

ENVIRONMENTAL IMPACT STATEMENT  
for the  
MACKENZIE GAS PROJECT

Volume 6: Part C

**Socio-Economic Impact Assessment**

**Wrigley  
Community Report**

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# 1 INTRODUCTION

## 1.1 Background and Purpose

The purpose of this report on Wrigley is to respond to the Joint Review Panel (JRP) request for a community-specific presentation of the environmental impact statement (EIS) socio-economic impact assessment (SEIA). For consistency and ease of use, the report is similar in structure to the regional-level material contained in the existing EIS, Volumes 6A and 6B. The report presents a community focus on a stand-alone basis, with the intent of meeting the needs of, and facilitating review by, the applicable community without substantial reference to other EIS documentation. A corresponding Volume 4B has been prepared to present the socio-economic baseline conditions on a community-specific basis.

## 1.2 How to Use this Report

In order to help the reader to locate content that may be of particular interest and to allow linkages for a given topic between the baseline information in Volume 4B and the effects assessment in Volume 6C, as well as to the existing Volumes 4 and 6 of the EIS, the following concordance table provides cross-references for the topics in each volume (see Table 1-1). The numbering has changed in Volume 6C from the EIS to accommodate new sections.

**Table 1-1: Environmental Impact Statement Topic Areas**

Topic	EIS, Volume 4	Volume 4B	EIS, Volumes 6A and 6B	Volume 6C
Introduction	1.0	1.0	1.0	1.0
Geographic Area of Interest	–	–	–	2.0
Public Participation	–	–	–	3.0
Project Expenditures	–	–	2.0	–
National Economic Effects	–	–	3.2	–
Population Composition and Dynamics (Demography)	2.2.1, 2.3.1, 2.4.1, 2.5.1, 2.6.1, 2.7.1, 2.8.1, 2.9.1	2.2	3.3	4.2
Economic Activity	2.2.2, 2.3.2, 2.4.2, 2.5.2, 2.6.2, 2.7.2, 2.8.2, 2.9.2	2.3	3.1	4.1
Labour Force	2.2.3, 2.3.3, 2.4.3, 2.5.3, 2.6.3, 2.7.3, 2.8.3, 2.9.3	2.4		
Income Sources and Amounts	2.2.4, 2.3.4, 2.4.4, 2.5.4, 2.6.4, 2.7.4, 2.8.4, 2.9.4	2.5		

Table 1-1: Environmental Impact Statement Topic Areas (cont'd)

Topic	EIS, Volume 4	Volume 4B	EIS, Volumes 6A and 6B	Volume 6C
Cost of Living	2.2.5, 2.3.5, 2.4.5, 2.5.5, 2.6.5, 2.7.5, 2.8.5, 2.9.5	2.6		
Transportation Infrastructure	3.2.1, 3.3.1, 3.4.1, 3.5.1, 3.6.1, 3.7.1, 3.8.1, 3.9.1	3.3	4.1	5.2
Utilities, Energy and Communications	3.2.2, 3.3.2, 3.4.2, 3.5.2, 3.6.2, 3.7.2, 3.8.2, 3.9.2	3.4	4.2	5.3
Housing	3.2.3, 3.3.3, 3.4.3, 3.5.3, 3.6.3, 3.7.3, 3.8.3, 3.9.3	3.5	4.3	5.4
Recreation	3.2.3, 3.3.3, 3.4.3, 3.5.3, 3.6.3, 3.7.3, 3.8.3, 3.9.3		4.4	5.5
Governance	3.2.4, 3.3.4, 3.4.4, 3.5.4, 3.6.4, 3.7.4, 3.8.4, 3.9.4	3.2	4.5	5.1
Health Conditions	4.2.1, 4.3.1, 4.4.1, 4.5.1, 4.6.1, 4.7.1, 4.8.1, 4.9.1	4.2	5.3	6.2
Health Care Facilities and Services	4.2.2, 4.3.2, 4.4.2, 4.5.2, 4.6.2, 4.7.2, 4.8.2, 4.9.2	4.3	5.2	6.1
Family and Community Conditions (Community Well-Being)	4.2.3, 4.3.3, 4.4.3, 4.5.3, 4.6.3, 4.7.3, 4.8.3, 4.9.3	4.4		
Human Health Risks	–	–	5.4	6.3
Accidents and Malfunctions	–	–	–	6.4
Social and Protection Facilities and Services	4.2.4, 4.3.4, 4.4.4, 4.5.4, 4.6.4, 4.7.4, 4.8.4, 4.9.4	4.5	5.5	6.5
Education and Training	4.2.5, 4.3.5, 4.4.5, 4.5.5, 4.6.5, 4.7.5, 4.8.5, 4.9.5	4.6	5.6	6.6
Traditional Harvesting	5.2.1, 5.3.1, 5.4.1, 5.5.1, 5.6.1, 5.7.1, 5.8.1, 5.9.1	5.2	6.2	7.1
Trapping	5.2.2, 5.3.2, 5.4.2, 5.5.2, 5.6.2, 5.7.2, 5.8.2, 5.9.2	5.3		

