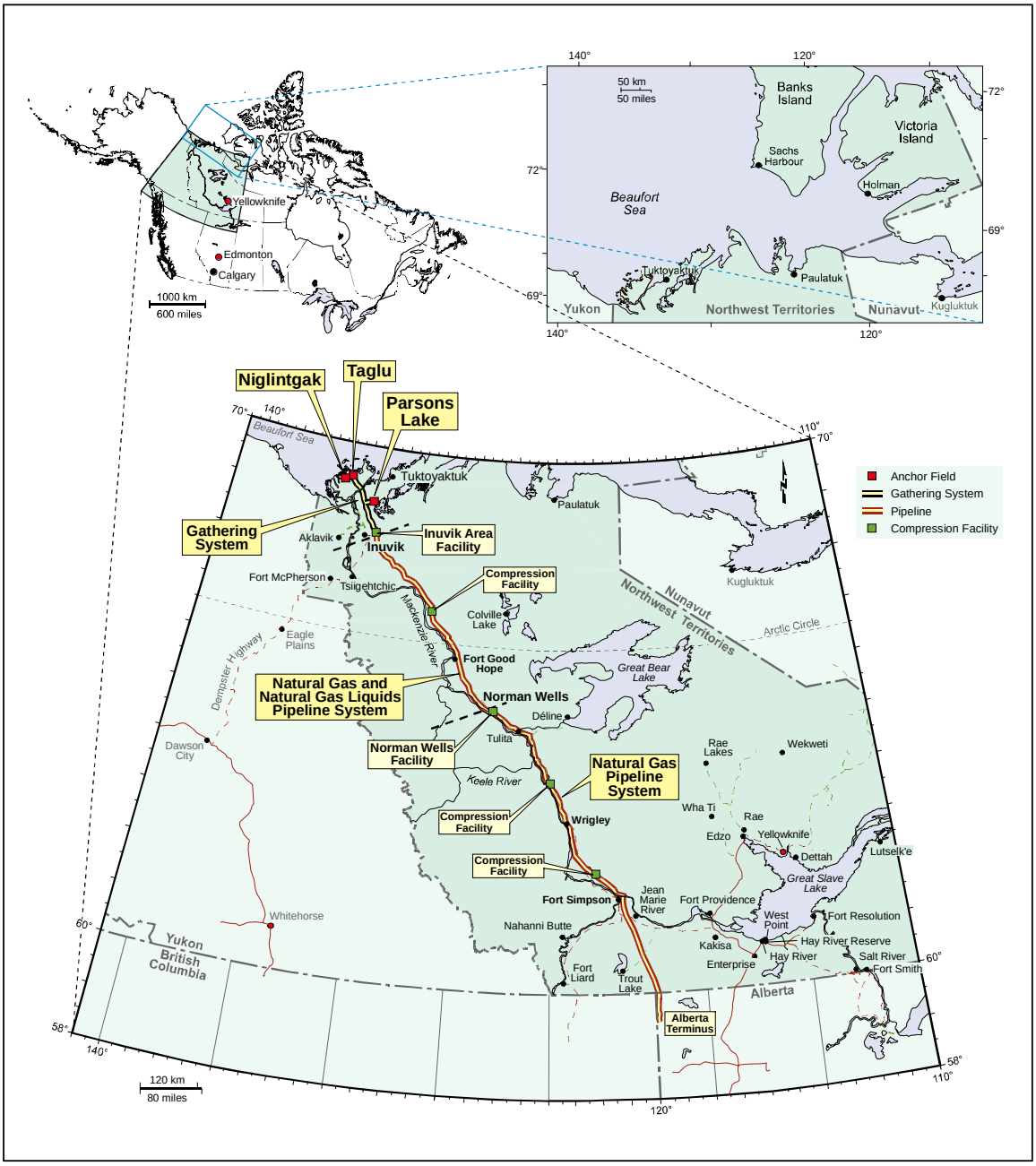

Figure 1-1: Project Location

PROJECT PROPONENTS

The Mackenzie Gas Project is being developed by:

- Imperial Oil Resources Ventures Limited, a subsidiary of Imperial Oil Limited (Imperial), which holds and operates the Taglu gas field and will have an interest in the gathering and Mackenzie Valley Pipeline systems

- the Aboriginal Pipeline Group (APG), which was formed by representatives of various aboriginal groups to represent the ownership interest of the aboriginal people of the Northwest Territories in the Mackenzie Valley Pipeline

- ConocoPhillips Canada (North) Limited (ConocoPhillips) and ExxonMobil Canada Properties (ExxonMobil), which jointly hold the Parsons Lake gas field and will have an interest in the gathering system and Mackenzie Valley Pipeline. The field is 75% held by ConocoPhillips and 25% held by ExxonMobil, and is operated by ConocoPhillips.

- Shell Canada Limited (Shell), which holds and operates the Niglintgak gas field and will have an interest in the gathering system and Mackenzie Valley Pipeline

The three anchor fields would be developed by the respective operator of each field. Ownership of the gathering and pipeline facilities by the field owners would be proportional to their capacity needs in the system.

The APG ownership interest in the Mackenzie Valley Pipeline will be based on such considerations as the contracted transportation volumes of natural gas that are incremental to those contracted from the three anchor fields. For the expected pipeline ownership, see Section 1.3, Proponents' Corporate Profiles.

REGULATORY PROCESS

The Cooperation Plan that was issued in June 2002 by the Northern Pipeline Environmental Impact Assessment and Regulatory Chairs' Committee provides the framework for the regulatory approval process for the Mackenzie Gas Project.

Applications for regulatory approval are expected to be submitted in 2003. The regulatory process will require cooperation among a number of regulatory agencies, as described in the Cooperation Plan. Regulatory authorities are working to develop procedures to coordinate the regulatory process. The project schedule depends on the results of this work.

Developing natural gas from the onshore reserves in the Mackenzie Delta, and constructing the required gathering system and transmission pipeline system to connect with existing delivery systems in Alberta, will require a phased effort over several years. The feasibility study, completed in 2001, assessed the regulatory approval processes that the project proponents would have to follow to

REGULATORY PROCESS (cont'd)

meet federal, provincial, territorial and settlement area requirements. The need for collaboration between the many regulatory authorities, and their capacity to handle the significant number of applications that will be filed, were identified as critical success factors for the project.

MAJOR REGULATORY COMPONENTS

Preliminary Information Package

The submission of this PIP is expected to initiate the regulatory process with the National Energy Board (NEB) under the National Energy Board Act (NEBA), the Canada Oil and Gas Operations Act (COGOA) and the Canadian Environmental Assessment Act (CEAA), and to meet the requirements of a project description under the CEAA and the Inuvialuit Final Agreement.

Early Project Licence and Permit Applications

The proponents of the Mackenzie Valley Pipeline also plan to seek water licences (Type B) and land use permits (Type A) for a barge landing and storage site at Camsell Bend on the Mackenzie River. This will be necessary to support the project's Construction Phase. The potential for these early project licence and permit applications to lead to a public hearing should enable the responsible northern authorities under the Mackenzie Valley Resource Management Act (MVRMA) to develop a coordinated approach to the application review and hearing processes. This suite of licence and permit applications for land and water use is in accordance with the MVRMA Preliminary Screening Requirements List regulation.

Field Development Applications

The individual operators for the Taglu, Parsons Lake and Niglintgak fields plan to file Commercial Discovery Declarations (CDDs) with the NEB in 2003. The CDDs will be followed by an individual Development Plan Application (DPA) for each of the natural gas fields. The individual field developers are responsible for filing these applications, as well as applications for supporting licences and permits.

Gathering System and Pipeline Development Applications

The gathering system proponents will file development plan applications for the gathering system and associated compression and natural gas liquid (NGL) facilities and pipeline.

The proponents of the Mackenzie Valley Pipeline will file an application for a Certificate of Public Convenience and Necessity (CPCN) for the Mackenzie Valley Pipeline.

Applications for the supporting construction and operating licences and permits that might require a public hearing as part of the regulatory approval process will also be filed. This should allow these hearings, if required, to be coordinated with the DPA and CPCN hearings.

Licences, Permits and Authorizations

Other licences, permits and authorizations required for the project include:

- participation and access agreements
- wildlife compensation agreements
- land use permits
- surface tenure agreements
- water use licences
- quarry permits
- bird sanctuary access permits
- authorizations under the Fisheries Act and the Navigable Waters Act

Between 400 and 500 applications for licences, permits and authorizations are expected to be filed during the definition, construction and start-up phases.

PROJECT SCHEDULE

The project schedule (see Figure 1-2) assumes that the major regulatory applications for the Mackenzie Gas Project are filed between six and 18 months after this PIP is submitted.

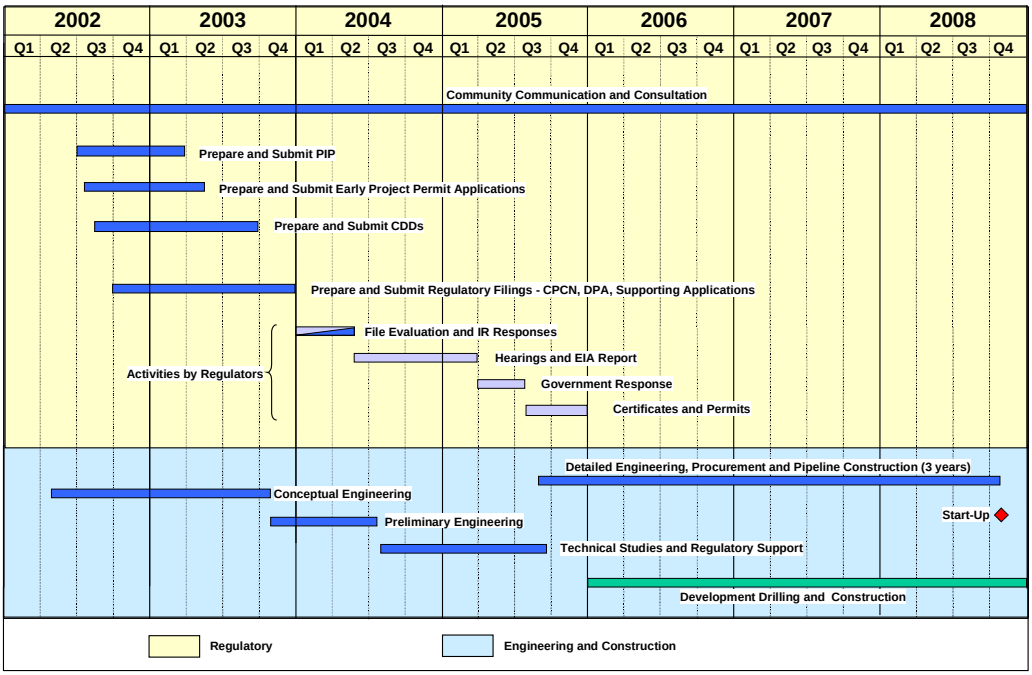

Figure 1-2: Mackenzie Gas Project Preliminary Schedule

PROJECT SCHEDULE (cont'd)

A phased approach is planned for filing applications that might result in public hearings.

The major regulatory applications, including applications for the CPCN and DPAs, would be filed in 2003. Supplementary material and applications for supporting licences, permits and authorizations would be filed with, or following, the initial regulatory submissions.

REGULATORY CONTACTS

Communications related to this Preliminary Information Package for the Mackenzie Gas Project should be directed to:

Mr. Peter Grout
Regulatory Manager, Mackenzie Gas Project
Imperial Oil Resources
237 Fourth Avenue S.W.
P.O. Box 2480, Station M
Calgary, Alberta T2P 3M9

Telephone: (403) 237-3580
Fax: (403) 237-2102
E-mail: peter.d.grout@esso.ca

or:

Mr. Don Davies
Macleod Dixon LLP
Canterra Tower
3700, 400 Third Avenue S.W.
Calgary, AB T2P 4H2

Telephone: (403) 267-8230
Fax: (403) 264-5973
E-mail: don.davies@macleoddixon.com

PURPOSE OF THE PROJECT

The purpose of the Mackenzie Gas Project is to develop Mackenzie Delta onshore natural gas and deliver it to market by 2008.

The major project priorities are to design, construct and operate the project safely, to meet quality, cost and schedule expectations, while demonstrating care for the environment and creating a wide range of opportunities for aboriginal and other northern and Canadian residents.

MAJOR PROJECT COMPONENTS

The project will likely consist of:

- natural gas field development facilities at Taglu, Parsons Lake and Niglintgak
- a gathering system to collect natural gas and associated NGLs from the three fields and ship them to natural gas compression and NGL facilities in the Inuvik area
- an NGL pipeline from the Inuvik area to Norman Wells
- a transmission pipeline system (the Mackenzie Valley Pipeline) from the Inuvik area south along the Mackenzie Valley via Norman Wells, to connect to the existing natural gas pipeline system in northwestern Alberta for delivery to market

Figure 1-3 illustrates the major project components.

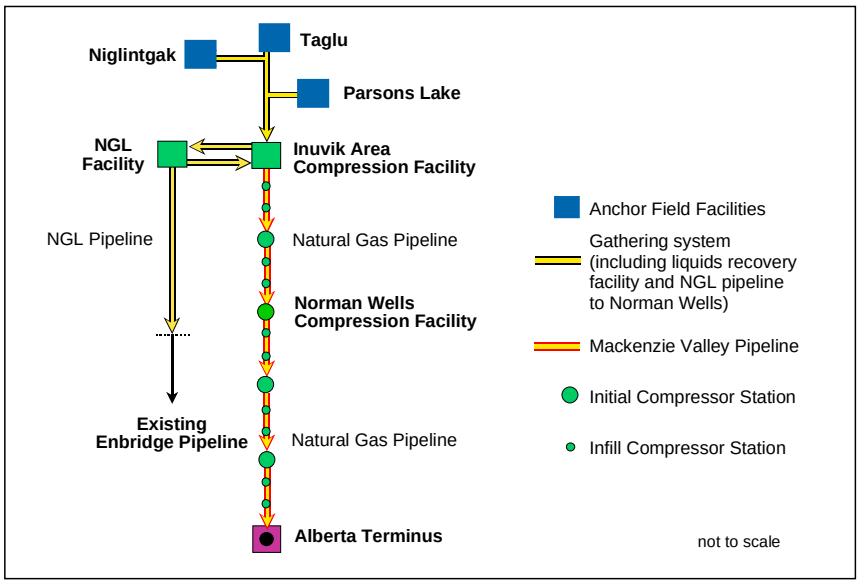

Figure 1-3: Major Project Components

MAJOR PROJECT COMPONENTS (cont'd)

The gathering system, transmission pipeline and associated facilities will be accessible for additional gas and NGLs from other natural gas fields in the Mackenzie Delta and other areas along or adjacent to the Mackenzie Valley area. These other projects would be the subject of other regulatory applications.

Current plans for the Mackenzie Gas Project are based on feasibility study and initial project definition work. The location and configuration of the project facilities will be subject to further technical and commercial studies, socio-economic and environmental impact assessments, and public input.

Public communication and consultation forms a central part of the planning process and is designed to respect the unique nature and cultures of the North. People in the neighbouring communities are being informed of project plans and feedback is being solicited.

EXPECTED INITIAL PRODUCTION RATES

The combined production rate of natural gas from the three anchor fields is expected to be between 23 and 28 Mm^3/d (0.8 and 1 Bcf/d). The estimated production rate for NGLs from the anchor fields is between 2,000 and 2,500 m^3/d (12,000 and 15,600 bbl/d).

The Mackenzie Delta and other areas in the North contain other discoveries of natural gas and are active areas of exploration. Therefore, the project proponents will provide an opportunity for other companies to commit volumes of natural gas and associated NGLs to be shipped through the gathering system and the Mackenzie Valley Pipeline system. Such commitments will be used in determining the initial capacity of the systems.

Based on a recent Open Season Expression of Interest process, nonbinding expressions of interest from potential shippers, including those from the three anchor fields, indicated that an initial gas volume of 34 Mm^3/d (1.2 Bcf/d) might be available to be shipped through the Mackenzie Valley Pipeline.

PROJECT DEVELOPMENT PHASES

Feasibility Study Phase

In January 2000, aboriginal leaders from the Northwest Territories indicated that they wished to pursue a business relationship to maximize ownership of, and to benefit from, the Mackenzie Valley Pipeline.

In February 2000, the operators of the three anchor gas fields announced that they planned to conduct a study to determine the commercial feasibility of developing Mackenzie Delta natural gas. This study was to evaluate the feasibility of

commercially developing the three largest onshore natural gas fields, and transporting the natural gas to market via pipeline.

The technical and economic viability of such a project was of renewed interest because several conditions that affected the commercial feasibility had recently changed. For example:

- natural gas markets had improved and were integrated across North America
- pipeline systems in Western Canada were being expanded, thereby increasing pipeline capacity
- technology and construction techniques had improved
- some aboriginal land claims had been settled
- support from interested northern parties for a Mackenzie Valley pipeline had increased

Developing the Mackenzie Delta natural gas reserves and constructing the Mackenzie Valley Pipeline require a multi-year phased effort (see Figure 1-4). This could result in natural gas production starting in 2008.

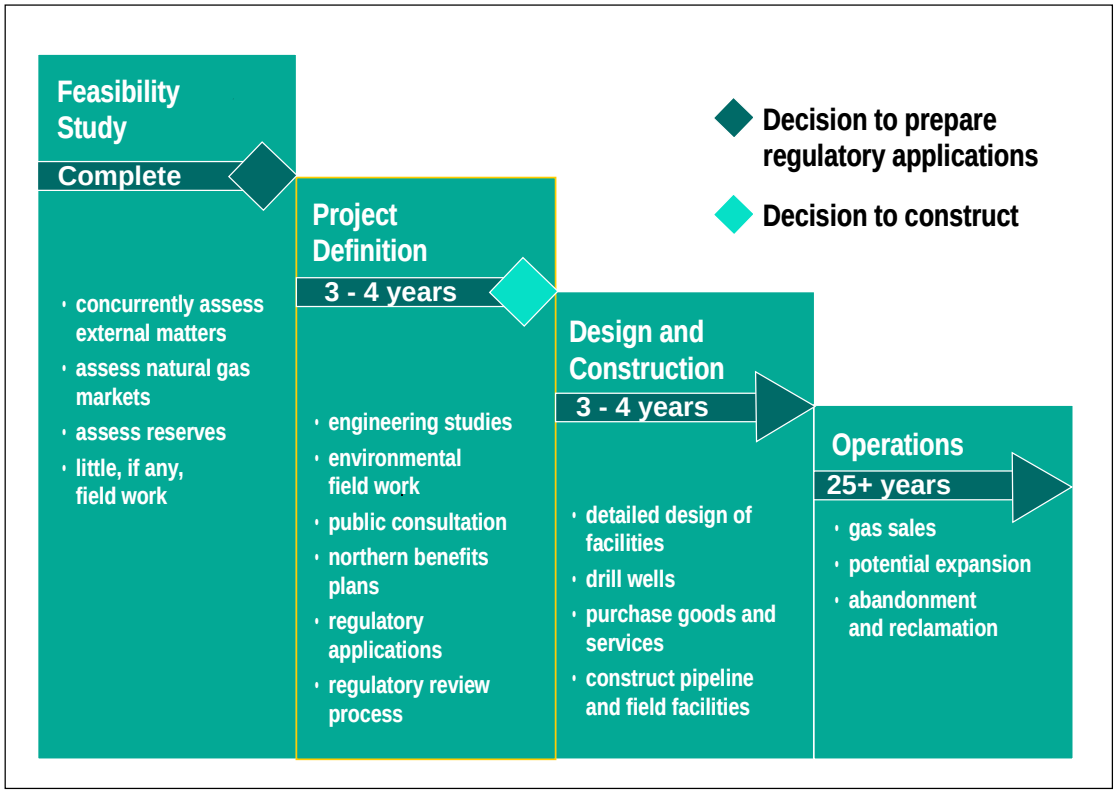

Figure 1-4: Mackenzie Gas Project Development Phases

Project Definition Phase

In January 2002, plans to proceed to the Project Definition Phase were announced. These plans include conducting conceptual engineering studies, preparing applications for regulatory approval, including the associated socio-economic and environmental impact assessments, and developing plans for environmental protection and monitoring. Expenditures required to complete this phase are estimated at about $250 million. Timing depends on several factors, including the regulatory review process.

Design and Construction Phase

The decision to proceed to construction of the project can only be made at the end of the Project Definition Phase. The decision will consider the terms and conditions of regulatory approvals, if granted, the results of engineering, commercial and public consultation activities, and other factors such as:

- natural gas markets
- fiscal terms
- the cost of construction, operation, abandonment and reclamation

Detailed design and construction is expected to take three to four years.

Operations Phase

The first natural gas production could be shipped through the gathering and transmission pipeline systems in 2008, if all necessary regulatory approvals for the field development, gathering and transmission pipeline systems have been received.

PUBLIC COMMUNICATION AND CONSULTATION

The project proponents are committed to a public communication and consultation program that provides aboriginal and other northern residents, and other Canadians, with an opportunity to influence the project planning process. The communication and consultation program will help to identify opportunities to participate in the employment and business created by the project.

The project's communication and consultation process is intended to be open, two-way, timely, respectful and responsive. Input will continue to be sought from interested individuals, communities and associations during all phases of the project.

SOCIO-ECONOMIC AND ENVIRONMENTAL ASSESSMENTS

A socio-economic impact assessment (SEIA) is being conducted. This assessment considers the project's economic, social, community and cultural effects and the

use of traditional knowledge, and will recommend mitigation measures. Public input is an important part of this assessment and the related benefits plan.

An environmental impact assessment (EIA) is also being conducted. This work began in 2001 with the collection of baseline biophysical data. Work on the data collection and other EIA studies continued through 2002 and into 2003.

INDUSTRIAL BENEFITS

The project proponents expect to invest between $4 billion and $5 billion in the field development, gathering system, transmission pipeline, and compression and NGL facilities. This will provide both direct and indirect benefits to the people in the North, as well as to other Canadians.

The direct benefits include employment and business opportunities during the definition, construction and operation phases of the Mackenzie Gas Project.

The indirect benefits include employment and business opportunities in:

- service, transportation and other industries required to support the project
- natural gas exploration and development with companies involved in developing other projects

Benefits will also flow to governments in the form of taxes and royalties.

The APG's ownership interest in the Mackenzie Valley Pipeline and the payment of associated access fees will also contribute to enhancing the aboriginal benefits from the pipeline.

IMPERIAL OIL RESOURCES VENTURES LIMITED

Imperial Oil Resources Ventures Limited is a wholly owned subsidiary of Imperial Oil Limited (Imperial). Imperial is one of Canada's largest corporations and has been a leading member of the country's petroleum industry for more than a century. Imperial is one of the largest producers of crude oil in the country and a major producer of natural gas.

Imperial is also the largest refiner and marketer of petroleum products, sold primarily under the Esso brand, with a coast-to-coast supply network.

Imperial's long history of successful operations in Canada is based on responding effectively to the expectations of communities, customers, employees and shareholders. Imperial is committed to maintaining the highest standards of ethics, safety, health and environmental care.

Imperial, which has been actively exploring and producing petroleum resources in northern Canada for more than 80 years, including the ongoing crude oil production operation at Norman Wells, is the designated operator of the Mackenzie Valley Pipeline, gathering system, compression and NGL facilities for the Mackenzie Gas Project.

ABORIGINAL PIPELINE GROUP

Representatives of various aboriginal groups in the Northwest Territories formed the Aboriginal Pipeline Group (APG). Currently, the APG is composed of the Mackenzie Valley Aboriginal Pipeline Corporation, which was formed in 2001 for the sole purpose of acting as general partner in the Mackenzie Valley Aboriginal Pipeline Limited Partnership. When formed, this partnership will hold the ownership interest of aboriginal people of the Northwest Territories in the Mackenzie Valley Pipeline. The Mackenzie Valley Aboriginal Pipeline Limited Partnership is expected to be owned primarily by organizations controlled by the Deh Cho, Sahtu, Gwich'in, Inuvialuit, Akaitcho, Dogrib, Salt River First Nation, North Slave Métis Alliance and South Slave Métis Alliance.

The APG is targeting participation and ownership of 33.3% in the Mackenzie Valley Pipeline.

On October 15, 2001, the Mackenzie Valley Aboriginal Pipeline Corporation signed a Memorandum of Understanding (MOU) with the other proponents. The MOU was also endorsed by numerous representatives of aboriginal groups in the Northwest Territories. This MOU documented the principles considered appropriate for incorporation into arrangements to be negotiated among the various parties for developing a potential Mackenzie Valley pipeline, and was an important milestone in northern development.

CONOCOPHILLIPS CANADA (NORTH) LIMITED

ConocoPhillips Canada (North) Limited (ConocoPhillips) is an indirect, wholly owned subsidiary of ConocoPhillips Canada Limited.

ConocoPhillips Canada Limited is one of Canada's largest oil and natural gas exploration and production companies. The company's diverse mix of oil and gas exploration and development opportunities stretch from Western Canada to the frontier regions of the Mackenzie Delta and offshore Atlantic Canada. ConocoPhillips Canada Limited is a leading marketer and distributor of crude oil, natural gas and NGLs.

ConocoPhillips Canada Limited is committed to the principle of sustainable development and is a recognized leader in the area of environmental stewardship. The company conducts business within the framework of its core values – safety, people, integrity, responsibility, innovation and teamwork.

SHELL CANADA LIMITED

Shell Canada Limited (Shell) is one of the largest integrated petroleum companies in Canada. The company is a major producer of natural gas, NGLs and bitumen, and the country's largest producer of sulphur. Shell is also a leading manufacturer, distributor and marketer of refined petroleum products.

Shell is committed to the principles of sustainable development, which means integrating economic, environmental and social considerations into all of its business activities.

EXXONMOBIL CANADA PROPERTIES

ExxonMobil Canada Properties is a partnership of ExxonMobil Canada Ltd. and its wholly owned subsidiary ExxonMobil Resources Ltd.

ExxonMobil Canada Ltd. (ExxonMobil) is one of Canada's leading energy producers with a leadership position in key exploration basins, and is a reliable producer of energy products to customers across North America. Company operations produce conventional crude oil, heavy oil, natural gas and NGLs.

ExxonMobil is committed to responsible stewardship. The company believes that with superior safety, health and environmental performance it can earn the public's trust, build respectful relationships with its neighbours and achieve success.

PIPELINE OWNERSHIP

Ownership of the Mackenzie Valley Pipeline is expected to be structured as an unincorporated joint venture (see Table 1-1).

Table 1-1: Mackenzie Valley Pipeline Expected Ownership Distribution

Owner Organization	Ownership (%)
Imperial Oil Resources Ventures Limited	34.4
Aboriginal Pipeline Group	33.3
ConocoPhillips Canada (North) Limited	15.7
Shell Canada Limited	11.4
ExxonMobil Canada Properties	5.2
Total	100.0

NEED FOR THE PROJECT

Recent analysis undertaken on behalf of the gathering system and Mackenzie Valley Pipeline proponents indicated growth in natural gas use for electrical power generation, and continued growth in residential, commercial and industrial consumption. Between 1999 and 2007, annual natural gas consumption in Canada and the U.S. is projected to expand by 20 to 25%, or between 394 and 493 Mm^3/d (14.0 and 17.5 Bcf/d). This projected growth in demand is expected to strain the productive capacity of the mature producing regions along the U.S. Gulf Coast, mid-continent and San Juan basin regions, as well as the southern regions of the Western Canada Sedimentary Basin. As a result, production growth is expected to shift to new regions, such as the deeper waters in the Gulf of Mexico, Eastern Canada offshore, new fields in the Rocky Mountains and, ultimately, fields in the Mackenzie Delta and Alaska.

In addition to the projected increase in supply from North American sources, liquefied natural gas (LNG) imports might also be relied on to meet the projected increase in gas demand.

MARKET DEMAND FORECAST

Western Canadian natural gas is delivered to most of the major markets in North America. Currently, the largest markets are:

- Western Canada
- the U.S. Midwest
- the U.S. West Coast

In Western Canada, development of heavy oil and oil sands, and growth in natural gas-fired electric power generation, is expected to account for between 40 and 45% of the projected growth in the current markets for Western Canadian natural gas. The next largest market is expected to be the U.S. Midwest, where natural gas demand is projected to expand by 42.2 Gm^3 (1.5 Tcf) through 2020 and account for 30% of the total growth in the three regions. The third-ranking market is likely to be the U.S. West Coast, where Western Canadian natural gas is likely to encounter competition from LNG imports, increased Rocky Mountain natural gas production, and growing production from central California.

OPEN SEASON EXPRESSION OF INTEREST

The Mackenzie Delta and other areas along or adjacent to the Mackenzie Valley have been, and continue to be, active areas of exploration. Therefore, commitments of natural gas and natural gas liquid (NGL) volumes will be considered in determining the initial capacity of the proposed gathering system

OPEN SEASON EXPRESSION OF INTEREST (cont'd)

and Mackenzie Valley Pipeline. Beyond this initial capacity, further expansion will be possible by adding compression facilities, as required.

A phased approach to the Open Season Expression of Interest process is being used to give companies that are exploring for natural gas additional time to determine what capacity they wish to nominate. A shippers' expression of interest process was completed in July 2002 as a first step to obtaining commitments from shippers interested in transporting natural gas in the Mackenzie Valley Pipeline (the transmission pipeline system).

Responses were received from 20 companies through the Open Season Expression of Interest process. The responses identified the potential need for receipt points in addition to Inuvik. They also identified a range in potential future capacity needs, reflecting uncertainties associated with forecasting the results of future exploration in the Mackenzie Delta and Mackenzie Valley regions. Follow-up meetings with interested shippers were held to clarify their responses and to assess the certainty of the capacity needed for shippers' natural gas fields.

The proponents of the Mackenzie Valley Pipeline intend to work with all interested shippers identified in the Open Season Expression of Interest process to confirm shipper volume, location of receipt and delivery points, timing and natural gas composition.

Transmission pipeline access will be provided to shippers at rates and terms that are subject to NEB review and approval. For information on access to the gathering system, see Section 2.2, Pipeline Tariffs and Tolls.

PIPELINE CAPACITY ANALYSIS

Analysis of the results of the Open Season Expression of Interest supports a 34 Mm^3/d (1.2 Bcf/d) initial capacity transmission pipeline that could be expanded with additional infill compression to 54 Mm^3/d (1.9 Bcf/d). This expanded pipeline capacity should accommodate the longer term needs for shippers requiring access to the Mackenzie Valley Pipeline. Given the current limited state of development of most Significant Discovery Licences in the Mackenzie Delta and Mackenzie Valley areas, obtaining binding commitments by 2005 for 34 Mm^3/d (1.2 Bcf/d) of initial capacity in 2008 will require further work with potential shippers.

Uncertainties in the amount, composition and timing of potential shipper volumes are factors that influence whether separate natural gas and NGL pipelines or a single, two-phase transmission pipeline will be required north of Norman Wells. Project definition work will focus on a system having separate gas and NGL lines with initial capacity of 34 Mm^3/d (1.2 Bcf/d), expandable to 54 Mm^3/d (1.9 Bcf/d) with infill compression. Commercial negotiations with each shipper will be

completed to substantiate this capacity or to modify it, as required. The technical design sensitivities will also be assessed for a lower capacity transmission pipeline, which could be reverted to, if projected binding commitments did not materialize.

COMMERCIAL AGREEMENTS

Precedent agreements, which specify volume commitments and other commercial terms, will be negotiated with individual shippers. These agreements are expected to be submitted with the application for regulatory approval. Final firm service transportation agreements are expected to be executed after regulatory approvals have been received.

The proponents plan to maintain flexibility in line pipe sizing and expansion capability as long as practical in the project schedule, thereby providing increased opportunity to accommodate additional volumes from the development of existing and new field discoveries. Accordingly, precedent agreements might contain conditions that provide for a range of capacity needs.

NORTHERN COMMUNITY ACCESS TO NATURAL GAS SUPPLY

The 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 the natural gas from the transmission pipeline system to users in the communities.

TRANSMISSION PIPELINE TOLLS

The Mackenzie Valley Pipeline tolls will be approved by the NEB. Although the terms of service remain to be established, the principle to be applied is that all shippers will pay the same toll for the same service.

GATHERING SYSTEM ACCESS

Access to the gathering system, including the NGL facility and the NGL pipeline from Inuvik to Norman Wells, will not be subject to regulation under the NEB Act. The gathering system proponents may consider options for ownership in these facilities by interested shippers, or will negotiate a fee-for-service with each shipper for the portion of the gathering and processing facilities that they use.

The need to process natural gas through liquid extraction facilities will be determined by the quality of each producer's gas. Shippers using the NGL facilities will be entitled to receive the liquids extracted from their natural gas in kind.

TRANSMISSION PIPELINE TARIFF

Before transmission pipeline operations begin, Imperial, as operator, will file a tariff with the NEB. The tariff will include the general terms and conditions relating to service on the transmission pipeline.

The general terms and conditions will include:

- provisions for:
    - gas quality
    - scheduling and curtailments
    - gas used by the system, including fuel gas
    - force majeure
- procedures for:
    - balancing actual quantities shipped against quantities nominated
    - invoicing and making payments

ANCHOR FIELD LOCATIONS

The three natural gas fields whose production will provide anchor volumes to the Mackenzie Valley Pipeline are:

- Taglu, operated by Imperial
- Parsons Lake, held by ConocoPhillips and ExxonMobil and operated by ConocoPhillips
- Niglintgak, operated by Shell

The title to the subsurface resources for each anchor field is held by the federal government. The anchor fields are located in the Inuvialuit Settlement Region of the Northwest Territories (see Figure 3-1, and Settlement Private Land Map 1 in Volume 2).

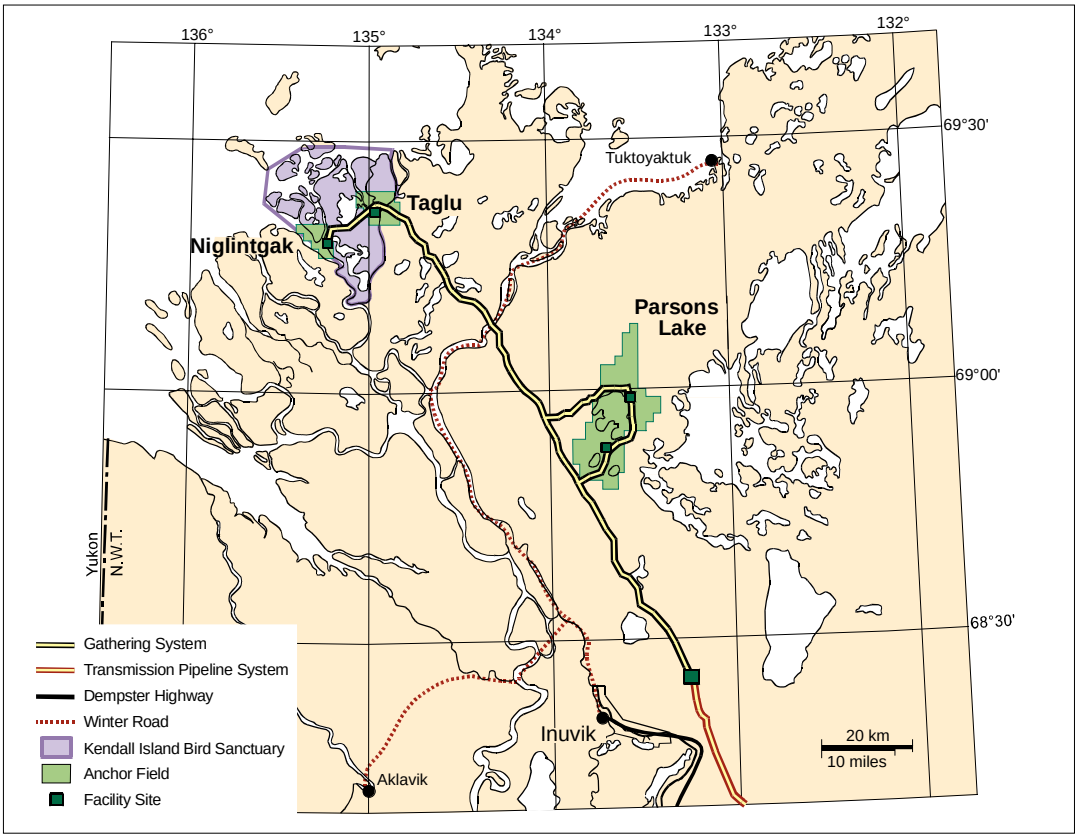

Figure 3-1: Location of Anchor Fields

ANCHOR FIELD LOCATIONS (cont'd)

Taglu is located about 120 km northwest of Inuvik and about 70 km west of Tuktoyaktuk. A large portion of the field is located within the Kendall Island Bird Sanctuary.

Parsons Lake is located about 45 km northeast of Inuvik and about 35 km southwest of Tuktoyaktuk.

Niglintgak is located at the southern end of Niglintgak Island in the Mackenzie Delta, about 120 km northwest of Inuvik and about 85 km west of Tuktoyaktuk. Most of the field lies within the Kendall Island Bird Sanctuary.

DEVELOPMENT HISTORY

Taglu

Imperial discovered Taglu in 1971. The discovery well was followed by six more wells drilled between 1972 and 1985. Of these seven wells, five encountered hydrocarbons and two were dry and abandoned. In 1987, Imperial was granted a Significant Discovery Licence for Taglu.

Also in 1987, a three-dimensional (3-D) seismic program was conducted. This seismic program has recently been re-interpreted to help determine the optimum depletion strategy.

Parsons Lake

The Parsons Lake field was discovered in 1972. It has been defined by two-dimensional (2-D) seismic and other study programs conducted between 1959 and 2000, and by 19 wells drilled between 1971 and 1986. The Significant Discovery Licences were made effective in 1987.

During the winter of 2001 to 2002, ConocoPhillips conducted a 3-D seismic program at Parsons Lake to enable more precise mapping of the field's productive intervals. This new mapping information will be used to help determine the optimum depletion strategy.

Niglintgak

Shell has been active in the Niglintgak area since the early 1970s. The Niglintgak field discovery well was drilled in 1973. During the next four years, four delineation wells were drilled. The information from these wells was analyzed and used to obtain a Significant Discovery Licence in 1985. In 1989, a 3-D seismic program was conducted to help determine the optimum depletion strategy.

ANCHOR FIELD DEVELOPMENT PLANNING

Approach

The development of each of the three anchor fields is in the conceptual planning stages. Several options for production and facility design, and pad locations, are currently being evaluated, to satisfy the requirements for environmental, operational and economic success.

The facilities needed to recover the hydrocarbon resources from the three natural gas fields will be developed in a manner that considers the environment and current land uses, while meeting the technical, safety and integrity needs of facilities operating in a harsh climate.

Field development plans will be finalized through a series of consultations and reviews with residents in potentially affected communities, and with other interested parties. The field operators have been conducting some of these activities in coordination with one another and with the gathering system and transmission pipeline operator, in order to reduce and mitigate any potentially adverse effects.

The results of the studies, environmental assessments and public consultation will be factored into each field development plan. Any changes that might be required will be documented in the individual development plan applications that will be submitted for regulatory approval with the Mackenzie Gas Project gathering and transmission pipeline system applications in 2003.

Wells

As all exploratory and delineation wells in the three anchor fields were abandoned, future development of these fields will require new wells. These wells will be drilled using commercially proven technology.

To minimize surface disturbance, most of the development wells at the three natural gas fields will be directionally drilled from central pads (see Figure 3-2).

Surface sites and wellbores will be designed to minimize impacts to the permafrost.

At Taglu, between 10 and 15 wells will be drilled from a single surface site.

At Parsons Lake, between 10 and 15 wells are likely to be drilled. An initial surface site is expected to be located in the northern portion of the field. A second surface site will be added later to develop the southern end of the field. One or more smaller well pads might also be required to optimize recovery from the Parsons Lake field.

Wells (cont'd)

At Niglintgak, between six and 10 wells will be drilled. Three or four surface drilling sites will likely be needed because of the relatively shallow depth (about 1,000 m) of the reservoir and the associated limitations of directional drilling.

The conceptual design evaluations, and the drilling and production results of the initial wells, might result in a change to the number and locations of the wells required to develop the resources in each field effectively. However, this optimization work should not result in material changes to the individual conceptual field development plans.

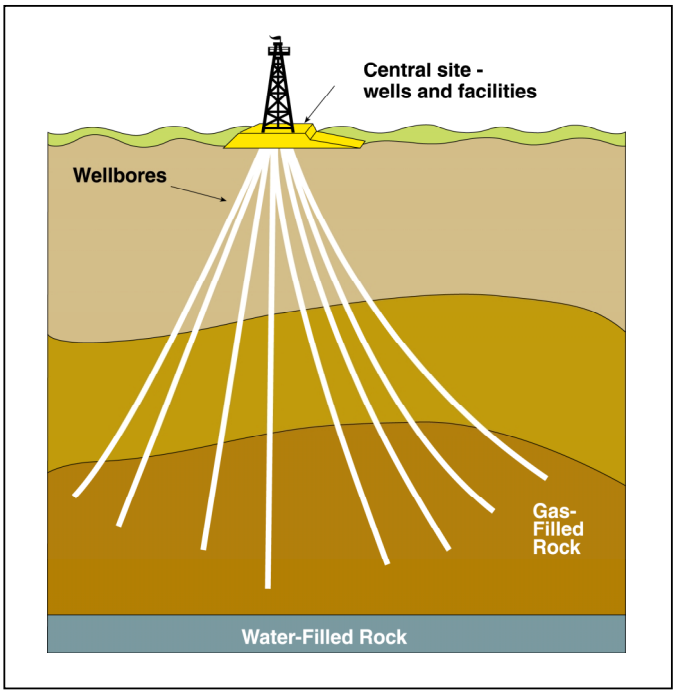

Figure 3-2: Directional Drilling

Production Facilities

The natural gas will be conditioned at the fields to meet the gathering system requirements for pressure, temperature and water content. Conditioning might include:

- dehydrating the gas to prevent ice and hydrates from forming
- compressing the gas to the pressure required for it to enter the gathering system
- controlling the temperature of the gas to meet gathering system specifications

The conditioning facilities and necessary utilities, such as electrical power generation, will likely be located at each field site.

Because of the shallow nature and low pressure of the reservoir at Niglintgak, gas-compression facilities will be installed as part of the initial construction. Compression is needed to maintain production rates and to supply natural gas at the required pressure for the gathering system. Compression facilities will be required at Taglu and Parsons Lake in the future.