Table 1-1: Environmental Impact Statement Topic Areas (cont'd)

Topic	EIS, Volume 4	Volume 4B	EIS, Volumes 6A and 6B	Volume 6C
Aboriginal Language	5.2.3, 5.3.3, 5.4.3, 5.5.3, 5.6.3, 5.7.3, 5.8.3, 5.9.3	5.4	6.3	7.2
Nontraditional Land and Resource Use	6.0	6.0	7.0	8.0
Heritage Resources	7.0	7.0	8.0	9.0
Cumulative Effects	–	–	9.0	–
Monitoring and Follow-Up	–	–	10.0	10.0
References, Glossary	end	end	end	end
NOTE: – = not included, or not discussed				

### 1.3 Approach

This SEIA is designed to focus on how the project may affect the wellness of a community. Wellness is often the most highly valued aspect of community life, and depends on the well-being of individuals, families and the community as a whole. Community wellness may be significantly enhanced by project benefits, and be vulnerable to adverse effects.

The effects assessment is focused on addressing community concerns, with the aim of designing and implementing the project using procedures that optimize beneficial effects and reduce effects the communities believe to be undesirable.

A community-driven approach requires:

- knowledge about the characteristics of the communities that may be affected
- understanding of the interests and concerns of these communities

Knowledge of community characteristics has been obtained by collecting information from residents who are informed about a particular circumstance. Information on interests and concerns was gained in the meetings and community consultations held with residents of Wrigley and the other communities in the Deh Cho Region (DCR).

### 1.4 How the Effects Assessment is Conducted

Communities experience socio-economic effects in accordance with two primary interactions:

- physical, social or economic interaction between the project components activities or personnel, and community residents and their economic, social or cultural resources and pursuits

- supplying workers or business services to the project, which generates income for firms and individuals. The spending or investment of this income will have both positive and negative effects.

These community-specific reports do not address cumulative effects since this is not an appropriate analysis to conduct at the community level.

## 1.5 Data Limitations

To the extent feasible, assessment information in the EIS, Volumes 6A and 6B has been supplemented by data and information available at the community level. In order that regional and community presentations are internally consistent and comparable, only limited new data is presented.

Many of the communities in the Northwest Territories have relatively small populations, which means that data collected by Statistics Canada and other agencies, at the community level, is either suppressed or has limitations to maintain confidentiality and privacy. As a result, in several instances, information and analysis is constrained to a regional-level discussion.

For the reasons described above, this report therefore contains a significant amount of information common to all DCR communities. However, the report also contains some community data previously collected but not presented in the EIS. Where distinct community-specific effects have been identified, they are provided in this report.

This approach is consistent with input from the public participation program for the EIS. During issues scoping meetings with individual communities and the subsequent regional workshops, it was found that the majority of issues were commonly held among communities. Not only were some issues similar among communities in any region, but many concerns were common across the study area.

## 1.6 New Information

In its letter of December 3, 2004, the JRP requested additional information related to the effects assessment. This volume contains the following new information:

- the geographic area of interest of each community is addressed by relating project facilities and activities to communities that have either stated an expressed geographic interest during project studies and consultations, or whose interests are documented in public plans or agreements. This exercise was undertaken to respond to a request from the JRP. In the process of identifying the geographic area of interest, some overlap of interests between communities occurs. Consequently, the geographic area of interest might not exactly represent an individual community's point of view. Further, it is only one of several factors taken into account in the effects assessment.

- the public participation program (EIS, Volume 1, Section 3) has been summarized by providing an overview of the important meetings and consultation events, quantifying the extent of participation, and listing the key issues identified for each community
- the human environment aspects of accidents and malfunctions scenarios have been developed. The description of accidents and malfunctions is the same for all communities.

Traditional knowledge (TK) studies are being conducted under contract with community and regional groups in all areas, and the results of these studies, when available, may provide additional information on the issue of geographic areas of interest. However, this information will be available only if TK study groups choose to disclose it.

### 1.7 Summary of Socio-Economic Effects on Wrigley

Wrigley is a very small community located at the northern end of the Mackenzie Highway, less than 1 km from the pipeline route and 28 km from a large construction camp. There will be considerable project activity on the highway, at the Wrigley airstrip and barge landing, and at neighbouring sites where pipe, fuel and other project supplies will be stockpiled. The project activity at this location may attract a small number of in-migrants, former community residents and others who have relatives in Wrigley.

The other major sources of effects Wrigley may experience will be the increased incomes of those who obtain project-related or induced employment. Much increased income may be spent in beneficial ways, but some may also be spent on alcohol or drugs. Project-related travel in and out of the community may cause some increase in exposure to disease.

Project effects are assessed for direction, magnitude, duration and geographic extent. These are commonly referred to as attributes. The direction of a project effect is evaluated as neutral, adverse or positive, while the magnitude of an effect can be no effect, low, moderate or high. Low-magnitude effects would be barely discernible, while high-magnitude effects would represent noticeable changes in the community. The duration of an effect can be short term (occurring during the Construction Phase only) or long-term (lasting into the Operations Phase). The geographic extent of an effect can be local (experienced by the community only) or regional (experienced throughout the DCR) in extent. Virtually all construction effects are short term, and those Wrigley may experience may be local or regional in extent.

**SECTION 1: INTRODUCTION**

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A socio-economic effect is only considered significant if the effect will be:

- high magnitude, short term, and regional, beyond regional or national in extent
- high magnitude, long term and any geographic extent
- moderate magnitude, long term, and beyond regional or national in extent

The following is a summary of some of the expected project effects for the DCR, some of which might be experienced in Wrigley. Not all attributes are described in the following text. Please see the appropriate sections of this report for full descriptions.

- Procurement, employment and income are expected to have high-magnitude, regional and beyond regional, positive effects during construction. During operations, effects are expected to be positive, low in magnitude, and regional and beyond regional.
- Because there may be limited in-migration to Wrigley, the resulting effects on population and housing availability are expected to be adverse, local and low in magnitude over the short term.
- No effects are expected on recreation facilities in Wrigley.
- Regional effects on road and air transport are expected to be adverse and moderate in magnitude, and barge transport effects are expected to be adverse and low in magnitude. All will be short term.
- Some project earnings may lead to increased alcohol abuse and associated undesirable behaviour, with adverse, moderate-magnitude effects on well-being conditions, and social and protection services expected. These effects will be short-term and local.
- Increased project-associated travel and the substance abuse sometimes associated with increased incomes may have effects on health conditions that are moderate in magnitude, adverse, short term and local in Wrigley. Effects on health care services are also expected to be moderate in magnitude, adverse, local and short term.
- Project opportunities may motivate some students to leave school early and perhaps some to return to school. Therefore, effects on education attainment may be positive and adverse, low to moderate in magnitude, and experienced locally for the short term. No effects are expected on education services.

- Regionally, traditional harvesting may experience low-magnitude adverse effects. Traditional culture will likely experience virtually no effect.
- It is expected that some nontraditional land users are based out of Wrigley. Effects on nontraditional land and resource use valued components (VCs), including land ownership, granular resources, timber resources, mineral resources, oil and gas activities, nontraditional resource harvesting, other commercial activities and tourism and recreation, are expected to be positive and adverse, ranging from low to moderate magnitude and short to long term. These effects are expected to occur locally to regionally in extent. In some cases, the project will have almost no effect on specific VCs. Effects on visual and aesthetic resources or protected areas are expected to be low to moderate in magnitude, adverse and short to long term.
- Project effects cannot be determined at this time because the final project component locations have not yet been finalized.



## 2 GEOGRAPHIC AREA OF INTEREST

### 2.1 Boundaries

This section describes the areas of interest for the DCR communities. The area of interest is defined as the geographic or spatial extent of most community socio-economic activity, and this area has been used to identify the most important potential project effects likely to impinge upon a given community. This area of interest can extend beyond the community to within, or even outside, the region.