A flare system will be installed at each field. Natural gas will only be flared, if necessary, during:

- start-ups and shutdowns
- well testing conducted during drilling, completion and workover operations
- abnormal and emergency conditions

All of the major production facilities, except the flare system and storage tanks, are likely to be fully housed and insulated in prefabricated modules.

Field Operations

The natural gas production, dehydration and compression facilities will be designed to operate safely and continuously. Each system will be capable of:

- monitoring wells and facilities automatically
- displaying alarm messages
- shutting the facility down in a fail safe mode

Control systems capable of monitoring and operating the facility will be located at each of the anchor fields as well as at the Inuvik facility. Initially, the fields will be operated locally with on-site operations and maintenance staff located at the facility on a 24-hour basis. Eventually, anchor field operations might be continuously monitored and controlled from the Inuvik facility, with only scheduled periodic on-site maintenance and surveillance support by operating personnel.

For information on the methods of accessing the anchor fields, see Site Access in Section 5.3.

Well Servicing and Testing

Well maintenance will require using service rigs or wireline units periodically to maintain the integrity of the wellbores and downhole equipment. The options being considered include either:

- having a full-time rig stationed at each field

Well Servicing and Testing (cont'd)

- managing operations to schedule maintenance during:
  - winter – with rigs transported to the field by truck over temporary ice roads
  - summer – with rigs and equipment transported to the field either by barge or helicopter

Decommissioning and Abandonment

The operational life of each anchor field is estimated to be about 25 years. An abandonment and reclamation plan will be filed as part of the Development Plan Application submitted for each anchor field.

OTHER PRODUCTION AREAS

If expressions of interest from other operators warrant, and subject to agreement on terms and conditions of access, facilities and pipelines at any of the three anchor field areas could be built to accommodate additional natural gas and associated NGLs. Any facilities needed to connect additional natural gas and NGLs from other fields are not considered part of the Mackenzie Gas Project and would be the subject of their own independent regulatory applications.

ENGINEERING STUDIES

The anchor field operators are conducting several engineering studies to help select the preferred design concepts for their field facilities (see Table 3-1). Field operators are participating only in the studies that are relevant to their own field.

Table 3-1: Anchor Field Engineering Studies

Study Title	Study Scope
Process	
Availability	Based on the equipment, designs and materials proposed, calculate appropriate availability factors for the facilities and propose equipment sparing philosophies and impact on availability and cost.
Flaring	Review options for reducing radiant heat on the permafrost.
Hydrate Prevention	Review the alternative hydrate prevention technologies from the wellhead and other pads to the production facilities.
Natural Gas Dehydration	Determine the optimum dehydration method.
Product Cooling	Review options to cool natural gas to meet the temperature specifications of the gathering system.
Utilities	
Building Heat	Evaluate building heating options.
Drilling Fluid Disposal	Assess alternative methods of disposing of drilling fluids.
Heat Integration and Energy Management	Review options for reducing energy use.
Power Generation and Utilization	Determine the level of electrical power generation required for operating a typical pad.
Waste Management	Quantify all waste produced during pad operations, such as waste fluids, sewage and replacement parts, and the options for handling the waste.
Civil and Geotechnical	
Dock Design	Review options for dock design.
Foundation Design	Review options for facilities and drilling pad foundation design.
Permafrost and Well Design	Assess the impact of thaw subsidence on permafrost well design.
Road Design and Other Civil Engineering	Review options for road design and other civil structures in the pad facility areas. Determine road construction parameters.
Subsidence	Determine how to accommodate potential surface subsidence resulting from reservoir compaction.
Logistics and Other	
Access to Pads	Review the options for all-year access to the facility pads.
Communications	Determine the Supervisory Control and Data Acquisition (SCADA) system and control communications required between the pads and the central control room.
Construction Equipment	Determine the preferred equipment for constructing the pad and facilities.
Modularization	Determine the optimum size of buildings to be transported to the field.
Shared Supply Base	Develop a technical definition of shared supply base requirements for simultaneously supporting the development drilling programs at the three anchor fields.
Transportation	Evaluate transportation options during construction and operations for personnel, materials and equipment.

DEVELOPMENT PLAN

The Taglu field (see Figure 3-3) is planned to be developed in one phase, with production starting in 2008. The productive reservoir is about 3 km beneath the land surface. Initially, compression will not be required, but will be phased in over future years as the reservoir pressure declines.

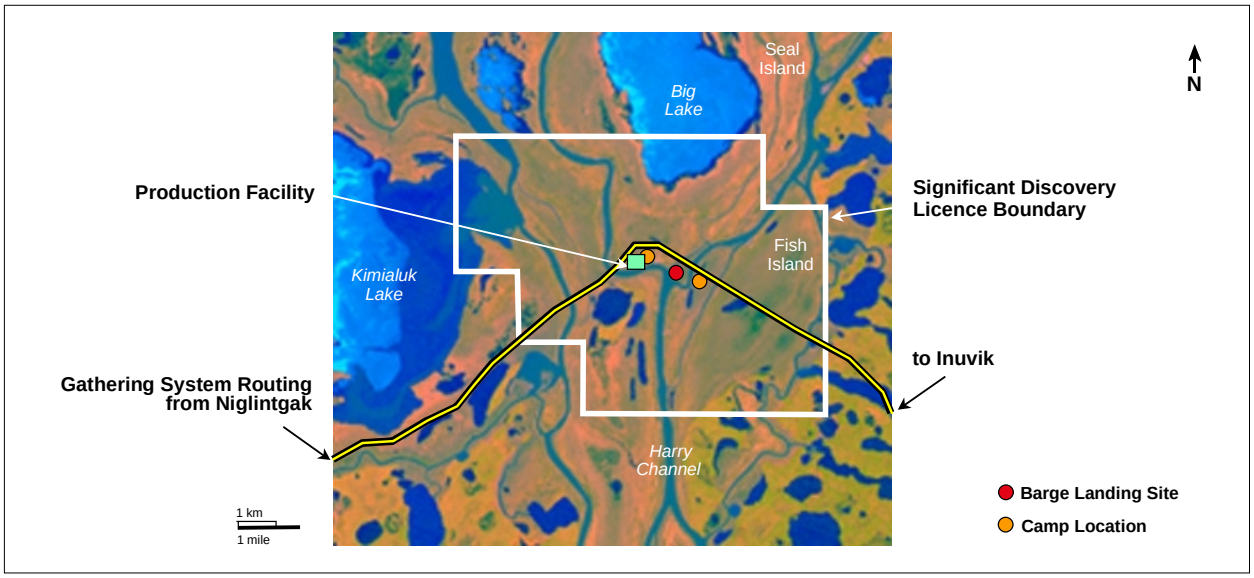

Figure 3-3: Taglu Significant Discovery Licence Area

For the specific location of the Taglu field, see Gathering System Routing Map 1 in Volume 2.

DRILLING FACILITIES

Well-Site and Production Pad

Natural gas from the Taglu field is expected to be produced through about 10 to 15 wells from a single, centrally located pad consisting of a drilling section and a gas-processing section. The natural gas will be sent to the gas-conditioning facility located on the processing section of the Taglu pad.

The pad will be located within the boundaries of the Kendall Island Bird Sanctuary, as a significant portion of the natural gas pool is within the sanctuary boundary.

Water crossings are not required for flow lines at Taglu for a single, centrally located pad.

PRODUCTION FACILITIES

The purpose of the processing section of the pad is to condition the natural gas to meet the specifications required by the gathering system. The production facilities are expected to include:

- wellheads
- in-line heaters for hydrate control
- one or two inlet separators
- a well-test separator and metering equipment
- control valves and piping
- dehydration equipment
- gas-compression equipment, about 10 years after start-up, as required
- cooling equipment, to maintain the integrity of the permafrost, if required
- a wastewater storage system
- one or two waste disposal wells
- a flare system
- electrical power generation facilities
- a service building
- a helicopter pad
- a connection to the gathering system

DEVELOPMENT PLAN

Phased Development

The Parsons Lake field (see Figure 3-4) has two main areas capable of producing natural gas and NGLs. The larger area is located on the northeast side of, and partly under, Parsons Lake. A smaller area is located southwest of Parsons Lake. The productive reservoirs are about 3 km beneath the land surface.

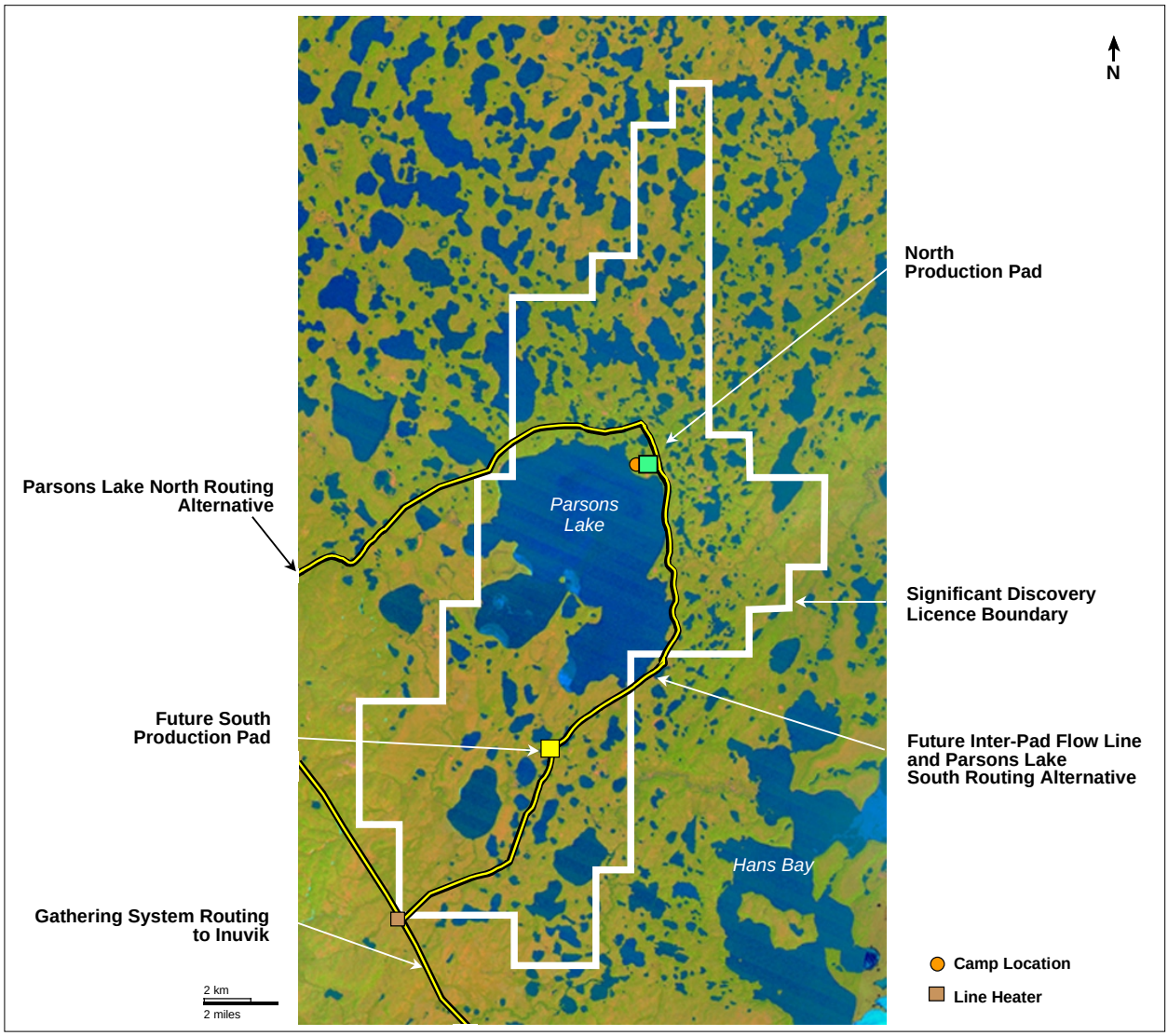

Figure 3-4: Parsons Lake Significant Discovery Licence Area

Phased Development (cont'd)

For the specific location of the Parsons Lake field, see Gathering System Routing Map 2 in Volume 2.

The development of the field will be phased. Production is planned to begin from the north area of the field in 2008. Production from the south area is expected to begin five to 10 years later, as production from the north area declines. In addition to a main well pad for each of the north and south production areas, one or more smaller well pads might be added in the production areas to optimize the recovery of natural gas from the field.

Two routing alternatives are currently being considered for connecting the Parsons Lake field with the gathering system. The final design of the development plan, including the location of the pads and route selection for the Parsons Lake field, will be based on reservoir simulation and other studies that are already underway and that will be documented in the Parsons Lake Development Plan Application.

First Phase of Field Development

Well-Site and Production Pad

The plan for the first phase of development includes constructing a pad on the northeast side of the lake, to support:

- drilling seven to 10 production wells and a waste disposal well
- installing dehydration and other production facilities

Production Facilities

The north pad production facilities are expected to include:

- wellheads
- an in-line heater for hydrate control
- inlet separators
- a well-test separator and metering equipment
- control valves and piping
- dehydration equipment
- gas-compression equipment, about three to five years after start-up, if required
- cooling equipment, to maintain the integrity of the permafrost, if required
- a wastewater storage system
- a waste disposal well
- a flare system
- electrical power generation facilities
- a service building
- a helicopter pad

- a connection to the gathering system
- a short road, to provide access to the well pad from Parsons Lake

The dehydration facility will be designed to remove water from the Parsons Lake natural gas stream. Recovered water is expected to be injected into a suitable subsurface rock formation through a waste disposal well.

Drilling fluids are expected to be injected into a suitable subsurface rock formation through a waste disposal well. However, depending on the outcome of the Drilling Fluid Disposal Study for Parsons Lake, an on-site drilling sump might also be included.

Because of the unique site-access requirements for the Parsons Lake field, the need for an all-year airstrip is also being evaluated.

Second Phase of Field Development

Well-Site and Production Pad

The second phase of development will include constructing a pad south of Parsons Lake, to support:

- drilling three to five production wells
- installing minor production facilities

The south pad will be connected to the main processing facility on the north pad, most likely by an elevated, insulated NPS 8 to NPS 12 flow line. This 15 to 20 km-long flow line will cross several small, unnamed tributaries to Parsons Lake, as well as Zed Creek, the outlet of Parsons Lake.

Production Facilities

The south pad production facilities are expected to include:

- wellheads
- an in-line heater for hydrate control
- an inlet separator
- a well-test separator and metering equipment
- control valves and piping
- cooling equipment, to maintain the integrity of the permafrost, if required
- a flare system
- electrical power generation facilities, if required
- a service building
- a helicopter pad

Drilling fluids are expected to be injected into a suitable subsurface rock formation through a waste disposal well. However, depending on the outcome of

Production Facilities (cont'd)

the Drilling Fluid Disposal Study for Parsons Lake, an on-site drilling sump might also be included.

Pad Design

The north pad is expected to have an area of between 20 and 25 ha. The south pad is expected to be smaller than the north pad.

The production facilities will occupy only a small portion of the production pad. Most of the pad area will be required to accommodate the drilling operations.

DEVELOPMENT PLAN

The Niglintgak field (see Figure 3-5) is planned to be developed over several drilling seasons, with production starting in 2008.

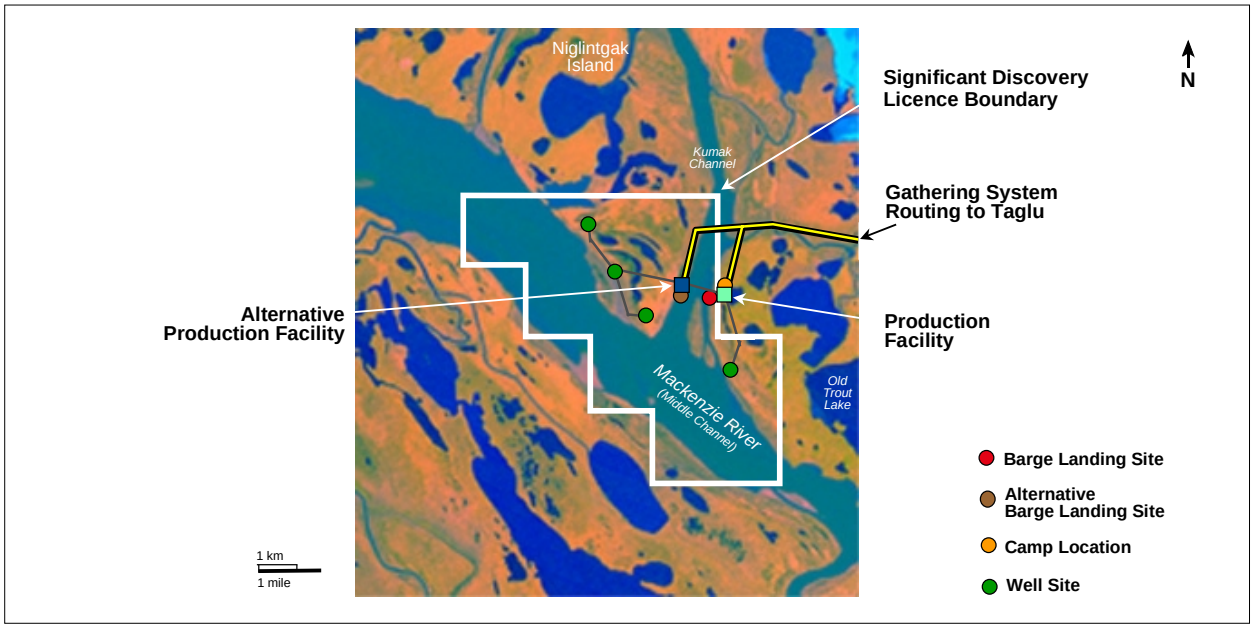

Figure 3-5: Niglintgak Significant Discovery Licence Area

For the specific location of the Niglintgak field, see Gathering System Routing Map 1 in Volume 2.

DRILLING AND PRODUCTION FACILITIES

Well-Site and Production Facilities

The current plans include constructing three or four well-site pads and one production facility pad, located inside the Kendall Island Bird Sanctuary, to support:

- six to 10 production wells
- one or two waste disposal wells
- production and compression facilities

Well-Site Pads

The well-site pads will likely contain:

- wellheads

Well-Site Pads (cont'd)

- equipment for hydrate control, e.g., in-line heating or chemical injection
- control valves and piping
- testing, measuring and well workover equipment
- a helicopter pad
- a flare system
- a service building

The well-site pads will be connected to the production facility pad through flow lines, which will be either elevated, or insulated and buried, to protect the permafrost. Chemical injection or heat will be used to prevent hydrates from forming in the wellbore and in the flow lines.

As a result of the reservoir location, flow line crossings of the Kumak Channel of the Mackenzie River will likely be required.

Production Facilities Pad

Natural gas production will be routed from the wells through flow lines to a common production facility pad for dehydration and compression. A dehydration facility to remove water from the Niglintgak natural gas stream will be required. Any water recovered will be injected into a suitable underground rock formation through waste disposal wells. The production facility pad is expected to contain:

- inlet separation equipment
- control valves and piping
- dehydration equipment
- gas-compression equipment
- cooling equipment, to maintain the integrity of the permafrost, if required
- a wastewater storage system
- one or two waste disposal wells
- a flare system
- electrical power generation facilities
- a service building
- a helicopter pad
- a connection to the gathering system

On-site sumps will not be required at Niglintgak for disposing of drilling fluid and cuttings. It is planned to use a remote sump, although other disposal methods, including subsurface disposal, are being evaluated.

Niglintgak has a shallow (about 1,000 m) reservoir. Consequently, the Niglintgak field has relatively low initial pressures, compared to the other anchor fields. Therefore, natural-gas-driven, on-site compression will be required at start-up to

achieve the required gathering system pressures. Additional compression will be installed over the field life to maintain production.

MAJOR COMPONENTS

The major components required to ship sweet natural gas and associated natural gas liquids (NGLs) from the three anchor fields to market are:

- a gathering system, north of Inuvik
- an NGL facility to recover associated NGLs
- a transmission pipeline from:
  - the Inuvik area to Norman Wells
  - Norman Wells to northwestern Alberta
- associated facilities, including compressor and pumping stations

The location and configuration of the components are subject to further technical and commercial studies, socio-economic and environmental impact assessments, and public communication and consultation.

Design Concepts

Two design concepts are being considered for the pipeline system between Inuvik and Norman Wells:

- a single-phase design, which includes a pipeline for natural gas and a separate pipeline for NGLs in a common pipeline right-of-way
- a two-phase design, which includes a single pipeline for natural gas and NGLs

Design Capacity

Pipeline designs for transporting a range of natural gas volumes are also being evaluated. Specific cases include:

- a base case – 34 Mm^3/d (1.2 Bcf/d), based on the results of the Open Season Expression of Interest (see Section 2.1, Pipeline Capacity Considerations)
- a reduced case – between 23 and 28 Mm^3/d (0.8 and 1 Bcf/d), based primarily on production volumes from the three anchor fields
- an expanded case – volumes up to 54 Mm^3/d (1.9 Bcf/d), based on infill compression added to the facilities forming the base case

GATHERING SYSTEM

The gathering pipeline and related facilities will be used to transport natural gas and associated NGLs from the outlets of the Taglu, Parsons Lake and Niglintgak production facilities, to the outlet of the facility near Inuvik. Gathering System Routing Maps 1 to 3 in Volume 2 illustrate the current gathering system route. For further information on the gathering system, see Section 4.2, Gathering System.

In the single-phase design, the NGL facility will be located on the same site as the compressor station near Inuvik. An NGL pipeline will transport NGLs from Inuvik to Norman Wells.

In the two-phase design, the NGL facility will be located at Norman Wells. This facility will be located on the same site as the Norman Wells compressor station.

The NGL facility and the NGL pipeline are part of the gathering system.

NGL FACILITY

The NGL facility will process NGLs for shipment through a liquids pipeline. The NGL facility would be located:

- near Inuvik, in the single-phase design
- near Norman Wells, in the two-phase design

The NGL facility will be similar in size for either design concept. For further information on the NGL facility, see Section 4.2, Gathering System.

TRANSMISSION PIPELINE

The transmission pipeline will be used to transport gas from the gathering system to a southern terminus in northwestern Alberta.

Pipeline Routing Maps 1 to 18 in Volume 2 illustrate the current pipeline route, resulting from technical studies and consultation with community residents. The location and configuration of the transmission pipeline are subject to further technical and commercial studies, socio-economic and environmental impact assessments, and public communication and consultation. For further information on the transmission pipeline, see Section 4.3, Transmission Pipeline.

ASSOCIATED FACILITIES

Compressor Stations

Compressor stations are required to move the natural gas through the transmission pipeline system from the outlet of the facility near Inuvik. If an increase in

transmission pipeline throughput capacity is required, infill compressor stations would be added, subject to regulatory approval.

For the preliminary locations of initial and infill compressor stations, see Pipeline Routing Maps 1 to 15 in Volume 2. For further information on the compressor stations, see Section 4.4, Associated Facilities.

Pumping Stations

In the single-phase design, initial NGL pumping facilities on the NGL pipeline would be located near Inuvik and Norman Wells. If an increase in throughput capacity were required, infill pumping stations would be added, subject to regulatory approval. The pumping stations would likely be located on the same sites as the compressor stations for the transmission pipeline.

Other Facilities

In addition to compressor and pumping stations, several smaller facilities, such as line heaters and block valves, will be located along the pipeline route.

ENGINEERING STUDIES

Engineering studies are underway to assess size, capacity, configuration, location, constructability and operability of the gathering system and transmission pipeline and associated facilities. Table 4-1 summarizes some of these studies, which are in progress.

Table 4-1: Engineering Studies

Study Title	Study Scope
Availability	Based on the equipment, designs and materials proposed, calculate appropriate reliability factors for the facilities and propose equipment sparing philosophies and impact on reliability and cost.
Communications	Determine the requirements for communications between facility sites, e.g., compressor stations and production pads.
Construction Equipment	Evaluate equipment requirements and identify equipment for constructing the pipeline systems.
Ditching	Assess ditching methods, including ditch production rates.
Facility Siting	Determine locations and requirements for the facilities, e.g., compressor and pumping stations, NGL facility and power generators. Determine facility locations for pipeline expansion.
Foundation Design	Assess options for designing the facility foundations, pads and roads.
Granular Material	Determine the quantity and quality of the project's granular requirements and assess the availability of granular deposits.
Infrastructure Study	Identify locations for staging line pipe and equipment, construction camps, barge landing sites, aircraft landing sites and access roads.
Measurement	Identify and evaluate alternatives for measuring natural gas and NGLs at each facility, e.g., fuel gas and custody transfer.

Table 4-1: Engineering Studies (cont'd)

Study Title	Study Scope
Permafrost, Right-of-Way Preparation	Collect data on permafrost conditions along the route. Assess impacts during construction and operation. Establish design requirements for pipeline integrity and long-term right-of-way stability.
Pipeline Design	Establish pipeline structural design criteria, including allowable strains. Determine the pipeline material required for the design conditions and evaluate availability and weldability. Assess internal and external coatings.
Pipeline Hydraulics	Analyze pipeline hydraulics for steady-state, transient and turndown conditions for single-phase and two-phase flow conditions. Determine whether a single-phase design or two-phase design is required north of Norman Wells. Determine the expansion capability of the pipeline system.
Pipeline Surveillance	Develop a surveillance program for the operating phase of the pipeline.
Routing Analysis	Determine the pipeline route, considering engineering, socio-economic, environmental, regulatory and community input.
Slope Stability	Evaluate slope stability and develop mitigation plans, as required.
Transportation and Logistics	Determine the transportation and logistics requirements for equipment, materials and personnel, e.g., roads and marine transportation.
Waste Identification	Identify potential sources of waste and the estimated volume of waste to be treated and disposed of during pipeline and facility construction and ongoing operations.
Water Crossings	Identify all water crossings and develop the preferred crossing method for each.

GATHERING SYSTEM COMPONENTS

The components of the gathering system include:

- gathering pipelines to transport natural gas and associated NGLs from the anchor fields to the facility near Inuvik
- a compressor station near Inuvik
- an NGL facility, located either near Inuvik or Norman Wells, for recovering NGLs from the gas stream
- a pipeline to transport NGLs from the facility near Inuvik to Norman Wells in the single-phase design. Pumping stations would also be required in future expanded cases.

Figure 4-1 shows the segments of the gathering system. This system is subject to further study.

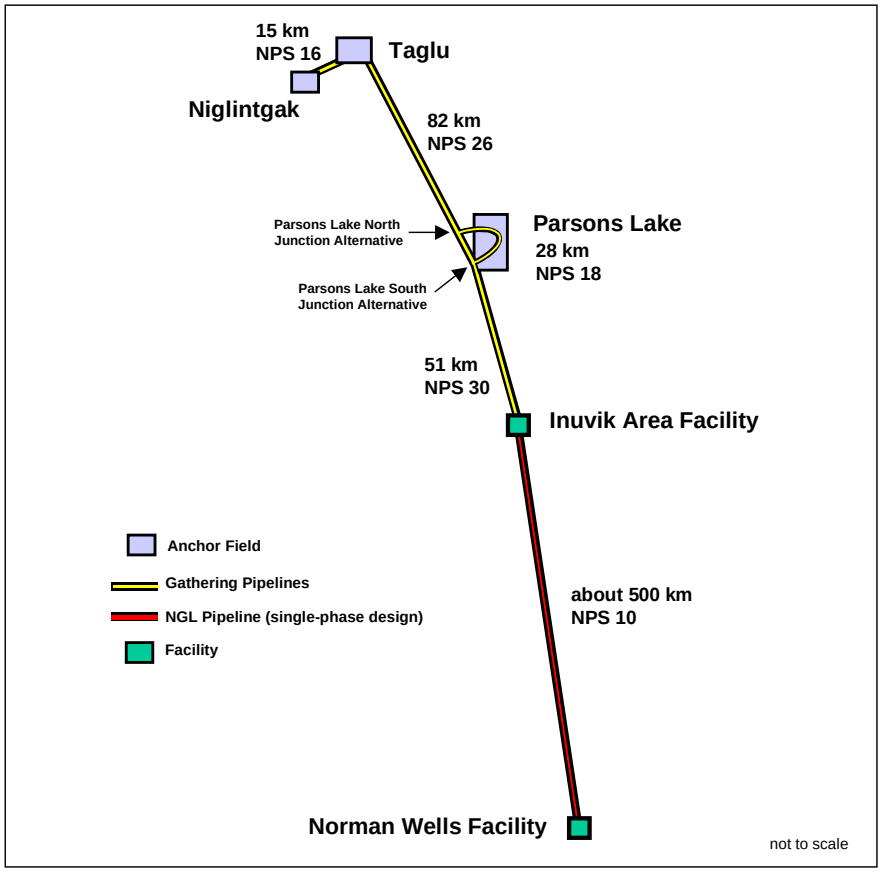

Figure 4-1: Gathering System Segments

GATHERING PIPELINES

The routing and location of the gathering pipelines are shown on Gathering System Routing Maps 1 to 3 in Volume 2.

The gathering pipelines that connect the three anchor fields to the facility near Inuvik consist of four segments:

- Niglintgak to Taglu
- Taglu to Parsons Lake Junction
- Parsons Lake to Parsons Lake Junction
- Parsons Lake Junction to the facility near Inuvik

Most of the gathering pipelines will be buried. Portions of the gathering pipelines could be above ground, subject to design or operational constraints. Further evaluations are underway to determine the specific requirements.

Niglintgak to Taglu

The segment of the gathering system from the Niglintgak field to the Taglu junction will consist of about 15 km of NPS 16 pipeline. This segment will deliver natural gas from the Niglintgak field to a location near the Taglu field.

Taglu to Parsons Lake Junction

The segment of the gathering system from the Taglu field to the Parsons Lake south junction will consist of about 82 km of NPS 26 pipeline. This segment will deliver natural gas from the Niglintgak and Taglu fields to the Parsons Lake junction.

Parsons Lake to Parsons Lake Junction

The segment of the gathering system from the Parsons Lake field to the Parsons Lake junction will consist of about 28 km of NPS 18 pipeline. This segment will deliver natural gas from the Parsons Lake field to the Parsons Lake junction.

Parsons Lake Junction to the Facility Near Inuvik

The segment of the gathering system from the Parsons Lake junction to the proposed facility near Inuvik will consist of about 51 km of NPS 30 pipeline. This segment will deliver natural gas from the Taglu, Parsons Lake and Niglintgak fields to the Inuvik facility.

Gathering Pipeline Design

Right-of-Way

Preliminary estimates of the width of the gathering pipeline right-of-way north of Inuvik indicate that it will be up to 40 m. The right-of-way width provides for

most construction activities and for a travel lane. Additional temporary workspace will be required in certain areas, such as water crossings. The right-of-way width will be assessed further during planned routing and construction studies.

Operating Pressure

Initial hydraulics studies have evaluated design pressures for the gathering pipeline of up to 12 MPa (1,740 psi). System operating pressure will vary relative to the distance from the Inuvik facility.

Wall Thickness

Subject to further study, wall thickness for the different laterals of the gathering system will be greater than 9 mm, based on using Grade 359 pipe material.

Pipe Coatings

The following pipe coatings are currently being assessed:

- external pipe coatings, for corrosion protection
- internal pipe coatings, for flow assurance

Metering

Custody transfer meter facilities are required at all receipt and delivery points along the gathering pipeline, including the NGL facility. Studies are underway to identify measurement requirements for the pipeline.

Compliance with Regulations

The gathering pipeline, including line pipe, valves, fittings and other components, will be designed and constructed consistent with the requirements of the NEB Onshore Pipeline Regulations, 1999, and the latest edition of the CSA Z662 Standards.

Other Gas

The gathering system would be accessible for additional gas from other natural gas fields in the Mackenzie Delta and other areas along or adjacent to the Mackenzie Valley area. Any of these other projects would be the subject of other regulatory applications. For further information on commercial aspects, see Section 2, Commercial Arrangements.

COMPRESSOR STATION

Gathering system compression equipment would be installed near Inuvik to meet the pressure requirements of the transmission pipeline system south of Inuvik. For information on compressor station equipment, see Section 4.4, Associated Facilities.

NGL FACILITY

The NGL facility is part of the gathering system, and will process:

- natural gas to the hydrocarbon dew point, pressure and temperature specifications of the transmission pipeline
- NGLs to the temperature and pressure specifications for the NGL pipeline

The NGL facility location depends on the design selected:

- in the single-phase design, the NGL facility will be located near Inuvik. An NGL pipeline will transport NGLs from the Inuvik area to Norman Wells.
- in the two-phase design, the NGL facility will be located on the same site as the Norman Wells compressor station

The NGLs recovered will be transported in the existing Enbridge pipeline from Norman Wells to Alberta.

Components of the NGL facility include:

- an inlet slug catcher
- liquids handling equipment, including:
  - separators
  - heat exchangers
  - pumps
  - stabilization towers
  - liquid product storage tanks
- natural gas handling equipment, including:
  - separators
  - heat exchangers
  - gas turbine drivers and compressors
- pigging facilities
- safety equipment, shutdown systems and a flare system
- utilities, such as fuel gas, electrical power and instrument air
- a control room and maintenance areas

NGL Volumes

The NGL volumes will depend on the volume and composition of the natural gas shipped. Table 4-2 shows the NGL volumes for the two design concepts and three design capacity cases.

Table 4-2: Estimated NGL Volumes

Design Concept	Pipeline Size	Reduced Case (m^3/d) [1]	Base Case (m^3/d) [1]	Expanded Case (m^3/d) [1, 3]	Reduced Case (bbl/d) [2]	Base Case (bbl/d) [2]	Expanded Case (bbl/d) [2, 3]
Single phase	NPS 28 (gas) NPS 10 (NGL)	2,000	3,200	4,500	12,000	20,000	28,000
	NPS 30 (gas) NPS 10 (NGL)	2,000	3,200	5,500	12,000	20,000	34,000
Two phase	NPS 28 (gas and NGL)	2,000	3,200	4,500	12,000	20,000	28,000
	NPS 30 (gas and NGL)	2,000	3,200	5,500	12,000	20,000	34,000

Notes:

1. Numbers are rounded to the nearest 100 m^3/d.
2. Numbers are rounded to the nearest 1,000 bbl/d.
3. Expanded case reflects gas transportation volumes up to 1.9 Bcf/d.

NGL PIPELINE

Two design concepts are being evaluated. In the single-phase design, a separate NGL pipeline would be built in the same right-of-way as the transmission pipeline from the facility near Inuvik to Norman Wells.

The NGL pipeline is planned to be about 500 km of NPS 10 pipe and have a design pressure of 10 MPa (1,440 psi), consistent with the existing Enbridge pipeline. The wall thickness will be greater than 9 mm, based on using Grade 359 pipeline material. The NGL pipeline is the subject of further study.

Meter facilities will be installed at the terminus of the NGL pipeline at Norman Wells.

In the two-phase design, there will not be an NGL pipeline.

NGL Pumping Stations

In the single-phase design, initial NGL pumping stations would be located near Inuvik and Norman Wells. If an increase in throughput capacity were required, infill pumping stations would be added, subject to regulatory approval. The pumping stations would likely be located on the same sites as the compressor stations for the transmission pipeline.

The pumping stations would be designed to operate safely, and would be equipped with emergency shutdown systems and controls. Pumping equipment would be designed to meet noise and emission regulations and standards, and would include:

- NGL pumps
- safety control systems
- pipeline in-line inspection tool receivers and launchers

TRANSMISSION PIPELINE COMPONENTS

The components of the transmission pipeline include:

- a segment from the Inuvik area to Norman Wells
- a segment from Norman Wells to northwestern Alberta

PIPELINE ROUTING

The location and configuration of the transmission pipeline are subject to further technical and commercial studies, socio-economic and environmental impact assessments, and public communication and consultation. Further studies will be conducted in areas that have:

- archaeological significance
- significant environmental or socio-economic concerns
- known physical features that are not conducive to pipeline construction

Pipeline Routing Maps 1 to 18 (see Volume 2) show areas where studies are underway, including:

- Travaillant Lake (see Maps 2 and 3)
- Great Bear River (see Maps 8 and 9)
- Ebbutt Hills (see Maps 12, 13 and 14)
- northwestern Alberta (see Maps 17 and 18)

Inuvik to Norman Wells

The pipeline from the Inuvik area to Norman Wells will be about 500 km long and will generally follow previously proposed pipeline routes (see Historical Pipeline Routing Maps 1 and 2 in Volume 2). The route will pass through the Gwich'in Settlement Area and the northern part of the Sahtu Settlement Area.

Based on information received during community consultations in the Gwich'in Settlement Area, the March 2001 route was revised in the Travaillant Lake area (see Pipeline Routing Maps 2 and 3 in Volume 2). The routing and configuration of this segment might be further modified, based on an additional Routing Analysis Study, the Pipeline Hydraulics Study and further consultation.

Norman Wells to Northwestern Alberta

A pipeline about 800 km long will carry natural gas from Norman Wells and connect with the existing natural gas pipeline system in northwestern Alberta. The route for the transmission pipeline from Norman Wells to Alberta will generally follow the existing Enbridge oil pipeline, except:

Norman Wells to Northwestern Alberta (cont'd)

- in the vicinity of Ebbutt Hills (see Pipeline Routing Maps 12, 13 and 14 in Volume 2)
- 50 km north of the Alberta boundary to the southern terminus (see Pipeline Routing Maps 17 and 18 in Volume 2)

The route passes through the southern part of the Sahtu Settlement Area and through the Deh Cho Region. For the Enbridge pipeline route, see Historical Pipeline Routing Maps 1 and 2 in Volume 2.

Southern Terminus

The transmission pipeline will deliver gas to the Alberta natural gas pipeline system in northwestern Alberta. The nearest existing pipeline infrastructure is located about 100 km south of the Northwest Territories boundary with Alberta (see Pipeline Routing Maps 17 and 18 in Volume 2).

Two alternatives are being considered for the location of the southern terminus for the transmission pipeline:

- a location in Alberta near the boundary with the Northwest Territories. This alternative would require the existing Alberta system to be extended to the southern terminus by a third party. The extension would also require the third party to obtain appropriate regulatory approvals.
- a location in Alberta at a connection point with the existing Alberta system. For this alternative, the Alberta segment of the transmission pipeline would be a part of the Mackenzie Valley Pipeline.

PIPELINE DESIGN

The transmission pipeline will transport the volume of natural gas for which firm shipping commitments have been made. Pipeline designs to transport a range of volumes are being studied (see Table 4-3). These studies include:

- evaluating various line sizes and operating parameters
- determining compression power requirements
- determining locations of the compressor stations
- addressing the capability to reduce or expand the volume of natural gas transported by removing or adding compressor stations
- determining the location of the NGL facility

The materials, diameters, wall thicknesses and operating pressures of the transmission pipeline will be determined following planned studies and completion of the final design for the project.

Table 4-3: Estimated Transmission Pipeline Volumes

Design Concept	Size (NPS)	Reduced Case (Mm^3/d) [1]	Base Case (Mm^3/d) [1]	Expanded Case (Mm^3/d) [1]	Reduced Case (Bcf/d) [2]	Base Case (Bcf/d) [2]	Expanded Case (Bcf/d) [2]
Single phase	28	23	34	45	0.8	1.2	1.6
	30	23	34	54	0.8	1.2	1.9
Two phase	28	23	34	45	0.8	1.2	1.6
	30	23	34	54	0.8	1.2	1.9

Notes:

1. Numbers are rounded to the nearest 1 Mm^3/d.
2. Numbers are rounded to the nearest 0.1 Bcf/d

Right-of-Way

Preliminary estimates of the width of the transmission pipeline right-of-way indicate that it will be:

- about 40 m for a single line
- about 50 m for the transmission pipeline and the NGL pipeline in the same right-of-way

The right-of-way width provides for most construction activities and for a travel lane. Additional temporary workspace will be required in certain areas, such as at water crossings. The right-of-way width will be assessed further during planned routing and construction studies.

Operating Pressure

Initial hydraulics studies have evaluated a range of design pressures for the transmission system. The design pressure of the system is about 18 MPa (2,600 psi). System operating pressure will vary relative to the distance from the compressor stations.

Wall Thickness

The wall thickness for the transmission line pipe is being evaluated and depends on pipe grade material, pipe diameter and design pressure. For the NPS 30, 18 MPa pipeline, the wall thickness will be greater than 15 mm, based on using Grade 550 pipe material.

Pipe Coatings

The following pipe coatings are currently being assessed:

Pipe Coatings (cont'd)

- external pipe coatings, for corrosion protection
- internal pipe coatings, for flow assurance

Metering

Custody transfer meter facilities are required at receipt and delivery points along the transmission pipeline, including the NGL facility and in northwestern Alberta. Studies are underway to identify measurement requirements for the pipeline.

Compliance with Regulations

The transmission pipeline system, including line pipe, valves, fittings and other components, will be designed and constructed consistent with the requirements of the NEB Onshore Pipeline Regulations, 1999, and the latest edition of the CSA Z662 Standards.

Other Gas

The transmission pipeline would be accessible for additional gas from other natural gas fields in the Mackenzie Delta and other areas along or adjacent to the Mackenzie Valley area. Any of these other projects would be the subject of other regulatory applications. Technical studies are being undertaken to evaluate the impacts of additional gas volumes on the transmission pipeline design. For further information on commercial aspects, see Section 2, Commercial Arrangements.

COMPRESSOR STATIONS

Figure 4-2 shows the preliminary locations of gas compressor stations. The initial compressor stations for the base case will be located:

- near Inuvik
- north of Fort Good Hope, near Little Chicago
- near Norman Wells
- north of Wrigley, near the Blackwater River
- north of Fort Simpson, near the Trail River

The gas compressor station near Inuvik would be part of the gathering system, and the remaining compressor stations would be part of the transmission system.