The Deh Cho Process is intended to achieve clarity on ownership, sovereignty and jurisdiction of the lands and First Nations in the Deh Cho territory. The Deh Cho Process refers to the land, resource and governance negotiation process between the Deh Cho First Nations, the Government of the Northwest Territories (GNWT) and the Government of Canada. Land use planning is only one part of this process, but it is intended to be of fundamental importance in establishing areas of interest within the DCR and communities.

The Deh Cho Land Use Planning Committee (DCLUPC) (2004) has the following Mission Statement:

*The Deh Cho Land Use Planning Committee will develop a land use plan as a management tool to determine what type of land use activities should occur and where they should take place. This plan will balance economic, social, environmental and cultural needs and interests.*

The guiding principle is stated as:

*This plan will be guided by the principles of sustainable development and respect for the land as understood and explained by the Deh Cho elders.*

Deh Cho Land Use Planning is defined:

*Land use planning outlines what types of activities should occur, where they should take place, and the terms and conditions necessary to guide land use decisions over time. It requires a clear vision of how we want the land and the people to be in 20 to 30 years. The Plan becomes the roadmap that guides decisions at every turn to take us where we want to go. Once approved the Land Use Plan will provide legally binding direction to regulatory agencies and decision-makers in their assessment of development projects, protected area proposals and other land uses. The planning area includes all lands in the Deh Cho territory outside the existing boundaries of a local government and Nahanni National Park Reserve. The planned area excludes municipal areas and Nahanni National Park Reserve.*

In 2004, the DCLUPC developed a set of land use options to begin discussions to determine how the land and resources in the DCR should be used. The committee states in its letter of January 15, 2005 that:

*the Committee has considered the feedback provided and has developed a Working Draft Land Use Map and Terms that balances the economic, social, cultural and environmental needs of the region. The Deh Cho Land Use Planning Committee is hosting a Regional Forum from March 29 to 31, 2005 on the Hay River Reserve to bring all our planning partners together to review our Working Draft Land Use Map and Terms.*

The DCLUPC *Summer 2004 Consultation Summary* (November 2004) includes draft land use maps for each of the 10 Deh Cho First Nations and communities. The bases of areas of interest have been initiated by community and for each community, and the documentation also includes *Mapping Summaries by Resource Sector for the Deh Cho Region* (Sectors: 1. Forestry; 2. Oil and Gas; 3. Mining; 4. Agriculture; 5. Consumptive Tourism; 6. Non-Consumptive Tourism).

Extensive DCLUPC community consultations have taken place, assessing and defining areas of interest, and will continue with the regional forum in April 2005, and through the remaining Phases 3 and 4 (Plan Preparation and Plan Implementation) of the Deh Cho land use planning process. The November 2004 report includes summaries of both written and verbal community comments and questionnaire results, and a table illustrating community priority results from a community priorities exercise.

At this stage, it is not clear what the functional relationship is between community general plans, the zoning bylaws that implement them and the Deh Cho Regional Land Use Plan.

The geographic local area of interest for Wrigley extends from the Blackwater River area in the north to the Camsell Bend area in the south, and includes proposed pipeline corridor lands (Pehdzeh Ki First Nation).

**2.2 Project Facilities in the Area of Interest**

Table 2-1 indicates the specific project components and the approximate construction timing relevant to the Wrigley area.

**Table 2-1: Project Components and Construction Timing Relevant to the Wrigley Area**

<b>Project Component</b>	<b>Construction Schedule</b>	<b>Location</b>
Anchor fields (includes flow lines)	N/A	N/A
Gathering pipelines	N/A	N/A
Gathering facilities	N/A	N/A
Pipelines	2006–2009	Gas pipeline
Pipeline facilities	2006–2009	Blackwater River compressor station Trail River compressor station
Barge landing sites	2006–2007	Blackwater River compressor station Ochre River Camsell Bend ferry crossing
Stockpile and storage sites	2006–2008	Blackwater River compressor station Ochre River Smith Creek north Smith Creek south Camsell Bend ferry crossing
Camps	2006–2008	Blackwater River compressor station Ochre River Camsell Bend ferry crossing
All-weather roads	2006–2009	Blackwater River compressor station Ochre River Camsell Bend
Airstrips and airports	N/A	Blackwater River compressor station (new?) Wrigley (existing)
Borrow sites	2006–2009	13 primary sites 16 secondary sites (if required)
NOTE: N/A = not applicable		



### 3 PUBLIC PARTICIPATION

Public participation activities for the EIS with the community of Wrigley can be summarized as follows.

The EIS public participation program consisted of two *rounds* of public participation activities. Each round consisted of community meetings, followed by a regional workshop. Round 1 focused on issues scoping, where communities were provided with information about the project, and asked to identify their issues and concerns. Round 2 focused on identifying and verifying possible project effects, based on issues identified in Round 1, and suggesting measures to manage or mitigate the negative effects and optimize the positive effects.

The corridor community of Wrigley was invited but chose not to participate in individual community meetings for the EIS public participation program. However, Wrigley was represented at the first regional EIS technical workshop held in Fort Simpson on October 1 to 2, 2003. Representatives from the leadership organizations of Wrigley attended, along with representatives from other Deh Cho communities, regulatory agencies, and the project team. They discussed the issues that arose in each community from the preceding community meetings and clarified which issues were common or unique across the different communities.

Similarly, on May 18 and 19, 2004 representatives from Wrigley leadership organizations participated in the second regional EIS technical workshop held in Fort Simpson, when Deh Cho communities again met with regulatory agencies and the project team to share the input gathered during the preceding community meetings, and to discuss ways in which the effects could be managed.

In addition to the above consultation activities, community consultation with Wrigley leadership organizations was carried out as part of the process for obtaining biophysical, socio-economic and traditional knowledge research licenses from the Aurora Research Institute.

Community participation activities were not restricted to those described previously. Initiatives by the individual project proponents to fulfill their community relations commitments provided additional opportunities for project representatives to interact with the communities.

### General Issues Identified

For a complete listing of all the issues and their respective suggested mitigative measures identified for Wrigley, please see Volume 1, Section 4 of the EIS. The general issues identified in Wrigley during public consultation included the following:

- the road north of Wrigley is narrow and unable to accommodate all traffic. There is a concern that the increase in project traffic, especially large trucks, will pose more of a safety issue.
- increase in project traffic during construction will increase exhaust fumes, potentially affecting vegetation such as berries and willows
- concern that the Blackwater River area, a prime Pehdzeh Ki First Nation hunting area, will be exposed to an increase in project noise, potentially negatively affecting the moose population
- because the Blackwater area is a prime hunting area for the Pehdzeh Ki First Nation, the Pehdzeh Ki would prefer directional drilling over the proposed open-cut method for pipeline construction
- separation of family unit because of camp life may contribute to a strain in family relationships

4 PEOPLE AND THE ECONOMY

4.1 Procurement, Employment and Regional Economic Effects

4.1.1 Effect Pathways

The expected influences of the project on procurement, employment and regional economies of the Northwest Territories are shown in Figure 4-1. In broad overview, project effects will derive from interactions of demand and supply. The project will generate a large demand for goods, services and workers at project locations in the Northwest Territories. Qualified and competitive suppliers of goods, services and workers in northern communities and regions will respond to the demand if possible and within their capacity limitations. Where demand exceeds northern supply capacity, the project will look beyond the Northwest Territories to meet supply requirements.