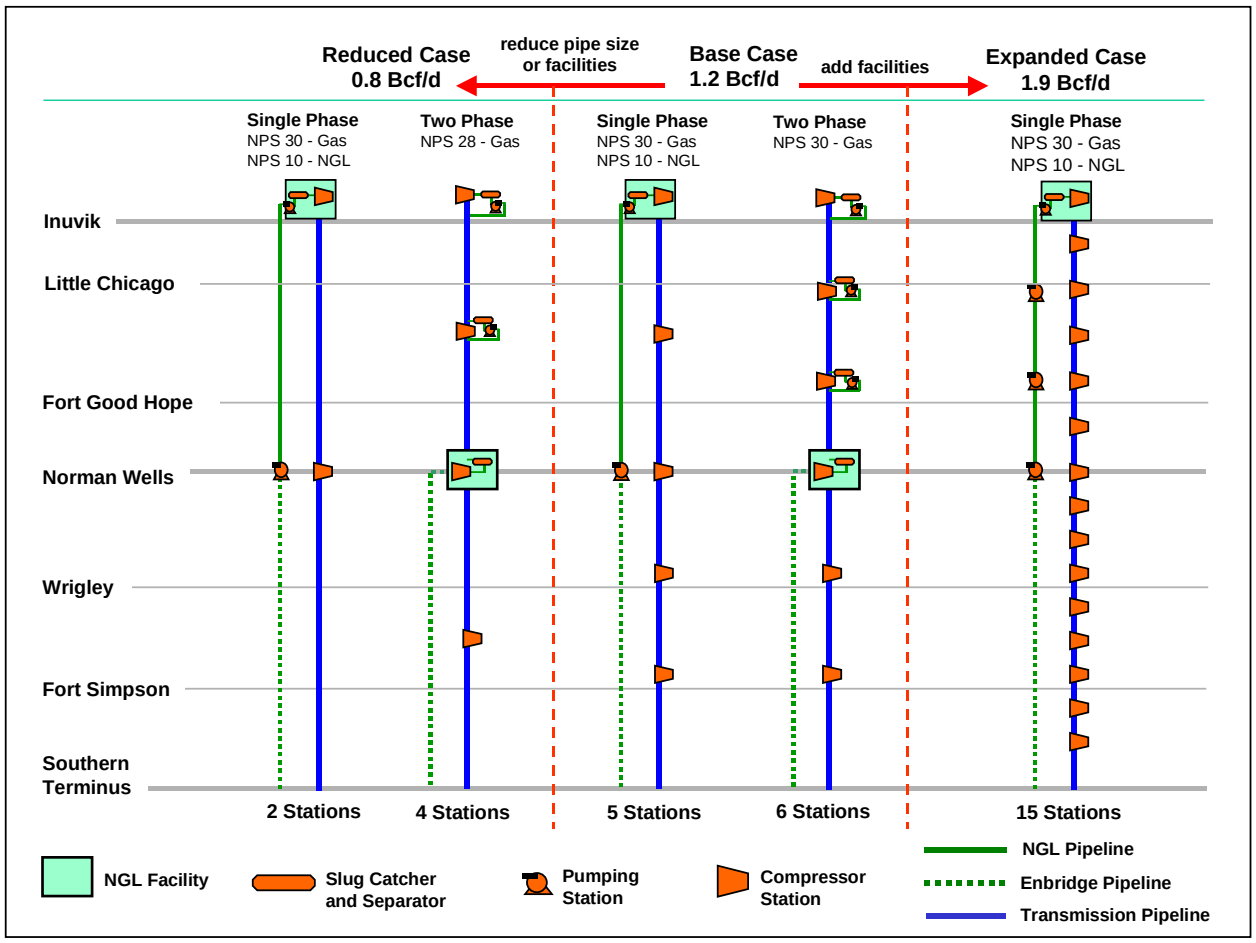

Figure 4-2: Compressor Station System Configuration

COMPRESSOR STATIONS (cont'd)

For the reduced case, alternatives being considered include reducing the pipeline diameter and the number of initial compressor stations.

For the expanded case, infill compressor stations will be added at intermediate locations between the initial compressor stations and the southern terminus.

To transport 1.9 Bcf/d of gas, the infill compressor stations would be located at about the one-third and two-third points between the initial compressor stations (see Pipeline Routing Maps 1 to 15 in Volume 2).

Preliminary power requirements for compressor stations are shown in Table 4-4.

Table 4-4: Compression Requirements

	Reduced Case (23 Mm^3/d) (kW)	Base Case (34 Mm^3/d) (kW)	Expanded Case (54 Mm^3/d) (kW)	Reduced Case (0.8 Bcf/d) (hp)	Base Case (1.2 Bcf/d) (hp)	Expanded Case (1.9 Bcf/d) (hp)
Inuvik	32,000	41,000	63,000	43,000	55,000	84,000
• 1/3 Station	–	–	9,000	–	–	12,000
• 2/3 Station	–	–	9,000	–	–	12,000
Little Chicago	–	10,000	9,000	–	13,000	12,000
• 1/3 Station	–	–	9,000	–	–	13,000
• 2/3 Station	–	–	9,000	–	–	13,000
Norman Wells	10,000	10,000	10,000	14,000	13,000	13,000
• 1/3 Station	–	–	11,000	–	–	15,000
• 2/3 Station	–	–	11,000	–	–	15,000
Blackwater River	–	10,000	11,000	–	14,000	14,000
• 1/3 Station	–	–	11,000	–	–	15,000
• 2/3 Station	–	–	11,000	–	–	15,000
Trail River	–	10,000	11,000	–	14,000	15,000
• 1/3 Station	–	–	11,000	–	–	15,000
• 2/3 Station	–	–	11,000	–	–	15,000
Totals	42,000	81,000	206,000	57,000	109,000	278,000

The compressor stations will be designed to operate safely and will be equipped with emergency shutdown systems and controls.

The compressors will be designed to meet noise and emission regulations and standards.

The specific location of each of the compressor stations will be based on:

- field assessments, which will provide information on the soil stability for foundations
- engineering studies
- socio-economic and environmental assessments
- community consultation

Infill Compressor Stations

Infill compressor stations required between the facility near Inuvik and the southern terminus would include equipment similar to that at the initial compressor stations. These stations will probably be remotely operated. Compressor stations will also contain accommodation and have air or road access.

Liquid slug catching and liquid pumping stations would be required at all compressor stations north of Norman Wells for the two-phase design. They are not required for the single-phase design.

Compressor Station Components

Compressor station components include:

- an inlet separation vessel
- a gas turbine driver and compressor
- cooling equipment
- electrical power generation equipment
- a control room
- safety systems
- valves and piping
- instrumentation
- buildings

OTHER FACILITIES

In addition to the compression and pumping facilities, several smaller facilities, such as line heaters and block valves, will be located along the gathering system and transmission pipeline route.

LOGISTICS PLANNING

The logistics of delivering materials, equipment and people to the field will incorporate various modes of transportation because of the:

- remote location of each of the project construction sites
- seasonal constraints on transportation

The main logistics challenges are to:

- transport line pipe, drilling rigs, compression and NGL facility modules, construction equipment, camp facilities and fuel
- obtain and deliver granular material to the drilling and construction sites
- provide transportation and accommodation for personnel

In addition, logistics planning will consider how to minimize the impact on existing transportation services for local communities.

CONSTRUCTION PLANNING

Project construction activities will take place:

- at the three anchor fields
- along the gathering system and transmission pipeline route
- at the compressor stations and NGL facility
- at associated infrastructure sites, such as:
    - construction camps
    - barge landing sites
    - airstrips
    - access roads
    - borrow sites
    - stockpile sites

Site-specific construction plans will be developed for each project site before work begins. Each plan will include measures to ensure that all construction activities are conducted safely and in an environmentally responsible manner.

EMERGENCY RESPONSE PLANNING

The safe production, processing and transportation of sweet natural gas and NGLs is based on well established practices. Emergency response planning for

EMERGENCY RESPONSE PLANNING (cont'd)

construction and operations is a required precautionary measure to ensure that appropriate procedures are in place to address any emergencies that might arise.

Site-specific emergency response plans will be developed in collaboration with potentially affected communities and all applicable regulatory agencies. This will ensure that any potential emergencies during construction and subsequent operations are dealt with safely and expeditiously.

Emergency procedures will be established in collaboration with the appropriate authorities and emergency services, and will address potential impacts on services available to local residents. The emergency response plan will include measures for:

- avoiding incidents, such as the release of hazardous materials, which might threaten the safety of people or property, or harm the environment
- mitigating the consequences of incidents

WASTE MANAGEMENT PLANNING

The types of waste that might be generated at field, pipeline and associated facility construction sites include:

- drilling fluids at the anchor fields
- hydrotesting fluids
- domestic waste at the camps
- construction waste

Waste management plans will be developed for all waste materials. Waste will be handled, treated and disposed of in compliance with applicable regulatory requirements, to ensure the safety of workers and protect the environment. Waste will be reduced, reused and recycled, where practical.

Sewage treatment facilities will also be provided at specific locations (see Section 5.2, Logistics Plan).

CONSTRUCTION SCHEDULE

Preconstruction and construction activities are expected to begin in 2005 (see Figure 5-1). Preconstruction activities will start once regulatory approval has been received, and will continue through the first season of pipeline construction.

During preconstruction and construction, detailed engineering design will be finalized, key facility modules and other modularized assemblies will be fabricated, and some contracts for construction and supplies will be awarded.

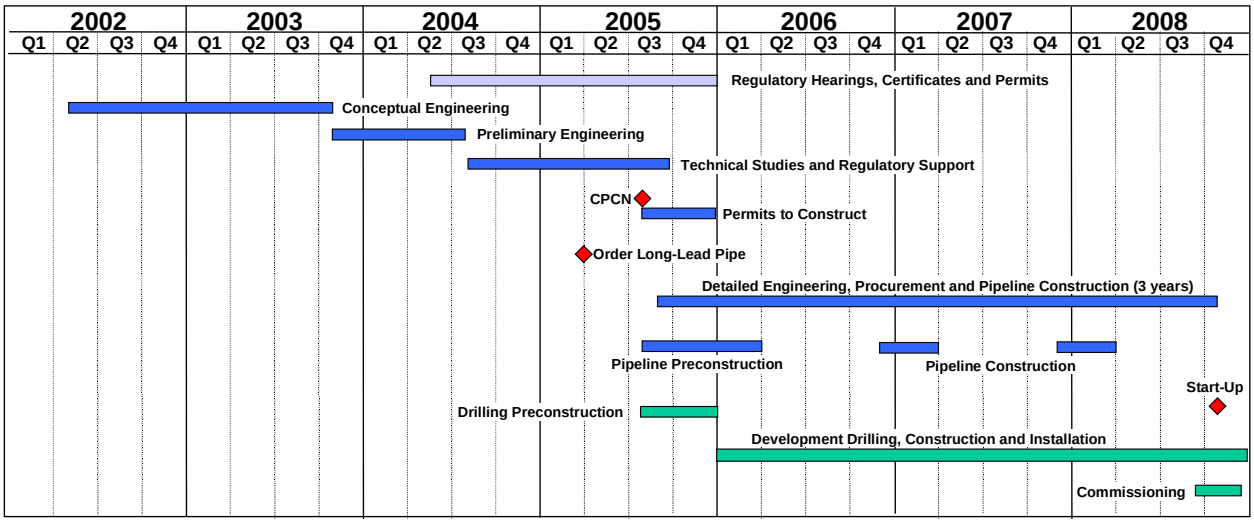

Figure 5-1: Preliminary Engineering and Construction Schedule

Development drilling is planned to start at all three anchor fields in 2006 and continue until 2008.

The construction period for installing the field facilities, gathering system, transmission pipeline system, and certain components of the compressor stations and NGL facility is scheduled to span two consecutive winter construction seasons. These construction seasons are planned for the first four months of 2007 and 2008, with preconstruction activities occurring in 2005 and 2006. Some field-related construction and drilling work is expected to occur all year.

For the single-phase design, these activities would also include constructing the NGL pipeline in a common pipeline right-of-way with the transmission pipeline from the Inuvik NGL facility to the Norman Wells compressor station.

LOGISTICS CONSIDERATIONS

Transportation Constraints

Most of the equipment, materials and supplies will need to be transported to the Northwest Territories. This includes items required to:

- construct the pad facilities at the anchor fields
- drill the wells
- construct the pipelines and associated facilities

Transportation is a key factor in delivering these items to the construction sites on schedule. Existing highway and railroad routes from the south converge on the Hay River and Fort Simpson areas. North of Fort Simpson, some road access is possible. However, most of the heavy, bulky equipment will be transported by barge on the Mackenzie River. A study is in progress to assess the transportation requirements for the project, and to evaluate alternatives.

The main constraints in delivering materials to, and working in, the North are that:

- road bans are in effect during the spring break-up period, normally March to June
- the barge transportation season is limited to three months, normally from late June to late September
- construction on the right-of-way is generally limited to winter
- winter conditions are required to construct and maintain winter roads
- the transportation infrastructure is limited, and additional logistics planning will be required to deliver all materials and equipment, including granular material

Transportation Methods

The primary method for transporting materials and equipment will be by truck and rail to the Hay River area and by truck to the Fort Simpson area. Transportation from there will be by barge down the Mackenzie River to stockpile sites along the river, and then by truck on winter roads to the right-of-way.

As an alternative, equipment and materials can be transported by truck on the Mackenzie Highway to Wrigley and on the Dempster Highway to Inuvik. These highways are accessible most of the year.

Transportation Methods (cont'd)

North of Wrigley, road access is limited to the winter road, which is constructed annually by the Government of the Northwest Territories (GNWT). The installation of additional bridges at water crossings on the winter road would allow the road to open sooner.

Transportation access north of Inuvik will include:

- barges on the Mackenzie River
- temporary ice and winter roads
- air transport

The pipeline route south of Fort Simpson will be serviced by existing all-weather roads and winter roads.

Barges will be used to transport line pipe, equipment and materials. Currently, two barge companies provide barge service along the Mackenzie River. Several other companies provide additional barge services in the Inuvik area.

Commercial jet aircraft operate between Inuvik, Norman Wells, Fort Simpson, Yellowknife, Edmonton and Calgary and can transport personnel and air cargo, as required. Smaller commercial aircraft could be used to access other locations.

Helicopters and fixed-wing aircraft are planned to be used to shuttle work crews between the construction camps and the three main existing airports along the pipeline route. Daily flights for each camp might be required for shipping perishable food items and air cargo, and for transporting personnel.

Helicopters and fixed-wing aircraft might also be required to transport work crews and equipment between Inuvik and the anchor field facilities and drilling camps.

Transporting Line Pipe

A combination of rail, truck and barge transportation will be used to deliver line pipe. The line pipe will be transported by rail or truck to the Hay River and Fort Simpson stockpile and staging sites.

The line pipe will be transported by barge or truck south to the pipeline right-of-way, or north to the northern stockpile and staging sites. The line pipe will be unloaded as close to the project site as practical and transported by truck to the right-of-way. Transporting the line pipe to the right-of-way will be part of the pipe-stringing operation.

The transportation route for any imported line pipe will be based on the port of entry and on the selected line pipe coating method.

Line pipe will be delivered during the Preconstruction Phase and throughout the Construction Phase. As much line pipe as possible will be delivered during the barge season, to minimize stockpiling. This will reduce the cost and damage that might result from extra handling of the line pipe during stockpiling.

Transporting Facility Modules

Starting in 2006, the modules, skids and equipment for the field and NGL facilities and the pumping and compressor stations will be moved from fabrication sites by truck or rail. The truck-transportable packages might be further assembled into larger modules in the North before being transported by barge to the barge landing sites. The modules will then be transported via access roads from barge landing sites to stockpile and staging sites. Access roads will also be required to move the modules, skids and equipment from the stockpile sites to the facility locations.

INFRASTRUCTURE

Access Roads and Barge Landing Sites

Where practical, existing all-weather roads, winter roads and barge landing sites along the Mackenzie River will be used to access the:

- anchor field facilities
- compressor stations
- NGL facility
- gathering, transmission and NGL pipelines

Studies are underway to further define the access road and barge landing site requirements.

Line pipe, equipment and materials will generally be transported by barge, but some will be transported on existing all-weather and winter roads. Existing barge loading facilities at Hay River and Fort Simpson are expected to be used for loading materials and equipment onto barges. Existing barge landing sites are planned to be used, where practical, to unload equipment and materials for delivery to the proposed pipeline right-of-way and to stockpile and staging sites. Potential barge landing sites are identified on Gathering System Routing Maps 1 and 3, and Pipeline Routing Maps 1, 4 to 11 and 13, in Volume 2.

Camps

Field and pipeline construction workers will be housed in camps, rather than in local communities.

Camps will be required at each anchor field to support drilling and facility construction operations. To the extent practical, camps will be located at existing camp sites.

Camps (cont'd)

Camps will also be located along the pipeline route, at the compressor stations and the NGL facility. Studies are underway to further define the camp locations and requirements. The potential camp locations are identified on Gathering System Routing Maps 1 to 3, and Pipeline Routing Maps 1, 3 to 7, 9 to 11, 13 and 15 to 18, in Volume 2.

Sewage Treatment Systems

A sewage treatment system will be installed:

- near each camp used during construction
- at each major facility to be used during operations

The system will include sufficient treating capability to meet regulatory standards. Sewage will be treated and disposed of at approved sites.

Construction Stockpile and Staging Sites

Each of the pipeline spreads will require stockpile and staging sites, depending on the length of the spread and the access. A construction stockpile and staging site will also be required near each compressor station and the NGL facility. Two construction stockpile and staging sites for each pipeline spread, and one at each of the facility sites, are planned. Stockpile and staging sites will also be required at, or near, the three anchor field sites. Studies are underway to further define the construction staging site requirements. The potential sites are identified on Gathering System Routing Maps 1 and 3, and on Pipeline Routing Maps 1, 4 to 11, 13, and 15 to 18, in Volume 2. These requirements will be confirmed as planning proceeds.

Airstrips

Existing paved and unpaved airstrips along the pipeline route will be used. Developing additional airstrips to access remote areas is being considered. Temporary winter airstrips might be required at one or more of the anchor fields. Because of the unique site access requirements for the Parsons Lake field, the potential need for an all-year airstrip is also being evaluated.

GRANULAR REQUIREMENTS

The amount of granular material required to construct the pipelines and facilities is being studied. Initial estimates indicate that about 5 Mm^3 of granular material might be required for use in constructing:

- well-site and production pads
- facility sites
- camp sites

- stockpile and staging sites
- barge landing sites
- airstrips
- access roads
- pipeline backfill in designated areas

Studies conducted by government and industry since the 1970s have established an inventory of granular supply sources. A study by the proponents of the existing and potential borrow sites that would supply granular material is in progress (see Settlement Private Land Maps 1 to 5, in Volume 2). Not all of these borrow sites are expected to be developed.

CONSTRUCTION AND DRILLING ACTIVITIES

Production Pad Construction

The facilities required to produce natural gas at Taglu, Parsons Lake and Niglintgak will be prefabricated in modules suitable for transport by truck and barge to the sites (see Section 5.2, Logistics Plan). Heavy and bulky equipment and supplies for development drilling, facility construction and operations, sourced from southern locations, will be moved to the Hay River and Fort Simpson areas. From there, transportation will be by barge to stockpile sites.

Equipment and supplies will be transported from the stockpile sites to the anchor fields by barge, winter road or air, and placed on suitable foundations. Electrical and piping connections to individual modules will be completed on site.

Various anchor field pad design options are being evaluated, including different pad sizes and construction material. Once the options have been evaluated, the required pad sizes and amount of building materials, such as granular resources, will be determined.

Studies are currently underway to define the granular resource requirements and sources for each anchor field. Borrow site development plans will be prepared for the preferred and alternative sources.

Drilling

Most wells will be directionally drilled from a central location to reduce surface disturbance.

The wells at the three anchor fields will be designed to minimize effects on permafrost. Drilling fluids will be contained and disposed of in an approved manner. Consumable materials required for drilling, such as casing strings, mud and cement, will be brought in to each anchor field as required during drilling operations.

Taglu

Facilities construction and drilling at Taglu are currently planned to be all-year activities, once initiated. The schedule for drilling will be determined once the number of wells and bottomhole locations are established. Individual wells are likely to take between 40 and 75 days to drill. Further investigation is required to finalize drilling plans. Barge landing sites and a drilling pad will be constructed before the drilling rig is mobilized to the Taglu site.

Parsons Lake

Facilities construction and drilling at Parsons Lake are currently expected to be all-year activities, once initiated. Individual wells are likely to take between 40 and 60 days to drill, although the drilling plan has not yet been finalized. The drilling rig will likely be mobilized to the field about 15 to 24 months before natural gas shipments start.

Niglintgak

Facilities construction and drilling at Niglintgak is currently planned to occur primarily in winter. Some summer construction work will be required to deliver and install large modules transported by barge.

The drilling plan has not yet been finalized, but individual wells will likely take between 15 and 30 days to drill. The current plan is to drill the proposed Niglintgak wells over two to three winter drilling seasons, although further investigation is needed to finalize this.

SITE ACCESS

The methods of accessing each of the three anchor fields will depend on the season, location and specific site considerations. Normally, the sites can be accessed by:

- fixed-wing aircraft in winter or helicopter all year
- river in summer, except for Parsons Lake
- ice road in winter

MAJOR ACTIVITIES

Preconstruction

Preconstruction activities will start once the required regulatory approvals have been received. Preconstruction activities at all project construction sites include:

- ordering materials, equipment and supplies
- conducting field preparation work
- moving initial equipment and materials to stockpile and staging sites

Personnel and equipment will be mobilized to enable construction crews to undertake preconstruction activities, including:

- establishing and operating the camps
- installing support infrastructure, including winter and other access roads
- developing borrow sites
- clearing the right-of-way
- preparing facility sites

The equipment and materials required to perform preconstruction activities will be sourced from a combination of northern and southern suppliers.

Gathering, Transmission and NGL Pipeline Construction Activities

Pipeline construction activities will start once:

- regulatory approvals have been received
- preconstruction activities are complete
- personnel and equipment have been mobilized to the work sites

Construction activities will be concentrated in the winter months. The preliminary plans call for constructing the gathering, transmission and NGL pipelines with five pipeline spreads in each of the two winter construction seasons. All-year construction will occur at some facility sites and potentially along some segments of the pipelines, such as at certain water crossings.

Some construction equipment is planned to be demobilized at the end of the first pipeline construction season and re-mobilized at the start of the next construction season. Further study is required to determine the economics of demobilizing equipment after each construction season, compared to paying standby fees for construction equipment when it is not in use.

Right-of-Way Preparation

Right-of-way preparation will depend on site-specific requirements, such as:

- slope changes
- types and densities of vegetation
- soil conditions

Studies are underway to evaluate methods to minimize terrain disturbance during the right-of-way preparation for construction activities. Additional temporary workspace will be required in certain areas, such as water crossings. The right-of-way width and workspace requirements are estimated to be between 40 and 50 m and will be assessed further during planned routing and construction studies.

Pipe Stringing, Bending, Welding and Trench Excavation

After the right-of-way construction activities begin, pipe stringing, bending, welding and trench excavation activities will start. Lengths of line pipe will be transported from stockpile sites to the right-of-way. The line pipe will be strung along the work side of the right-of-way. The line pipe will then be bent, where required, and welded into strings in preparation for lowering into the ditch.

The ditch will be excavated using a combination of chain and bucketwheel trenchers, as well as conventional backhoes, depending on soil conditions. It might be necessary to drill and blast a portion of the ditch line ahead of excavation.

The right-of-way for the gathering system and the segment of the transmission pipeline south of Norman Wells would be about 40 m wide (see Figure 5-2). The ditch centreline will be positioned to locate the ditch spoil material pile on the narrow side of the right-of-way. This will leave the wide side of the right-of-way for the work area and travel lane.

From Inuvik to Norman Wells, the right-of-way configuration will depend on the design selected:

- for the single-phase design, two ditches would be required on a right-of-way of about 50 m (see Figure 5-3)

- for the two-phase design, one ditch would be required on a right-of-way of about 40 m. This would be the same configuration as for the gathering system and transmission pipeline south of Norman Wells (see Figure 5-2).

After the line pipe has been lowered into the ditch, the ditch will be backfilled. Spoil material produced by the trenching operation, or imported bedding and padding materials, will be used as backfill.

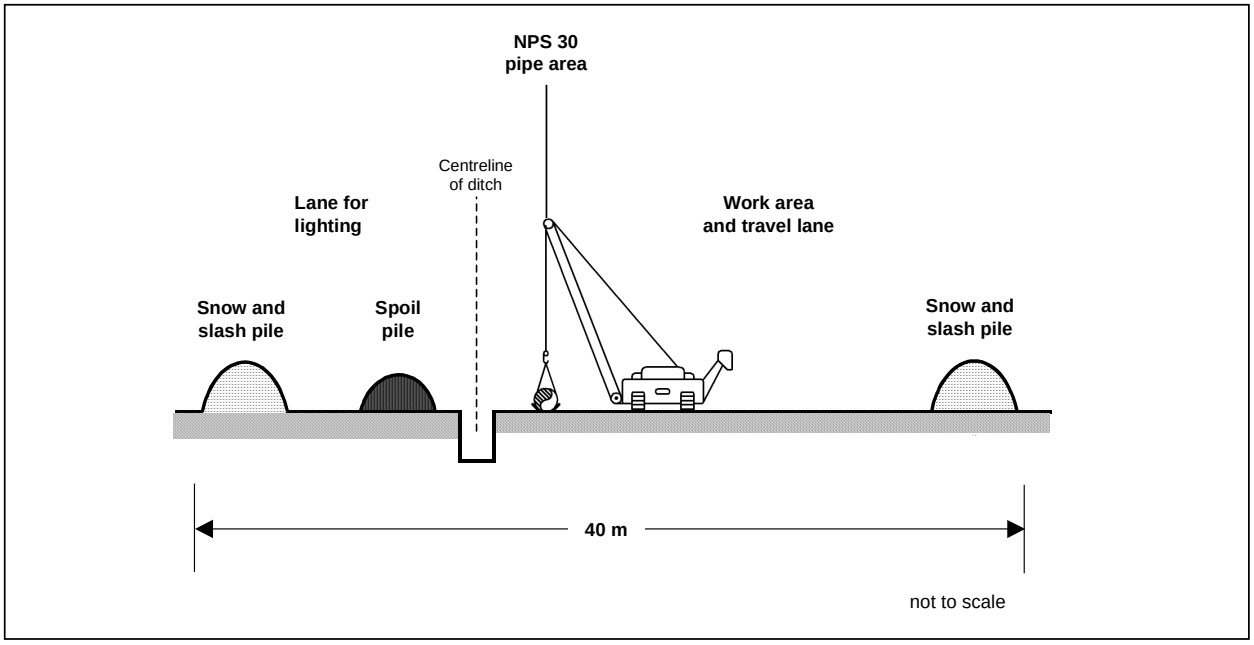

Figure 5-2: Right-of-Way for Constructing One Pipeline

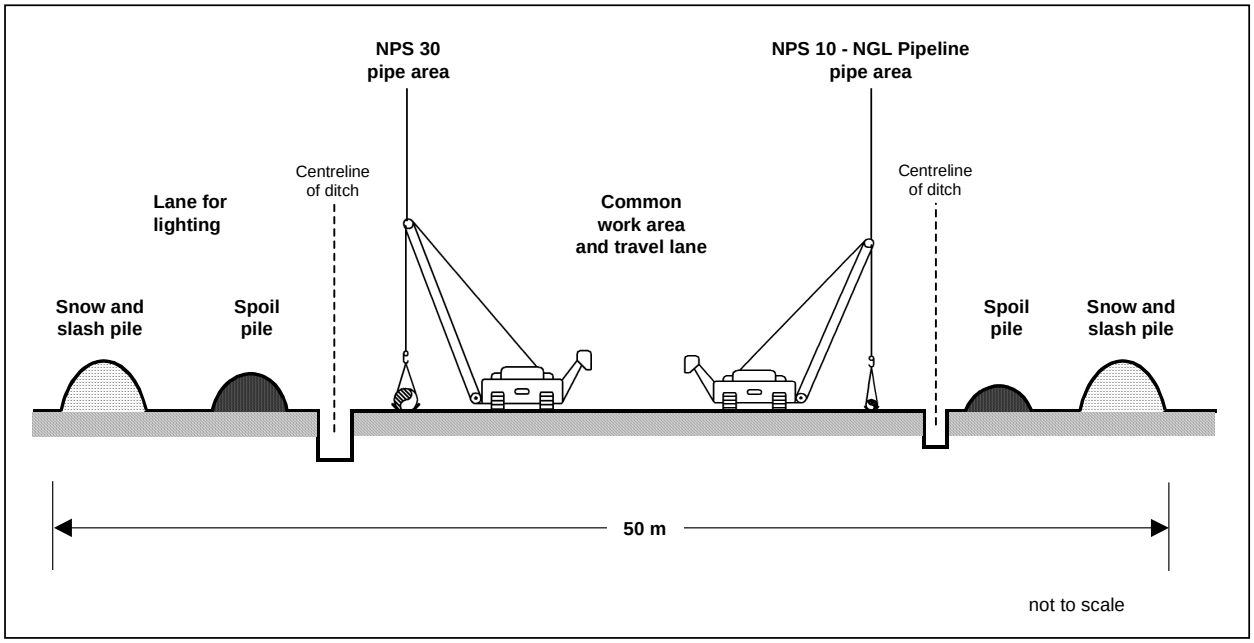

Figure 5-3: Right-of-Way for Constructing Two Pipelines

Water Crossings

Special crews will construct major water crossings. Crossings will be installed using a combination of horizontal directional drilling and conventional open-cut techniques. In some cases, an elevated crossing might be required. The specific techniques selected will depend on the results of site-specific studies.

Leak Testing

When the ditch has been backfilled, the pipeline will be tested for strength and to confirm that it is free from leaks. The pressure in the pipeline will be brought up to the required test pressure and maintained for a pre-established time. If a leak is detected, that segment of the pipeline will be exposed, and repaired or replaced.

Infrastructure Construction

The infrastructure and support facilities will be constructed before mobilizing the pipeline spreads of equipment, personnel, materials and supplies. This will facilitate the construction efforts at the anchor fields, on the right-of-way, and at the NGL facility and compressor station sites.

Existing barge landing sites, docks, storage sites and access roads will be assessed to determine if they are suitable for delivering equipment and materials to the field. Where necessary, existing barge landing sites and docks will be upgraded to accommodate moving heavy equipment and significant volumes of permanent and consumable materials. For some locations, new barge landing facilities might be constructed.

Camp, stockpile, staging and permanent facility sites will be cleared and prepared for the arrival of equipment and materials. Right-of-way clearing will begin during the preconstruction period.

Operations Approval and Construction Demobilization

After the pipelines have been successfully tested, any approvals required to operate the production fields, gathering system, NGL facility and pipelines will be requested.

The right-of-way will be cleaned up and restored. Construction crews and infrastructure support facilities will then be demobilized.

ASSOCIATED FACILITY CONSTRUCTION

Associated facilities include:

- compressor stations
- pumping stations
- line heaters
- pigging facilities
- block valves

These facilities will generally be prefabricated in modules sized to enable the components to be transported to the construction sites.

The sites for the associated facilities will be developed during the Preconstruction Phase. Activities to be undertaken include:

- initial site grading
- pad development
- foundation installation

During the Construction Phase, modules will be placed on foundations, and structural, electrical and piping connections will be completed to connect individual modules.

Each facility will be tested before being connected to the pipelines. When testing has been completed and connections made, the facilities will be ready for commissioning and start-up, after any required regulatory approvals have been received.

PUBLIC COMMUNICATION AND CONSULTATION PROGRAM

Purpose of Program

The project proponents have begun public communication and consultation with communities, aboriginal organizations and regulatory authorities affected by the Mackenzie Gas Project. The public communication and consultation program reflects the proponents' commitment to providing interested northerners with an opportunity to influence the project planning process, including providing feedback and comments on socio-economic and environmental impact assessments, related mitigation plans and northern benefits plans.

Program Objectives

The objectives of the public communication and consultation program are to:

- provide local communities and interested individuals with timely information about the project
- help to identify key issues and concerns early in the project and facilitate constructive and informed dialogue on them
- give local communities and interested individuals a meaningful opportunity to provide timely input to improve project decisions
- improve project design and enhance northern support for the project, by responding to concerns and incorporating changes into project design and execution, where appropriate
- strengthen relationships by building mutual understanding, respect and trust

Program Principles

The public communication and consultation program is based on the principles that:

- affected members of the public have the right to a meaningful opportunity, early in the project planning process, to become informed about proposed developments affecting their community
- the knowledge and experience that local residents have about regional conditions and concerns is a valuable resource for project planners
- local knowledge through timely public involvement can add value to the project design, impact assessment and mitigation planning process

Program Principles (cont'd)

- the project proponents can earn trust by communicating and consulting with interested parties in an open, honest, approachable manner

- effective communication and consultation requires that everyone involved approach the process in a spirit of partnership, openness and commitment and be prepared to share their information and views early, continuously and candidly

Scope of Program

Meetings and discussions have been, and will continue to be, held with aboriginal organizations and residents in such regions as the:

- Inuvialuit Settlement Region
- Gwich'in Settlement Area
- Sahtu Settlement Area
- Deh Cho Region
- Dene Tha' Region in northern Alberta

COMMUNICATION AND CONSULTATION METHODS

The communication and consultation process involves a variety of techniques that are effective in facilitating two-way dialogue, considering the particular nature and needs of the interested parties and the issues in question. This process includes formal presentations, workshops, open houses and informal discussions, using:

- slide presentations
- brochures
- handouts
- posters
- maps
- models
- web-site information
- videos
- bulletins
- newspaper advertisements
- other media, as appropriate

Translation services will often be used at community meetings.

PRELIMINARY COMMUNICATION AND CONSULTATION

Feasibility Study Phase

During the project's Feasibility Study Phase, numerous communications and meetings took place with aboriginal and northern communities, territorial and federal governments and other interested parties. During 2000 and 2001, meetings were held with local communities, the APG, governments, regulators, oil and gas companies, pipeline companies and service industries.

Proposed Field Programs

In 2001, socio-economic and environmental consultants and project representatives met with numerous affected communities and interested individuals. The meetings focused on the planned field and community-based data collection programs for biophysical and socio-economic baseline studies.

Socio-Economic Initiatives

In 2002, the socio-economic study team conducted meetings and interviews in study area communities to collect, review and verify socio-economic baseline data. In most instances, local aboriginal residents, who served as community coordinators, accompanied the researchers. Because of their unique local knowledge and experience, the community coordinators also helped to evaluate the data collected.

COMMUNITY INFORMATION MEETINGS

In January 2002, the project progressed from the Feasibility Study Phase into the Project Definition Phase, which marked the start of a more widespread public communication and consultation process. The primary purpose of the public information meetings was to begin the formal public consultation process by providing an overview of the Mackenzie Gas Project. During March and between May and August 2002, the first public information meetings were held in the following locations:

- Aklavik
- Colville Lake
- Déline
- Enterprise
- Fort Good Hope
- Fort Liard
- Fort McPherson
- Fort Providence
- Fort Simpson

COMMUNITY INFORMATION MEETINGS (cont'd)

- Hay River
- Hay River Reserve
- Holman
- Inuvik
- Jean Marie River
- Kakisa
- Nahanni Butte
- Norman Wells
- Paulatuk
- Sachs Harbour
- Trout Lake
- Tsiigehtchic
- Tuktoyaktuk
- Tulita
- West Point
- Wrigley

At the meetings, project representatives answered questions, recorded and addressed concerns raised, and obtained feedback on how the communities wanted future communication and consultation to proceed. Meetings continue to be held with the communities.

In addition to public meetings, project representatives have provided updates to other organizations and at other meetings and conferences to which they have been invited, including:

- the Deh Cho Resource Development Conference
- the Inuvik Petroleum Show
- aboriginal assemblies

Project representatives will continue to participate in similar events and meetings.

ONGOING COMMUNICATION AND CONSULTATION PROCESS

Regional offices for the Mackenzie Gas Project have been opened in Inuvik, Norman Wells and Fort Simpson. Regional liaison personnel located in these offices provide information on project plans, including project employment and business opportunities. They also provide northerners with an additional resource for providing their input to the project.

In addition, part-time community representatives will support the communication and consultation process in the following communities:

- Aklavik
- Colville Lake
- Chateh
- Déline
- Fort Good Hope
- Fort McPherson
- Hay River
- Jean Marie River
- Kakisa
- Trout Lake
- Tsiigehtchic
- Tuktoyaktuk
- Tulita
- Wrigley

An issue-tracking system will provide a process to ensure that issues are addressed in a timely way.

The proponents will continue to communicate and consult with interested parties throughout the life of the project.

KEY ISSUES

Community consultation includes matters of concern to northern residents, as well as other issues relating to regulatory requirements. Key issues include:

- the socio-economic and environmental impact assessment and mitigation
- the collection and integration of traditional knowledge (TK)
- employment opportunities
- business opportunities
- training needs and opportunities, such as apprenticeship
- education, such as fostering interest in technical fields
- pipeline route selection
- road, camp, barge landing, stockpile and borrow site selection
- facility design and location
- land access

SUMMARY OF MEETINGS

Table 6-1 lists many of the meetings conducted, or attended, by project representatives up to December 31, 2002.