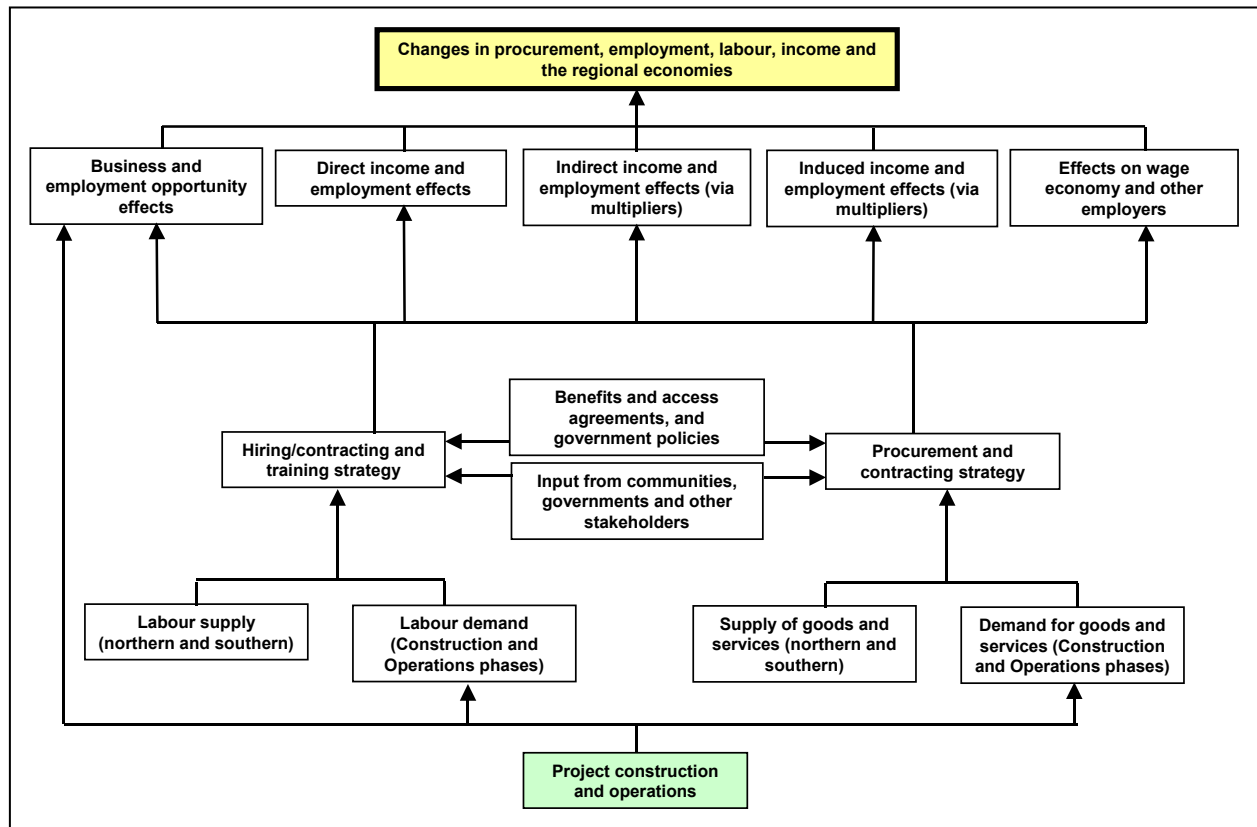


Figure 4-1: Project Effects on Regional Economies and the Northwest Territories Economy

Addressing purely labour considerations first, labour demand and labour supply, the pending benefits and access agreements, benefits plans pursuant to the *Canada Oil and Gas Operations Act (COGOA)*, the Northwest Territories Socio-Economic Agreement, and inputs from communities and other stakeholders will influence educational upgrading, training, hiring and contracting strategies. These strategies will have multiple regional effects on:

- direct, indirect and induced employment and income
- capacity development
- the wage economy
- other employers

The influences driving effects on goods and services are similar to those for labour. The supply of goods and services and the demands for them, and benefits and access agreements, the Northwest Territories Socio-Economic Agreement, *COGOA* benefits plans, and inputs from communities and other stakeholders will affect procurement and contracting strategies. These strategies will have multiple regional effects on:

- business opportunities
- revenue and capacity development
- direct, indirect and induced income and employment
- the wage economy and other employers

This analysis of the effect pathways for project effects on regional economies, and employment and expenditures therein, is based on both quantitative and qualitative data. There are empirical indicators for most of the links in the diagram. It is clear that project-induced demands will affect the supplies of, and the demands for, employees, goods and services in study area regions and communities.

Although project effects on individual community labour, goods and services were not provided in the regional analysis, it is reasonable to assume that community effects will largely be influenced by the community labour force and business capacity. In turn, availability, qualifications and interest of local labour force, and suppliers of goods and services will affect local capacity, as will mitigation measures designed to expand capacity and qualifications of local businesses and labour force.