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings

Date	Topics	Community or Organization Contacted
2000		
Mar 17	Feasibility Study – overview and plans	Mackenzie Valley Development Planning Steering Committee
Apr 10	Feasibility Study – overview and plans	Government of the Northwest Territories (GNWT), Premier's Office
Apr 11	Feasibility Study – overview and plans	TransCanada PipeLines Limited and Westcoast Energy Inc.
Apr 12	Feasibility Study – overview and plans	Enbridge Pipelines (NW) Inc.
Apr 14	Feasibility Study – overview and plans	Indian and Northern Affairs Canada (INAC)
Apr 14	Feasibility Study – overview and plans	Natural Resources Canada, Industry Canada, Environment Canada, Finance Canada
Apr 20	Feasibility Study – overview and plans	BP Amoco
Apr 20	Feasibility Study – overview and plans	Burlington
May 2	Feasibility Study – overview and plans	National Energy Board
May 3	Feasibility Study – overview and plans	Déline
May 3	Feasibility Study – overview and plans	Norman Wells Town Council
May 4	Feasibility Study – overview and plans	Fort Good Hope
May 4	Feasibility Study – overview and plans	Sahtu Land and Water Board
May 5	Feasibility Study – overview and plans	Tulita
May 5	Feasibility Study – overview and plans	Ernie MacDonald Land Corporation, Norman Wells

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2000		
May 17	Feasibility Study – overview and plans, regulatory process Inuvialuit Joint Secretariat community conservation plans	Inuvialuit Joint Secretariat
May 17	Feasibility Study – overview and plans	Inuvialuit Regional Corporation
May 18	Feasibility Study – overview and plans Inuvialuit Land Administration regulatory process, administrative procedures and guidelines, list of fees	Inuvialuit Land Administration
May 18	Feasibility Study – overview and plans Gwich'in Land and Water Board regulatory process	Gwich'in Land and Water Board
May 18	Feasibility Study – update	INAC regional office in Inuvik
May 19	Feasibility Study – overview and plans	Inuvialuit Regional Corporation
May 19	Feasibility Study – overview and plans	Gwich'in Tribal Council and staff
May 23	Feasibility Study – overview and plans Arctic Resource Company plans	Arctic Resources Company
May 24	Feasibility Study – overview and plans	Deh Cho First Nation staff
May 24	Feasibility Study – update Mackenzie Valley Development Planning Steering Committee nonrenewable resource strategy	Mackenzie Valley Development Planning Steering Committee
May 25	Feasibility Study – overview and plans Mackenzie Highway plans	GNWT, Ministry of Transportation
May 25	Feasibility Study – overview and plans Ministry of Aboriginal Affairs department overview	GNWT, Ministry of Aboriginal Affairs
May 25	Feasibility Study – overview and plans	GNWT, Resources, Wildlife and Economic Development – Minerals, Oil and Gas Division
May 25	Feasibility Study – overview and plans	Federal Interdepartmental Task Force
May 25	Feasibility Study – overview and plans	Ministers' Assistants from the Federal Government
May 26	Feasibility Study – update GNWT overview	GNWT, Resources, Wildlife and Economic Development – Policy, Planning
May 26	Feasibility Study – update	INAC regional office in Yellowknife
May 26	Feasibility Study – overview and plans	Mackenzie Valley Land and Water Board and the Mackenzie Valley Environmental Impact Review Board
Jun 1	Feasibility Study – overview and plans	Senator from NWT
Jun 13	Feasibility Study – overview and plans	Ministers and MLAs from the GNWT
Jun 14	Feasibility Study – update	TransCanada PipeLines Limited and Westcoast Energy Inc.
Jun 15	Feasibility Study – overview and plans	B.C. Oil and Gas Commission
Jun 20	Feasibility Study – update	Enbridge Pipelines (NW) Inc.
Jun 22	Feasibility Study – update, tax clarifications	Canada Customs and Revenue Agency, Natural Resources Canada and Ministry of Finance

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2000		
Jun 28	Feasibility Study – update, regulatory overview and information exchange	National Energy Board
Jul 4	Feasibility Study – update	Federal Interdepartmental Task Force
Jul 4	Feasibility Study – overview and plans	Foothills Pipeline Company
Jul 5	Feasibility Study – overview and plans	Canadian Environmental Assessment Agency
Aug 2	Feasibility Study – update, understanding of benefits plans	INAC
Aug 17	Feasibility Study – understanding of benefits plans	INAC
Aug 21	Feasibility Study – overview and plans Gwich'in Draft Land Use plan	Gwich'in Land Use Planning Board, Gwich'in Land Administration
Aug 21	Presentation on Feasibility Study – overview and plans, quality assurance	Canadian Association of Members of Public Utility Tribunals Conference
Aug 22	Feasibility Study – overview and plans	GNWT, Municipal and Community Affairs
Aug 22	Feasibility Study – update	GNWT, Resources, Wildlife and Economic Development
Aug 22	Feasibility Study – overview and plans	Northwest Territories Water Board
Aug 22	Feasibility Study – update	INAC
Aug 30	Feasibility Study – overview and plans	GNWT, Ministry of Education, Culture and Employment
Aug 31	Feasibility Study – update	Industry Canada, INAC
Sep 6	Feasibility Study – overview and plans	Mackenzie Delta exploration companies
Sep 11	Feasibility Study – overview and plans	Aboriginal Pipeline Group Executive Committee
Sep 12	Feasibility Study – overview and plans	Métis Nation representatives
Sep 13	Feasibility Study – overview and plans	Dene Nation, Denendeh Development Corporation
Sep 13	Feasibility Study – update	Mackenzie Valley Development Planning Steering Committee
Sep 13	Feasibility Study – overview and plans	Environment Canada, Canadian Wildlife Service
Sep 19	Feasibility Study – update	GNWT, Premier's Office
Sep 20	Presentation on Feasibility Study – update	Insight Conference, Calgary
Sep 26	Feasibility Study – update	National Energy Board
Oct 16	Feasibility Study – overview and plans	Alberta Energy and Utilities Board, Calgary
Oct 17	Feasibility Study – overview and plans	El Paso and Tennessee Pipeline companies
Nov 2	Presentation on Feasibility Study – update	Regional Oil and Gas Information Workshop, Hay River Reserve
Nov 9	Presentation on Feasibility Study – overview and plans	Certified General Accountants Annual Meeting (NWT)
Nov 27	Feasibility Study – overview and plans	Canadian Hunter
Nov 28	Feasibility Study – update, regulatory road map	National Energy Board
Nov 29	Feasibility Study – update, regulatory road map	Mackenzie Valley Land and Water Board, Mackenzie Valley Environmental Impact Review Board
Nov 29	Feasibility Study – update, regulatory road map	GNWT, including Transportation, Finance and Resources, Wildlife and Economic Development
Nov 29	Feasibility Study – update, benefits and protocol	GNWT, including Transportation, Finance and Resources, Wildlife and Economic Development

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2000		
Nov 30	Feasibility Study – regulatory road map	Federal Agencies in Yellowknife, including INAC, Fisheries and Oceans Canada and Environment Canada
Nov 30	Feasibility Study – regulatory road map	INAC, in Inuvik
Dec 1	Feasibility Study – regulatory road map	Inuvialuit Joint Secretariat, Environmental Impact Screening Committee and Environmental Impact Review Board, Inuvialuit Land Administration, Inuvialuit Game Council
Dec 4	Feasibility Study – regulatory road map	GNWT, Deputy Minister of Transportation
Dec 4	Presentation on Feasibility Study – regulatory road map	Federal and Northern Regulatory Agencies Workshop
Dec 4	Feasibility Study – Memorandum of Understanding	Mackenzie Valley Environmental Impact Review Board and the National Energy Board
Dec 6	Feasibility Study – update	Federal Interdepartmental Task Force – Regulatory Subgroup
Dec 12	Feasibility Study – update	Chevron, Burlington and BP
Dec 18	Feasibility Study – overview and plans	Dene Tha' Chief and Council
2001		
Jan 9	Feasibility Study – overview and plans	Yukon Government, Economic Development
Jan 11	Feasibility Study – overview and plans	Gwich'in Tribal Council, in Calgary
Jan 12	Feasibility Study – update	Natural Resources Canada, in Calgary
Jan 26	Presentation on Feasibility Study – update	Annual Energy Conference, Peters and Company
Jan 29	Feasibility Study – overview and plans	Alaska Gas Producers
Feb 6	Feasibility Study – update	Arctic Resources Company
Feb 8	Feasibility Study – update	Mackenzie Valley Development Planning Steering Committee
Feb 8	Feasibility Study – update	GNWT, Standing Committee on Governance and Economic Development
Feb 8	Feasibility study – update	GNWT Minister and Deputy Ministers of Finance, Resources, Wildlife and Economic Development, Deputy Minister of Education, Culture and Employment
Feb 9	Feasibility Study – update	INAC, in Yellowknife
Feb 12	Feasibility Study – update	Natural Resources Canada
Feb 13	Feasibility Study – update	Federal ministerial assistants
Feb 13	Feasibility Study – update	INAC
Feb 13	Feasibility Study – update	Federal Department of Finance
Feb 15	Feasibility Study – update ATCO corporate overview	ATCO Group, ATCO Pipeline, ATCO Frontec
Feb 21	Feasibility Study – update	Sahtu Land Use Planning Board
Feb 21	Feasibility Study – update	Sahtu Land and Water Board
Feb 22	Feasibility Study – update	Yamoga Land Corporation
Feb 26	Feasibility Study – update	Sahtu Land Use and Planning Board, Sahtu Land and Water Board
Feb 26	Feasibility Study – regulatory road map	National Energy Board in Calgary

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2001		
Mar 2	Feasibility Study – update	National Energy Board, Mackenzie Valley Environmental Impact Review Board, Canadian Environmental Assessment Agency, Environmental Impact Screening Committee, and the Environmental Impact Review Board (Inuvialuit)
Mar 2	Feasibility Study – update	Mackenzie Delta Exploration Companies
Mar 5	Feasibility Study – update	Arctic Institute of North America
Mar 6	Feasibility Study – overview and plans, northern pipeline presentation	Fort Chicago Energy Partners
Mar 9	Feasibility Study – update	Mosbacher Energy Company
Mar 15	Feasibility Study – update	Alaska Gas Producers
Mar 19	Feasibility Study – update	TransCanada PipeLines Limited and Westcoast Energy Inc.
Mar 28	Feasibility Study – overview and plans, wildlife, noise, design, construction, communication and consultation process, soils and geology	Aklavik Hunters and Trappers Committee
Mar 29	Feasibility Study – update, regulatory roadmap	INAC
Mar 30	Feasibility Study – update	Alliance Pipeline
Apr 6	Presentation on Feasibility Study – update	Canadian Gas Producers Conference
Apr 10	Presentation on Feasibility Study – update	Canadian Energy Research Institute, North American Natural Gas Conference
Apr 12	Feasibility Study – update	Enbridge Pipelines (NW) Inc.
Apr 26	Feasibility Study – update	Alliance Pipeline
Apr 30	Feasibility Study – update	Gwich'in Land Use Planning Board, Gwich'in Land Administration, Gwich'in Land and Water Board, Gwich'in Renewable Resource Board
May 4	Feasibility Study – update	Natural Resources Canada
May 7	Feasibility Study – update	Alaska Gas Producers
May 23	Workshop on Feasibility Study – update	Mackenzie Delta Exploration Companies
Jun 4 to 6	Feasibility Study – overview and plans, Memorandum of Understanding	NWT aboriginal leaders
Jun 8	Feasibility Study – update	Arctic Institute of North America
Jun 11	Feasibility Study – update wildlife	Inuvialuit Regional Corporation
Jun 11	Feasibility Study – overview and plans, communication and consultation process	Wildlife Management Advisory Committee (NWT)
Jun 12	Feasibility Study – overview and plans, business opportunities	Gwich'in Development Corporation Board
Jun 12	Feasibility Study – overview and plans, land and resource use	Gwich'in Renewable Resource Board
Jun 13	Feasibility Study – overview and plans, communication and consultation process, EIA requirements, wildlife, fisheries	Fisheries Joint Management Committee

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2001		
Jun 14	Feasibility Study – update, land and resource use, design, construction, fisheries	Inuvialuit Game Council
Jun 14	Feasibility Study – overview and plans, land and resource use, cumulative effects	Tuktoyaktuk Hunters and Trappers Committee
Jun 14	Feasibility Study – update, Memorandum of Understanding	Mackenzie Delta exploration companies
Jun 15	Presentation on Feasibility Study – update, Memorandum of Understanding	NWT Association of Municipalities, 35th Annual General Meeting
Jun 18	Feasibility Study – update, Memorandum of Understanding	INAC
Jun 22	Presentation on Feasibility Study – update, Memorandum of Understanding	Inuvik Petroleum Show
Jun 26	Feasibility Study – update	Federal Department of Finance
Jun 27 to 29	Feasibility Study – update, Memorandum of Understanding	Ninth Annual Deh Cho Assembly
Jun 29	Feasibility Study – overview and plans, communication and consultation process, biophysical baseline program scope	Inuvik Hunters and Trappers Committee
Jul 4	Feasibility Study – update, communication and consultation process	Gwich'in Land and Water Board
Jul 5	Feasibility Study – update	Sahtu Land and Water Board
Jul 5	Feasibility Study – overview and plans	Colville Lake, Behdzi Ahda' First Nation, Ayoni Keh Land Corporation
Jul 5	Feasibility Study – overview and plans, Environmental Research Permit consultation	Fort Good Hope Renewable Resources Council Yamoga Land Corp K'ahsho Got'ine Band GNWT, Resources, Wildlife and Economic Development K'ahsho Got'ine Community Councils Fort Good Hope Métis Nation Local No. 54
Jul 17	Feasibility Study – overview and plans, biophysical baseline program scope	Nihtat Band Council and Inuvik Renewable Resources Council
Jul 23	Feasibility Study – update, biophysical baseline program scope	Nihtat Band Council and Inuvik Renewable Resources Council
Jul 24	Feasibility Study – overview and plans, traditional knowledge	Tsiigehtchic (Gwichya Gwich'in) Renewable Resources Council
Jul 25	Feasibility Study – overview and plans, traditional knowledge, socio-economic process, land and resource use	Fort McPherson (Tetlit Gwich'in) Renewable Resources Council
Jul 31	Feasibility Study – overview and plans, Memorandum of Understanding, employment, business opportunities, training, consultation process, environmental protection	Trout Lake
Aug 1	Feasibility Study – overview and plans, Memorandum of Understanding, capacity building, jobs, business opportunities, consultation process	Fort Simpson, Harvest and Trappers Association

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2001		
Aug 1	Feasibility Study – overview and plans, environmental baseline program scope	Tulita Land and Financial Corporation Fort Norman Métis Land Corporation Sahtu Renewable Resources Council Tulita Renewable Resources Council
Aug 13	Feasibility Study – overview and plans, Memorandum of Understanding	ADK Corporate Group, Fort Liard Community
Aug 14	Feasibility Study – overview and plans, Memorandum of Understanding	Nahanni Butte
Aug 14	Feasibility Study – overview and plans, biophysical baseline program scope	Norman Wells Renewable Resources Council
Aug 15	Feasibility Study – overview and plans, biophysical baseline program scope	Tulita District Land Corporation
Aug 15	Feasibility Study – update, Memorandum of Understanding, employment, business opportunities	Hay River Reserve, West Point
Aug 17	Feasibility Study – update	Alberta Energy, Minister's Office
Aug 17	Feasibility Study – update	TransCanada PipeLines Limited
Aug 23	Feasibility Study – overview and plans, Memorandum of Understanding, benefits, education, employment, pipeline route, river crossings, impact on wildlife harvesting	Fort Simpson
Aug 23	Memorandum of Understanding	Gwich'in Community in Inuvik
Aug 28 to 30	Feasibility Study – update, Memorandum of Understanding	Deh Cho Special Assembly in Wrigley
Sep 11	Feasibility Study – overview and plans, EIA requirements for aquatic resources	Fisheries and Oceans Canada
Sep 21	Presentation on Feasibility Study – update	Insight Conference, Far North
Sep 25	Feasibility Study – update	Mackenzie Delta exploration companies
Oct 15	Signing ceremony for Memorandum of Understanding	Public event, including guests from government and industry, in N'Dilo
Oct 26	Feasibility Study – update Cameron Hills Development Process	Paramount Resources
Oct 29	Feasibility Study – update	Mackenzie Delta exploration companies
Oct 29	Feasibility Study – update, biophysical baseline program scope	Tuktoyaktuk Hunters and Trappers Committee
Nov 2	Feasibility Study – update, Memorandum of Understanding	Mackenzie Delta Exploration Companies
Nov 6	Feasibility Study – update, vegetation, fisheries, biophysical baseline program scope	Inuvik Hunters and Trappers Committee
Nov 6	Feasibility Study – overview and plans, fisheries, water quality, socio-economic program scope	Nihtat Gwich'in Renewable Resources Council

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2001		
Nov 8	Feasibility Study – update, wildlife, fisheries, noise, consultation process, Environmental Impact Assessment requirements	Aklavik Hunters and Trappers Committee
Nov 9	Feasibility Study – overview and plans, employment opportunities, socio-economic process	Ehdiitat Gwich'in Renewable Resources Council
Nov 12 and 13	Feasibility Study – update, water crossings, noise	Sahtu Land and Water Board
Nov 12 and 13	Feasibility Study – overview and plans, noise, water crossing, permits	Fort Good Hope Renewable Resources Council
Nov 13	Feasibility Study – update, biophysical baseline program scope	Fort Good Hope Renewable Resources Council
Nov 13	Feasibility Study – update, biophysical baseline program scope	Fort Good Hope Métis Local No. 54 Land Corporation
Nov 13	Feasibility Study – overview and plans, biophysical baseline program scope	K'ahsho Got'ine District Land Corporation
Nov 13	Feasibility Study – update, biophysical baseline program scope	Sahtu Land Use Planning Board
Nov 14	Feasibility Study – overview and plans, biophysical baseline program scope	Fort Norman Renewable Resources Council
Nov 15	Feasibility Study – update, socio-economic program scope	Sahtu Land and Water Board
Nov 15	Feasibility Study – update, noise, employment opportunities, communication and consultation process	Fort Norman Métis Land Corporation, Fort Norman Métis Financial Corporation
Nov 15	Feasibility Study – overview and plans, Environmental Impact Assessment requirements	Sahtu Renewable Resources Board
Nov 15	Feasibility Study – update, biophysical baseline program scope	GNWT, Resources, Wildlife and Economic Development
Nov 15	Feasibility Study – update, environmental field program	Tulita District Land Corporation
Nov 16	Feasibility Study – overview and plans, traditional knowledge	Inuvialuit Cultural Resource Centre, in Inuvik
Nov 20	Presentation on Feasibility Study – update	Insight Conference, in Vancouver
Nov 21	Presentation on Feasibility Study – update	2001 Geoscience Forum, in Yellowknife
Nov 22	Feasibility Study – update	Enbridge Pipelines (NW) Inc.
Nov 22	Feasibility Study – update	World Wildlife Fund
Nov 28	Feasibility Study – update, wildlife studies	GNWT, Resources, Wildlife and Economic Development office, in Inuvik
Nov 29	Feasibility Study – overview and plans, Memorandum of Understanding	Sahtu Secretariat Inc. and Sahtu Dene Council, in Fort Good Hope
Nov 30	Feasibility Study – update	Ernie MacDonald Land Corporation, in Norman Wells
Nov 30	Feasibility Study – update, water bird baseline studies	Canadian Wildlife Service, in Yellowknife

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2001		
Dec 5	Feasibility Study – update	INAC
Dec 6	Feasibility Study – overview and plans, environmental, route selection, employment and business opportunities	Beaufort Delta Leaders Conference, in Inuvik
Dec 6	Feasibility Study – update, Memorandum of Understanding	South Slave Métis Association, Annual General Meeting, in Edmonton
Dec 11	Feasibility Study – overview and plans, biophysical baseline program scope	Fort Simpson Métis Local No. 54
Dec 11	Feasibility Study – overview and plans, environmental employment opportunities	Liidlii Kue First Nation and Denendeh Resource Committee
Dec 11	Feasibility Study – update, biophysical baseline program scope	GNWT, Resources, Wildlife and Economic Development Regional Office, in Fort Simpson
Dec 12	Feasibility Study – update, environmental research permit	Deh Cho First Nation
Dec 13	Feasibility Study – overview and plans, traditional knowledge	Jean Marie River Band Office
Dec 13	Feasibility Study – update, design, construction, communication and biophysical baseline program scope	Trout Lake Band Council Office
2002		
Jan 16	Project update, infrastructure	GNWT representatives, in Yellowknife
Jan 23	Project overview	Northrock, in Calgary
Jan 27	Project update	Gwich'in Tribal Council Board of Directors
Feb 5	Project update, review of draft cooperation plan	The Northern Pipeline Environmental Impact Assessment and Regulatory Chairs' Committee
Feb 6 and 7	Project update, BHP/Billeton's recent regulatory approval process	BHP/Billeton
Feb 8	Project update	Mackenzie Valley Development Planning Steering Committee
Feb 12	Project update, contracting process	Inuvialuit Regional Corporation
Feb 12	Project update	MLA from Boot Lake
Feb 12	Project update, formation of Pipeline Operation Training Committee	Federal and Territorial Government, Aurora College, industry representatives
Feb 12	Presentation on project update	Deh Cho Resource Development Conference
Feb 12	Presentation on project update	NexPlore Group
Feb 12 and 13	Presentation on project update, northern support, employment and business opportunities	Deh Cho Resource Development Conference, Fort Simpson
Feb 13	Project update	Northwest Territories Chamber of Commerce, Norman Wells
Feb 14	Project update	Northern Cross (Yukon) Limited
Feb 19	Project update, technical review of arctic pipeline experience	Enbridge Pipelines (NW) Inc.
Feb 20	Project update, environmental work	Inuvialuit Regional Corporation
Feb 21	Project update, Aurora Research Institute Research permitting process	Aurora College and Aurora Research Institute

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Feb 21	Project update, status of engineering contract	Gwich'in Tribal Council, in Inuvik
Feb 27	Project update	Federal Department of Finance
Mar 5	Project update	Mackenzie Delta exploration companies
Mar 6	Project update, development of school presentation materials	Sahtu Education Division, in Norman Wells
Mar 7	Presentation on project update	Arctic Gas Symposium
Mar 8	Project update, infrastructure	GNWT, Resources, Wildlife and Economic Development
Mar 12	Project update, biophysical baseline program scope	Jean Marie River
Mar 13 to 15	Project update, career information	Inuvik Career Fair
Mar 18	Project update, socio-economic impacts	Déline
Mar 18	Project update, socio-economic impacts	Tulita
Mar 19	Project update, socio-economic impacts	Colville Lake
Mar 20	Project update, socio-economic process, traditional knowledge	Déline
Mar 20	Project update, socio-economic impacts	Norman Wells
Mar 21	Project update, infrastructure	GNWT, Resources, Wildlife and Economic Development
Mar 21	Project update, socio-economic impacts	Fort Good Hope
Mar 22	Project update, infrastructure	GNWT, Resources, Wildlife and Economic Development
Mar 27	Project update	Prime Minister's office
Mar 27	Project update, biophysical baseline program scope	Liidlii Kue First Nation
Apr 8	Project update, participation in and benefits from the pipeline	Dene Tha' consultant, Calgary
Apr 12	Presentation on project update	Economic Society of Northern Alberta Conference
Apr 17	Presentation on project update, Memorandum of Understanding	Economic Development Discussion Group
Apr 24	Project update	Minister of Natural Resources
Apr 24	Project update	Assistant Deputy Ministers, Federal Interdepartmental Task Force on Northern Energy
Apr 24	Project update	INAC
Apr 25	Project update	Assistants to Federal Cabinet Ministers
Apr 25	Project update	Finance Canada
Apr 25	Project update	Minister of Indian and Northern Affairs
Apr 29	Arctic Gas Pipelines – opportunities in the north	Insight Conference (presentation), in Houston
May 9	Project update, recent events	Mackenzie Delta exploration companies
May 13	Project update, participation in and benefits from the pipeline	Dene Tha' consultant, in Calgary
May 16	Project update, fiscal certainty	GNWT
May 27	Project update	Fort Simpson

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
May 27	Project update, socio-economic impacts	Liidlii Kue First Nation Denendeh Resource Committee Nogha Enterprises
May 28	Project update	Jean Marie River
May 29	Project update, socio-economic impacts	Wrigley
May 30	Project update, benefits, vegetation, land and resources	Deh Cho First Nation, in Fort Simpson
May 30	Project update, vegetation	Trout Lake
May 31	Project update, consultation process	Deh Cho First Nation
Jun 3	Project update, employment opportunities, socio-economic impacts	Fort Good Hope
Jun 4	Project update	National Association of Petroleum Investment Analysts
Jun 5	Project update	GNWT MLAs
Jun 8	Project update, socio-economic impacts	Economic Development, Nahanni Butte
Jun 11	Project update, pipeline routing	INAC
Jun 11	Project update	Mackenzie Valley Environmental Impact Review Board
Jun 11	Project update	Mackenzie Valley Land and Water Board
Jun 11	Project update, socio-economic impacts	Aklavik
Jun 11	Project update, socio-economic impacts	Gwich'in Tribal Council, in Inuvik
Jun 12	Project update, employment, business opportunities, training and education, community and cultural impacts, traditional knowledge, migratory birds, other wildlife	Northern regulatory agencies, in Inuvik
Jun 12	Project update, socio-economic impacts, employment and business opportunities, training and education, monitoring, communication and consultation process	Community meeting, in Inuvik
Jun 12	Project update, communication and consultation process, employment opportunities, socio-economic impacts	Nihtat (Inuvik) Renewable Resources Council
Jun 12	Project update, housing	Inuvik Town Council
Jun 12	Project update, socio-economic impacts, employment, business opportunities, training and education, monitoring, traditional knowledge	Inuvik Native Band
Jun 13	Project update, socio-economic impacts, employment, training and education, community and cultural impacts, monitoring	Sachs Harbour, community meeting
Jun 13	Project update, fisheries, employment opportunities, design, construction, socio-economic impacts, Travaillant Lake sensitivities	Tsiigehtchic, community meeting
Jun 13	Project update, traditional knowledge, socio-economic impacts, employment opportunities	Fort McPherson, community meeting

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Jun 14	Project update, employment, business opportunities, training and education	Holman, community meeting
Jun 14	Project update, socio-economic impacts, employment, business opportunities, training and education, traditional knowledge	Paulatuk, community meeting
Jun 18	Presentation on project update	Natural Resource Committee, Calgary Chamber of Commerce
Jun 20 and 21	Presentations on project update, jobs, business opportunities, training, education and environment	Inuvik Petroleum Show
Jun 24	Project update, Socio-Economic Baseline Study	Inuvialuit Regional Corporation
Jun 24	Project update, Socio-Economic Baseline Study	GNWT Municipal and Community Affairs, in Inuvik
Jun 25	Project update, Socio-Economic Baseline Study	Aurora Research Institute, in Inuvik
Jun 25	Project update, Socio-Economic Baseline Study	Inuvik Health Region
Jun 25	Project update, Socio-Economic Baseline Study	Inuvik Housing Authority
Jun 25	Project update, Socio-Economic Baseline Study	GNWT, Municipal and Community Affairs, in Inuvik
Jun 25	Project update, Socio-Economic Baseline Study	Inuvik Region, GNWT, Resources, Wildlife and Economic Development
Jun 26	Project update, Socio-Economic Baseline Study	Inuvik Royal Canadian Mounted Police (RCMP)
Jun 26	Project update, Socio-Economic Baseline Study	Northwest Territories Housing Corporation, Beaufort Delta District
Jun 26	Project update, Socio-Economic Baseline Study	Social Programs Office, Inuvik Health and Social Services
Jun 26	Project update, Socio-Economic Baseline Study	Church of the Ascension, in Inuvik
Jun 26	Project update, Socio-Economic Baseline Study	Ingamo Hall Friendship Centre
Jun 27	Project update, Socio-Economic Baseline Study	Inuvik Mayor's Office
Jun 27	Project update, Socio-Economic Baseline Study	Mackenzie Delta Social Service, Inuvik Hospital, Alcohol and Drug Program and Foster Care
Jun 27	Project update, Socio-Economic Baseline Study	Education, Culture and Employment, GNWT
Jun 27	Project update, Socio-Economic Baseline Study	Aurora College, Inuvik Campus
Jun 28	Project update, Socio-Economic Baseline Study	Aurora College, Inuvik Campus
Jun 28	Project update, Socio-Economic Baseline Study	Samuel Hearne Secondary School, Inuvik

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Jun 28	Project update, Socio-Economic Baseline Study	Inuvik Justice Committee
Jul 3	Project update, traditional knowledge	Fort Good Hope
Jul 3	Project update, traditional knowledge	Tulita
Jul 5	Project update, traditional knowledge	Inuvialuit Cultural Resource Centre, in Inuvik
Jul 12	Project update, traditional knowledge	Déline
Jul 15	Project update, Socio-Economic Baseline Study	GNWT, Resources, Wildlife and Economic Development
Jul 15	Project update, Socio-Economic Baseline Study	Canada Mortgage and Housing Corporation, in Yellowknife
Jul 15	Project update, Socio-Economic Baseline Study	Mineral and Petroleum Resources
Jul 15	Project update, Socio-Economic Baseline Study	Inuvialuit Regional Corporation
Jul 15	Project update, Socio-Economic Baseline Study	Inuvik Regional Health and Social Services Board
Jul 15	Project update, Socio-Economic Baseline Study	Public Health, in Inuvik
Jul 16	Project update, social impact, waste management, employment	Planning and Assessment, Lands Administration, Municipal and Community Affairs, GNWT
Jul 16	Project update, Socio-Economic Baseline Study	Planning and Lands, City of Yellowknife
Jul 16	Project update, Land and Resource Use	Minerals, Oil and Gas, GNWT, Resources, Wildlife and Economic Development
Jul 16	Project update, Socio-Economic Baseline Study	Inuvik Region Health and Social Services Board
Jul 16	Project update, Socio-Economic Baseline Study	Employment Development, Northwest Territories Education, Culture and Employment
Jul 16	Project update, Socio-Economic Baseline Study	Community Development Division, Inuvialuit Regional Corporation
Jul 16	Project update, biophysical baseline program scope	Deh Cho First Nation
Jul 16	Project update, Socio-Economic Baseline Study	Inuvik Community Corporation
Jul 16	Project update, Socio-Economic Baseline Study	Aklavik Band Office
Jul 17	Project update, Socio-Economic Baseline Study	Roman Catholic Church, in Tuktoyaktuk
Jul 17	Project update, Socio-Economic Baseline Study	Inuvik Regional Health and Social Services Board
Jul 17	Project update, Socio-Economic Baseline Study	Conrad Realty
Jul 17	Project update, Socio-Economic Baseline Study	Hay River Community Health Board

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Jul 17	Project update, Socio-Economic Baseline Study	Hay River RCMP
Jul 17	Project update, Socio-Economic Baseline Study	MLA, Hay River South
Jul 17	Project update, Socio-Economic Baseline Study	Hay River Housing Authority
Jul 17	Project update, Socio-Economic Baseline Study	Hay River Chamber of Commerce
Jul 17	Project update, Socio-Economic Baseline Study, benefits, pipeline access	Tuktoyaktuk Community Meeting
Jul 18	Project update, benefits plans and access agreements	INAC
Jul 18	Project update, Socio-Economic Baseline Study	Planning and Lands, City of Yellowknife
Jul 18	Project update, Socio-Economic Baseline Study	Tuktoyaktuk RCMP
Jul 18	Project update, Socio-Economic Baseline Study	Northwest Territories Energy Secretariat Office
Jul 18	Project update, Socio-Economic Baseline Study	Town of Hay River
Jul 18	Project update, Socio-Economic Baseline Study	Public Works and Planning, Town of Hay River
Jul 18	Project update, Socio-Economic Baseline Study	Community and Allied Health Service, Hay River Community Health Board
Jul 18	Project update, Socio-Economic Baseline Study	E. Gruben Transport Ltd.
Jul 18	Project update, Socio-Economic Baseline Study	Tuktoyaktuk Health Centre
Jul 18	Project update, Socio-Economic Baseline Study	Tenant Relations Office, NWT Housing Corporation, in Tuktoyaktuk
Jul 18	Project update, Socio-Economic Baseline Study, traditional knowledge, land and resource use	Aklavik Band Office
Jul 18	Project update, Socio-Economic Baseline Study	Aklavik RCMP
Jul 18	Project update, training and education, community and cultural impacts, human health, employment, benefits	Aklavik Renewable Resource Committee, Aklavik Band Office
Jul 18	Project update, Socio-Economic Baseline Study	Aklavik Health Centre
Jul 18	Project update, Socio-Economic Baseline Study	Employment Department, in Aklavik
Jul 18	Project update, Socio-Economic Baseline Study	Moose Kerr School, in Aklavik

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Jul 18	Project update, socio-economic process, land and resource use	Sachs Harbour and Tuktoyaktuk
Jul 19	Project update, Socio-Economic Baseline Study	Public Health Unit, in Inuvik
Jul 19	Project update, Socio-Economic Baseline Study	Inuvik Region Health and Social Services, Inuvik Hospital
Jul 19	Project update, Socio-Economic Baseline Study	E. Gruben Transport Ltd.
Jul 19	Project update, Socio-Economic Baseline Study	Inuvik Region Health and Social Services Board
Jul 19	Project update, Socio-Economic Baseline Study	Health and Social Services, in Inuvik
Jul 19	Project update, Socio-Economic Baseline Study	INAC
Jul 23	Project update, Socio-Economic Baseline Study	Liidlii Kue First Nation
Jul 26	Project update	Mackenzie Valley Land and Water Board, Mackenzie Valley Environmental Impact Review Board, Northwest Territories Land and Water Board
Jul 26	Project update, traditional knowledge	Sahtu Land Use Planning Board
Jul 29	Project update, Socio-Economic Baseline Study	Education Culture and Employment, GNWT
Jul 30	Project update, Socio-Economic Baseline Study	Colville Lake
Jul 31	Project update, Socio-Economic Baseline Study	Executive Office, Inuvik Regional Health
Jul 31	Project update, Socio-Economic Baseline Study	Renewable Resources Council, in Fort McPherson
Jul 31	Project update, Socio-Economic Baseline Study	Community Health Centre, in Fort McPherson
Aug 5	Project update, pipeline route reconnaissance	Representatives from the Sahtu Settlement Region, in Norman Wells and Fort Good Hope
Aug 6	Socio-economic data verification and traditional knowledge	Fort Providence chief, band manager and councillors, in Yellowknife
Aug 7	Project update, traditional knowledge	Liidlii Kue First Nation, Fort Good Hope and Tulita, in Fort Simpson
Aug 8	Project update, traditional knowledge	Tuktoyaktuk Community Corporation
Aug 8	Project update, traditional knowledge	Aklavik Hunters and Trappers Committee
Aug 12 to 16	Project update, traditional knowledge	Inuvik Community Corporation and Inuvik Hunters and Trappers Committee in Inuvik, Tuktoyaktuk and Paulutuk
Aug 13	Project update, traditional knowledge	Inuvik Community Corporation
Aug 13	Socio-economic impact data verification	Yellowknife RCMP
Aug 13	Review of baseline biophysical program	Canadian Environmental Assessment Agency, in Yellowknife

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Aug 14	Socio-economic impact data verification	Chief Executive Officer of the Deh Cho Health and Social Services Authority in Fort Simpson
Aug 14	Socio-economic impact data verification	Administrator for Fort Simpson Health Centre in Fort Simpson
Aug 14	Socio-economic impact data verification	Mayor of Fort Simpson
Aug 14	Project update, traditional knowledge	Research director, Gwich'in Social and Cultural Institute – Inuvik, Yellowknife
Aug 15	Socio-Economic Impact Assessment – drugs and alcohol	Fort Simpson RCMP
Aug 15	Project update, winter field geotechnical investigation program	Acting Grand Chief, Deh Cho First Nation, in Fort Simpson
Aug 15	Environmental Impact Assessment, land and resource use data verification	GNWT, Resources Wildlife and Economic Development, in Fort Simpson
Aug 16	Traditional knowledge, archaeology permit	Tulita District Land Corporation
Aug 17	Project update, pipeline route	Representatives from the Gwich'in Settlement Area
Aug 19	Project update	Natural Resources Canada, in Calgary
Aug 19	Project update	Chief of the Deh Gah Gotie Dene Council, the Sambaa K'e Dene Band, in Fort Providence
Aug 20	Project update	Mayor of Enterprise
Aug 21	Project update	Nahanni Butte First Nation council members
Aug 21	Project update, traditional knowledge	Aklavik Community Corporation
Aug 21	Project update	Acho Dene Koe First Nation Chief, in Fort Liard
Aug 22	Archaeology permit	Tulita District Land Corporation
Aug 22	Project update	Hay River Chamber of Commerce
Aug 22	Project update	Town of Hay River, Hay River Reserve and West Point Reserve, in Hay River
Aug 23	Project update, traditional knowledge	Liidlii Kue First Nation and Nogha Enterprises, in Fort Simpson
Aug 26	Project update, traditional knowledge program	Tuktoyaktuk Hunters and Trappers Committee in Inuvik
Aug 27	Socio-economic impact, employment opportunities	President, Gwich'in Tribal Council, Research Director, Gwich'in Social and Cultural Institute in Yellowknife
Aug 27	Project update, traditional knowledge	Tuktoyaktuk Community Corporation
Aug 28	Project update, traditional knowledge, archaeology permit	Tulita District Land Corporation
Sep 3	Project update, winter field geotechnical investigation program	Gwich'in Tribal Council, Gwich'in Development Corporation, in Inuvik
Sep 4	Project update, winter field geotechnical investigation program	President of the Gwich'in Gwichya, Mayor of Tsiigehtchic, Tsiigehtchic Band Manager, in Tsiigehtchic
Sep 4	Project update, winter field geotechnical investigation program	Mayor, Tetlit Gwich'in Council and Tetlit Renewable Resource Council in Fort McPherson
Sep 5	Project update and review	GNWT, Resources, Wildlife and Economic Development, in Yellowknife
Sep 5	Regulatory and royalty review	INAC, in Calgary

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Sep 5	Project update, winter field geotechnical investigation program	President of the Ehdiitat Gwich'in and Mayor of Aklavik
Sep 5	Project update, winter field geotechnical investigation program	Nihtat Renewable Resource Council, in Inuvik
Sep 10	Project update, traditional knowledge	Representatives from the Inuvialuit Settlement Region and the Inuvik Elders Committee, in Inuvik
Sep 12	Socio-economic impact data verification	Chiefs from NWT, GNWT ministers and industry representatives, in Fort Liard
Sep 12	Project update, traditional knowledge	Representatives from the Inuvialuit Settlement Region, Inuvik Hunters and Trappers Committee, in Inuvik
Sep 12	Workshop on business opportunities	Deh Cho leaders and business representatives, in Fort Liard
Sep 16	Mackenzie Gas Project office opening	Open house, Fort Simpson
Sep 17	Mackenzie Gas Project office opening	Open house, Norman Wells
Sep 17	Project update, traditional knowledge	President of GreenPipe Industries Ltd. and representatives of Colville Lake and Norman Wells Métis, in Tulita
Sep 17 to 19	Socio-economic impact data verification	Representatives from the Inuvialuit Settlement Region in Sachs Harbor and Holman Island
Sep 18	Socio-economic impact data verification, employment opportunities, traditional knowledge	Chief of the Nahanni Butte First Nation in Nahanni Butte
Sep 18	Socio-economic impact data verification	Executive Director of the Acho Dene Koe First Nation, in Fort Liard
Sep 18	Socio-economic impact data verification	President, Métis Local No. 67 in Fort Liard
Sep 18	Project update and structure of future consultations	Dene Tha' First Nation Chief and Band Council, in Chateh
Sep 18	Project update	Deh Cho Teachers Convention, in Fort Simpson
Sep 19	Project update, traditional knowledge	Representatives of the Liidlii Kue First Nation and Nogha Enterprises, in Fort Simpson
Sep 19	Socio-economic impact data verification	Senior Administrative Officer for the Town of Fort Liard
Sep 19	Socio-economic impact data verification	Representatives of the Acho Dene Koe First Nation, in Fort Liard
Sep 19	Socio-economic impact data verification	GNWT Resources, Wildlife and Economic Development, in Fort Liard
Sep 19	Socio-economic impact data verification	Fort Liard RCMP
Sep 19	Socio-economic impact data verification	Community Adult Educator, in Fort Liard
Sep 20	Socio-economic impact data verification	Jean Marie River First Nation
Sep 22	Project update, traditional knowledge, archaeology permit, employment opportunities	Representatives of the Pehdzeh Ki First Nation, in Wrigley
Sep 23	Socio-economic impact, benefits	Band Manager, Pehdzeh Ki First Nation, in Wrigley
Sep 23 to 25	Project overview	Fort Simpson Chamber of Commerce, in Fort Simpson
Sep 24	Socio-economic impact data verification	Principal, Chief T'Selehya School in Fort Good Hope
Sep 25	Socio-economic impact data verification	K'a'agee Tu First Nation, in Kakisa

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Sep 25	Socio-economic impact data verification, employment opportunities	Mayor and Deputy Mayor of Enterprise, Manager of the Enterprise Resource and Information Centre
Sep 26	Socio-economic impact data verification	Fort Providence RCMP
Sep 26	Socio-economic impact data verification, employment opportunities, training and education	Principal of the Fort Providence Deh Gah School
Sep 26	Socio-economic impact data verification	Manager of the Fort Providence Northern Store
Sep 26	Socio-economic impact data verification, employment opportunities	Nurse of the Fort Providence Health Centre
Sep 26	Socio-economic impact data verification	Career Development Coordinator, in Fort Providence
Sep 26	Project update	Sahtu General Assembly, in Tulita
Oct 1	Mackenzie Gas Project office opening	Open house, Inuvik
Oct 3	Project update, winter field geotechnical investigation program	Inuvialuit Land Administration, in Inuvik
Oct 3	NWT Protected area strategy	World Wildlife Fund, in Calgary
Oct 7	Project update, traditional knowledge	Gwich'in Social and Cultural Institute, in Inuvik
Oct 8	Project update	Representatives of the Pehdzeh Ki First Nation, in Wrigley
Oct 8	Project update, traditional knowledge	Gwich'in Tribal Council, in Inuvik
Oct 16	Traditional knowledge	Chief Operating Officer for the Inuvialuit Regional Corporation, in Inuvik
Oct 17	Project update	Representatives of the Dene Tha' First Nation, in Chateh
Oct 17	Project update, winter field geotechnical investigation program	INAC, in Calgary
Oct 21	Project update, winter field geotechnical investigation program, benefits and access	Dene Community Council and Fort Good Hope Métis Local No. 54, in Fort Good Hope
Oct 21	Project update, winter field geotechnical investigation program, review of the land use permit and water licence for Camsell Bend development	Jean Marie River First Nation
Oct 21	Review of the land use permit and water licence for Camsell Bend development	GNWT Department of Transportation, in Inuvik
Oct 21	Review of the land use permit and water licence for Camsell Bend development	Gwich'in Land and Water Board, in Inuvik
Oct 22	Traditional knowledge	President of the Tulita District Land Corporation, President of the Yamoga Corporation, Vice-president of Mackay Range Contracting, Executive, Mackay Range Contracting, and GreenPipe Industries Ltd.
Oct 22	Review of the land use permit and water licence for Camsell Bend development	Inuvialuit Land Administration, in Inuvik
Oct 22	Review of the land use permit and water licence for Camsell Bend development	Senior Administrative Officer for the Town of Inuvik
Oct 22	Review of the land use permit and water licence for Camsell Bend development	Sahtu Land and Water Board, in Fort Good Hope
Oct 22	Review of the land use permit and water licence for Camsell Bend development	Representatives of the Liidlii Kue First Nation, in Fort Simpson

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Oct 22	Project update, winter field geotechnical investigation program	Ayoni Keh Land Corporation and Behdzi Ahda First Nation Band Council, in Colville Lake
Oct 22	Project update, winter field geotechnical investigation program	Representatives of the Liidlii Kue First Nation, in Fort Simpson
Oct 22	Traditional knowledge	Tulita District Land Corporation
Oct 23	Project update, winter field geotechnical investigation program	Ernie McDonald Land Corporation, in Norman Wells
Oct 23	Project update, winter field geotechnical investigation program	Deh Cho First Nation, in Fort Providence
Oct 23	Review of the land use permit and water licence for Camsell Bend development	Town Manager for Norman Wells
Oct 23	Traditional knowledge	Inuvik Hunters and Trappers Committee, Inuvik Elders and Community Corporation
Oct 23	Traditional knowledge	Sahtu Grand Chief, in Tulita
Oct 23 and 24	Review of the land use permit and water licence for Camsell Bend development	GNWT Resources, Wildlife and Economic Development, in Yellowknife
Oct 23 and 24	Socio-economic impact, business opportunities	Gwich'in Development Corporation, in Inuvik
Oct 24	Review of the land use permit and water licence for Camsell Bend development	INAC regional office, in Yellowknife
Oct 24	Review of the land use permit and water licence for Camsell Bend development	Sambaa K'e First Nation, in Trout Lake
Oct 24	Project update	Northern Cross (Yukon) Ltd., in Calgary
Oct 24	Project update, winter field geotechnical investigation program	Pehdzeh Ki First Nation, in Wrigley
Oct 25	Project update, winter field geotechnical investigation program, land use permit and water licence for Camsell Bend development	K'a'agee Tu First Nation, in Kakisa
Oct 28	Review of the land use permit and water licence for Camsell Bend development	Mackenzie Valley Land and Water Board, in Yellowknife
Oct 29	Project update, pipeline route	INAC regional office, in Yellowknife
Oct 29	Project update, winter field geotechnical investigation program	Déline Dene Band, Déline Land and Financial Corporation and Sahtu Land and Water Board, in Déline
Oct 29	Socio-economic data verification	Nurse and Community Researcher for the Tulita District Land Corporation, in Tulita
Oct 29	Socio-economic data verification	Tulita District Land Corporation
Oct 30	Socio-economic data verification	Housing Coordinator and Community Researcher for the Tulita District Land Corporation, in Tulita
Oct 30	Socio-economic data verification	Employment Officer and Community Researcher for the Tulita District Land Corporation, in Tulita
Oct 30	Traditional knowledge	Chief, K'ahsho Got'ine Community Council and Mayor of Fort Good Hope, Community Council Accountant, Band Manager, Band Advisor, in Fort Good Hope

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Oct 30	Socio-economic data verification – health	Social Service Coordinator, Child Protection Services and Community Researcher for the Tulita District Land Corporation
Oct 30	Socio-economic data verification	Principal, Chief Albert Wright School, Community Researcher for the Tulita District Land Corporation
Oct 30	Socio-economic data verification	RCMP, Community Researcher for the Tulita District Land Corporation
Oct 30	Permit requirements and regulations	Sahtu Land and Water Board, in Fort Good Hope
Oct 30	Project update, winter field geotechnical investigation program, benefits and access agreements	Fort Good Hope Métis Local No. 54 Land Corporation, K'ahsho Got'ine District Land Corporation, Xahweguweh Financial/Yamoga Land Corporation, in Fort Good Hope
Oct 30 and 31	Traditional knowledge	Representatives of the Norman Wells Métis, in Norman Wells
Oct 31	Socio-economic data verification	Community Researcher for the Tulita District Land Corporation
Oct 31	Project update, winter field geotechnical investigation program	Tulita District Land Corporation, Tulita Renewable Resource Council, Fort Norman Métis Land No. 60 Financial Corporation and Fort Norman Métis Association, in Tulita
Oct 31	Training related to the oil and gas industry	GNWT Territorial Oil and Gas Committee, in Yellowknife
Nov 4	Review of field development for Parsons Lake, Taglu and Niglintgak	Gwich'in Development Corporation and Gwich'in Tribal Council, in Inuvik
Nov 4	Review of field development for Parsons Lake, Taglu and Niglintgak	Nihtat Gwich'in and Nihtat Renewable Resource Council, in Inuvik
Nov 4	Review of field development for Parsons Lake, Taglu and Niglintgak	Principal, Vice Principal and student representatives for Samuel Hearne Secondary School, in Inuvik
Nov 5	Review of field development for Parsons Lake, Taglu and Niglintgak	Inuvialuit Joint Secretariat; Inuvialuit Environmental and Geotechnical Inc.; Inuvialuit Land Administration; GNWT - Resources, Wildlife and Economic Development; Fisheries and Oceans Canada, Fisheries Joint Management Committee; INAC, in Inuvik
Nov 5	Review of field development for Parsons Lake, Taglu and Niglintgak	Department of Justice; Canadian Coastguard; Inuvik Community Corporation; Inuvik Development Corporation; INAC; Inuvialuit Regional Corporation; Arctic Oil and Gas; Beaufort Delta Self Government; Gwich'in Tribal Council; Environment Canada; Aboriginal Pipeline Group; Inuvik Hunters and Trappers Committee; Inuvialuit Joint Secretariat Community Support Unit, in Inuvik
Nov 5 to 7	Project update, winter field geotechnical investigation program, access agreement and participation	Inuvialuit Land Administration, in Inuvik
Nov 5 to 7	Project update, winter field geotechnical investigation program, benefits and access agreements	Gwich'in Tribal Council, in Inuvik
Nov 6	Cross-cultural training	President, Ehdiitat Gwich'in and Nethru Consulting, in Calgary
Nov 6	Project update, winter field geotechnical investigation program	President, Ehdiitat Gwich'in, Nethru Consulting, and EBA representatives, Calgary
Nov 6	Review of field development for Parsons Lake, Taglu and Niglintgak	Aklavik Band, Aklavik Elders Committee, Aklavik Community Corporation, Ehdiitat Renewable Resource Council, Inuvialuit Environmental and Geotechnical Inc., in Aklavik