#### **4.1.2 Assessment and Management of Project-Specific Effects**

The assessment of project-specific effects includes:

- an overview of procurement and employment opportunities associated with the project

- a description of the methods used to assess procurement, employment, income and regional economic effects
- an assessment of expenditure, employment and labour income in the study area, taking into consideration capacity constraints that exist in the study area as a whole and the individual regions therein
- a qualitative assessment of effects on northern wages and other northern employers

The assessment of expenditure, employment and labour income has been extracted from a more detailed economic assessment of project effects on the economies of the study regions, the Northwest Territories, Alberta and the rest of Canada, entitled *Predicted Economic Impacts of the Proposed Mackenzie Gas Project* (Ellis Consulting Services 2004). This assessment and the extracts from it are presented for the regional but not the community level, because most community data is too small to meet the quantitative requirements of statistical modelling procedures.

The assessment of project-specific operations effects includes an evaluation of direct, indirect and induced employment, and labour income in the region. Both employment and labour income are generated because of operations, and ongoing capital and drilling activities scheduled over the life of the project.

#### 4.1.2.1 Procurement and Employment Opportunities

Table 4-1 and Table 4-2 show the direct and indirect project-related opportunities available to qualified business and individuals.

Capital expenditures made in the DCR for goods, services and labour will be linked to project components and activities located in the region. This includes:

- two compressor stations, near the Blackwater River and Trail River
- part of gas pipeline spread B1, and all of spreads B2, A1 and A2 (see the EIS, Volume 2, Figure 4-7 for details)
- one heater station, located near Trout River
- nine infrastructure sites that could include:
  - camps
  - fuel storage
  - pipe and materials stockpiles
  - equipment storage
  - barge landings and, in some cases, airstrips

**Table 4-1: Project Procurement Opportunities**

<b>Business Opportunity</b>	<b>Typical Goods and Services Required</b>
Communication	<ul style="list-style-type: none"> <li>• Voice: telephone, cellular, satellite, VHF or UHF radios</li> <li>• Data: Internet, internal company systems</li> <li>• Satellite and cable television</li> </ul>
Community accommodation and related services	<ul style="list-style-type: none"> <li>• Apartments, hotels and motels</li> <li>• Restaurants</li> <li>• Taxi, laundry and dry-cleaning services</li> </ul>
Construction	<ul style="list-style-type: none"> <li>• Drilling               <ul style="list-style-type: none"> <li>• drilling engineering and geologist</li> <li>• drilling supervision</li> <li>• drilling and completion rigs</li> <li>• coiled tubing unit</li> </ul> </li> <li>• Oilfield services               <ul style="list-style-type: none"> <li>• cementing</li> <li>• drilling fluids</li> <li>• directional drilling</li> <li>• bit supply</li> </ul> </li> <li>• Facilities               <ul style="list-style-type: none"> <li>• concrete, crushed rock, sand, gravel and ready-mix products</li> <li>• forms, rebar, cribbing, cement finishing and masonry products</li> </ul> </li> <li>• Pipelines               <ul style="list-style-type: none"> <li>• timber for pipeline skids and survey laths</li> <li>• welding services and supplies, such as acetylene and oxygen</li> </ul> </li> <li>• Construction services</li> <li>• Surveying</li> <li>• Welding and inspection services</li> <li>• Building trades               <ul style="list-style-type: none"> <li>• electrical, mechanical, instrumentation, insulating and pipefitting</li> </ul> </li> </ul>
Construction (cont'd)	<ul style="list-style-type: none"> <li>• Building materials and supplies               <ul style="list-style-type: none"> <li>• wire, fittings and pipe</li> </ul> </li> <li>• Civil construction services</li> <li>• Crane services</li> <li>• Heating, ventilation and air conditioning supply, installation and maintenance</li> <li>• Environmental monitor services</li> <li>• On-site safety professional services</li> </ul>
Equipment	<ul style="list-style-type: none"> <li>• Heavy equipment supply and service</li> <li>• Drilling equipment and services</li> <li>• Small engine and equipment supply and service</li> <li>• Industrial supplies, steam and high-pressure water</li> <li>• Industrial rental services</li> </ul>
Fuel and fuel storage	<ul style="list-style-type: none"> <li>• Propane, diesel, aircraft fuels, gasoline, grease, lubricant oil, anti-freeze and chemicals</li> <li>• Propane and fuel storage tanks: storage, inventory management and fuel delivery</li> <li>• Oil spill response services and equipment</li> <li>• Super cargo services</li> </ul>