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Nov 7	Review of field development for Parsons Lake, Taglu and Niglintgak	Moose Kerr School District Education Authority and school representatives from Moose Kerr School, in Aklavik
Nov 7	Review of field development for Parsons Lake, Taglu and Niglintgak	Inuvialuit Land Administration, in Tuktoyaktuk
Nov 7	Review of field development for Parsons Lake, Taglu and Niglintgak	Mangilatuk School, in Tuktoyaktuk
Nov 8	Review of field development for Parsons Lake, Taglu and Niglintgak	Inuvialuit Land Administration, Tuktoyaktuk Environmental Services, Tuktoyaktuk Development Corporation, in Tuktoyaktuk
Nov 8	Review of field development for Parsons Lake, Taglu and Niglintgak	Tuktoyaktuk Community Corporation, Tuktoyaktuk Hunters and Trappers Committee, Tuktoyaktuk Elders Committee
Nov 8	Project update	Senator for the NWT, in Calgary
Nov 12	Environmental Impact Assessment, noise	Representatives of the Fort Simpson Métis Nation
Nov 13	Traditional knowledge	Ernie MacDonald Land Corporation, in Norman Wells
Nov 14	Socio-Economic Impact Assessment and Environmental Impact Assessment, issues scoping workshop	Open house, Tuktoyaktuk
Nov 18	Traditional Knowledge Working Group	Aklavik Hunters and Trappers Committee
Nov 18 and 19	Socio-Economic Impact Assessment and Environmental Impact Assessment, issues scoping workshop	Open house, Aklavik
Nov 19	Project update, winter field geotechnical investigation program	Mackenzie Valley Land and Water Board, in Yellowknife
Nov 19	Socio-Economic Impact Assessment and Environmental Impact Assessment	Aklavik Band Council
Nov 20	Project update, winter field geotechnical investigation program	Town manager and business and community representatives for Norman Wells, in Norman Wells
Nov 20	Project update	INAC, in Calgary
Nov 20	Socio-Economic Impact Assessment and Environmental Impact Assessment	Open house, Inuvik
Nov 21	Project update, Socio-Economic Baseline Study	Inuvik Area Supervisor of Social Programs
Nov 21	Project update, Socio-Economic Baseline Study, employment, training	Gwich'in and Inuvialuit Elders, in Inuvik
Nov 21	Traditional knowledge	Chief of the Jean Marie River First Nation
Nov 21	Project update, winter field geotechnical investigation program	GNWT Resources, Wildlife and Economic Development, in Calgary
Nov 22	Project update, winter field geotechnical investigation program	Sahtu Land and Water Board, in Fort Good Hope
Nov 22	Project update, design and construction, cumulative effects and training	Inuvik Hunters and Trappers Committee, in Inuvik
Nov 22	Environmental Impact Assessment, land and resource use	GNWT Resources, Wildlife and Economic Development – Senior Advisor for Wildlife and Fisheries
Nov 22	Project update, Socio-Economic Baseline Study, human health, employment and benefits	Chief of the Nihtat Gwich'in Council

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Nov 25	Project update, Socio-Economic Baseline Study, employment	Tetlit Gwich'in Council (Band and RRC), in Fort McPherson
Nov 25	Socio-Economic Impact Assessment and Environmental Impact Assessment – design and construction, employment, traditional land, permafrost	Open house, Fort McPherson
Nov 25	Traditional knowledge	Members of the Déline community
Nov 26	Project update, pipeline route alternatives	Gwichya Gwich'in Council, in Tsiigehtchic
Nov 26	Socio-Economic Impact Assessment and Environmental Impact Assessment	Open house, Tsiigehtchic
Nov 28	Traditional knowledge	Community of Colville Lake
Dec 3	Socio-Economic Impact Assessment and Environmental Impact Assessment	Tuktoyaktuk Community Council and Elders
Dec 3	Project update, Socio-Economic Baseline Study	Tuktoyaktuk Hunters and Trappers Committee and representatives from Holman, Paulatuk, Sachs Harbour, in Tuktoyaktuk
Dec 3	Project update, Socio-Economic Baseline Study	Holman Hunters and Trappers Committee and Community Council
Dec 4	Project update	Open house, Tuktoyaktuk
Dec 4	Project update, Socio-Economic Baseline Study	Head Nurse of the Tuktoyaktuk Health Centre
Dec 4	Project update, Socio-Economic Baseline Study	Tuktoyaktuk Housing Corporation
Dec 4	Project update, Socio-Economic Baseline Study	Mental health worker from Tuktoyaktuk
Dec 4	Project update, Socio-Economic Baseline Study – air	Private resident, in Tuktoyaktuk
Dec 4	Environmental Impact Assessment – remediation and odours	Private resident, in Tuktoyaktuk
Dec 4	Project update	Private resident, in Tuktoyaktuk
Dec 5	Environmental Impact Assessment – land and resource use	GNWT Resources, Wildlife and Economic Development, in Yellowknife
Dec 5	Project update, Socio-Economic Baseline Study, employment opportunities	Inuvik Community Council
Dec 5	Project update, Socio-Economic Baseline Study	Independent businessperson, in Paulatuk
Dec 5	Project update, Socio-Economic Baseline Study	School Principal, Angik School in Paulatuk
Dec 5	Project update, Socio-Economic Baseline Study	Assistant Senior Administration Officer for Hamlet of Paulatuk
Dec 5	Project update, Socio-Economic Baseline Study – wildlife	Paulatuk Hunters and Trappers Committee and Paulatuk Community Council
Dec 5	Project update, Socio-Economic Baseline Study	Paulatuk RCMP
Dec 5	Project update, Socio-Economic Baseline Study	Community Health and Addictions Worker, Inuvik Regional Health and Social Services Authority

Table 6-1: Mackenzie Gas Project Communication and Consultation Meetings (cont'd)

Date	Topics	Community or Organization Contacted
2002		
Dec 6	Project update, Socio-Economic Baseline Study	Paulatuk Health Centre
Dec 10	Project update, Socio-Economic Baseline Study	Clinical Social Worker and Mental Health Therapist, in Yellowknife
Dec 10	Project update, Socio-Economic Baseline Study	Yellowknife RCMP
Dec 10	Project update, Socio-Economic Baseline Study	Public Health Nurse for Yellowknife
Dec 13	Project update, Socio-Economic Baseline Study	Alcohol and Drug Supervisor for the Beaufort Delta Region, in Inuvik
Dec 13	Project update, Socio-Economic Baseline Study	Regional Health and Social Services Authority, in Inuvik
Dec 13	Project update, Socio-Economic Baseline Study	Manager of the Transition House, in Inuvik
Dec 13	Project update, Socio-Economic Baseline Study	Community Health representative for Inuvik
Dec 16	Project update, winter field geotechnical investigation program	Representatives of the Dene Tha' First Nation, in Edmonton
Dec 18	Access and benefits overview	Fort Providence Band Office
Dec 18	Project update	Pehdzeh Ki First Nation, in Fort Simpson
Dec 18	Traditional knowledge	Tulita Dene Band, Fort Good Hope Dene Community Council, Xahweguweh Financial/Yamoga Land Corporation, Tulita District Land Corporation, GreenPipe Industries Ltd., Ernie McDonald Land Corporation, in Tulita
Dec 19	Project update, winter field geotechnical investigation program	Chief of the Gwichya Gwich'in Band and community representatives, in Tsiigehtchic

COMMITMENT

The project proponents recognize and respect the desire of northerners to have an opportunity to participate in, and benefit from, the Mackenzie Gas Project.

The project proponents are committed to working collaboratively with aboriginal and nonaboriginal residents in northern communities, and with other Canadians, to develop and implement benefits plans. These plans will emphasize opportunities for aboriginal and nonaboriginal northern participation in all phases of anchor field, gathering system and transmission pipeline system development. Contractors and subcontractors working on the project will also be required to foster business, employment and training opportunities for aboriginal and other northern residents.

The involvement of the APG in the Mackenzie Valley Pipeline, through the Memorandum of Understanding (MOU), has contributed to enhancing aboriginal participation in, and benefits from, the Mackenzie Valley Pipeline. The arrangements remaining to be negotiated for the Mackenzie Valley Pipeline under the terms of the MOU will continue to enhance this participation and benefits.

The project proponents plan to address benefits to aboriginal and other northern residents, and other Canadians, for all components and phases of the project.

The benefits plans will focus on such matters as:

- identifying employment and business opportunities
- enhancing human and business capacity through general educational and technical training programs, so that aboriginal and nonaboriginal northerners can pursue those opportunities

The intent is to identify these opportunities during the Project Definition Phase. Project representatives will work with the providers of existing education and training programs. Using their program delivery methods and infrastructure will enhance the ability of aboriginal and other northerners to pursue the education and training that will help them access employment opportunities. Where necessary, this period will enable the appropriate education and training programs to be designed and implemented.

GUIDELINES FOR PLAN DEVELOPMENT

The MOU signed in October 2001 contains, among other matters, a statement of principles that will serve as a guideline for developing and establishing the benefits plans.

GUIDELINES FOR PLAN DEVELOPMENT (cont'd)

Applying the same guiding principles to the gathering system and the anchor field developments would provide consistency among these arrangements. Specific regional and local circumstances will be recognized in the benefits plans.

STATUS OF BENEFITS PLANS

Benefits plans for aboriginal and nonaboriginal northern participation in the project are being developed with organizations and communities in the Mackenzie Delta and Mackenzie Valley.

The benefits plans will be an important aspect of the Socio-Economic Impact Assessment (SEIA) mitigation plan being developed as part of the regulatory application.

The benefits plans will be submitted with the various regulatory applications.

REGULATORY REQUIREMENTS

Under certain land claims agreements and processes, unless the designated aboriginal organization agrees otherwise, project proponents are required to negotiate participation agreements when they wish to:

- access lands owned by the aboriginal beneficiaries of these agreements
- seek approval to cross such lands to access and exercise their rights on Crown lands

In implementing their corporate commitments, the project proponents will also comply with a number of regulatory and legal requirements for benefits plans. For example:

- Section 5.2 of the Canada Oil and Gas Operations Act requires that a project proponent develop a benefits plan that provides Canadians with employment opportunities as well as full and fair opportunity to participate competitively in supplying goods and services related to the development of the natural gas resources
- relative to the proposed Mackenzie Valley Pipeline, Section 52(d) of the National Energy Board Act provides that the NEB, in determining whether to issue a Certificate of Public Convenience and Necessity, may consider the extent to which Canadians will have an opportunity to participate in the financing, engineering and construction of the pipeline

EMPLOYMENT INITIATIVES

Education

Northern residents are encouraged to acquire the skills and training needed to qualify for the job opportunities created by the project. To foster education, project representatives plan to:

- work with schools, including students, teachers and school administrators, as well as the GNWT, to ensure an adequate understanding of the work and career opportunities resulting from the project, and the related education requirements
- develop petroleum-industry materials that could be used in schools

Training

To enhance training opportunities for northerners, project representatives plan to:

- work with local communities, to identify candidates for training and their training requirements
- work with pipeline contractors and oil and gas companies in the Mackenzie Delta, to provide training opportunities
- support existing and additional training initiatives, such as the work of the Pipeline Operations Training Committee. Through this committee, several petroleum companies, in collaboration with the GNWT, Aurora College and technical institutes in Alberta, are developing a training program that will prepare northerners for potential long-term employment during the project's operating phase.

Job Opportunities

Project representatives plan to foster opportunities for employment by:

- working with employment officers and staff in local communities, government agencies and aboriginal organizations to help recruit qualified aboriginal and other northern employees
- pursuing hiring practices that are designed to provide opportunities for qualified aboriginal and other northern residents

To encourage northerners to participate in the employment opportunities created by the project, the project proponents will:

Job Opportunities (cont'd)

- identify employment opportunities early
- consider equivalency to education levels required for some jobs, where appropriate
- hire qualified local residents
- establish on-the-job support

PRELIMINARY EMPLOYMENT ESTIMATES

The proposed project is expected to create employment opportunities for an estimated:

- 2,600 people in short-term positions during the peak construction period
- 50 people in permanent, long-term positions in pipeline and facility operations

These job estimates, which are based on preliminary studies, are related directly to the gathering and transmission pipeline systems as the project moves from the Project Definition Phase through the Construction Phase to the Operations Phase. More short-term construction positions will be associated with the single-phase design than with the two-phase design.

The anchor field development activities will result in additional opportunities for employment. These activities include:

- constructing pads and facilities
- drilling and well servicing
- operating facilities

Project Definition Phase

During the Project Definition Phase, most jobs will be associated with engineering studies, environmental assessments and community consultation activities. An estimated 130 jobs are expected to be created to support this phase of the project.

Construction Phase

Preconstruction

Preconstruction will be scheduled to support major pipeline and facility construction. An estimated 540 jobs could be available during the preparatory activities to provide infrastructure requirements. These will include granular material supply, access road construction, camps and catering.

Pipeline Construction

The proposed gathering and transmission pipeline systems are expected to be constructed over the course of two winter seasons. Each pipeline spread will require crews for:

- clearing
- grading
- digging ditches
- stringing pipe
- bending pipe
- welding pipe
- backfilling
- tying-in pipe
- cleaning up
- testing pipe

Some river crossings might be completed during the summer. Crew requirements will generally be lower during this period.

About 2,300 jobs will be created by the major activities associated with pipeline construction.

Facilities Construction

Facilities will be constructed all year and will mainly involve preparing sites and installing compressor stations and related facilities.

Some facilities will be constructed at the site. Others will be modularized and prefabricated elsewhere, then shipped to the site for assembly and installation.

About 250 jobs will be created by the construction of project facilities.

Operations Phase

After all pipelines and related facilities have been constructed and tested, pipeline and facility operations will begin.

About 50 full-time employees will be required to operate the pipelines and related facilities. Additional opportunities will be associated with facility maintenance and pipeline surveillance activities, as well as anchor field operations.

BUSINESS DEVELOPMENT INITIATIVES

The proposed project will generate a need for goods and services throughout the definition, construction and operations phases. Much of the employment will be supplied through contractors and suppliers.

The project proponents are committed to fostering the development of aboriginal and northern businesses. To encourage northern suppliers and contractors to participate in the sustainable business opportunities created by the project, the project proponents will:

- identify the business opportunities and potential northern suppliers of goods and services, early in the project
- facilitate northern sourcing by breaking appropriate contracts down into smaller components
- contract locally, where northern businesses are:
    - internationally cost competitive at the point where the goods and services are required
    - able to meet or exceed specified safety, quality and technical standards as well as the project's timing requirements

Project representatives will work with local businesses, to ensure that they are:

- aware of the opportunities created by the project
- notified about any prequalification process
- familiar with safety requirements, bidding procedures and business processes

TYPES OF OPPORTUNITIES

Table 7-1 lists the types of goods and services likely to be required by the project.

Table 7-1: Potential Business Opportunities

Category	Typical Goods and Services
Accommodation and Related Services	• Apartments, hotels and motels • Camps, camp catering, camp supplies • Restaurants • Taxi, laundry and dry-cleaning services • Retail and wholesale grocery supply • Water delivery, sewage treatment, snow removal and garbage disposal
Communication	• Telecommunications, cellular phones, high-speed internet and cable TV
Construction – Facilities	• Surveying • Building supplies, hardware, paint, lumber supply and plywood • Electrical contracting and supplies • Plumbing contracting and supplies • Carpentry and finishing • Heating, ventilation and air conditioning supply, installation and maintenance • Electrical power generation and supply • Concrete, crushed rock, sand, gravel and ready-mix products • Forms, rebar, cribbing, cement finishing and masonry products
Construction – Pipeline	• General contracting • Timber for pipeline skids and survey laths • Welding services and supplies, such as acetylene and oxygen
Equipment	• Industrial supplies, steam and high-pressure water • Small engine repair, small equipment supply and rental • Heavy-duty equipment rental, repairs and service • Drilling equipment for core samples
Fuel and Fuel Storage	• Bulk fuel, propane, diesel fuel, aircraft fuel, gasoline, fuel oil, grease, lubricating oil, glycol and chemicals • Propane and fuel storage tanks, oil and diesel fuel tanks, fuel delivery and storage
Office Requirements	• Security and janitorial services • Office space, supplies, furniture, computers and other equipment
Personnel Requirements	• Secretarial, clerical, word processing, accounting, bookkeeping and payroll services • Travel services • Banking services
Safety and Medical	• Medical facilities, supplies, services, air and ground ambulance, dentistry, optometry and prescription drugs • Safety equipment, supplies and training
Logistics	• Materials handling, expediting, freight transport, light delivery and courier services • Air transport, aircraft charters and maintenance • Vehicle sales, rentals, repairs and service • Charter boats and barges

Table 7-1: Potential Business Opportunities (cont'd)

Category	Typical Goods and Services
Drilling, Completions and Well Servicing	• Drilling contracting • Service rig contracting • Coiled tubing services • Wireline services • Well testing services • Water filtration services • Well-site trailers • Pressure trucks

COMMUNITY SELECTION CRITERIA

Socio-economic assessments are community focused, whereas biophysical assessments are focused on geographical study areas. Therefore, the preliminary selection of the communities included in the socio-economic study program for the Mackenzie Gas Project was based on identifying communities that:

- are within a 200 km radius of the proposed major facilities and have a direct historic, cultural or economic link to the project area
- have traditional land and resource use areas that could be directly affected by the project facilities or operations
- have populations likely to provide a significant number of employees for construction or operations jobs
- might experience a substantial increase in traffic, as a result of construction-related vehicles
- might service the project's construction or operations phases

Applying these criteria resulted in selecting the communities shown in Table 8-1.

The locations of the selected communities are shown in Figure 8-1.

Table 8-2 provides the economic and employment statistics for the communities.

Other communities might be selected as the socio-economic study progresses.

HISTORY AND DEMOGRAPHICS OF PROJECT AREA COMMUNITIES

Inuvialuit Settlement Region

The boundaries of the Inuvialuit Settlement Region were defined in 1984, after a comprehensive land claim settlement with the federal government through the Inuvialuit Final Agreement. There are six Inuvialuit communities in the socio-economic study program:

- Sachs Harbour
- Paulatuk (Paulatuuq)
- Holman (Olokhaktomiut)
- Aklavik
- Tuktoyaktuk
- Inuvik

Sachs Harbour

Sachs Harbour is situated on the southwest shore of Banks Island, 500 km northeast of Inuvik. Sachs Harbour and other areas of Banks Island, including the Sachs, Kellett and Lennie rivers, have traditionally been important to the Inuvialuit for harvesting fish, caribou, seal and muskox. Seasonal trapping began in 1917 and Sachs Harbour soon became one of the most productive white fox trapping areas in the world. A store and Royal Canadian Mounted Police (RCMP) station were established in the community and a more permanent settlement eventually followed. Today, traditional harvesting activities, as well as big game hunting and government service employment, are important economic activities in the community.

Paulatuk (Paulatuuq)

Paulatuk (Paulatuuq) is located on the Arctic coast 400 km east of Inuvik. It has long been an important area for the Inuvialuit people because of the local char fishery and natural coal outcrops. A Catholic mission, established in 1935, and a Distant Early Warning (DEW) line station, established in the early 1950s, led to a more permanent settlement at Paulatuk. The community has traditionally followed a largely subsistence lifestyle. In recent years, wage employment in government service, big game hunting and mineral exploration have resulted in a mixed economy.

Holman (Olokhaktomiut)

Holman (Olokhaktomiut) is located on the east coast of Victoria Island, 670 km northeast of Inuvik. Holman was settled by the Inuit from Walker Bay and Minto Inlet, Tuktoyaktuk, Sachs Harbour, Kugluktuk and Reed Island. The people of Holman have close links to the natural resources of the region, including beluga whales, polar bears, seals and white fox. The close relationship with these resources is strongly reflected in the community's seasonal activity patterns and culture.

Aklavik

Aklavik is located in mid-delta about 60 km west of Inuvik and is home to both Gwich'in and Inuvialuit people. It was created as a delta trading post in the early 1920s, and because of its strategic location, became the government and commercial centre in the western Arctic, until Inuvik was built in 1960. Although trapping has always been an important economic activity in Aklavik, there have been few economic benefits from this activity since fur prices began to fall in the 1980s. Wage employment and business opportunities in Aklavik have been limited. However, oil and gas exploration has stimulated some employment and business development in recent years.

Table 8-1: Demographics and Municipal Status of Communities

Community	Population		Aboriginal People (%)	% Under Age 25	% Over Age 59	M:F Ratio	Municipal Status
	2000	1991					
NORTHWEST TERRITORIES COMMUNITIES[1]							
Inuvialuit Communities							
Sachs Harbour	153	132	93	48	8	55:45	Hamlet
Paulatuk	323	271	92	45	7	50:50	Hamlet
Holman	470	383	92	49	6	47:53	Hamlet
Aklavik[2]	748	842	91	48	10	53:47	Hamlet
Tuktoyaktuk	979	965	90	51	10	53:47	Hamlet
Inuvik[2]	3,451	3,393	60	42	7	52:48	Town
Gwich'in Communities							
Fort McPherson	910	793	90	45	10	50:50	Hamlet
Tsiigehtchic	195	151	94	54	7	54:46	Charter
Aklavik[2]	748	842	91	48	10	53:47	Hamlet
Inuvik[2]	3,451	3,393	60	42	7	52:48	Town
Sahtu Communities							
Norman Wells	882	669	26	38	2	52:48	Town
Fort Good Hope	747	646	85	48	9	51:49	Charter
Déline	645	594	95	53	6	50:50	Charter
Tulita	506	396	90	52	8	49:51	Hamlet
Colville Lake	96	73	93	[3]	[3]	[3]	Settlement
Deh Cho Communities							
Fort Simpson	1,273	1,197	68	40	7	50:50	Village
Fort Providence	837	692	90	38	11	54:46	Hamlet
Fort Liard	524	517	87	47	10	54:46	Hamlet
Wrigley	183	196	93	44	11	52:48	Designated Authority
Nahanni Butte	82	90	91	33	13 [4]	53:47 [4]	Designated Authority
Jean Marie River	50	53	90	36 [4]	18 [4]	45:55 [4]	Designated Authority
Trout Lake	79 [4]	[3]	86 [4]	38 [4]	15 [4]	50:50	Designated Authority
Kakisa	[3]	[3]	[3]	[3]	[3]	[3]	Designated Authority
Hay River Reserve	[8]	[8]	[8]	[8]	[8]	[8]	Designated Authority
West Point	68 [4]	[3]	[3]	[3]	[3]	[3]	Designated Authority
Enterprise	88	49	25	30	8	[8]	Incorporated Settlement

Table 8-1: Demographics and Municipal Status of Communities (cont'd)

Community	Population 2000	Population 1991	Aboriginal People (%)	% Under Age 25	% Over Age 59	M:F Ratio	Municipal Status
Industrial, Commercial and Government Centres							
Yellowknife	18,028	16,227	23	40	4	51:49	City
Hay River	3,835	3,451	43	42	8	51:49	Town
ALBERTA COMMUNITIES							
Dene Tha' First Nation Communities							
Dene Tha' Total On Reserve	1,580 [5]	1,222	96	57 [6]	10 [6]	52:48 [6]	Dene Tha' First Nation
Meander River	347 [5]	333	[8]	[8]	[8]	[8]	Indian Reserve 212
Chateh	915 [5]	[3]	[8]	[8]	[8]	[8]	Indian Reserve 207
Bushe River	347 [5]	116	96	57	6	54:46	Indian Reserve 209
Industrial Commercial and Government Centres							
High Level	3,800 [5]	2,849	[8]	48	4	53:47	Town

Note:
1. Unless otherwise noted, source is GNWT, Bureau of Statistics, 2001: 2000 data.
2. Aklavik and Inuvik are shown in the Inuvialuit and Gwich'in Settlement Areas as they are home to both Inuvialuit and Gwich'in people.
3. Data suppressed because of low frequencies, to protect privacy.
4. Source – GNWT Bureau of Statistics, 1996 data, imprecise because of random rounding.
5. Source – Statistics Canada, 2002, preliminary 2001 Census tabulation.
6. Source – Statistics Canada, 1993: 1991 data.
7. Source – Statistics Canada, 1998: 1996 data.
8. Not available.

M:F Male to female ratio.

Tuktoyaktuk

Tuktoyaktuk is located at the mouth of the Mackenzie River. Tuktoyaktuk is the oldest and largest Inuvialuit community. It was gradually settled by Arctic coastal residents and some Alaskan Inupiat early in the 1920s. Beluga whale harvesting, caribou hunting and fishing have traditionally been key economic activities for the people of Tuktoyaktuk. In recent decades, the community has experienced more wage employment and business opportunities through the development of a port facility and hydrocarbon exploration activity.

Inuvik

Inuvik is the largest community in the Gwich'in Settlement Area. It is home to Gwich'in, Inuvialuit and nonaboriginal people and is the main service and business centre for hydrocarbon exploration in the Mackenzie Delta. As a result, the population of Inuvik has tended to rise and fall with oil industry activity. The Inuvialuit and Gwich'in traditionally hunted and fished in the region where Inuvik is now located. A permanent settlement was created in Inuvik after regional

government services were relocated from Aklavik in 1960. Since then, Inuvik has developed as a regional government and business centre for the western Arctic.

Gwich'in Settlement Area

The Gwich'in Settlement Area, located south of the Mackenzie Delta, was created in 1992 through a comprehensive land claim settlement with the federal government, the Gwich'in Comprehensive Land Claim Agreement. There are four Gwich'in communities in the socio-economic study program:

- Fort McPherson (Tetlit Gwich'in)
- Tsiigehtchic (Gwichya Gwich'in)
- Aklavik (Ehdiitat Gwich'in)
- Inuvik (Nihtat Gwich'in)

Fort McPherson (Tetlit Gwich'in)

Fort McPherson (Tetlit Gwich'in) is the largest of the Gwich'in aboriginal communities and is located on the Dempster Highway at the Peel River, 120 km south of Inuvik. It was originally established as a trading post in 1840 and then became a missionary outpost in 1860. Whitefish from the Peel River, and caribou, are particularly important economic and cultural resources in the community. The hamlet's location on the Dempster Highway has led to several employment and business development opportunities.

Tsiigehtchic (Gwichya Gwich'in)

Tsiigehtchic is the smallest community in the Gwich'in Settlement Area. A Catholic mission was established there in 1868. The community is situated near the Dempster Highway along the Mackenzie River at the Mackenzie's confluence with the Arctic Red River. It has always been an important fishing area for the Gwich'in people. Wage employment in the community has been limited to government service. However, recent activities in the oil and gas sector have created additional employment opportunities.

Aklavik (Ehdiitat Gwich'in)

Aklavik (Ehdiitat Gwich'in), located in mid-delta about 60 km west of Inuvik, is home to both Gwich'in and Inuvialuit people. It was created as a delta trading post in the early 1920s, and because of its strategic location, became the government and commercial centre in the western Arctic, until Inuvik was built in 1960. Although trapping has always been an important economic activity in Aklavik, there have been few economic benefits from this activity since fur prices began to fall in the 1980s. Wage employment and business opportunities in Aklavik have been limited. However, oil and gas exploration has stimulated some employment and business development in recent years.

Figure 8-1: Socio-Economic Assessment Communities

Table 8-2: Economics and Employment Statistics of Communities

Community	Resource Harvesting			Labour Force [1]	Employment Rate (%)[1]	Average Income (from 1998 Taxable Returns) ($)[2]
	Hunted/ Fished (%) [1]	Trapped (%) [1]	Consumed ≥50% Country Food (%)[1]			
NORTHWEST TERRITORIES COMMUNITIES						
Inuvialuit Communities						
Sachs Harbour	69	6	44	101	67.3	28,425
Paulatuk	64	[4]	72	174	47.7	35,180
Holman	73	13	83	310	53.5	32,464
Aklavik[3]	36	15	61	288	42.9	34,079
Tuktoyaktuk	60	10	71	655	41.7	37,008
Inuvik[3]	46	8	31	1,899	74.4	43,283
Gwich'in Communities						
Fort McPherson	35	13	81	379	47.9	33,271
Tsiigehtchic	58	11	73	67	41.7	26,760
Aklavik[3]	36	15	61	288	42.9	34,079
Inuvik[3]	46	8	31	1,899	74.4	43,283
Sahtu Communities						
Norman Wells	44	[4]	25	566	84.2	55,668
Fort Good Hope	39	13	72	325	52.7	30,459
Déline	53	6	83	247	44.8	34,665
Tulita	45	7	77	219	58.6	33,292
Colville Lake	56	33	97	46	43.9	26,700
Deh Cho Communities						
Fort Simpson	37	9	42	604	60.4	39,329
Fort Providence	43	19	57	334	46.5	32,204
Fort Liard	53	[1]	40	216	56.0	30,600
Wrigley	34	21	53	78	40.8	35,700
Nahanni Butte	42	6	22	91	53.6	[4]
Jean Marie River	58	25	31	41	52.5	[4]
Trout Lake	67	31	48	50	48.3	23,250
Kakisa	18	21	100	30	32.1	[4]
Hay River Reserve	[6]	[6]	[6]	[6]	[6]	[6]
West Point	[4]	[4]	[4]	[4]	[4]	[4]
Enterprise	[6]	[6]	[6]	50	82	18,750
Industrial, Commercial and Government Centres						
Yellowknife	40	[4]	11	11,072	79.5	50,535
Hay River	41	5	20	2,156	73.4	44,316

Table 8-2: Economics and Employment Statistics of Communities (cont'd)

Community	Resource Harvesting			Labour Force [1]	Employment Rate (%)[1]	Average Income (from 1998 Taxable Returns) ($)[2]
	Hunted/ Fished (%) [1]	Trapped (%) [1]	Consumed ≥50% Country Food (%)[1]			
ALBERTA COMMUNITIES						
Dene Tha' First Nation Communities						
Dene Tha' Total	[6]	[6]	[6]	360 [5]	66.6 [5]	13,005 [5]
Meander River	[6]	[6]	[6]	[6]	[6]	[6]
Chateh	[6]	[6]	[6]	[6]	[6]	[6]
Bushe River	[6]	[6]	[6]	45 [5]	27 [5]	[6]
Industrial, Commercial and Government Centres						
High Level	[6]	[6]	[6]	1740	86.2 [5]	28,905 [5]

Note:
1. Unless otherwise noted, data in this column is from GNWT, Bureau of Statistics, 1999 data, from Labour Force Survey.
2. Unless otherwise noted, data in this column is from GNWT, Bureau of Statistics, 1998 data from Canada Customs and Revenue.
3. Aklavik and Inuvik are shown in the Inuvialuit and Gwich'in Settlement Areas as they are home to both Inuvialuit and Gwich'in people.
4. Data suppressed because of low frequencies, to protect privacy.
5. Source – Statistics Canada, calculated from 1996 Census data.
6. Not available.

Inuvik (Nihtat Gwich'in)

Inuvik (Nihtat Gwich'in) is the largest community in the Gwich'in Settlement Area. It is home to Gwich'in, Inuvialuit and nonaboriginal people and is the main service and business centre for hydrocarbon exploration in the Mackenzie Delta. As a result, the population of Inuvik has tended to rise and fall with oil industry activity. The Inuvialuit and Gwich'in traditionally hunted and fished in the region where Inuvik is now located. A permanent settlement was created in Inuvik after regional government services were relocated from Aklavik in 1960. Since then, Inuvik has developed as a regional government and business centre for the western Arctic.

Sahtu Settlement Area

The Sahtu Settlement Area was created through the Sahtu Final Agreement in 1994. There are five Sahtu communities in the socio-economic study program:

- Norman Wells
- Fort Good Hope (K'ahsho Got'ine)
- Déline
- Tulita
- Colville Lake (Behdzi Ahda')

Norman Wells

Norman Wells is a major centre in the lower Mackenzie region, hosting a variety of key business and government services. The economy in Norman Wells has been primarily driven by oil exploration and development. Increased demand for oil during World War II led to further development of Norman Wells. In 1985, an oil pipeline to Alberta was put into service.

Fort Good Hope (K'ahsho Got'ine)

Fort Good Hope (K'ahsho Got'ine) is located at the confluence of the Hare Indian and the Mackenzie rivers. It is one of the oldest permanent settlements in the region, dating back to the opening of a trading post in 1805. Its economy is a mix of wage employment, mainly in government service, and traditional pursuits, which are important to the culture and lifestyle of the population. Although it is located several hundred kilometres from the major centres of Inuvik and Yellowknife, the community is accessible by air and by winter road to Norman Wells.

Déline

Déline is located at the western end of the central arm of Great Bear Lake, northeast of the Great Bear River. A permanent settlement was established there in the 1950s. However, the area has always been an important site for hunting, trapping and fishing. The community is relatively isolated and for much of the year the only access is by aircraft or boat.

Tulita

Tulita is located at the confluence of the Great Bear and Mackenzie rivers. It has always been a key area for traditional harvesting activities and became a permanent settlement in 1810 when a trading post was established there. The community is linked to Norman Wells, Déline and Fort Simpson by winter roads.

Colville Lake (Behdzi Ahda')

Colville Lake (Behdzi Ahda') is located on the southeast shore of Colville Lake, which is 135 km northeast of Fort Good Hope. Colville Lake was established as a permanent settlement in the 1970s and is the ancestral home of the Hareskin Dene, who still follow the traditional lifestyle of hunting, fishing and trapping. Some wage employment opportunities also exist in the community, from government service, oil and gas exploration and tourism.

Deh Cho Region

The Deh Cho First Nations have not yet negotiated a self-government agreement with the federal government. However, negotiations are in progress through the Deh Cho Process. An Interim Measures Agreement and a Framework Agreement

Deh Cho Region (cont'd)

were both signed in Fort Simpson on May 23, 2001. These agreements are between the Deh Cho First Nations, the federal government and the Government of the Northwest Territories.

There are 11 Deh Cho First Nation communities in the socio-economic study program:

- Fort Simpson (Liidlii Kue First Nation and Fort Simpson Métis Nation)
- Fort Providence (Deh Gah Gotie First Nation and Fort Providence Métis Nation)
- Fort Liard (Acho Dene Koe and Fort Liard Métis Nation)
- Wrigley (Pehdzeh Ki First Nation)
- Nahanni Butte (N'ah adehe First Nation)
- Jean Marie River (Tthe'K'ehdeli First Nation)
- Trout Lake (Sambaa K'e First Nation)
- Kakisa (K'a'agee Tu First Nation)
- Hay River Reserve (K'atlodeeche First Nation)
- West Point (Ts'uehda First Nation)
- Enterprise

Fort Simpson

Fort Simpson **(**Liidlii Kue First Nation and Fort Simpson Métis Nation) is the oldest community on the Mackenzie River. The first permanent settlement in 1802 was a trading post located at the confluence of the Liard and Mackenzie rivers. Now strategically located on the Mackenzie Highway and Mackenzie River, it serves as the administrative and service centre for the Deh Cho Region.

Fort Providence

Fort Providence **(**Deh Gah Gotie First Nation and Fort Providence Métis Nation) was first permanently settled in 1861 as a Roman Catholic mission and trading post. At one time, small-scale farming and beef production were present, but these activities have not remained economically feasible. However, Fort Providence's location on the Mackenzie River and the highway to Yellowknife has stimulated a range of economic opportunities related to transportation and tourism.

Fort Liard

Fort Liard **(**Acho Dene Koe and Fort Liard Métis Nation) has early trading post roots and a favourable location on the Liard Highway and Liard River. With tourism (Nahanni National Park) as well as recent and continuing oil and gas development in the area, the local population has access to significant employment and business development opportunities.

Wrigley

Wrigley (Pehdzeh Ki First Nation) is located on the Mackenzie River at the Wrigley River, north of Fort Simpson at the end of the Mackenzie Highway. The economy of the community revolves around traditional activities as well as some wage employment and business opportunities in tourism and government service.

Nahanni Butte

Nahanni Butte (N'ah adehe First Nation) is situated at the confluence of the South Nahanni and Liard rivers, 22 km from the Liard Highway. The area has always been important for traditional harvesting activities. A permanent settlement was created there in 1958, when families were moved from their community on the Netla River. The economy still revolves around hunting, trapping and fishing, with increasing economic opportunities being created by tourism.

Jean Marie River

Jean Marie River (Tthe'K'ehdeli First Nation) is located on the Jean Marie Creek, southeast of Fort Simpson. The economy in this small and somewhat isolated community is based on a mixed traditional and wage economy.

Trout Lake

Trout Lake (Sambaa K'e First Nation) is located on Trout Lake, 155 km south of Fort Simpson. Road access to Trout Lake is limited to a winter road. Traditional harvesting activities are still important. However, recent developments in oil and gas activities have created some wage employment.

Kakisa

Kakisa (K'a'agee Tu First Nation) is located on the Kakisa River at Kakisa Lake, 10 km off the Mackenzie Highway. This area has always been an important traditional harvesting area for the Deh Cho people. People from Kakisa are able to travel to Hay River and Yellowknife all year on the Mackenzie Highway.

Hay River Reserve

Hay River Reserve (K'atlodeeche First Nation) is located next to the East Channel of Hay River opposite the Town of Hay River. The proximity to the town provides residents of Hay River Dene Reserve No. 1 with access to wage

Hay River Reserve (cont'd)

employment opportunities as well as a range of amenities and services in this regional centre. Commercial activities and services on the reserve are limited.

West Point

West Point (Ts'uehda First Nation) is located 15 km from Hay River on Vale Island at the mouth of the Hay River. This small reserve is located next to the old fishing village of West Channel. Fishing is both a commercial and traditional activity for members of West Point First Nation. The proximity to the town of Hay River provides the West Point First Nation with access to a range of employment opportunities, services and amenities.

Enterprise

Enterprise is a transportation and logistics centre located 38 km southwest of Hay River on the Mackenzie Highway. In addition to catering to highway traffic with truck stops, gas stations, a bed and breakfast, a cabinet-making shop and a small sawmill, it is located on the main railroad line from Edmonton to Hay River and has a rail spur line and siding.

Industrial, Commercial and Government Centres

Yellowknife and Hay River are the two largest communities in the project area and in the Northwest Territories. They are also the dominant industrial, commercial and government centres in the region.

Yellowknife

Yellowknife is located on Great Slave Lake. It is the capital of the Northwest Territories, the largest city, and the major supplier of industrial, commercial and government services to the project area and the territory.

Hay River

Hay River is located on the Hay River, just upstream from Great Slave Lake. In 1868, the Hudson's Bay Company constructed a trading post on the Hay River, followed by a Catholic mission in 1869 and an Anglican mission in 1893. Hay River functions as the trans-shipment point for river barges and for re-supply via sea lift to western Arctic communities. This has resulted in its becoming the dominant transportation hub of the region.

Alberta Communities

The Mackenzie Gas Project might affect two areas in northwestern Alberta:

- the traditional territories of the Dene Tha' First Nation, including the communities of Chateh, Meander River and Bushe River
- the regional industrial, commercial and government centre of High Level

Dene Tha' First Nation Communities

The Dene Tha' First Nation has seven reserves located east, west and north of High Level. The Dene Tha' people reside on three of the reserves in the communities of Chateh, Bushe River and Meander River. Each community has a school and a few services. The Dene Tha' have several band-owned businesses that work in the oil and gas sector, including a road and lease construction company, and have part ownership in a drilling company. In addition to wage employment, many Dene Tha' people continue to pursue traditional activities on and off reserve land.

High Level

High Level is located about 800 km north of Edmonton on Highway 58. It is a transportation and service centre for northwest Alberta, serving a trading area population of about 18,000. It has a good mix of community businesses and services and its economic base includes forestry, oil and gas and agriculture.

LAND TENURE CLASSIFICATION

The current land tenure classification includes:

- public land
- private land

PUBLIC LAND

There are two types of public land in the Northwest Territories:

- Crown land, which is controlled, managed and administered by the federal government, mostly by Indian and Northern Affairs Canada (INAC)

- Commissioner's land, which is controlled, managed and administered by the Department of Municipal and Community Affairs and the Government of the Northwest Territories. Most Commissioner's land is within established communities.

In Alberta, the pipeline route is believed to be entirely on public land. Detailed analysis of land ownership will be conducted before a final route is selected.

PRIVATE LAND

In the Northwest Territories, private land is owned mainly by aboriginal people with settled land claims. There are three such major landowners in the Northwest Territories – the Inuvialuit, Gwich'in and Sahtu claims beneficiaries. Settlement Private Land Maps 1 to 5 in Volume 2 show the disposition of aboriginal claims settlement land.

Inuvialuit

Under the Inuvialuit Final Agreement, the Inuvialuit retain ownership to:

- 77,700 km^2 of surface rights (excluding oil, gas, related hydrocarbons, coal, native sulphur and minerals)

- 10,878 km^2 of subsurface rights (including all minerals and all granular surface or subsurface materials)

Generally, the land for which the Inuvialuit have subsurface rights is held in blocks of 1,813 km^2 or less, near each of the six established communities.

The Inuvialuit Land Corporation was created to hold title to the Inuvialuit land received under the Inuvialuit Final Agreement. The Inuvialuit Land

Inuvialuit (cont'd)

Administration is responsible for administering and managing the land received under the Inuvialuit Final Agreement. The Inuvialuit Land Administration:

- reviews and approves applications to access and use Inuvialuit land
- ensures that the Inuvialuit receive business, employment and training benefits
- monitors land use operations to ensure protection of the land and environment

Gwich'in

The Gwich'in Comprehensive Land Claim Agreement provided the Gwich'in with title to:

- 16,264 km^2 of private land, with surface rights only
- 6,065 km^2 of private land, including all surface and subsurface rights
- 93 km^2 of private land, to which they hold the subsurface rights only

The Gwich'in Tribal Council holds title to this land. The Gwich'in Land Administration, an administrative body of the Gwich'in Tribal Council, was established to manage its privately owned land. The Gwich'in Land Administration:

- develops policies and procedures for authorizing land use activities
- sets guidelines for, and monitors, land use activities
- maintains a land registry
- collects fees for land use activities
- conducts resource and land use inventories
- oversees land use activities on private land
- consults with Gwich'in communities during land authorization processes

Sahtu

The Sahtu Dene and Métis have title to 39,624 km^2 of private land with surface rights, 1,813 km^2 of which include the subsurface rights.

The Sahtu Dene and Métis have structured their land interests into three districts of equal size. Settlement land in each district is owned by District Land Corporations, which consist of a community or communities in that district. The three District Land Corporations are the:

- K'ahsho Got'ine Land Corporation
- Tulita District Land Corporation
- Déline Land Corporation

In the Fort Good Hope District, the settlement land is owned by the K'ahsho Got'ine District Land Corporation, which is composed of the following land corporations:

- Yamoga Land Corporation
- Fort Good Hope Métis No. 54 Land Corporation
- Ayoni Keh Land Corporation of Colville Lake

In the Tulita District, the settlement land is owned by the Tulita District Land Corporation, which consists of the following land corporations:

- Tulita Land Corporation
- Fort Norman Métis Land Corporation
- Ernie McDonald Land Corporation

In the Déline District, all private land is owned by the Déline Land Corporation.

OTHER LANDOWNERS

Other private landowners include members of the public who hold title to land either inside or outside community boundaries. Indian and Northern Affairs Canada no longer sells land. However, land outside established communities can be leased for five years.

LAND IN THE PRODUCTION AREA

Land Management Categories

All land within the field production and gathering pipeline areas is within the Inuvialuit Settlement Region.

The Inuvialuit Community Conservation Plans identify areas with restrictions for development, which are identified using letters. The greatest level of development restriction is designated Category E and the lowest level is Category A.

None of the land adjacent to the field production and gathering facilities is designated as Category E land. Only two areas designated as Category D land are encountered, the:

- Kendall Island Bird Sanctuary
- Central Mackenzie Estuary

The production area might also affect 14 areas identified as Category C land and three areas identified as Category B land. Although Category A land is also crossed, it is not specified in the Inuvialuit Community Conservation Plans.

Land with Restrictions

Land with restrictions within, and adjacent to, the field production area includes:

- the Kendall Island Bird Sanctuary (Category D land), within which the Taglu and Niglintgak fields are located. Oil and gas exploration and development activities are permitted in this area, which is administered by the Canadian Wildlife Service.

- the Mackenzie River Delta (Category C land), which the Canadian Wildlife Service has identified as a key migratory bird habitat site

- two national historic sites, the Pingo Canadian Landmark and Kittigazuit

- several sites near the project identified as International Biological Programme sites

- Reindeer Station, which has been identified as a potential territorial park or historic site

- the Husky Lakes Management area

Granular Resources

No existing granular resource operations have been identified within the production area. Potential granular resource sites are labelled as borrow sites on Settlement Private Land Map 1 in Volume 2.

Mining

No mines or identified mineral showings are located near the production area. Known deposits of iron, coal, copper, lead and zinc exist within the Mackenzie estuary area, but have yet to be developed.

Oil and Gas

The Taglu, Niglintgak and Parsons Lake natural gas fields are described in Section 3, Field Facilities. To date, the onshore Ikhil natural gas field and its associated pipeline is the only hydrocarbon development in the Mackenzie Delta–Beaufort Sea region.

Exploration licences were issued during 1999 and 2000. Additionally, the Inuvialuit Regional Corporation recently put some of its subsurface land out for bid, resulting in four parcels being allocated.

Exploratory and Significant Discovery Licences have been issued to oil and gas companies for areas surrounding the field production area.

Commercial Hunting, Trapping and Fishing

Some commercial fishing occurs in the Mackenzie Delta area. Every year a number of commercial fishermen are licensed from Aklavik and Inuvik.

Species harvested include broad whitefish, rainbow smelt, char, cisco, saffron cod, inconnu, some lake whitefish and burbot. According to the Beaufort Sea Beluga Management Plan, no commercial fisheries currently exist in the Canadian Beaufort Sea area.

Trapping records show that two trapping areas lie within land associated with the production area. Within these trapping areas, a trapper is required to have a licence issued by the area hunters and trappers committee.

Three known outfitters use land in or near the production area and operate out of Tuktoyaktuk. Their activities include hunting for polar bear, barren ground grizzly, muskox, barren ground caribou, wolf and wolverine.

Other Commercial Activities

The Kuññek Resource Development Corporation has been given approval to revitalize the historic reindeer herding operation. Initially, commercial activities

will be limited to antler harvesting, but plans include meat production and tourism. The herd is located on the Tuktoyaktuk Peninsula and, eventually, will be summered on Richards Island.

Recreational Activities

Some recreational activities have been increasingly popular in recent years, including cruise ship tours, boat tours of the Mackenzie Estuary, kayaking and flight tours.

Cultural immersion tours, including tours of beluga hunting camps, are also increasing in popularity. Other recreation activities include hunting, fishing, dog sledding and snowmobiling.

Heritage and Cultural Sites

Heritage and cultural resources are fragile, nonrenewable resources that are generally situated on or just below the ground surface. Occasionally, they might be preserved in deeply buried sites. A search of the site database at the Prince of Wales Northern Heritage Centre has been completed for all the land associated with the production area.

The presence of prehistoric material at sites used currently or in the recent past indicates long-term continuity of certain cultural practices. Six cultural sites on land within or immediately adjacent to the proposed production area are currently on record.

LAND IN THE PIPELINE AREA

Areas Designated for Limited Development

The pipeline route would traverse one area designated for limited development and several other areas proposed for designation as areas of limited development. Several proposed or existing areas of limited development would not be traversed by the pipeline, but are near the project.

Gwich'in Settlement Area

Existing and proposed protected areas identified from the Gwich'in Land Use Plan include:

- Campbell Creek Special Management Area
- proposed Lakes Around Travaillant Lake Special Management Area
- proposed Travaillant Lake, Mackenzie and Tree River Protected Area
- proposed Thunder River Heritage Site

Gwich'in Settlement Area (cont'd)

- Gwich'in Territorial Park, which is located about 20 km from the proposed pipeline area

Sahtu Settlement Area

Existing and proposed protected areas identified by the Sahtu Land Use Planning Board include:

- land adjacent to the reaches of the Mackenzie and Great Bear rivers within the Sahtu Settlement Area, as well as Mount Effie, which are considered Sahtu heritage sites
- land around Chick Lake and north of Fort Good Hope that has been designated for consideration as future heritage sites
- Kelly Lake Protected Area, which lies about 12 km to the east of the proposed pipeline area
- Brackett Lake and Brackett River area, once considered for designation as an International Biological Programme site

Deh Cho Region

The Deh Cho are currently working on a strategy for protected areas that might provide information on other proposed protected areas. This strategy might include a proposal for protecting the Ebbutt Hills, which is an International Biological Programme site, as well as land adjacent to the Willowlake River.

The Ede'hzeh (Horn Plateau) candidate protected area has achieved interim protection as part of the Northwest Territories Protected Areas Strategy process. A pipeline corridor has been included in the proposed protected area.

Northwestern Alberta

Land in the pipeline area in Alberta lies within the Northern Boreal Caribou Protection Area.

Granular Resources

Several developed granular sites are found adjacent to the Dempster Highway. Records exist for recent granular resource use near Tulita. In addition, several previously used and existing granular pits are located near Norman Wells and along the Mackenzie Highway between Fort Simpson and Wrigley. Potential granular resource sites are identified as borrow sites on Settlement Private Land Maps 1 to 5 in Volume 2.

Timber Resources

Recent records indicate that timber harvesting occurs in the Tsiigehtchic area and near Norman Wells, and timber harvesting and mill operations occur within the Sahtu Settlement Area and the Deh Cho Region. A forest management agreement has not been established for the pipeline area within Alberta.

Mining

No existing mines have been identified near the pipeline area. In the Northwest Territories, no ore deposits of interest have been identified near the pipeline area within the Gwich'in Settlement Area or the Sahtu Settlement Area. Mineral showings of copper, iron and zinc have been identified north of Wrigley in the Deh Cho Region.

In Alberta, no mines or areas of mineral exploration are located close to the pipeline area.

Oil and Gas

The most prominent oil and gas activity in the pipeline area is the Norman Wells oilfield and associated pipeline. In addition, several oil and gas exploration licences have been issued for areas near the pipeline area in the Gwich'in Settlement Area and the Sahtu Settlement Area. Some Significant Discovery Licences are also held in the Colville Lake area.

Historically, some hydrocarbon exploration has taken place within the pipeline area near Wrigley and south of the Mackenzie River. Currently, the closest locations of oil and gas activity in the Deh Cho Region are in the Fort Liard and Cameron Hills areas. Both these areas are located more than 100 km away from the proposed pipeline area. In Alberta, several existing oil and gas developments are located near the pipeline area. Developments include seismic exploration sites, well sites and pipelines.

Commercial Hunting, Fishing and Trapping

Trapping furbearers within the Gwich'in Settlement Area and the Sahtu Settlement Area is only permitted for participants of the Gwich'in Comprehensive Land Claim or the Sahtu Comprehensive Land Claim. The pipeline route does not traverse any designated guide or outfitter areas within the Gwich'in Settlement Area, Sahtu Settlement Area or the Deh Cho Region.

Other Commercial Activities

The Mackenzie River is an important transportation corridor for barges and other boats, which deliver goods to many of the towns along its banks and to communities on the Beaufort Sea and other parts of the Arctic. During the winter,

Other Commercial Activities (cont'd)

the winter extension of the Mackenzie Highway, which reaches as far north as Fort Good Hope, is an important transportation corridor.

Recreational Activities

Tourism is the third leading industry of the Northwest Territories, ranking behind minerals and oil and gas, and is considered to be a growing sector. Recreational activities conducted by nonresidents in and around the pipeline area include hunting and fishing as well as water-oriented activities on the Mackenzie River and its major tributaries.

Heritage and Cultural Sites

Heritage and cultural resources are fragile, nonrenewable resources that are generally situated on or just below the ground surface. Occasionally, they might be preserved in deeply buried sites. A search of the site database at the Prince of Wales Northern Heritage Centre has been completed for all the land within the pipeline area.

About 100 cultural sites might be associated with the gathering system and the transmission pipeline system. About 20 of these sites are within a 1 km corridor centred on the alignment for the gathering system and transmission pipeline, and the remainder are located in areas nearby. These sites include buried and surficial historic and prehistoric period sites.

Residential and Other Urban Areas

Most of the permanent residences in the project areas are located within the communities previously listed in Table 8-1. However, seasonal residences, usually hunting and fishing camps and cabins, are located along the Mackenzie River and throughout the project areas.

The preferred locations of the transmission pipeline and project facilities have yet to be determined. The facility sites and pipeline routing will be the subject of a detailed technical study and extensive public consultation. Traditional knowledge, environmental, social, economic, engineering and public safety concerns will be carefully assessed as integral parts of this process.

Facility siting and routing information suggests that the established residential areas most likely to be close to the project areas are Inuvik and Norman Wells. Residents in the community of Norman Wells in particular are familiar with the implications of being near significant oil and gas facilities, and will be able to provide valuable and informed input to the siting, routing and planning processes.

SOCIO-ECONOMIC STUDIES

Socio-Economic Work Plan Components

The socio-economic work plan consists of six elements:

- socio-economic baseline studies and an impact assessment
- a traditional knowledge (TK) assessment
- a human health effects assessment
- a public participation program, including specific regulatory requirements, such as:
  - scoping and assessing issues
  - tracking and reporting issues
- land and resource use studies
- heritage resource studies and an impact assessment

For a summary of the current and proposed socio-economic, land use, heritage resources and TK studies, see Table 8-3. Additional studies might be undertaken or the scope of the current studies modified.

Data Collection

Because of the complex nature of the issues, some aspects of the socio-economic work plan will be modified as new information is received. Information from interested parties, particularly from residents in individual regions and communities, will be used to help define the program. Work has begun on all aspects of the study program.

Each of the aboriginal regions and many communities have documented relevant data for the TK component. This data can be classified as intellectual property. It is variable in nature, region-specific, and can only be accessed through community-specific or regional-specific agreements. Traditional knowledge has important links to biophysical studies and could require significant lead time to complete. Discussions on the agreements required, including relevant scope and protocols for conducting these studies, have begun in all regions.

Socio-Economic Study Process

The field-based activity required to support the data collection and analysis requirements is expected to include several rounds of community visits, which will involve:

- collecting data using participative methods
- verifying the data collected
- scoping issues
- assessing impacts
- establishing mitigation, monitoring and management plans

The study teams will include regional or community coordinators or advisors as key participants and facilitators of the data collection and analysis process.

The level of TK program activities with a community will depend on the specific provisions agreed to with each region or community.

The public participation program will include coordinating with, and participating in, the overall project communication and consultation program and regional technical workshops, to ensure that issues scoping, tracking and management are adequately addressed.

The work plan is designed to assess the project's potential socio-economic effects, including:

- changes in traditional resource access and use
- changes in the quality and type of traditional resource use
- creating employment opportunities
- creating business opportunities
- effects on population and demographics, including migration
- effects of growth on infrastructure and services
- changes in personal, corporate and government income and expenditure patterns
- changes in community well-being and quality of life

Table 8-3: Current and Proposed Socio-Economic and TK Studies for Mackenzie Gas Project

Study Type	Study Activities	Location	Purpose	Method
Socio-Economic	Identify appropriate study area communities.	NWT and Alberta	Identify areas and communities that might be affected by the project.	Determine the area likely to be affected by project employment, construction and operations effects.
	Draft generic community profiles for the study area communities.	Study area communities	Identify and use the data available to achieve a preliminary understanding of the communities affected and determine data gaps.	Collect all relevant, accessible statistical data.
	Identify socio-economic data gaps and fill them participatively.	Study area communities	Develop a comprehensive understanding of the current profile of the communities that might be affected by the project.	Consult with informed community members in verifying existing data, and sourcing locally any added statistical and qualitative data needed for the baseline report.
	Prepare a preliminary socio-economic issues list.	Study area communities	Identify possible impacts on the communities that might experience project effects.	Identify the current conditions and relevant resources essential to the current levels of community well-being in communities that might experience project effects.
	Begin the assessment process and issues scoping in consultation with community members. Prepare lists of valued socio-economic components.	Study area communities	Establish that the assessment process meets community needs and expectations, and that the baseline report contains all the indicators needed to evaluate possible project effects, and focuses on key issues.	Consult with informed community members regarding valued socio-economic components and potential impact issues posed by the project, and the assessment process or method.
	Produce a baseline report for the socio-economic study area.	Study area communities	Establish that the indicator data needed to monitor project effects on valued socio-economic components has been collected in appropriate form for monitoring relevant project effects.	Establish that the baseline report includes indicator data relevant to all of the socio-economic issues and valued components that were identified in community consultations.
	Produce on impact assessment technical report.	Study area communities	Provide the assessment required for the regulatory application.	Evaluate the vulnerability of valued socio-economic components to the expected effects of the project, and design mitigation measures.
	Produce an Environmental Impact Statement (EIS), develop mitigative measures in consultation with area communities, and revise as needed.	Study area communities	Establish a participative assessment and plan for addressing project effects on communities, and comply with regulatory requirements.	Conduct community participation sessions at which the project, the expected effects of the project, and the proposed mitigation are discussed, critiqued and modified.

Table 8-3: Current and Proposed Socio-Economic and TK Studies for Mackenzie Gas Project (cont'd)

Study Type	Study Activities	Location	Purpose	Method
Traditional Knowledge (TK)	Consult with the communities regarding existing TK and the process that is needed to fill any gaps.	Study area communities	Determine the extent and current locations of archived TK, and develop region-specific approaches to access the data and conduct new TK studies.	Hold consultation meetings with regional cultural institutions and leaders to identify TK program requirements and appropriate approaches.
	Conduct TK data gap analyses, and identify the TK yet to be collected.	Study area communities	Identify where and what kinds of TK studies are required to best evaluate the effects of the project and meet regulatory requirements.	Compare the types of existing TK and the areas to which it pertains with the project's need for TK, and identify all relevant data needs.
	Formulate the content needed in TK collection protocols, for efficient TK collection.	Study area communities	Establish an orderly, efficient and comprehensive TK collection process.	Establish that TK working groups specify appropriate, efficient methods for collecting the required TK.
	Collect and verify the required TK data, and produce TK reports.	Study area communities	Establish that all relevant TK is accurately collected and made available for improving the accuracy of predicting project effects, and establish that the TK collected contributes to project planning and meets regulatory requirements.	Make contractual arrangements with local communities or community cooperation agencies to collect and verify the needed TK. Monitor the execution of these arrangements.
Land and Resource Use	Identify and verify current land use and land use trends.	Production and pipeline areas	Identify any nontraditional land use that is present within the study areas.	Conduct a literature review and synthesize data. Conduct discussions with resource managers.
	Identify potential issues and associated mitigation.	Production and pipeline areas	Determine which land use might be affected by the proposed development, and how to offset those effects.	Conduct discussions with resource managers.
Heritage Resources	Phase 1: Conduct an overview assessment of the potential of a landform to have an associated heritage resource.	Production and pipeline areas	Identify potential heritage resource issues within the study areas.	Conduct preliminary reviews of relevant literature.
	Phase 2: Carry out a reconnaissance study.	Production and pipeline areas	Identify some of the heritage sites within the study areas, and assess specified locations to help in the route selection process.	Conduct detailed field surveys, and record any sites located according to the Northwest Territories Archaeological Sites Regulations.

Table 8-3: Current and Proposed Socio-Economic and TK Studies for Mackenzie Gas Project (cont'd)

Study Type	Study Activities	Location	Purpose	Method
Heritage Resources (cont'd)	Phase 3: Acquire site-specific information and produce baseline and permit reports.	Production and pipeline areas	Establish that all required heritage resource information is collected and used to assess project effects, and meets all permit requirements.	Perform in-field assessment activities, and complete post-field analysis and reporting.
	Phase 4: Do post-assessment work.	Production and pipeline areas	Collect or verify information required to offset the impacts of development.	Conduct field studies as required.

SCOPE OF STUDY AREAS

Two study areas were identified for describing the existing biophysical features in the vicinity of the proposed Mackenzie Gas Project:

- a Production Study Area
- a Pipeline Study Area (see Section 9.2)

PRODUCTION STUDY AREA

The Production Study Area (see Figure 9-1) includes:

- the three anchor field areas
- a 1 km buffer around each field area
- a 1 km-wide corridor centred on the alignment for the gathering pipeline between the Niglintgak and Taglu field areas, the gathering system from Taglu south to the compressor station near Inuvik, and the gathering pipeline from Parsons Lake to the gathering system

Site-specific surveys were undertaken near the proposed infrastructure locations, such as barge landing sites, stockpile and borrow sites. For the location of these sites in the production area, see Gathering System Routing Maps 1 to 3 in Volume 2.

BIOPHYSICAL FEATURES

Existing biophysical features within the Production Study Area include:

- air quality
- noise
- aquatic features, including:
  - hydrogeology
  - hydrology, including water quality
  - fisheries
- terrestrial features, including:
  - geology
  - permafrost
  - soils
  - vegetation
  - wildlife

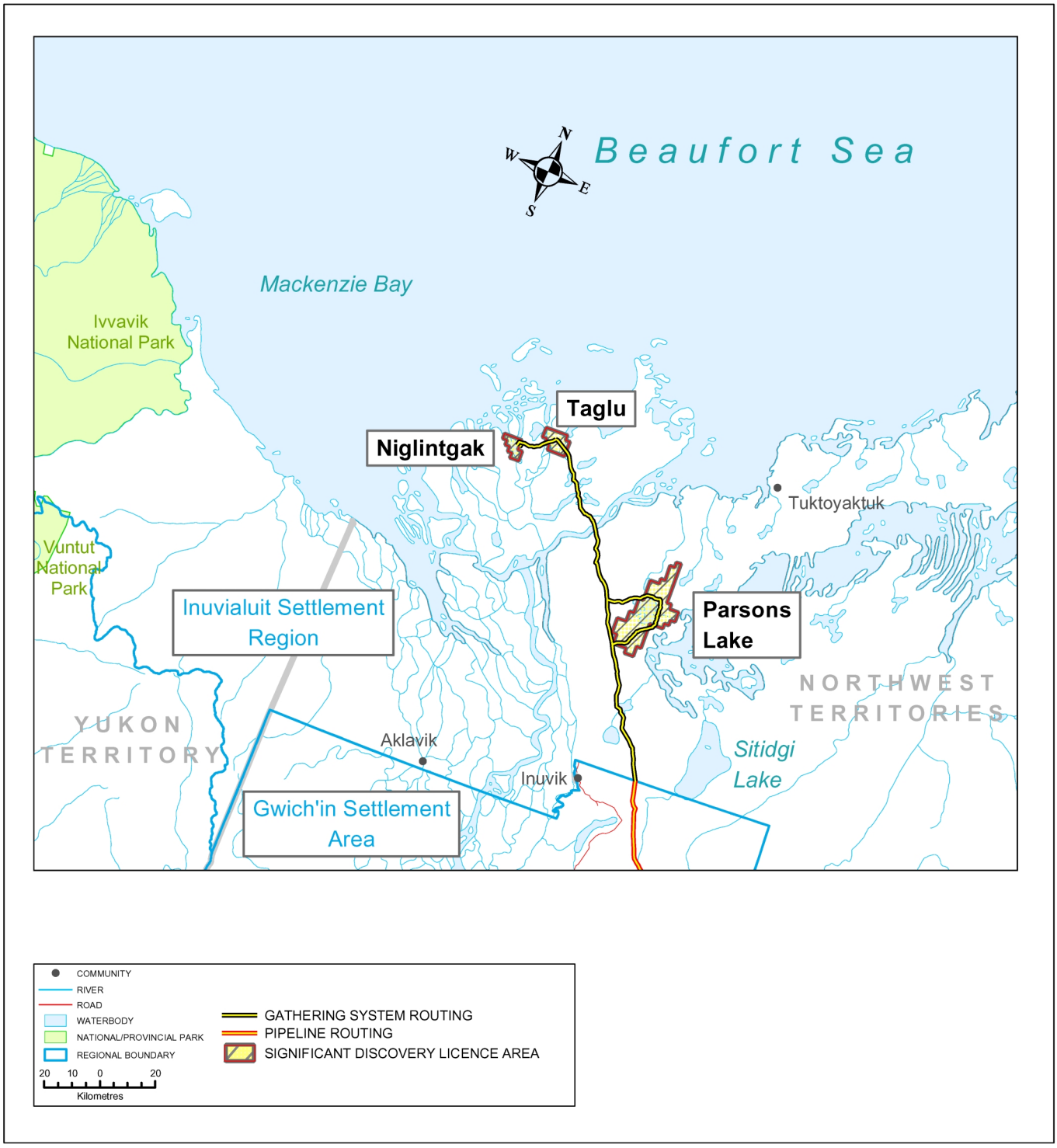

Figure 9-1: Mackenzie Gas Project Production Study Area

AIR QUALITY

The existing air quality in the area affected by the project is typical of northern environments in Canada. Natural and anthropogenic airborne particulate matter is transported into the area. This creates Arctic haze conditions, which are most evident in March and April.

The natural background air quality in the Production Study Area includes gaseous and particulate emissions from:

- terrestrial and marine sources
- volcanic activity
- forest fires

Local anthropogenic sources of emissions include:

- ground and aerial transportation activities
- petroleum exploration and development
- home heating units in small communities

NOISE

Currently, noise emissions in the Production Study Area are from localized intermittent sources, such as:

- vehicle traffic in winter
- barge and boat traffic in summer
- air traffic all year
- petroleum exploration activities in winter
- compressor stations
- processing facilities

AQUATIC FEATURES

Hydrogeology

Hydrogeological features encountered within the Production Study Area include:

- seasonal springs and naturally occurring icings
- retrogressive thaw flow slides along the edges of lakes and streams
- pingos
- thermokarst

Hydrology

The Mackenzie Delta is the largest Canadian delta, with an active area of 12,170 km^2. Surface waters of the Mackenzie Delta include major (West, Middle

Hydrology (cont'd)

and East) and minor tributary channels of the Mackenzie River and deltaic lakes. About two-thirds of the Mackenzie River flows through the Middle Channel.

Waterbodies within the Production Study Area vary from small sloughs and dry, ephemeral drainages to large channels and lakes and brackish coastal bay areas of the southeastern Beaufort Sea.

Waterbodies near the Taglu and Niglintgak field areas include Big Lake and Kimialuk Lake, as well as several Mackenzie River channels (Middle, Kumak, Kuluarpak, Harry and East) and the Yaya River.

Waterbodies in the Parsons Lake field area include Parsons Lake, East and West Hans lakes, and Zed and Hans creeks.

The freshwater delta floodplain lakes are recharged through spring flooding of the Mackenzie River's sediment-laden waters. The duration of spring flooding, and the degree of connection between a floodplain lake and the river, determines the physical, chemical and biological properties of these delta lakes. The delta channels and lakes are well supplied with nutrients. However, the productivity of these waterbodies appears to be controlled by turbidity, substrate stability, abrasion and climate, rather than by nutrients.

Lakes in the southern third of the delta are seldom flooded, and typically have clear waters and organic sediments. Oxygen is often depleted under winter ice. Alkalinity levels indicate that waterbodies are well buffered against acid deposition.

Waterbodies in the Parsons Lake area are well oxygenated and have low to moderate concentrations of major ions. High alkalinity levels indicate that waterbodies are well buffered against acid deposition. Total phosphorous concentrations indicate eutrophic waterbodies.

Fisheries

Thirty species of fish are known to be present in the Production Study Area, including freshwater fish and marine to brackish and anadromous species. Fish use of various waterbodies ranges from extremely limited or no use, to all-year use by multiple species. Some habitats are only used for a certain life stage, while others are used for all life stages.

TERRESTRIAL FEATURES

Geology

The Production Study Area is situated in the Mackenzie Delta, which is a physiographic subdivision of the Arctic Coastal Plain. The surficial geology

adjacent to Niglintgak and Taglu is predominantly of modern deltaic origin. Parsons Lake lies within the Pleistocene Coastal Plain.

Bedrock in the Mackenzie Delta area is sedimentary, composed primarily of Tertiary shale and sandstone. Preglacial, glacial and postglacial deposits overlie the bedrock. The depth to the top of bedrock ranges from 70 m near Inuvik to over 150 m near the seaward limit of the modern delta. Depth to bedrock at Richards Island is about 60 m.

In the northern part of the Caribou Hills, adjacent to the Parsons Lake region, Tertiary shale is at, or near, the surface, beneath a thin veneer of glacial deposits. The bedrock consists of poorly indurated interbedded conglomerate, sandstone and mudstone. The bedrock in the southern part of the Caribou Hills is also exposed and consists of Cretaceous shale.

The surficial geology within the Production Study Area comprises:

- recent, level alluvial deposits from the Mackenzie Delta – north and northwest of Inuvik
- hummocky glacial till – north and northeast of Inuvik

Depths of surficial deposits range from thin colluvium deposits covering bedrock in the southeast of the Production Study Area, to 150 m of silt and fine sand with high organic content near the northern limit of the delta.

The topography within the Production Study Area is generally level, with elevations ranging from sea level in the delta to 150 m towards Parsons Lake. Most of the Niglintgak site is at elevations of less than 3 m. The topography near Parsons Lake is rolling, with elevations of up to 150 m in some areas.

Permafrost

Permafrost underlies about two-thirds of the Mackenzie Delta. Both the Niglintgak and Taglu fields are within the continuous permafrost zone. Parts of the Production Study Area lying south of the East Channel of the Mackenzie River, including the Parsons Lake field, are also located within the continuous permafrost zone.

Soils

Soils in the Production Study Area include:

- Cryosols – ice-rich material
- Organic soils – organic-rich surface material
- Gleysols – poorly drained material
- Regosols – soils subject to flooding or erosion

Soils (cont'd)

Where permafrost occurs, the depth of the active layer in the soil column ranges between 30 and 100 cm.

Vegetation

The Production Study Area lies within the Southern Arctic Ecozone, which represents the shift from taiga forest in the south to tundra in the north. In the northwest tip of the ecozone, where the Production Study Area is located, this shift is more rapid and the tree line transition is more abrupt. There is a gradient of change from coniferous-dominated vegetation types, to shrub and graminoid vegetation types. Within this ecozone, the Production Study Area crosses the Tuktoyaktuk Coastal Plain and Mackenzie Delta ecoregions.

Abundant low shrubs, sedges and mosses characterize tundra. Primary forest species include black spruce, white spruce and tamarack with alder and willow shrubs and a ground cover of herbs, sedges, cotton grass, moss and lichens. Thirty-four rare vascular plant species have the potential to occur in the Production Study Area.

Wildlife

Wildlife is a fundamental element of northern culture and an important subsistence resource for residents in all of the communities in the Mackenzie Delta. Previous studies and preliminary input by community residents and government officials indicate that 20 species of mammals and 34 species of birds are considered important. This is based on subsistence use, management concerns and ecological sensitivity.

The diversity, distribution and abundance of wildlife species in the Production Study Area are influenced by the vegetation types that occur there. Wildlife use of the area varies by season, with most use occurring in the summer. In winter, only a few species, such as Arctic fox, red fox, lemming and snowshoe hare, might occur where shrubby vegetation types offer security and thermal protection. During other times of the year, wildlife use occurs in areas with relatively drier grass and shrub vegetation types.

Caribou and Reindeer Habitat

Caribou and reindeer use of the Production Study Area varies by season, with most use occurring in the summer. An exception is the Cape Bathurst and Bluenose West caribou herd that uses the Parsons Lake area in the winter.

Caribou and reindeer also use Holmes Creek, the only forested riparian valley in the Production Study Area. The riparian black spruce and shrub and other dense shrub types in the Holmes Creek riparian corridor provide food, visual cover and thermal protection, particularly in the winter.

Moose Habitat

Moose use of the Production Study Area varies by season, with most use occurring in the summer. Moose also use the favourable habitat in the Holmes Creek area and the lowlands adjacent to the East Channel of the Mackenzie River.

Grizzly Bear and Red Fox Habitat

The coastal tundra on Richards Island and adjacent areas provides excellent habitat and numerous denning locations for grizzly bear and red fox. Other areas of importance for grizzly bear include the southern portion of Tuktoyaktuk Peninsula to Inuvik and Holmes Creek. The area from the northern coast of Richards Island to Parsons Lake is also considered important for the red fox.

Muskrat Habitat

The delta region west of the Caribou Hills provides important habitat for muskrat and supports the highest muskrat densities within the Production Study Area.

Bird Habitat

The Mackenzie Delta is important to waterfowl for breeding, moulting and staging. Many of the lagoons and bays along the coast provide waterfowl habitats. The northern coastline of Richards Island is noted for shorebird staging.

The middle and southern parts of the delta have more wooded habitat and numerous freshwater lakes, and are important breeding areas for birds, including:

- brant geese, whose important nesting areas are:
    - east of Pelly Island
    - on the islands south of Kendall Island
    - Rae Island
    - Denis Lagoon
- snow geese, which nest on the islands south of Kendall Island
- white-fronted geese, which are found in large numbers in:
    - the Kendall Island Bird Sanctuary and neighbouring areas
    - the Parsons Lake area
- other species of geese, large numbers of which stage in Kittigazuit Bay, and which have important moulting areas on Richards Island
- tundra swans, whose important nesting areas are:
    - Mallik Bay

- near Kendall Island
- Olivier Islands
- along Shoalwater Bay

PIPELINE STUDY AREA

The Pipeline Study Area includes a 1 km-wide corridor centred on the alignment for the transmission pipeline from Inuvik to northwestern Alberta (see Figure 9-2). Detailed field surveys were focused within this 1 km area. In several areas, such as Travaillant Lake, Great Bear River and Ebbutt Hills, a wider area was surveyed to reflect potential environmental sensitivities, as well as potential realignments of the pipeline to avoid these sensitive areas. Reconnaissance-level surveys were conducted over a broader area in conjunction with preliminary assessments for potential infrastructure sites and borrow sites.

For details on the pipeline route, see Pipeline Routing Maps 1 to 18 and Settlement Private Land Maps 1 to 5 in Volume 2.

BIOPHYSICAL FEATURES

The biophysical features within the Pipeline Study Area include:

- air quality
- noise
- aquatic features, including:
  - hydrogeology
  - hydrology, including water quality
  - fisheries
- terrestrial features, including:
  - geology
  - permafrost
  - soils
  - vegetation
  - wildlife

AIR QUALITY

The existing air quality within the Pipeline Study Area is typical of northern environments in Canada. Natural and anthropogenic airborne particulate matter is transported into the area. This creates Arctic haze conditions, which are most evident in March and April.

The natural background air quality includes gaseous and particulate emissions from:

- terrestrial and marine sources
- volcanic activity
- forest fires

AIR QUALITY (cont'd)

Local anthropogenic sources of emissions include:

- ground and aerial transportation activities
- petroleum exploration and development
- home heating units in small communities
- crude-oil production facilities in Norman Wells
- oil and gas facilities in northwestern Alberta

NOISE

Currently, noise emissions along the Pipeline Study Area are from localized intermittent sources, such as:

- vehicle traffic all year
- barge and boat traffic in summer
- air traffic all year
- petroleum exploration activities in winter
- crude-oil production facilities in Norman Wells
- oil and gas facilities in northwestern Alberta

AQUATIC FEATURES

Hydrogeology

Hydrogeologic features within the Mackenzie Valley include areas of all-year groundwater flow, particularly in the karst topography in the southern regions.

Groundwater inflow to streams in the form of springs and seeps maintains stream baseflow. Perennial springs related to karstification of carbonate rocks are common between Willowlake River and Chick Lake, and help to maintain stream flow in winter. Icings and open water stretches along streams in winter are an indication of groundwater inflow.

Seasonal springs and seepages originating from shallow flow systems in other permeable sediments are present in other areas, even within zones of continuous permafrost. These generally originate in ice-free sands and gravels within kame and esker complexes or glacial outwash.

Hydrology

The Mackenzie River is the largest north-flowing river in North America. The Mackenzie River Basin contains the longest drainage system in Canada, flowing about 4,000 km from the Finlay River headwaters in British Columbia to the Beaufort Sea. Draining one-fifth of Canada's total area, the drainage basin is the second largest in North America and the sixth largest in the world.

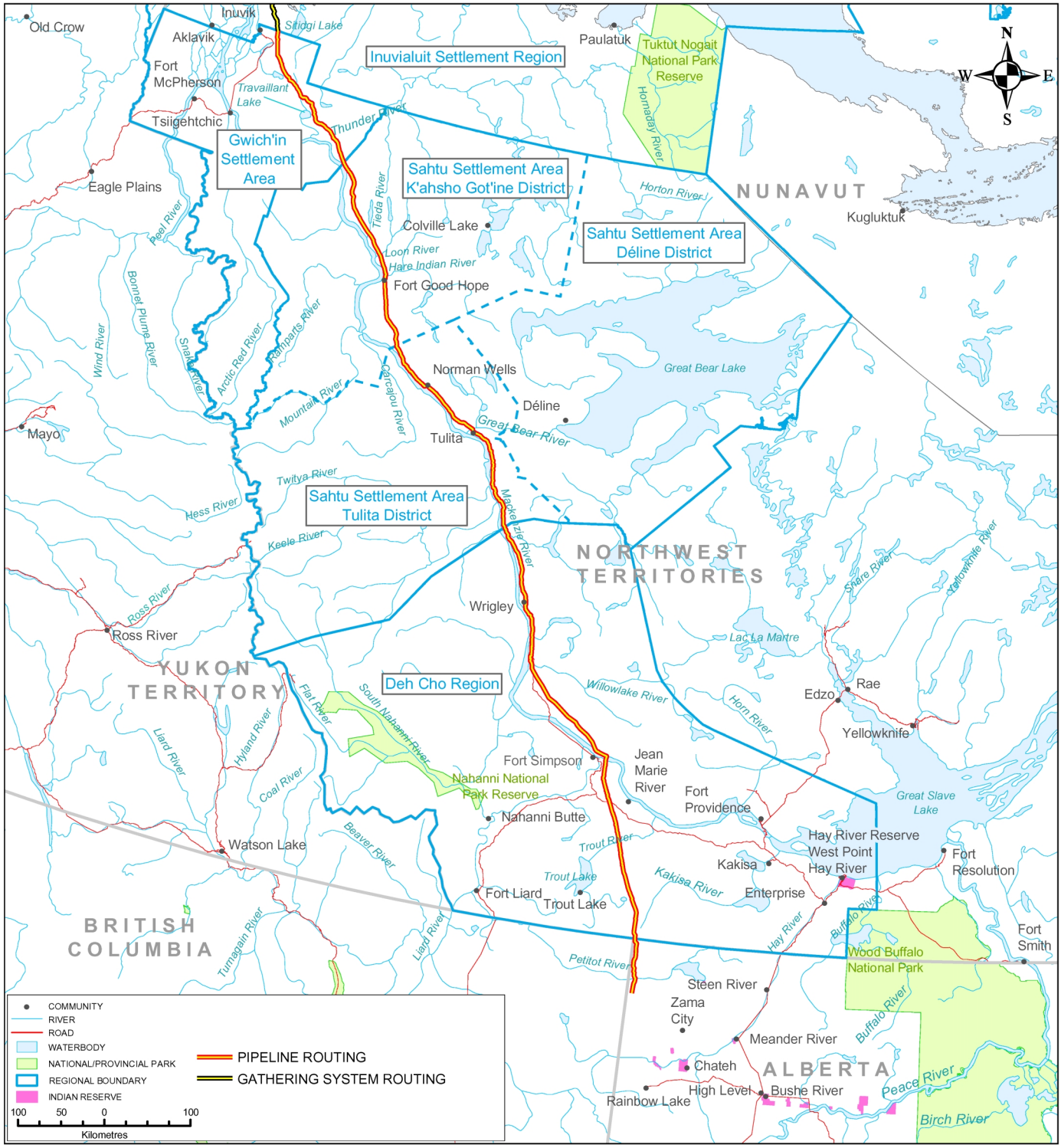

Figure 9-2: Mackenzie Gas Project Pipeline Study Area

Hydrology (cont'd)

The two largest tributaries to the Mackenzie River, adding the most drainage basin area, are the Liard River and Great Bear River. Other notable rivers include the Travaillant, Thunder, Tieda, Loon, Hare Indian, Blackwater and Willowlake. Drainage is generally poor, with much of the Pipeline Study Area consisting of wetlands and bogs.

Rivers in the Mackenzie Valley exhibit a mean monthly flow pattern dominated by snowmelt and freezing. The maximum monthly discharge occurs between May and July. As the snow pack wanes, flow gradually depends on base flow. Discharge decreases throughout the summer and fall and into the winter, as ground temperatures decline and freeze-up begins. From January to March, discharge is low, because precipitation occurs as snow, and base flow is severely limited by the deeply frozen land surface.

The pipeline will cross more than 500 waterbodies along its path from the Production Study Area in the Mackenzie Delta to the southern terminus. These waterbodies vary from dry, ephemeral drainages to large rivers, such as the Mackenzie River.

Fisheries

The Mackenzie River and its tributaries support both anadromous and resident fish species. Previous studies in the area have documented 15 species of fish that are important sport fish or fish harvested for food. Ten of these are anadromous and five are resident species. An additional 13 nonsport species have also been recorded or are suspected within the area. The fish habitat use in the various waterbodies ranges from extremely limited or no use, to all-year use by multiple species and all life stages.

TERRESTRIAL FEATURES

Geology

The Pipeline Study Area includes portions of three geological subregions:

- Mackenzie Valley North
- Mackenzie Valley South
- Great Slave Plain–Alberta Plateau

Mackenzie Valley North

Mackenzie Valley North falls within the Anderson Plain physiographic region and is underlain by Upper and Middle Devonian shale.

Surficial deposits within Mackenzie Valley North consist of hummocky moraine and glaciolacustrine silt and clay. Areas of bog and fen and thermokarst

depressions filled with organic-rich silts and clays occur along the northern portions of the Pipeline Study Area. South of Fort Good Hope, an extensive organic deposit underlies most of the Mackenzie Valley corridor.

The terrain of Mackenzie Valley North is relatively flat and featureless, except for a few areas that have hummocky topography with drumlins. Elevation ranges from 90 to 300 m. The highest point is north of Fort Good Hope and the lowest is within the narrow lowland adjacent to the Mackenzie River.

Mackenzie Valley South

Mackenzie Valley South is situated within the eastern part of the Mackenzie Plain and the adjacent Norman and McConnell ranges of the Franklin Mountains. It is underlain by Lower Cretaceous bentonitic clay shale and sandstone along its northern part with occasional sinkholes and limestone outcrops along the Norman and McConnell ranges. Upper Devonian and Lower Cretaceous shales underlie the southern part.

The surficial geology of Mackenzie Valley South is complex, consisting of:

- glacial till
- glaciolacustrine sediments
- moraine
- colluvium
- bedrock exposures
- peatlands
- fen lands

The terrain of Mackenzie Valley South varies from level to undulating topography with an elevation of about 150 m in the north, to rolling topography with elevations between 200 and 300 m in the south. However, elevations can exceed 1,500 m in the Norman and McConnell ranges.

Great Slave Plain–Alberta Plateau

The Great Slave Plain–Alberta Plateau lies within the Great Slave Plain and the Alberta Plateau physiographic region. It is underlain by Upper Devonian fine-grained strata and the Lower Cretaceous shale.

Within the Great Slave Plain–Alberta Plateau, surficial deposits include:

- glacial till
- silts and sands (near the Mackenzie River)
- glaciolacustrine silts
- organic deposits

Great Slave Plain–Alberta Plateau (cont'd)

The topography of the Great Slave Plain–Alberta Plateau is level to gently undulating. The elevation along this section ranges from 150 m near the Mackenzie River to a maximum of 750 m along the southern boundaries of the Redknife Hills between the Great Slave Plain and the Alberta Plateau.

Permafrost

Permafrost in the Pipeline Study Area ranges from the continuous permafrost zone north of Latitude 67.5°N to the discontinuous to sporadic permafrost zone south of Latitude 62.5°N. Localized patches (less than 10%) of isolated permafrost occur in the Fort Simpson area. South of 60°N to the pipeline terminus in Alberta, less than 10% of the land area is underlain with permafrost. Frost action and permafrost processes have left numerous landforms that are particular to the North, such as:

- sorted stripes
- polygons
- peat palsas
- frost boils
- earth hummocks
- solifluction lobes

Soils

About 80% of the soils between Inuvik and Norman Wells have developed on mineral parent materials, including:

- moraine deposits (50%)
- bedrock and colluvium (15%)
- glaciolacustrine deposits (15%)

Organic soils have generally developed over glaciolacustrine deposits and in small areas of alluvial and glaciofluvial materials along the valley. Permafrost is prevalent within 1 m of the surface.

The soils between Norman Wells and Willowlake River are deeper and less influenced by permafrost, particularly in the southern half of this area. However, as much as 40% of the soil in this region shows evidence of some permafrost activity. Within this region, 90% of the soils are developed on mineral parent materials, with those on morainal plains (45%) and bedrock and colluvium (30%) being most prevalent. Organic soils occur in about 10% of this area.

The remainder of the Pipeline Study Area lies within the Great Slave Plain–Alberta Plateau where organic soils are common, covering about 25% of the corridor, particularly south of Fort Simpson. These soils occur in low-lying

plains between upland ridges and hills on morainal deposits and glaciolacustrine plains. The peat layer is normally over 1 m thick and is developed from sedge, moss and tamarack vegetation. Permafrost is common in bog and forest-type peatlands, but uncommon in fen-type landforms. Within this region, 75% of the soil is developed on mineral parent materials. Soils on moraine (till) deposits (50%) and glaciolacustrine deposits (15%) are most common.

Vegetation

The Pipeline Study Area is located in the Taiga Plains Ecozone and crosses the following eight ecoregions:

- Great Bear Lake Plain
- Norman Range
- Fort McPherson Plain
- Mackenzie River Plain
- Franklin Mountains
- Horn Plateau
- Hay River Lowlands
- Northern Alberta Uplands

Great Bear Lake Plain

Great Bear Lake Plain is characterized by open, stunted stands of black spruce and tamarack, with secondary quantities of white spruce, and ground cover of dwarf birch, willow, ericaceous shrubs, cotton grass, lichen and moss. Tussock tundra and low shrub tundra occur in the northern part of the ecoregion.

Norman Range

The Norman Range is characterized by open stands of black spruce and a ground cover of dwarf birch, Labrador tea, lichen and moss. Drier sites tend to have more white spruce, tamarack, white birch and aspen. Wet sites have bog–fen vegetation, such as black spruce, Labrador tea, ericaceous shrubs and mosses.

Fort McPherson Plain

The Fort McPherson Plain is characterized by open, stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen and moss. Poorly drained sites usually support tussocks of sedge, cottongrass and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. Wetlands cover over 25% of the area in the north of the ecoregion and over 50% of the area in the south.

Mackenzie River Plain

The Mackenzie River Plain is characterized by tall to medium stands of closed black spruce and a ground cover of feathermoss, bog cranberry, blueberry, Labrador tea and lichens. Jack pine stands are present south of Tulita. Drier sites have more open stands of black spruce and jack pine. White spruce, balsam poplar and aspen can occur in warmer, moister sites in the southern section of the region. Poorly drained, peat-filled depressions are dominated by low stands of black spruce, ericaceous shrubs and sphagnum moss. Wetlands cover 25 to 50% of the ecoregion and are characteristically peat plateau bogs and ribbed and horizontal fens.

Franklin Mountains

The Franklin Mountains are characterized by open stands of black spruce and a ground cover of dwarf birch, Labrador tea, lichen and moss. Drier sites tend to have more white spruce, white birch and aspen. Wet sites have bog–fen vegetation, such as dwarf black spruce, Labrador tea, ericaceous shrubs and mosses.

Horn Plateau

The Horn Plateau is characterized by low to medium closed stands of black spruce and jack pine and an understory of feather moss, bog cranberry, blueberry, Labrador tea and lichens. White spruce, balsam fir and aspen occur in warmer, moister sites in the southern part of the region. Drier, colder sites have more open stands of black spruce and jack pine. Poorly drained, peat-filled depressions are dominated by low stands of black spruce, ericaceous shrubs and sphagnum moss. Wetlands cover 50% of the ecoregion and are characteristically peat plateau bogs, palsa and fens.

Hay River Lowlands

The Hay River Lowlands are characterized by closed mixed stands of trembling aspen, balsam poplar, white spruce and balsam fir on drier sites. Poorly drained fens and bogs, covered with tamarack and black spruce, occupy about 30% of this area.

Northern Alberta Uplands

The Northern Alberta Uplands are between 50 and 70% wetlands, covered in stands of stunted black spruce and tamarack. Other stands are closed mixed stands of trembling aspen, balsam poplar, white spruce and balsam fir on drier sites.

Rare Species

Within the northern part of the Mackenzie Valley, four endemic species and 14 nationally rare species have been recorded, whereas 33 rare vascular species have

been reported in the southern Mackenzie Valley. In Alberta, 24 rare vascular species are known to occur within the natural subregions that the transmission pipeline might cross.

Wildlife

Wildlife is a fundamental element of northern culture and a critical subsistence resource for residents in all of the Mackenzie Valley communities. Previous studies and preliminary input from community residents and government officials indicate that 61 wildlife species (38 birds, 21 mammals and two amphibians) are considered important. This is based on subsistence use, management concerns and ecological sensitivity.

Important wildlife habitat has been identified throughout the Pipeline Study Area. Known habitats are associated primarily with the tributaries to the Mackenzie River and lakes within the Mackenzie Valley watershed.

Caribou Habitat

Woodland caribou have been observed in specific areas along the entire length of the pipeline route, most frequently in open habitats, black spruce muskeg, and post-fire and riparian habitats containing lichens. These habitats provide preferred forage, such as terrestrial lichens, and lower snow accumulations.

Bear Habitat

Areas of importance for grizzly bear occur from Campbell Lake to the Arctic Red River. Black bear denning sites are most common between Inuvik and Fort Good Hope, with high denning densities reported along the banks of the Mackenzie River. The mixed-wood forests within the Pipeline Study Area are also important black bear habitat.

Moose Habitat

Winter ranges for moose are located on islands within the Mackenzie River, and at the mouths of tributaries between Travaillant Lake and the Redstone River. The Sans Sault Rapids area and the Ochre River valley, including areas to the north, provide winter range for moose.

Muskrat and Beaver Habitat

Brackett Lake provides exceptional habitat for muskrat and beaver. Important muskrat habitat is also found on islands in the Mackenzie River between Norman Wells and the Redstone River and along the Mackenzie Valley, east of Camsell Bend.

The Ramparts River area, north of Fort Simpson, is considered to be preferred beaver habitat. Important beaver habitat is also found near the Thunder River,

Muskrat and Beaver Habitat (cont'd)

Hume River, Oscar Lake, Mackay Creek, the Mackenzie Valley immediately north of Camsell Bend, and the Trail River to Harris Creek area. In the area south of Fort Simpson, high-quality beaver habitat occurs along the Harris, Trail, Martin and Spence rivers, Jean-Marie Creek, upper Redknife River, Kakisa River and tributaries to the Rabbitskin River.

Bird Habitat

The Mackenzie Valley is an important continental bird migration corridor and is used heavily in the spring, summer and fall. The Mackenzie River provides important spring habitat for migrating waterfowl, because it thaws early.

Many waterbodies in the Mackenzie Valley are traditional staging areas, and important nesting habitat is provided for many bird species. The most important staging areas are:

- Brackett Lake
- the Ramparts River
- Tate Lake
- the Mills–Beaver lakes area
- the islands in the Mackenzie River near Norman Wells
- the islands in the Mackenzie River between Fort Good Hope and Tsiigehtchic

The Loche and Great Bear rivers also have high densities of breeding and staging waterfowl.

Tundra swans gather at open water areas near islands and sandbars on the Mackenzie River between Norman Wells and the Arctic Red River. Bald eagles nest frequently around lakes and, during migration, can be found in relatively large numbers at Brackett Lake, Mills Lake and Beaver Lake. The most important areas for peregrine falcons include the Norman Range, the Ramparts area, and the Campbell Hills. In northwestern Alberta, the Hay–Zama lakes wetlands complex provides a major staging area for all waterfowl.

BASELINE STUDIES

Environmental baseline studies are an important component of the EIA and SEIA for the project. Baseline studies are used as the basis for estimating project effects on the environment.

In early 2001, a gap analysis was completed to help in planning and designing the environmental field studies. Reconnaissance surveys during the summer and fall of 2001 were also used to help focus survey efforts on the critical information needs. Input from local community residents during the review of research permit applications, and from local technicians during the various field surveys in 2001 and 2002, also helped in planning and refining the survey programs.

Table 9-1 provides details on field environmental study programs for the project during 2001 and 2002. These studies might be modified, or new studies might be initiated, as the work proceeds.

2001 Studies

Between the summer and fall of 2001, the following field studies were initiated:

- air quality monitoring near Inuvik and Norman Wells
- preliminary surveys of aquatic habitat, hydrology and surface water quality, and development of a classification system for aquatic habitats
- spring surveys of migratory waterfowl, from Alberta to Inuvik
- spring surveys of nesting waterfowl and broods in the Gwich'in area
- detailed vegetation surveys in the Production Study Area and the northern half of the Pipeline Study Area
- preliminary classification and mapping of biophysical units, i.e., land units with common vegetation communities and landforms

2002 Studies

During 2002, several of these field programs continued, and several new field studies were initiated, specifically:

- ongoing monitoring of air quality near Inuvik and Norman Wells, as well as the establishment of a new air quality station in the Taglu area

2002 Studies (cont'd)

- a noise study, to measure existing noise levels
- hydrogeological surveys, to define and assess natural seeps and springs
- hydrological surveys, to characterize watercourses and waterbodies in the Production and Pipeline Study Areas. A stream classification system was developed as part of this program.
- a water quality program, to document existing water quality conditions related to community water use and fish habitat
- an aquatic survey program that included spring spawning surveys, summer surveys to document fish habitat during normal flow conditions, and fall spawning surveys. A survey of overwintering habitat will be completed in winter 2002-2003.
- mapping and description of terrain and soil units
- ecological land classification surveys in the southern half of the Pipeline Study Area
- preliminary rare plant surveys in the Production and Pipeline Study Areas, to identify areas with a high probability of supporting rare plants
- monitoring existing reclamation sites within the Production and Pipeline Study Areas
- a wildlife survey program that included winter track count surveys for furbearers, winter aerial surveys for ungulates, and spring pellet group surveys. Waterfowl surveys included additional spring migration surveys, as well as nesting and brood surveys in the Mackenzie Delta and adjacent areas.
- environmental surveys of potential infrastructure and borrow sites were conducted in summer 2002

Table 9-1: Baseline Biophysical Studies for the Mackenzie Gas Project

Study Type	Type of Survey	Study Area	Date	Purpose	Method
Air					
	Baseline – passive	Production Study Area (Field Facilities)	2002	• Provide a measure of pre-operation air quality. • Determine current conditions in the project area and provide a comparison with model predictions.	• Install passive monitoring station in Inuvik, east of the town, at a fixed location between the proposed facility and the settlement. Measure monthly values of SO_2, NO_x, NO_2 and O_3. • Conduct passive sampling for volatile organic compounds at Taglu.
	Baseline – passive	Production and Pipeline Study Areas (Inuvik and Norman Wells)	2001, 2002	• Provide a measure of pre-operation air quality. • Determine current conditions in the project area and provide a comparison with model predictions.	• Install passive monitoring station in Norman Wells at west side of town, near the proposed facility. Measure monthly values of SO_2, NO_x, NO_2 and O_3. • Use passive monitoring station in Inuvik.
	Baseline – continuous	Pipeline Study Area (Norman Wells)	2001, 2002	• Provide the opportunity to compare monitored concentrations with guideline values. • Assess the effect of emissions from existing oil and gas facilities.	• Use the continuous monitoring station in Norman Wells, west of town near the proposed facility. Measure hourly values of SO_2, NO_x, NO_2 and O_3.
Noise					
	Baseline monitoring	Production and Pipeline Study Areas (near Inuvik and Norman Wells facilities) and Pipeline Study Area (near compressor stations)	2002, 2003	• Confirm potential noise generating sources, including all oil and gas facilities and possible receptors.	• Characterize existing conditions at specific sites and assess potential project effects on ambient noise levels. • Start monitoring, using Type 1 monitoring instrumentation, after locations have been identified.
	Modeling	Production and Pipeline Study Areas (near Inuvik and Norman Wells facilities) and Pipeline Study Area (near compressor stations)	2002, 2003	• Use environmental noise model to conduct noise propagation modeling.	• Assess potential project noise effects and design appropriate mitigation. Model output will include noise contour maps and a prediction of permissible sound levels and ambient noise levels.

Table 9-1: Baseline Biophysical Studies for the Mackenzie Gas Project (cont'd)

Study Type	Type of Survey	Study Area	Date	Purpose	Method
Aquatics					
Hydrogeology	Identifying open water and icings	Production and Pipeline Study Areas	Late winter to early spring, and early summer 2002	• Identify areas of open water in winter and the locations of icings, which might be an indication of spring flow, or build-up of hydraulic pressure indicating groundwater discharge.	• Conduct aerial-supported and limited ground surveys at locations of interest. • Identify areas of groundwater inflow (springs, seeps), and examine outlets to determine the source aquifers. • Measure flow rates, water temperature and water quality.
Hydrology	Reconnaissance	Production and Pipeline Study Areas	Summer 2001, 2002	• Identify watercourses requiring detailed hydrology studies.	• Conduct aerial reconnaissance survey of all watercourses crossed to determine locations of detailed hydrometric fieldwork.
	Detailed hydrologic assessments	Production and Pipeline Study Areas	Summer 2001, 2002	• Provide site data on stream morphology, erosion potential, sediment transport and variations of hydraulic parameters.	• Conduct aerial-supported and ground-based detailed hydrologic assessments of the streams identified during the reconnaissance.
	Winter freeze assessment	Production and Pipeline Study Areas	Late winter 2002, 2003	• Determine freezing characteristics for selected streams.	• Conduct aerial-supported and ground-based surveys.
	Spring break-up assessment	Production and Pipeline Study Areas	Spring to early summer 2002	• Identify the type of break-up and measurement of near-peak spring flows for selected streams.	• Conduct aerial-supported and ground-based surveys. • Install temporary stream flow monitoring stations to monitor water levels continuously throughout the spring, summer and early fall.
	Water and sediment sampling	Production and Pipeline Study Areas	Summer 2001, 2002, 2003	• Measure existing baseline water quality conditions at selected locations and determine fish habitat quality.	• Collect grab samples at watercourses visited by fisheries and hydrology field crews.
Fisheries	Reconnaissance	Production and Pipeline Study Areas	Summer 2001, 2002	• Identify several watercourses and lakes requiring detailed fisheries studies.	• Conduct aerial reconnaissance survey of all watercourses crossed, to determine locations of detailed fisheries fieldwork.
	Detailed fish habitat	Production and Pipeline Study Areas	Summer 2001, 2002	• Conduct a detailed assessment of fish habitat for the streams and lakes identified during the reconnaissance.	• Conduct aerial-supported and ground-based assessments, which involve measuring stream characteristics and identifying fish species present.

Table 9-1: Baseline Biophysical Studies for the Mackenzie Gas Project (cont'd)

Study Type	Type of Survey	Study Area	Date	Purpose	Method
Fisheries (cont'd)	Spring spawning	Production and Pipeline Study Areas	Spring 2002	• Characterize habitat conditions and spawning use by spring spawning species for selected stream-crossing sites.	• Conduct aerial-supported and ground-based fish sampling, to determine the presence or absence of spring spawners and deposited eggs.
	Fall spawning	Production and Pipeline Study Areas	Fall 2002	• Assess fall spawning use by follow-up survey of crossing sites identified as having potentially suitable habitat conditions.	• Conduct aerial-supported and ground-based fish sampling, to determine the presence or absence of fall spawners and deposited eggs.
	Overwintering habitat	Production and Pipeline Study Areas	Late winter 2002 and Q1, 2003	• Survey main delta channels and selected streams and lakes along the preliminary pipeline route, to assess overwintering conditions for fish near the crossing sites. • Identify any open water areas, which suggest the location of springs, that are typically important as overwintering areas for fish.	• Conduct aerial-supported and ground-based fish sampling, to determine the presence or absence of overwintering fish, only at areas of open water.
Terrestrial					
Geology, Permafrost and Soils	Terrain mapping (1:30,000 scale map)	Production and Pipeline Study Areas	2002	• Develop an integrated map for terrain and soils, to help assess project effects. • Develop ecological land classification maps.	• Review literature, including surficial geology data used for mapping. • Interpret air photographs.
	Permafrost mapping	Production and Pipeline Study Areas	2002	• Develop a permafrost map, to help assess project effects and the effects of the environment on the project.	• Conduct a detailed geotechnical literature survey and prepare environmental criteria and design standards. • Conduct a reconnaissance survey.
	Soil mapping	Production and Pipeline Study Areas	2002	• Develop a soil map to help assess project effects. • Develop an ecological land classification map.	• Review literature and existing maps. • Interpret air photographs. • Prepare map and conduct a ground truth survey.
Vegetation	Ecological land classification	Production and northern portion of Pipeline Study Areas	Summer 2001	• Obtain detailed information on site conditions, for preparing the ecological land classification map.	• Conduct an aerial survey. About 46% of the project area was covered during 2001. • Develop preliminary maps.

Table 9-1: Baseline Biophysical Studies for the Mackenzie Gas Project (cont'd)

Study Type	Type of Survey	Study Area	Date	Purpose	Method
Vegetation (cont'd)		Southern portion of Pipeline Study Area	Summer 2002	• Obtain detailed information on site conditions, for preparing the ecological land classification map.	• Conduct an aerial survey. • Ground truth ecological land classification maps.
	Rare plant	Production and Pipeline Study Areas	Summer 2002, 2003 and 2004	• Provide information on occurrence and distribution of rare plants in relation to the proposed project.	• Conduct preliminary aerial surveys in documented areas of concern, e.g., Bear Rock. • Define more detailed surveys using input from the communities.
	Reclamation monitoring	Representative sites in the delta region and along the Norman Wells pipeline	Summer 2002	• Provide information on vegetation conditions in previous completed reclamation sites, to develop procedures for treating disturbed areas within the Production and Pipeline Study Areas.	• Conduct aerial surveys. • Record plant cover, species composition and surface erosion along a 30 m transect. • Characterize plant cover and composition in the adjacent undisturbed plant community, for comparison.
Wildlife	Track count (terrestrial furbearers)	Production and Pipeline Study Areas	Late winter to early spring 2002	• Provide information on winter habitat use by furbearers and some ungulates. • Provide habitat information, e.g., snow depths.	• Conduct walked transects of variable length, recording the number of track intercepts for each species, the dominant canopy cover and the snow depth.
	Aerial (moose and caribou)	Production and Pipeline Study Areas	Late winter to early spring 2002	• Provide information on habitat use and population distribution in the project area.	• Conduct aerial surveys along transects within stratified survey blocks, which are designed to survey known areas of concern, e.g., Parsons Lake for caribou or Holmes Creek for moose.
	Waterfowl nesting	Production Study Area	Spring 2001, 2002	• Assess project effects on waterfowl habitat, and provide input for the project footprint and timing of activities.	• Survey the transects flown in the production area.
	Pellet group (ungulates, hare, grouse, carnivore)	Production and Pipeline Study Areas	Spring 2002 following snowmelt and before leaf out	• Provide input for habitat suitability models for key wildlife species.	• Survey the transects established at selected sites, to count animal pellets.

IDENTIFICATION OF POTENTIAL KEY ISSUES

The key socio-economic and environmental issues that might be associated with the design, construction and operation of the project were identified through:

- a review of published TK studies and existing information on socio-economic, cultural and biophysical components
- discussions with communities on establishing TK working groups
- a review of issues associated with past and existing oil and natural gas exploration and development projects in the project area or in a northern environment
- discussions with officials in selected regulatory and government agencies
- comments by community residents and members of community organizations during the first round of communication and consultation meetings for the project, as well as during communication and consultation meetings for research permits
- the professional experience of the assessment team on the construction, operation and maintenance of production facilities and pipelines in general, and specifically, those in northern environments

The summaries of potential socio-economic and environmental issues provided in this section are preliminary, as consultation with community residents, government and regulatory agencies, other interested parties and the public will continue. Issues are not prioritized, or ranked by importance or intensity.

The lists of potential issues are intended as a starting point for communication and consultation with interested parties, as well as for community meetings and issue scoping workshops that are planned as part of the public communication and consultation process for the impact assessment.

SOCIO-ECONOMIC ISSUES

The potential socio-economic effects are expected to be some of the most important effects to be addressed by the Mackenzie Gas Project. Major types of effects that are being considered include the:

- effects on traditional resource use and culture
- effects on other land and resource use
- socio-economic effects
- effects on human health
- effects on heritage resources

Potential issues for each of these major categories are summarized in Table 10-1.

SOCIO-ECONOMIC MITIGATION PLAN

Development of Plan

The issues and mitigation for socio-economic impacts have been, and will continue to be, reviewed and modified, as necessary, during public consultation with residents in local communities and regional workshops during 2003. This consultation process is intended to lead to the development of a socio-economic plan, by:

- identifying and further evaluating the potential issues
- identifying project-related impacts
- determining potential mitigation

Planning Participants

The project proponents will develop and implement a socio-economic plan with the input, cooperation and coordination of key interested parties, including:

- residents in the affected communities and regions
- representatives of the GNWT
- representatives of public agencies and institutions responsible for delivering:
    - education
    - training
    - law enforcement
    - health care
    - other public services

Because of the nature of socio-economic issues, many causal factors are beyond the control of the project proponents. Therefore, the plan will emphasize the need

Planning Participants (cont'd)

to identify the responsibilities of the proponents, governments, affected communities and residents for managing the potential impacts.

Scope of Plan

The socio-economic plan might 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
- a socio-economic monitoring program

Benefits plans (see Section 7) will be an important aspect of the mitigation plan.

HERITAGE RESOURCES

The project will be designed to avoid heritage resource sites as much as possible. However, because of the size and nature of the project, it is unlikely that all heritage sites that might be identified within the development zones will be avoidable. If significant heritage resources are identified in potential impact zones and avoidance is not feasible, mitigative measures will be taken before development proceeds. Mitigation might consist of surface collection, mapping or salvage excavation. If an extremely significant heritage resource is identified, permanent avoidance might be necessary.

Sufficient time should be available before construction starts to enable any follow-up assessment or mitigation that the Prince of Wales Northern Heritage Centre and Alberta Community Development staff might require. As the project has a long-term schedule of development, it will be possible to complete the mitigation in stages, building on initial results to make later measures more effective.

Table 10-1: Preliminary Socio-Economic Issues

Issues Associated with the Project	Issue Assessment Approach
Traditional Resource Use and Culture	
1. Disruption of traditional hunting and fishing, as a result of disturbance to harvesters and disturbance of harvested species. 2. Alteration of hunting and fishing patterns and resource availability as a result of improved access. 3. Real or perceived tainting of fish or game. 4. Loss of harvesting knowledge and skills.	1 to 4. Develop focused TK studies in consultation with, and with the approval of, affected communities. 1 to 4. Have elders, hunters, trappers and other resource harvesters participate in TK studies. 1 to 4. Integrate TK and biophysical and social science in the impact assessment.
Socio-Economics	
1. Creation of new northern employment opportunities (short and long term).	1. Conduct workforce supply and demand analysis.
2. Increase in disposable income of some northern residents, and the resulting related social issues.	2. Analyze personal income effects.
3. Creation of northern business opportunities and revenue (short and long term).	3. Conduct quantitative and qualitative assessments of business opportunities and analyze business income effects.
4. Capacity building at the local and regional level.	4. Conduct a qualitative assessment of absorptive capacity.
5. Changing government revenue (royalties and taxes).	5. Assess government revenue and macro-economic effects.
6. Creation of new infrastructure for northern communities and regions.	6. Conduct a qualitative assessment of public infrastructure effects.
7. Movements of population to seek work on the project.	7. Conduct quantitative demographic effect assessments based on workforce analysis.
8. Overburdening of infrastructure (housing, community services, transportation).	8. Review community infrastructure supply and demand, based on demographic assessment.
9. Increased demand for government and community services and delays in response to the identified need.	9. Conduct a community and commercial service supply and demand analysis driven by demographic assessment, business opportunity assessment and income analyses.
10. Changes in community well-being.	10. Conduct a quantitative and qualitative social effect analysis based on demographic and income analyses.
11. Contact between project workers and local residents.	1 to 11. Conduct community-based consultation with service providers and the public. This will be key to all issues and assessments, and will be the primary basis for all socio-cultural effect analyses, e.g., community well-being, youth, families.
Human Health	
1. Effects on public health conditions and services.	1. Assess community services and social effects.
2. Effects of emissions and discharges on human health.	2. Review and summarize existing information on potential project-related effects.

Table 10-1: Preliminary Socio-Economic Issues (cont'd)

Issues Associated with the Project	Issue Assessment Approach
Land and Resource Use	
1. Changes in land use, such as recreational or commercial hunting and fishing, as a result of industrial activity and improved access. 2. Effects on ecotourism operations. 3. Disruption of reindeer herding activities. 4. Depletion of nonrenewable resources, such as gravel, for community and other uses. 5. Changes in availability of renewable resources.	1 to 5. Identify and conduct geographic information system (GIS) mapping of existing and known future activities in relation to project components. 1 to 5. Consult communities on use plans and alternatives in conjunction with the SEIA. 4 to 5. Assess supply and demand for key community resources.
Heritage Resources	
1. Destruction or impairment of heritage and archaeological sites and artifacts. 2. Disturbance of culturally sensitive areas.	1 to 2. Identify potential sites at risk through archive searches and field surveys. 1 to 2. Conduct GIS mapping of important areas in relation to project components.

BIOPHYSICAL ENVIRONMENT ISSUES

Northern traditional use and lifestyles and the biophysical environment are strongly inter-related. Potential effects on the biophysical environment will be specifically addressed in the issue scoping and impact assessment process. Effects on the biophysical environment will then be related to potential socio-economic effects, especially traditional use. Community participation in the impact assessment and the traditional knowledge studies will help ensure that the effects of potential biophysical impacts on resource harvesting are effectively addressed.

Table 10-2 summarizes the preliminary issues identified for the biophysical environment.

ENVIRONMENTAL MANAGEMENT PLAN

An environmental management plan will be developed for the project. The plan will include the philosophy and procedures to be applied to the design, construction, operations and decommissioning of the project. The environmental management plan will be updated as:

- construction and operational procedures evolve
- the regulatory environment for the project evolves
- potential project effects are identified and potential mitigation measures are assessed
- new plans, protection plans and measures are adopted by the project

Traditional knowledge, scientific information, and information from the project's baseline and engineering design studies will be used to develop the environmental management plan.

The environmental management plan will be a comprehensive document containing:

- a description of the project
- a description of the environmental setting
- the socio-economic plan
- environmental protection plans
- environmental alignment sheets
- engineering and construction standards
- contingency and emergency response plans
- information on key contacts and resource personnel

MITIGATION PLANNING ACTIVITIES

Mitigating the potential project effects on the biophysical environment might involve changing:

- the location of facilities, infrastructure or activities
- the timing of certain activities or operations
- the construction methods, operational procedures or processes

LOCATIONAL MEASURES

Throughout the project design and construction, biophysical impacts may be reduced by ensuring that temporary and permanent facilities, infrastructure and human activities are located in areas that reduce or avoid impacts to the physical or biological environment. Important initiatives that have been, or might be, undertaken to facilitate the optimal siting of facilities and infrastructure to reduce biophysical effects include:

- assessing routing options and alternatives for the flow lines, gathering system and transmission pipeline
- conducting analyses of existing information and conducting biophysical reconnaissance surveys for borrow sites, barge landing sites, stockpile sites, access roads and camps, to help in designing and locating these facilities
- sharing access routes or some facilities, where possible, to reduce their surface area
- reducing the surface area required for project facilities and infrastructure, without compromising safety or operational integrity
- avoiding, where practical, permafrost areas that are unstable as a result of thawing
- locating facilities and infrastructure away from groundwater sources and in areas where changes to existing drainage patterns and intercepts of watercourses are reduced
- locating hazardous product and waste storage areas away from surface waterbodies
- avoiding sensitive fish habitats in locating and designing the pipeline water crossings
- avoiding unique sites and special features, such as landforms, uncommon vegetation communities, rare plants and important wildlife habitat

- using standard flight corridors to reduce the amount of disturbance from aircraft noise

TIMING MEASURES

Most construction activities will be undertaken in the winter because of the need to use winter roads and frozen ground. Constructing in winter will help reduce damage to aquatic habitat, terrain, soils and vegetation. Specific timing measures that might be undertaken as part of the project include:

- excavating or modifying sensitive terrain only in the winter and applying treatments throughout one season to help maintain and restore site conditions

- timing in-stream construction activities to avoid periods when fish are present, thus reducing impacts. For example, water crossings in areas not used by fish for overwintering habitat will be constructed during the winter.

- clearing the pipeline right-of-way and other facility sites during winter to reduce ground disturbance, damage to vegetation and disturbance of sensitive bird habitat

- timing certain construction activities in specific areas to avoid wildlife movements and important seasonal periods, such as calving or hibernation

CONSTRUCTION AND OPERATIONAL MEASURES

Where feasible, construction and operational procedures and processes will be used to reduce:

- the amount of emissions or effluent released into the environment
- the amount of noise and artificial light generated
- changes to drainage patterns and groundwater
- disturbance to terrain, soils and permafrost

Measures will be taken to avoid or reduce impacts to fish, vegetation and wildlife. The types of measures taken will likely include:

- using equipment, infrastructure and vehicles that reduce air emissions and water vapour emissions

- designing storage and handling facilities, using specific handling procedures

- using specific storage and disposal methods for hazardous waste, and training staff to avoid spills of hazardous materials and waste

- treating sewage and all other effluent appropriately before release

CONSTRUCTION AND OPERATIONAL MEASURES (cont'd)

- using erosion control measures and other methods to protect terrain, permafrost, shorelines and banks

- using appropriate methods at water crossing sites, such as directional drilling or isolation techniques, to reduce effects on fish habitat

- using specific procedures for handling and cleaning equipment, to reduce effects on vegetation

- developing operating guidelines for project personnel and contractors to follow, to help reduce encounters and conflicts between humans and wildlife, and collisions between vehicles and wildlife

Table 10-2: Preliminary Biophysical Environment Issues

Issues Associated with the Project	Issue Assessment Approach
AIR QUALITY	
1. Deterioration of local air quality, as a result of emissions from the Production Study Area facilities, the compressor stations and the NGL facility. 2. Deterioration of regional air quality from combined industrial, municipal and transportation emissions, including the potential for acid emissions. 3. Effects of emissions on human health, vegetation and wildlife. 4. Visible plumes and ice fog.	1 to 3. Model emission dispersion from source facilities. 1 to 3. Model and predict air quality effects from related activities. 1 to 4. Verify model predictions and potential effects through monitoring.
NOISE	
1. Noise from construction activities, field operations and aerial and ground transport.	1. Monitor ambient noise levels to measure local conditions. 1. Model noise dispersion for permanent facilities.
AQUATICS	
Hydrogeology	
1. Change in near-surface groundwater flow resulting from the pipeline trench thaw bulbs and frost bulbs. 2. Change in groundwater quality resulting from spills or leaks.	1 to 2. Identify locations of near-surface groundwater flow and establish existing water quality. 1 to 2. Assess effects of the pipeline trench and other facilities on groundwater flow and quality.
Hydrology	
1. Change in local surface water drainage patterns resulting from land disturbance, infrastructure, permafrost degradation, frost heave, land subsidence (Production Study Area only) and water withdrawal. 2. Increased shoreline erosion and sedimentation resulting from pipeline crossings, barge use, permafrost degradation and associated changes in river channels (Production Study Area only). 3. Changes in surface water quality from site drainage, sewage discharge, erosion and minor spills.	1 to 2. Model potential hydrological changes associated with facilities and pipeline crossings. 1. Model probable scenarios for subsidence in the Production Study Area. 3. Document existing water quality, including water sources, for existing facilities and communities.
Fisheries	
1. Loss or alteration of aquatic habitat associated with pipeline crossings and barge landing areas, disturbance of riparian habitat, increased sediment loads, water withdrawal and construction site areas (Production Study Area only). 2. Blockage of fish movement resulting from physical obstructions, frost bulbs and water withdrawal.	1 to 3. Identify fish species and life phases sensitive to expected project activity. 1. Document and classify existing aquatic habitat quality and productivity, and predict potential changes. 2. Document existing fish movement patterns and assess potential changes.

Table 10-2: Preliminary Biophysical Environment Issues (cont'd)

Issues Associated with the Project	Issue Assessment Approach
Fisheries (cont'd)	
3. Fish mortality resulting from construction activities, spills, increased harvesting and seismic exploration in the Production Study Area.	3. Integrate field monitoring programs before construction.
TERRESTRIAL	
Geology, Permafrost and Soils	
1. Increased ponding, slumping, ground settlement and erosion as a result of permafrost degradation.	1 to 5. Quantify the project footprint and relate it to potential terrain and soil sensitivities, including permafrost. 1, 6. Determine the regional potential for permafrost degradation, including potential future trends.
2. Slope failure resulting from altered surface drainage or groundwater flows.	2. Identify and categorize existing slope failures and causes.
3. Soil loss resulting from well pads and other facilities.	
4. Ground disturbance associated with excavating granular resources and with stockpile and staging sites, and road access to the right-of-way (Pipeline Study Area only).	
5. Subsidence associated with natural gas production (Production Study Area only).	5. Model probable scenarios for Production Study Area subsidence.
6. Effects of climate change on permafrost stability.	6. Assess effects of climate change on permafrost distribution.
Vegetation	
1. Direct removal, or alteration, of species and communities resulting from facility construction, transportation, altered drainage and permafrost degradation. 2. Loss or alteration of unique sites or special features.	1 to 2. Use ecological land classification and GIS overlay analyses to estimate the potential effects of the project on sensitive species and important communities.
3. Mortality or altered health resulting from emissions, effluent or contaminant spills.	3. Assess the potential spill risk and probable effects on sensitive species and communities.
4. Introduction of exotic species.	4. Do a qualitative assessment of the potential to introduce exotic species.
Wildlife	
1. Direct removal or alteration of habitat. 2. Sensory disturbance from construction activities, facility noise and aircraft. 3. Avoidance of habitat resulting from human disturbance and noise.	1 to 5. Use ecological land classification, habitat models and GIS overlay analyses to estimate potential changes in habitat suitability for habitat fragmentation, potential alteration of movements, and potential mortality.

Table 10-2: Preliminary Biophysical Environment Issues (cont'd)

Issues Associated with the Project	Issue Assessment Approach
Wildlife (cont'd)	
4. Fragmentation of habitat in the Production Study Area, associated with human disturbance and noise, and along the pipeline, associated with excavating granular resources, and with stockpile and staging sites, road access to the right-of-way and human disturbance. 5. Alteration of animal movements in the Production Study Area, as a result of elevated flow lines or gathering lines and other infrastructure, and along the pipeline as a result of the cleared right-of-way, borrow sites, stockpile and staging sites and access roads.	
6. Mortality resulting from collisions, human–wildlife interactions, increased predation and altered harvesting patterns.	6. Use existing data and traditional knowledge in combination with recent survey data, to identify population trends and species at risk, relative to potential project effects.
7. Ingestion of contaminants.	7. Assess the potential contaminant risk and probable effects on sensitive species.
INCIDENTS AND MALFUNCTIONS	
1. Effect of a flow line, gathering line or pipeline rupture (worst case scenario) on environment and human health.	1. Assess the potential risk of rupture. Use scenarios to estimate the risk of releasing various products, such as natural gas and NGLs.
2. Effect of climate change on infrastructure and pipeline integrity. 3. Effect of climate change on water levels in the Beaufort Sea and Mackenzie Delta (Production Study Area).	2 to 3. Review existing climate information, to establish probable future trends.
4. Effect of storm surges and land subsidence on infrastructure in the Mackenzie Delta (Production Study Area).	4. Review existing information on storm surges and floods, using a 100-year event prediction model.
5. Hydrological effects on pipeline crossings of major rivers and streams (Pipeline Study Area).	5. Consider the risks in the engineering design and construction phases.
CUMULATIVE EFFECTS	
1. Changes in regional air quality from combined industrial, municipal and residential effects. 2. Changes in surface and groundwater quality. 3. Changes in fish habitat and survival.	1 to 7. Assess project-specific effects and the contribution of the project to existing and reasonably foreseeable regional effects.
4. Changes in permafrost and terrain resulting from industrial activities and climate change.	1 to 2. Identify ambient conditions, using models to predict future air quality trends, and monitor for long-term changes.

Table 10-2: Preliminary Biophysical Environment Issues (cont'd)

Issues Associated with the Project	Issue Assessment Approach
CUMULATIVE EFFECTS (cont'd)	
5. Loss or alteration of plant species and communities of concern. 6. Changes in the effectiveness of wildlife habitat and survival of wildlife, as a result of multiple corridors and human disturbance.	5 to 6. Use ecological land classification, habitat models and GIS overlay analyses.
7. Alteration of traditional harvesting activities as a result of direct effects on harvest success, changes in quality of experience, and real or perceived contamination.	7. Do a qualitative analysis based on traditional knowledge and scientific data.

EIA SCOPING PROCESS FACILITATION

The *Cooperation Plan for the Environmental Impact Assessment and Regulatory Review of a Northern Gas Pipeline Project through the Northwest Territories* identifies that the Preliminary Information Package offers the project proponents:

> *. . . the opportunity to facilitate the environmental assessment scoping process, by presenting the environmental issues it has identified through its own analysis and through its initial public consultation process. This may be presented in the form of a draft scope of the environmental assessment which suggests a scope of the project, outlines the factors to be included in the environmental assessment, and indicates the scope of those factors, in accordance with the Canadian Environmental Assessment Act, the Mackenzie Valley Resource Management Act, the Inuvialuit Final Agreement and other guidance material issued by the parties.*

The project proponents are taking this opportunity to facilitate the environmental assessment scoping process, by providing in this section:

- an outline of the environmental assessment approach and the process that has been used to develop the environmental assessment
- a draft scope of the environmental assessment, including the scope of the project and the environmental factors to be considered in the environmental assessment (see Section 11.2)

ASSESSMENT CONSIDERATIONS

The Environmental Impact Statement (EIS) for the Mackenzie Gas Project will address project-specific effects and the project's contributions to cumulative effects. The EIS will assess the anchor field, gathering system and transmission pipeline system components of the project. However, the regulatory applications will differentiate between the three components in the assessment because of the unique nature of each component.

The assessment of project-specific and cumulative effects will involve:

- identifying and assessing the significance of project-specific effects, including the effects of the:
  - project on the biophysical, social and economic features
  - biophysical, social and economic features on the project

ASSESSMENT CONSIDERATIONS (cont'd)

- identifying appropriate mitigation measures for project-specific effects and determining the residual effects

- determining if the residual project effects could interact cumulatively with the effects from other projects or activities that have been, or will be, carried out

- identifying mitigation measures and impact management approaches to use on a regional scale, and determining their ability to reduce potential cumulative effects

- assessing the significance of the residual cumulative effects on the social and economic features and biophysical environment

The impact assessment for the project will meet the requirements of the Environmental Impact Statement Terms of Reference for the Mackenzie Gas Project, which will be issued by the Joint EIA Panel in accordance with the Cooperation Plan. The impact assessment will also be guided, in part, by several publications, specifically the:

- *Cumulative Effects Assessment Practitioners Guide*, Canadian Environmental Assessment Agency, 1999

- *Addressing Cumulative Environmental Effects in Environmental Assessments under the Mackenzie Valley Resource Management Act,* September 2000

- *Generic Terms of Reference for the Environmental Assessment of Oil and Gas Developments*, Mackenzie Valley Environmental Review Board, April 2001

- *Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Proponents,* Inuvialuit Environmental Impact Assessment Review Board, August 2002

- *A Practical Approach to Assessing Cumulative Effects for Pipelines*, National Energy Board Application for the Westpath Expansion, 2002

- *Consolidated Information Requirements for the Environmental Assessment Land Regulatory Review of a Northern Gas Pipeline Project Through the Northwest Territories,* Northern Pipeline Environmental Impact Assessment and Regulatory Chairs' Committee, September 2002

IMPORTANCE OF TRADITIONAL KNOWLEDGE

Traditional knowledge is cultural knowledge. It is based on direct observation, or information passed on orally from other community members, and can be viewed as a database of information that has been developed from centuries of experience

of living off the land. Traditional knowledge changes and adapts as new information is learned. Therefore, it can provide an accurate picture of the local area in both the present and the past.

Traditional knowledge will be used, together with information from scientific studies, to develop an understanding of existing conditions, important issues and potential effects. Traditional knowledge is expected to influence the project design and the development of environmental management measures. For example, it is expected to be used to help determine pipeline routing and facility siting and to avoid sensitive areas.

Traditional knowledge can be collected and used only with the permission and active participation of those who possess it. Often, these are elders and resource users or harvesters. Consultations are underway to involve those communities whose traditional lands could be affected by the project in the Traditional Knowledge Study Program.

The traditional knowledge studies for the Mackenzie Gas Project will be designed to:

- provide the specific traditional knowledge information needed for the project
- facilitate meaningful participation by community residents in the environmental assessment process
- ensure that the use of traditional knowledge in the environmental assessment complies with regulatory requirements

The methods of collecting and using traditional knowledge will support the documentation requirements of the various regulatory agencies reviewing the project. The data collection method is also likely to be a concern of the affected communities. The actual knowledge collected, and how it is used, will be decided in consultation with the traditional knowledge holders.

ISSUES TO BE CONSIDERED

The identification of issues to be considered in the assessment will be based on consultation with communities, government agencies and other interested parties.

Issues and associated effects will be assessed for the following subject areas:

- biophysical features:
  - air quality
  - noise

ISSUES TO BE CONSIDERED (cont'd)

- aquatic features, including hydrogeology, hydrology, water quality and fisheries
- terrestrial features, including geology, terrain, permafrost, soils, vegetation and wildlife

- social and economic features, including:
  - socio-economics
  - traditional lifestyles and culture
  - land and resource use
  - human health
  - heritage resources

Other issue areas that will be considered include:

- the effects on the biophysical and socio-economic environment that might result from potential project incidents and malfunctions
- the effects of the environment, such as permafrost, on project engineering
- the cumulative effects of past, present and reasonably foreseeable human development and activities

ASSESSMENT COMPONENTS

Public Communication and Consultation

Public communication and consultation will be fundamental to the assessment. The assessment approach will include initiatives, to ensure that interested parties have an opportunity to:

- obtain information about the project and the assessment
- provide input to the project design
- provide input to, and influence, the assessment, particularly the:
  - scope of the assessment
  - methods and conclusions
  - impact management
  - approach for follow-up monitoring

Public participation will be encouraged through:

- a series of community meetings, to encourage input by residents
- assessment workshops on:

- issue identification and scoping
- impact assessment and mitigation

Assessment Indicators

For each socio-economic or biophysical feature considered in the assessment, one or more indicators will be selected. Using indicators in the assessment will help to focus on the issues of greatest concern to communities, the public and government. Indicators will be selected based on clearly defined criteria, such as:

- for socio-economic indicators:
  - importance to the stability and function of economic, social and cultural systems
  - importance to the overall quality of life in northern communities
  - sensitivity to change as a result of the proposed development
- for biophysical indicators:
  - importance to local communities
  - importance to ecosystems
  - rarity, including special status species
  - sensitivity to human disturbance

Traditional knowledge and scientific data will be used in selecting the socio-economic and biophysical indicators.

Spatial Boundaries

Spatial boundaries will be developed using traditional knowledge, scientific and technical information, and input from the public. The spatial boundaries for the assessment will differ among biophysical features, to reflect the different geographic extent of project-specific effects on the key environmental indicators.

Project-Specific Effects

For socio-economic impacts, the spatial boundary for the project will encompass the northern communities from which permanent residents might be drawn to work on the project, as well as communities that might receive benefits from, or might be affected by, the project.

Spatial boundaries for assessing biophysical impacts will typically be established by determining the relevant spatial extent of an effect from all activities or structures that will be required for project construction and operations.

Cumulative Effects

Generally, the spatial boundary for the cumulative effects assessment will encompass the area or population affected by:

- a specific project effect
- similar effects from other projects or activities that overlap the project effect

Spatial boundaries for the assessment of cumulative socio-economic effects will consider a wide geographic range of communities from which individuals might be drawn for employment, as well as the dispersal of economic benefits and social impacts to these communities.

Spatial boundaries for the assessment of cumulative biophysical effects will reflect the nature of each effect, as well as the nature of the environmental features, both of which can be stationary or mobile. Each subject area will have to develop specific approaches that take into account the spatial nature of the effects and the indicators for that subject area.

Temporal Boundaries

The temporal boundaries for the impact assessment will be specific to the issue being considered. Different temporal boundaries may be used for specific subject areas and for different issues within a subject area, to reflect:

- the nature and duration of the effect
- the characteristics of the indicator
- the types of actions and projects that will need to be considered within the cumulative effects assessment

Managing Effects

An environmental management plan will be developed, which will include mitigation measures for the socio-economic and biophysical impacts.

Social and Economic Features

Mitigation for socio-economic impacts will be reviewed and modified during ongoing public communication and consultation with local communities. This process is intended to lead to the development of a socio-economic plan.

The project proponents will develop and implement a socio-economic plan with the input, cooperation and coordination of key interested parties, including:

- affected communities and regions

- the GNWT
- public agencies and institutions responsible for delivering education, training, law enforcement, health care and other public services

Because of the nature of socio-economic issues, many causal factors are beyond the control of the project proponents. Therefore, the plan will emphasize the need to identify the responsibilities of the project proponents, governments, and affected communities and residents for managing the potential impacts.

Biophysical Features

An environmental management plan for biophysical effects will be developed. This plan will describe:

- the project design
- conventional on-site mitigation measures for construction and operations
- any further measures required to address unique or unusual northern environmental conditions and community concerns

Traditional knowledge and scientific information will be used in developing the environmental management plan.

Existing regional initiatives will be evaluated, such as the:

- Mackenzie Valley Cumulative Impact Monitoring Program
- NWT Cumulative Effects Assessment and Management Strategy and Framework

Evaluating Significance

All socio-economic or biophysical components are influenced by multiple human and natural pressures. Therefore, the importance of any project-specific change to a socio-economic or biophysical feature must be placed in the context of other effects influencing that component. In most cases, impact significance should be based on the project's contribution to cumulative effects and the significance of cumulative effects. The exception would be if a project-specific effect did not result in a cumulative effect. In this case, the significance of the project effect would be determined.

For most socio-economic effects, impact significance will be discussed in a regional context that considers all relevant pressures and influences. This is particularly important in northern communities, where individuals working on the project and associated developments are likely to be drawn from communities

Evaluating Significance (cont'd)

directly adjacent to, as well as some that are geographically remote from, the project. Although economic benefits are likely to accrue to these communities, social impacts could also occur in the North. Therefore, the socio-economic impact assessment is expected to consider a broad geographic context and the full range of impacts from all sources.

The significance of residual effects for the biophysical environment will be characterized through interpreting conventional impact attributes, such as the geographic extent, direction, magnitude, duration, frequency and likelihood of an effect, and the recovery potential. Significance will then be evaluated based on considering those attributes and the condition of the socio-economic or biophysical component relative to:

- any applicable and known thresholds
- known and likely long-term trends of change of the component
- the possible contravention of any applicable act, land claim agreement, guide, policy, treaty or convention
- the displacement of a protected environmental feature
- the contribution to acute or chronic health effects

The significance will then be quantitatively evaluated if thresholds are available. If appropriate thresholds are absent, significance will be qualitatively evaluated, based on professional judgment. Although the evaluation of significance will be based on this approach, the approach will be modified, as appropriate, to meet the unique conditions for each subject area.

SCOPE OF THE PROJECT

The project to be assessed will exclude environmental field studies and other activities of a preliminary investigative or evaluative nature. The scope of the project will consist of the various undertakings proposed by the project proponents, or likely to be carried out in relation to the physical works proposed by the proponents of the specific components of the project, such as construction, operation, decommissioning and abandonment of:

- facilities at the Taglu natural gas field, including:
  - about 10 to 15 production wells
  - one well-site and production pad
  - one or two waste disposal wells
  - flow lines
  - production, processing and compression facilities
- facilities at the Parsons Lake natural gas field, including:
  - about 10 to 15 production wells
  - a waste disposal well
  - two major well-site and production pads and one or more smaller well-site and production pads
  - flow lines
  - production, processing and compression facilities
- facilities at the Niglintgak natural gas field, including:
  - about six to 10 production wells
  - three or four well site pads
  - one or two waste disposal wells
  - one production facility pad
  - flow lines
  - production, processing and compression facilities
- gathering pipelines from the outlets of the Taglu, Parsons Lake and Niglintgak production facilities to the outlet of the compressor at the Inuvik facility. The gathering pipeline system would include the compressor station, line heating and pigging facilities, metering equipment, valves and other associated pipeline facilities.

SCOPE OF THE PROJECT (cont'd)

- a pipeline system from Inuvik to Norman Wells, consisting of one of the following design concepts:

  1. a single-phase design, which would include:

     - an NGL facility near Inuvik

     - an NGL pipeline from Inuvik to Norman Wells. This would include pumping stations, line heaters, pigging facilities, metering equipment, valves and other associated pipeline facilities.

     - a single-phase transmission pipeline system from Inuvik to Norman Wells. This would include compressor stations, line heaters, pigging facilities, metering equipment, valves and other associated pipeline facilities.

  2. a two-phase design, which would include:

     - a two-phase transmission pipeline system from Inuvik to Norman Wells. This would include compressor stations, line heaters, pigging facilities, metering equipment, valves and other associated pipeline facilities.

     - an NGL facility near Norman Wells

- a transmission pipeline system from Norman Wells to northwestern Alberta. This would include compressor stations, line heaters, pigging facilities, metering equipment, valves and other associated pipeline facilities.

- ancillary undertakings in relation to the previously described physical works, including:

  - access roads
  - barge landing sites
  - airstrips and related facilities
  - stockpile and staging sites
  - borrow sites
  - construction camps
  - communications equipment
  - electrical power supply
  - waste management facilities, including sewage treatment systems

FACTORS TO BE CONSIDERED

The assessment will include consideration of the factors described in the Canadian Environmental Assessment Act, the Mackenzie Valley Resource Management Act, and the Inuvialuit Final Agreement, including:

- the impact of the project on the environment, including the impact of malfunctions or incidents that may occur in connection with the project, and any cumulative impacts that are likely to result from the project in combination with other developments
- the significance of the impacts of the project
- comments submitted by members of the public
- mitigative or remedial measures that are technically and economically feasible
- the purpose of the project
- the nature and extent of the project
- the rationale for site selection
- alternative means of carrying out the project that are technically and economically feasible, and the environmental effects of such alternative means
- the need for, and any requirements of, any follow-up environmental programs
- the impact of the project on present or future wildlife harvesting, including the assessment of a realistic worst case scenario for facilities and activities within the Inuvialuit Settlement Region
- the capacity of renewable resources that are likely to be significantly affected by the project to meet existing and future needs
- the need for the project
- alternatives to the project
- a description of the current environment that might reasonably be expected to be affected, directly or indirectly, by the project, including adequate baseline characterization
- measures to enhance any beneficial environmental effects
- a proposal for contingency and emergency response plans
- effects of the environment on the project

SCOPE OF FACTORS TO BE CONSIDERED

The assessment will consider the potential effects of the project within temporal and spatial boundaries that encompass the periods and areas during and within which the proposed project may potentially interact with, and have an effect on, components of the environment. The boundaries will vary with the issues and factors considered.

Glossary

°C	The symbol for degrees Celsius.
<	The symbol for less than.
>	The symbol for greater than.
≥	The symbol for greater than or equal to.
%	The symbol for percent.
µm	The symbol for micron.
3-D	The abbreviation for three-dimensional.
abandoned well	A well not in use because it was a dry hole originally, or because it has ceased to produce.
abandonment and reclamation	The act of permanently stopping operations, removing facilities and restoring land to a productive state.
aboriginal person	Any Indian, Inuit or Métis person who was born in the Northwest Territories or who is descended from an aboriginal person born in the Northwest Territories.
Aboriginal Pipeline Group	The Mackenzie Valley Aboriginal Pipeline Corporation and, when formed, the Mackenzie Valley Aboriginal Pipeline Limited Partnership.
access road	A temporary or permanent road that provides access to a pipeline right-of-way or to a facility, and which is not open to the general public.
acid deposition	Precipitation containing harmful amounts of nitric and sulphuric acids formed primarily by nitrogen oxides and sulphur oxides released into the atmosphere when fossil fuels are burned. It can be wet precipitation, i.e., rain, fog or snow, or dry precipitation, such as absorbed gaseous and particulate matter, aerosol particles or dust. Also called *acid precipitation*.
alkalinity	A measure of water's capacity to neutralize an acid.
all-weather road	A paved or unpaved, i.e., gravel, road that is open to traffic all year.
alluvial fan	A fan-shaped deposit formed by a stream.

anadromous species	Fish that travel up fresh-water streams from the sea to spawn.
anchor fields	The three natural-gas fields, Taglu, Parsons Lake and Niglintgak, whose production will provide the basic volume of gas shipped in the Mackenzie Valley Pipeline.
anthropogenic	Materials made or modified by humans.
APG	The abbreviation for Aboriginal Pipeline Group.
aquatic	Growing, living in, or frequenting water. Also, occurring or situated in or on water.
aquifer	A water-saturated, permeable body of rock capable of transmitting significant or usable quantities of groundwater to wells and springs under ordinary hydraulic gradients.
archaeology	The study of human history and prehistory through the excavation of sites and the analysis of physical remains.
availability	Unit of measure for the actual time a facility, pipeline, or other equipment is capable of providing service, if called upon.
backfill	The fill material used to cover a completed pipeline. Adequate fill material is provided above and below the pipe to prevent damage caused by loose rock, abrasion, shifting or washouts.
baseline	A surveyed condition that serves as a reference point to which later surveys are coordinated or correlated.
bbl/d	The abbreviation for barrels per day.
BC	The abbreviation for British Columbia.
Bcf/d	The abbreviation for billion cubic feet per day.
bedrock	The solid rock underlying soil or any other unconsolidated surficial cover.
benefits plan	A plan to provide aboriginal and nonaboriginal northerners and other Canadians with a fair opportunity to participate competitively in supplying the goods, services and personnel required by the project.
biophysical environment	The air, noise, aquatics (hydrogeology, hydrology, water quality and fisheries) and terrestrial (geology, permafrost, soils, vegetation and wildlife) conditions.

biophysical unit	A land unit with common vegetation communities and landforms.
bog	A plant community that develops and grows in areas with permanently waterlogged peat substrates.
borrow site	An area that could be excavated to provide material, such as gravel or sand, to be used as fill elsewhere.
brackish species	Species that live in water with a lower concentration of soluble salts than sea water.
brackish water	Water that contains relatively low concentrations of soluble salts. Brackish water is saltier than fresh water, but not as salty as salt water.
carbonate	A compound containing the carbonate (O_3^{2-}) radical.
carbonate rock	A rock, such as limestone, composed of at least 50% of carbonates.
carnivore	Any mammal of the order Carnivora, such as cats, dogs, bears and seals, with powerful jaws and teeth adapted for stabbing, tearing and eating flesh.
casing	Steel pipe placed in an oil or gas well as drilling progresses, to prevent the wall of the hole from caving in during drilling, to prevent seepage of fluids, and to provide a means of extracting petroleum if the well is productive.
casing joint	The length of casing between connections.
casing string	The entire length of all the joints of casing run in a well.
CDD	The abbreviation for Commercial Discovery Declaration.
CEAA	The abbreviation for Canadian Environmental Assessment Act. Also, the abbreviation for the Canadian Environmental Assessment Agency.
cf/d	The abbreviation for cubic feet per day.
chain-and-bucketwheel trencher	A large excavating device that uses multiple buckets on a digging wheel.
clay	The fraction of an earthy material containing the smallest particles, i.e., particles finer than 3 μm.
cm	The metric symbol for centimetre.

coating, pipe	A material that forms a continuous film over the surface of a pipe, and which may be used internally or externally, to prevent corrosion damage.
COGOA	The abbreviation for Canada Oil and Gas Operations Act.
colluvium	Loose, heterogeneous deposits at the foot of a slope or cliff, brought there mainly by gravity. Also known as *creep*.
Commissioner's land	Land that is controlled, managed and administered by the Government of the Northwest Territories.
commissioning	The act of charging a system and doing checkouts to ensure that equipment functions safely before start-up.
Comprehensive Land Claim Agreements	Agreements negotiated to clarify the rights of aboriginal groups to land and resources in a way that facilitates their economic growth and self-sufficiency. Such claims are negotiated in areas where aboriginal title has not been dealt with by treaty or other legal methods. They include The Western Arctic Claim, i.e., The Inuvialuit Final Agreement (1984), the Gwich'in Comprehensive Land Claim Agreement (1992), and the Sahtu Dene and Métis Comprehensive Land Claim Agreement (1993).
compression, gas	The process of increasing the pressure on gas to reduce its volume or cause it to flow. Natural gas is usually compressed for pipeline transportation.
compressor station	A facility containing equipment that is used to increase pressure to compress natural gas for transportation.
Conceptual Engineering Phase	The phase of a project preceding the Preliminary Engineering Phase that includes evaluating a broad variety of development options and testing them against project development criteria, to determine a conceptual plan.
confluence	The place where two rivers meet.
conglomerate	Cemented, rounded fragments of water-worn rock or pebbles, bound by a cement-like substance.
coniferous forest	Typically, evergreen trees or plants that are cone bearing, such as pine trees.
ConocoPhillips	The abbreviation for ConocoPhillips Canada (North) Limited.

Construction Phase	The phase of a project preceding the Operations Phase, during which project facilities and infrastructure are assembled and installed on their foundations, and connected and tested, to ensure that they operate as designed.
consultation, public	The process of involving all affected parties in the design, planning and operation of a project. The process requires that the proponents give the parties to be consulted notice of the matter in sufficient form and detail to allow them to prepare their views on the matter. They are also given a reasonable amount of time to prepare their views and an opportunity to present their views to the proponents, who consider the views presented, fully and impartially.
consumable	A commodity that is eventually used up, worn out, or eaten.
contaminant	A substance that makes another substance impure when mixed with it.
country food	Food traditionally eaten by local residents.
CPCN	The abbreviation for Certificate of Public Convenience and Necessity.
creep	Loose, heterogeneous deposits at the foot of a slope or cliff, brought there mainly by gravity. Also known as *colluvium*.
Cretaceous	The geological period between about 65 and 144 million years before present.
Crown land	Land whose mineral rights are owned by the federal or provincial governments in Canada.
Cryosol	Mineral or organic soil that has perennially frozen material within 1 m of the surface in some part of the soil body.
CSA	The abbreviation for Canadian Standards Association.
decommissioning	The act of taking a processing plant or facility out of service and isolating equipment, to prepare for routine maintenance work, suspending or abandoning.
dehydration	The process of removing water or water vapour from gas or oil.
delineation well	A well drilled to evaluate the quality, thickness and areal extent of a reservoir.

delta	An alluvial deposit, usually triangular in shape, at the mouth of a river, stream, or tidal inlet.
deltaic	Of or relating to a delta.
demobilization	The process of moving people, supplies and equipment from the work site to another location.
demographics	Of or relating to the dynamic balance of a population, especially with regard to its density and capacity for expansion or decline.
denning sites	Locations where bears create their dens.
Detailed Engineering Phase	The phase in a project preceding the Construction Phase that involves creating equipment specifications, detailed construction drawings and related engineering documents.
development well	A well that is drilled after an exploration well has confirmed the presence of oil or gas in a formation.
Devonian	The geological period between about 360 to 408 million years before present.
DEW line	The abbreviation for distant early warning line, a network of radar stations stretching along the Arctic coast from Alaska to Baffin Island, built in the 1950s to provide advance warning of an aircraft or missile attack.
dew point	The temperature at which a liquid, e.g., water vapour, at a specified pressure, begins to condense out of gas.
directional drilling	A drilling method in which the wellbore intentionally deviates from the vertical.
dock	A berth or wharf, or an artificially enclosed body of water for loading and unloading ships and barges.
domestic waste	Waste products, such as sewage, typically generated in camps.
downhole	Pertaining to the wellbore.
DPA	The abbreviation for Development Plan Application.
drilling mud	The fluid circulated through the wellbore during rotary drilling.

drumlin	A hill of glacial drift or bedrock having a form like the inverted bowl of a spoon, with its long axis parallel to the direction of movement of the glacier that formed it.
ecoclimatic region	An ecological area that has broad similarities in soil, relief and dominant vegetation. Also referred to as an *ecoregion.*
ecological land classification	A means of classifying landscapes by integrating landforms, soils and vegetation components in a hierarchical manner.
ecoregion	An ecological area that has broad similarities in soil, relief and dominant vegetation. Also referred to as an *ecoclimatic region*.
ecotourism	Tourism to exotic or wilderness areas, often threatened natural environments, especially intended to support conservation efforts.
EIA	The abbreviation for Environmental Impact Assessment.
EIS	The abbreviation for Environmental Impact Statement.
Enbridge	The abbreviation for Enbridge Pipelines (NW) Inc.
endemic species	A species restricted to a certain country or area.
environmental assessment	The second stage of the MVRMA process of environmental impact assessment.
environmental impact assessment	The process of evaluating the biophysical, social and economic effects of a proposed project.
environmental impact statement	A report containing the environmental impact assessment.
environmental management plan	A description of what will be done to minimize effects before, during and after project construction and operation. This includes protecting the environment and reducing effects from project activities.
ephemeral drainage	A drainage feature that is present for only a short time.
ericaceous shrubs	Shrubs that belong to the heather family.
esker	A winding ridge of irregularly stratified sand, gravel and cobbles deposited under the ice by a rapidly flowing glacial stream.
eutrophic waterbody	A waterbody that contains concentrations of nutrients that will support or nearly support plant or animal growth.

exotic species	A species introduced from, or originating in, a foreign or distant place.
exploration well	A well that is drilled primarily to determine if oil or gas actually exists in a subsurface rock formation.
ExxonMobil	The abbreviation for ExxonMobil Canada Properties.
fen	Low land, such as peat land, that is wholly or partly covered by water, especially in the upper regions of old estuaries and around lakes. These areas do not drain naturally.
Final Agreement	The outcome of successful land claim and self-government negotiations among an aboriginal group, the province or territory, and the federal government. It concerns all relevant issues, such as resources, self-government, financial benefits and land ownership, and must be ratified by all parties.
flare system	An arrangement of piping and burners used to dispose of surplus combustible vapours by igniting them in the atmosphere.
flow line	A pipe through which gas travels from a well to processing equipment or to storage. The pipe is either buried, or installed above-ground.
force majeure	An unforeseeable course of events that excuse a person or an organization from fulfilling a contract.
frost boil	A low mound formed by local differential frost heaving at a location most favourable for the formation of segregated ice and accompanied by the absence of an insulating cover of vegetation.
frost heave	Movement of the soil resulting from alternate thawing and freezing.
ft	The abbreviation for feet.
G	The metric symbol for giga (billion or 10^9).
gas hydrate plug	A mixture of water and gas that forms a solid plug in a gas pipeline under certain conditions. Also known as *hydrate.*
gas, natural	A compressible mixture of hydrocarbons with a low specific gravity that occurs naturally in a gaseous form.
gathering system	A system of pipelines, compressor stations, NGL and other related facilities that gather natural gas and associated NGLs from the supply region and transport it to the transmission pipeline system.

geographic information system	An information system that uses computers to manage information concerning geographical locations, plant assets, engineering, maintenance and operational performance.
GIS	The abbreviation for geographic information system.
glacial outwash	Sand and gravel transported away from a glacier by streams of meltwater and deposited along a pre-existing valley or plain in a form similar to an alluvial fan.
glacial till	Unsorted sedimentary material deposited directly by, and underneath, a glacier, consisting of a mixture of clay, silt, sand, gravel and boulders. Also known as *till.*
glaciofluvial materials	Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice.
glaciolacustrine	Related to lakes fed by melting glaciers, or to the deposits forming in the lakes.
Gleysol	A group of soils in the Gleysolic order.
glycol	A group of compounds, such as ethylene glycol and diethylene glycol, used to dehydrate gaseous or liquid hydrocarbons, to inhibit the formation of hydrates, or to cool fluids (liquid or gas), by acting as a heat transfer medium.
Gm^3	The metric symbol for billion cubic metres.
GNWT	The abbreviation for Government of the Northwest Territories.
grade, pipe	A designation of the pipe based on strength. Grade designation is nondimensional, but numerically equivalent to the specified minimum yield strength in megapascals. Grade 359 pipe material is equivalent to Grade X-52. Grade 550 pipe material is equivalent to Grade X-80.
grading, pipeline	The process of constructing a work area to facilitate moving personnel, equipment and material onto and along a right-of-way. The process includes levelling, cutting and filling. The travel surface is similar to a winter road.
graminoid	A grass-like plant, including both grass and sedge species.
granular resources	Material deposits that have a granulated surface or structure, such as gravel.

ground truth survey	Measures of various properties, such as temperature and land use, that are done on the ground to calibrate observations made from satellites or aircraft.
groundwater	The water within the earth that supplies water wells and springs.
ha	The metric symbol for hectare.
habitat	The part of the physical environment in which a plant or animal lives.
hazardous material	Any material that presents a potential for unwanted consequences to people, property and the environment.
haze	Fine dust, smoke or light vapour causing lack of transparency of the air.
heavy oil	Crude oil that has a low measure of specific gravity.
heritage resources	Any tangible or intangible product of human or natural history that has the potential to have scientific, educational, aesthetic, cultural, or social meaning or value for present or future generations.
horizontal directional drilling	A river crossing technique used in pipeline construction in which the pipe is buried under the riverbed at depths much greater than conventional crossings. An inverted arc-shaped hole is drilled beneath the river and the preassembled pipeline is pulled through it.
hp	The abbreviation for horsepower.
hummock	A rounded or conical mound or hillock, generally of equal dimensions and not ridge-like.
hummocky landscape	A till deposit composed of knobs and depressions with high local relief.
hydrate	A mixture of water and gas that forms a solid plug in a gas pipeline under certain conditions. Also known as *gas hydrate plug.*
hydraulics	The branch of science and technology concerned with the mechanics of fluids, especially liquids.
hydrocarbons	Organic compounds of hydrogen and carbon whose densities, boiling points, and freezing points increase as their molecular weights increase. Petroleum is a mixture of many different hydrocarbons.

hydrogeology	The science dealing with the occurrence of ground water, its use and its functions in modifying the earth, primarily by erosion and deposition.
hydrology	The science that treats the occurrence, circulation, distribution and properties of the waters of the earth and their reaction with the environment.
ice road	A secondary road made of compact snow or ice, often plowed over a frozen lake or ground, and which is impassable in the summer. Also known as *winter road*.
icings	A mass or sheet of ice formed on the ground surface during the winter by successive freezing of sheets of water that may seep from the ground, from a river or from a spring.
Imperial	The abbreviation for Imperial Oil Limited and its affiliates.
INAC	The abbreviation for Indian and Northern Affairs Canada (formerly DIAND).
incident	A specific unplanned event or sequence of events that has an unwanted and unintended effect on people's safety or health, on property or the environment, or on regulatory compliance.
indurated layer	A soil layer that has become hardened, generally by the cementation of soil particles.
infill compression	A method of increasing capacity on a gas pipeline by installing compression facilities between initial compressor stations.
infrastructure	Basic facilities, such as transportation, communications, power supplies and buildings, which enable an organization, project or community to function.
inlet separator	A vessel located at the entrance to a hydrocarbon facility that separates the incoming stream into different components, such as gas and liquids.
ion	An atom, group of atoms, or compound that is electrically charged as a result of the loss of electrons (cation) or the gain of electrons (anion).
kame	A low, long, steep-sided mound of glacial drift, commonly stratified sand and gravel, deposited as an alluvial fan or delta at the terminal margin of a melting glacier.

karst topography	The landscape surface that forms over limestone, dolomite or gypsum and is characterized by sinkholes, caves and underground drainage.
karstification	The formation of karst features by the solutional, and sometimes mechanical, action of water in a region of limestone, gypsum or other bedrock.
km	The metric symbol for kilometre.
km^2	The metric symbol for square kilometres.
Land Use Permit	A permit issued by the designated managing body for a specific tract of land, allowing for an activity to be conducted on that land, as described in a land use application.
lichen	The common name for members of the Lichenes, a group of organisms consisting of fungi and algae growing symbiotically together.
limestone	A sedimentary rock rich in calcium carbonate.
line heater	Equipment used to increase the temperature of natural gas flowing in a pipeline.
line pipe	Sections of pipe that can be welded together to form a pipeline.
liquefied natural gas	Supercooled natural gas that is maintained as a liquid at –160°C. As this gas occupies 1/640th of its original volume, it is easier to transport if pipelines cannot be used.
LNG	The abbreviation for liquefied natural gas.
logistics	The activities associated with procuring, maintaining and transporting materials, equipment and personnel.
M	The metric symbol for mega (million or 10^6).
m^3	The metric symbol for cubic metres.
m^3/d	The metric symbol for cubic metres per day.
malfunction	Failure to function in a normal or satisfactory manner.

Memorandum of Understanding	The written statement, signed on October 15, 2001, and ratified by Imperial, the APG, ConocoPhillips, Shell and ExxonMobil, identifying mutually acceptable principles and arrangements for the economic and timely development of a Mackenzie Valley pipeline.
mitigate	To cause to become less harsh or hostile.
MLA	The abbreviation for Member of the Legislative Assembly.
Mm^3	The metric symbol for million cubic metres.
Mm^3/d	The metric symbol for million cubic metres per day.
mobilize	To move people or equipment to the work site.
modularization	The process of assembling components into larger constructed modules in areas remote from the construction site.
moraine	An accumulation of glacial drift deposited by a glacier.
MOU	The abbreviation for Memorandum of Understanding.
moulting	The process, often seasonal, of shedding hair, feathers, shell, horns or an outer layer.
MPa	The metric symbol for megapascal.
mud, drilling	The fluid circulated through the wellbore during rotary drilling.
mudstone	A blocky or massive, fine-grained sedimentary rock in which the proportions of clay and silt are about equal.
MVRMA	The abbreviation for Mackenzie Valley Resource Management Act.
N/A	The abbreviation for not applicable.
natural gas	A compressible mixture of hydrocarbons with a low specific gravity that occurs naturally in a gaseous form.
natural gas liquids	Hydrocarbons that are gaseous in the reservoir, but that will separate out in liquid form at the pressures and temperatures at which separators normally operate. The liquids consist of varying proportions of butane, propane, pentane and heavier fractions, with little or no methane or ethane.
NEB	The abbreviation for the National Energy Board.

NEBA	The abbreviation for the National Energy Board Act.
NGL	The abbreviation for natural gas liquid.
NO_2	The chemical formula for nitrogen dioxide.
nominal pipe size	The outside diameter of a pipe, expressed in inches.
nonrenewable resources	Resources, such as fossil fuels (oil, gas, coal) and minerals that occur naturally but cannot be replaced once exploited.
North, the	The Arctic, or the northern part of a province.
NO_X	The chemical formula for oxides of nitrogen.
NPS	The abbreviation for nominal pipe size.
NWT	The abbreviation for Northwest Territories.
O_3	The chemical formula for ozone.
Open Season Expression of Interest	A process whereby pipeline owners publicly advertise and invite interested companies to indicate their interest in shipping gas in a pipeline.
open-cut	A river crossing technique used in pipeline construction where a trench is cut into a river bed.
Operations Phase	The phase of a project during which the pipeline and associated facilities are operated.
organic matter	The fraction of a soil that contains plant and animal residues in various stages of decomposition.
organic soil	Any soil consisting chiefly of, or containing at least 30% of, organic matter.
overwintering habitat	A habitat used by a species to survive the winter.
pad	The surface parts of a multiwell drilling or production site, including wells, buildings, piping and electrical facilities.
palsa	A landform of subarctic regions, consisting of a mound or ridge of peat covered with vegetation and containing a core of frozen peat or mineral soil.

parent material	The unconsolidated mineral and organic material from which soil develops.
particulate matter	Matter in the form of small liquid or solid particles.
peat	Unconsolidated soil material consisting largely of undecomposed, or only slightly decomposed, organic matter, such as mosses, sedges and other plants that grow in marshes or other wet places.
peat palsa	A peat mound with a core of segregated ice.
perennial spring	A spring that flows through all seasons of the year.
permafrost	Perennially frozen ground, occurring wherever the temperature remains below 0°C for several years.
permeability	The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.
physiography	Of, or pertaining to, physical geography.
pigging	The act of pushing a device through a pipeline in order to physically clean deposits from the inner surface of the pipeline, or to remove liquids.
pigging facilities	Pipeline in-line inspection and cleaning tool receivers and launchers.
pingo	A low hill or mound forced up by hydrostatic pressure in an area underlain by permafrost.
PIP	The abbreviation for Preliminary Information Package.
pipeline spread	The equipment and crew needed to build a pipeline.
polygons	Arrangements of rock, soil and vegetation formed on a level or gently sloping surface by frost action.
predation	The natural preying of one animal on others.
prehistoric	Of, or relating to, a time that predates written history.
Preliminary Engineering Phase	The phase of a project preceding the Detailed Engineering Phase that includes establishing design standards and recommendations for initiating detailed design.

Preliminary Information Package	The initial report submitted by the proponents of a proposed project, indicating their intentions and providing information relevant to the project.
procurement	Activities that must take place to obtain, on schedule and at optimum price, materials or services needed to construct a project.
production	The operation of bringing raw natural gas to the surface for processing.
project proponents	The five organizations (Imperial, the APG, ConocoPhillips, Shell and Exxon Mobil) that are undertaking the Mackenzie Gas Project.
psi	The abbreviation for pounds per square inch.
public consultation	The process of involving all affected parties in the design, planning and operation of a project. The process requires that the proponents give the parties to be consulted notice of the matter in sufficient form and detail to allow them to prepare their views on the matter. They are also given a reasonable amount of time to prepare their views and an opportunity to present their views to the proponents, who consider the views presented, fully and impartially.
public land	All land owned by the federal, provincial or territorial governments.
pumping station	A facility containing equipment that is used to increase the pressure of a liquid, such as NGL, for further transportation in a pipeline.
Q1	The abbreviation for the first quarter of the year (January 1 to March 31).
Q2	The abbreviation for the second quarter of the year (April 1 to June 30).
Q3	The abbreviation for the third quarter of the year (July 1 to September 30).
Q4	The abbreviation for the fourth quarter of the year (October 1 to December 31).
radiant heat	The heat that travels in all directions from a heat source.
RCMP	The abbreviation for Royal Canadian Mounted Police.
reclamation	The process of returning land to a productive state.

reconnaissance survey	A high-level biophysical survey that does not include a detailed sample regime.
Regosol	An azonal soil from deep unconsolidated deposits that has no definite genetic horizon.
regulators	The government departments or agencies that issue licences, permits or authorizations likely to be applied for in respect of a proposed project.
regulatory review	For the Mackenzie Gas Project, the processes related to a review of a certificate under the NEBA, applications under COGOA, land use permits and water licences under the NWT Waters Act, the MVRMA and others.
reliability	The availability of equipment after considering maintenance and problem time.
riparian	Living or located on a riverbank.
reservoir	A subsurface, porous, permeable rock body containing a natural accumulation of oil or gas, or both.
right-of-way	The right of passage or of crossing over someone else's land. Also, an easement in lands belonging to others that is obtained by agreement or lawful appropriation for public or private use.
rotary drilling	The method for drilling wells using a cutting bit attached to a revolving drill pipe.
sandstone	A consolidated rock composed of sand grains cemented together.
SCADA	The abbreviation for Supervisory Control and Data Acquisition.
sedimentary rock	A rock composed of materials that were transported to their present position by water or wind.
seep	An area, generally small, where water or another liquid, such as oil, percolates slowly to the land surface.
SEIA	The abbreviation for Socio-Economic Impact Assessment.
seismic program	A study to obtain detailed information from earth vibrations that are produced naturally or artificially (as in geophysical prospecting).
service rig	A hoist and engine, mounted on a wheel chassis with a self-erecting mast, that is used to service wells.

settlement area	The main area where an aboriginal group traditionally lived and pursued their livelihood. Rights and benefits defined by the Final Agreement, such as rights to hunt and fish, or economic benefits, such as consultation on exploration and development, may extend to the whole settlement area.
shale	A fine-grained laminated or fissile sedimentary rock made up of silt or clay-size particles. It generally consists of about one-third quartz, one-third clay materials and one-third miscellaneous minerals, including carbonates, iron oxides, feldspars and organic matter.
Shell	The abbreviation for Shell Canada Limited.
shipper	An individual or company that contracts with a gathering, transmission or distribution system for transporting natural gas.
shutdown	The act of stopping work temporarily or stopping a machine or piece of equipment in operation.
Significant Discovery Licence	A licence, issued under the provisions of the Canada Petroleum Resources Act, which allows the licence holder to explore, drill and test for petroleum and to develop frontier lands to produce petroleum.
silt	Fine sand, clay or other soil carried by moving or running water and deposited as sediment on the bottom or on the shore of a lake or stream.
sinkhole	Closed surface depressions in regions of karst topography produced by the subsurface limestone geology or the collapse of cavern roofs.
single-phase design	Separate pipelines for natural gas and for NGLs.
skid	A plank or roller on which a heavy object may be placed to facilitate moving.
slough	A minor marshland or tidal waterway that usually connects other tidal areas.
slug catcher	A vessel or series of pipes to collect liquids at the inlet of a compressor station.
SO_2	The chemical formula for sulphur dioxide.
socio-economics	The study of social and economic factors.

solifluction	A rapid soil creep, especially referring to downslope soil movement in periglacial areas.
solifluction lobes	An isolated, tongue-shaped feature of the land surface with a steep front and a smooth upper surface formed by more rapid solifluction on certain sections of the slope.
sorted stripes	A nongenetic group of patterned ground features forming stripes or rows of stones, commonly alternating with very small particles and larger stones and boulders. The sorting is caused by natural processes, such as the action of running water or freeze and thaw cycles.
southern terminus	The southernmost point of the Mackenzie Valley Pipeline where the transmission system connects either directly with the Alberta natural gas pipeline system in northwestern Alberta or to a third-party extension that subsequently connects to the Alberta system.
species	A group of organisms that actually or potentially interbreed and are reproductively isolated from all other such groups; a taxonomic grouping of genetically and morphologically similar individuals; the category below genus.
spring break-up	The time of year when the temperature rises sufficiently to thaw ice, causing it to break up in rivers, allowing them to become navigable.
staging area	An area used by migratory birds to prepare for, or rest during, migratory flights.
staging site	A location where equipment is stored, maintained or readied for work.
start-up	The act of recommencing work or starting up machinery or equipment after a temporary shutdown or decommissioning.
steady-state conditions	The normal functioning of a process or equipment, as opposed to start-up and shutdown conditions.
stockpile	A storage supply of something, such as line pipe or soil, to be used later.
stream baseflow	The flow of water entering stream channels from groundwater sources in the drainage of large lakes.

stringing	The process of delivering and distributing line pipe and joints where and when they are needed along the right-of-way. Pipe is strung so that the movement of livestock and vehicles is not impeded.
subsistence lifestyle	Producing a sufficient quantity of goods to sustain one's own existence or to support one's household, without producing a sufficient surplus for trade.
substrate	An underlying surface or foundation of a structure or development.
subsurface rights	The rights to exploit oil, gas and mineral resources and to benefit from the development of resources and minerals found beneath the ground.
surface rights	The rights to work on the surface of the land only, mineral rights being reserved.
surficial deposits	Uncompacted deposits and soil lying on bedrock or occurring on or near the earth's surface.
sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
sweet natural gas	Gas that has no more than the maximum sulphur content, as defined by the specifications for the sales gas from a plant or by a legal body.
taiga	A large temperate forest zone characterized by forests drawing on discontinuous permafrost and mineral soils.
tariff	The terms and conditions under which the service of a pipeline is offered or provided, including the tolls, the rules and regulations, and the practices relating to specific services.
Tcf	The abbreviation for trillion cubic feet.
temporal	Of, or related, to time.
terrestrial	The earth's land area, including its human-made and natural surface and subsurface features, and its interfaces and interactions with the atmosphere and the oceans.
thaw subsidence	The caving in of a surface as a result of ice lenses in permafrost melting.

thermokarst topography	An irregular land surface formed in a permafrost region by melting ground ice.
throughput	The amount of material put through a process or pipeline.
till	Unsorted sedimentary material deposited directly by, and underneath, a glacier, consisting of a mixture of clay, silt, sand, gravel and boulders. Also known as *glacial till.*
timberline	The altitudinal level on a mountain above which no trees grow. Also known as *tree line.*
TK	The abbreviation for traditional knowledge.
toll	The fee charged by a pipeline company for the use of its facilities.
topography	The configuration of a surface, including its relief and natural and artificial features.
traditional harvest	Activities involving the harvest of traditional resources, such as hunting and trapping, fishing, gathering medicinal plants, and travelling to engage in these activities.
traditional knowledge	Cultural knowledge that is based on direct observation or information passed on orally from other community members, developed from centuries of experience of living off the land.
TransCanada PipeLines	The abbreviation for TransCanada PipeLines Limited.
transient conditions	Varying flow conditions within a pipeline.
transmission pipeline	A system of pipelines, compressor stations and other related facilities that transport natural gas from the gathering system to the southern terminus.
tree line	The altitudinal level on a mountain above which no trees grow. Also known as *timberline.*
tributary	A stream that feeds or flows into or joins a larger stream or a lake.
tributary channels	An irregular branch flowing out from a main stream and not returning to it.
tundra	A vast treeless zone, lying between the ice cap and the timberline of North America and Eurasia, that has a permanently frozen subsoil.

turbidity	A cloudy or hazy appearance in a naturally clear liquid caused by a suspension of colloidal liquid droplets or fine solids.
turndown conditions	Conditions during which a pipeline or equipment operates at less than design flow.
two-phase design	A single pipeline for natural gas and NGLs.
U.S.	The abbreviation for the United States.
understory	A foliage layer occurring beneath, and shaded by, the main canopy of a forest.
ungulate	A hoofed mammal.
vascular plants	Plants, such as grasses or trees, that have a vascular or conductive system.
wastewater	Water that is mostly vapour condensed from natural gas and any free water produced with the natural gas.
water crossing	A location where a pipeline crosses a stream or a river.
wellbore	The hole drilled by the bit in a well.
wellhead	The equipment installed at the surface of the wellbore.
Westcoast	The abbreviation for Westcoast Energy Inc.
wetlands	A broad group of wet habitats where the water table is usually at or near the surface, or the land is covered by shallow water.
winter road	A secondary road made of compact snow or ice, often plowed over a frozen lake or ground, and which is impassable in the summer. Also known as *ice road*.
wireline	A slender, small diameter, rod-like or thread-like piece of metal that is used for lowering special tools, such as perforating guns, into a well.
wireline unit	A service vehicle or unit on which the spool or wireline is mounted for use in downhole wireline work.
workover	One or more of a variety of remedial operations performed on a producing oil or gas well, to try to increase production.
workover rig	A portable rig used for working over a well.

Tips for Using Online Documents
for
Preliminary Information Package – Volumes 1 and 2

Changing Display Settings

For best results, maximize Acrobat (or Reader). The documents will be difficult to read and navigate if you run Acrobat (or Reader) in a small window.

Each volume opens to show bookmarks and text. If you need more room for text display, you can toggle the bookmark list by clicking the *Show/Hide Navigation Pane* icon on the toolbar.

The default zoom setting is 125%, which provides sufficient space for bookmarks and the full width of a portrait page at a size that is legible for most users.

If you like, you can change the zoom setting, but doing so might affect the result when you click a bookmark or link. Bookmarks and links were created at a zoom setting of 125%. If your zoom setting is significantly higher than that, your screen might not show text that was visible when the bookmark or link was created. In that case, you can press [Page Down] to move to the next screen.

Using Bookmarks and Links

Bookmarks, which appear in the navigation pane, provide direct access to:

- sections and subjects in Volume 1
- alphabetic groups in the Volume 1 glossary
- this page of tips
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Initially, bookmarks for sections and the glossary are collapsed, showing only the highest level. A [+] sign beside a bookmark indicates that you can expand the bookmark to show lower-level items.

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Viewing Maps

When you click links to Volume 2 maps, please be patient. Maps are stored in separate files, some of which are extremely large (several megabytes for a single page), so they might take a long time to display.

Also, be careful if you run Acrobat (or Reader) inside Internet Explorer. With some software versions, you might find that you can link to a map in a separate file, but can't return to the page where you clicked the link.

In that case, you can use Internet Explorer's [Back] button to return to Page 1 in the original file, but you'll have to find your location again. To make that easier, make a note of the page number you are viewing **before** you click a link to a map.