**Table 4-1: Project Procurement Opportunities (cont'd)**

<b>Business Opportunity</b>	<b>Typical Goods and Services Required</b>
Logistics	<ul style="list-style-type: none"> <li>• Safety equipment, supplies and training</li> <li>• Materials management, expediting, freight transport, flight planning</li> <li>• Hot shot services</li> <li>• Air transport, aircraft charters and maintenance</li> <li>• Vehicle sales, rentals, repairs and service</li> <li>• Charter boats and barges</li> <li>• Procurement, including customs brokers</li> </ul>
Office	<ul style="list-style-type: none"> <li>• Janitorial services</li> <li>• Office space, supplies, furniture, computers and other equipment</li> <li>• Administrative services: secretarial (word processing), clerical, accounting, bookkeeping and payroll</li> <li>• Travel reservation services</li> <li>• Banking services</li> </ul>
Remote site services	<ul style="list-style-type: none"> <li>• Camps, camp catering, camp supplies</li> <li>• Retail and wholesale grocery supply</li> <li>• Water delivery, sewage treatment, snow removal and garbage disposal</li> <li>• Security services</li> </ul>
Safety and medical	<ul style="list-style-type: none"> <li>• Emergency medical facilities, staff, supplies, air and ground ambulance, dentistry, optometry and prescription drugs</li> <li>• Occupation health services</li> </ul>
NOTES: UHF = ultra-high frequency VHF = very high frequency	
SOURCE: Imperial Oil (2004e)	

**Table 4-2: Project Employment Opportunities**

<b>Job Type</b>	<b>Specific Job Titles</b>	
<b>Construction</b>		
Management or supervisory	<ul style="list-style-type: none"> <li>• Construction manager</li> <li>• Superintendent</li> <li>• Foreman</li> </ul>	<ul style="list-style-type: none"> <li>• Assistant foreman</li> <li>• Assistant (lead hand)</li> </ul>
Equipment operators	<ul style="list-style-type: none"> <li>• Heavy equipment operator</li> <li>• Truck driver (oilfield or transport)</li> </ul>	<ul style="list-style-type: none"> <li>• Bus driver</li> <li>• Crane operator</li> </ul>
Trades	<ul style="list-style-type: none"> <li>• Welder</li> <li>• Electrician</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanic</li> <li>• Pipefitter</li> <li>• Other similar trades</li> </ul>
Labour, semi-skilled and unskilled	<ul style="list-style-type: none"> <li>• Swamper</li> <li>• Welder's helper</li> <li>• Nozzleman</li> <li>• Labourer</li> <li>• Oiler</li> </ul>	<ul style="list-style-type: none"> <li>• Rigger</li> <li>• Painter</li> <li>• Parts runner</li> <li>• Mechanic's helper</li> </ul>
<b>Drilling</b>		
Drilling supervision	<ul style="list-style-type: none"> <li>• Drilling supervisor</li> </ul>	<ul style="list-style-type: none"> <li>• Drilling engineer</li> </ul>

Table 4-2: Project Employment Opportunities (cont'd)

Job Type	Specific Job Titles	
Rigs and crews	<ul style="list-style-type: none"> <li>• Rig manager</li> <li>• Derrickhand</li> <li>• Driller</li> </ul>	<ul style="list-style-type: none"> <li>• Motor man</li> <li>• Floor hand</li> </ul>
Services	<ul style="list-style-type: none"> <li>• Bit supplier</li> <li>• Directional drilling personnel</li> <li>• Coring personnel</li> <li>• Power tong crew</li> </ul>	<ul style="list-style-type: none"> <li>• Cementing crew</li> <li>• Wireline services personnel</li> <li>• Drilling fluids personnel</li> <li>• Well site geologist</li> </ul>
<b>Engineering and Technologists</b>		
Engineer	<ul style="list-style-type: none"> <li>• Mechanical</li> <li>• Chemical</li> <li>• Civil</li> </ul>	<ul style="list-style-type: none"> <li>• Geotechnical</li> <li>• Drafting</li> </ul>
Technologists	<ul style="list-style-type: none"> <li>• Instrumentation</li> <li>• Chemical</li> <li>• Information</li> <li>• Project manager</li> </ul>	<ul style="list-style-type: none"> <li>• Production operations</li> <li>• Mechanical</li> <li>• Petroleum</li> <li>• Electrical</li> </ul>
<b>Logistics Services</b>		
Accommodation	<ul style="list-style-type: none"> <li>• Camp manager</li> <li>• Camp attendant</li> </ul>	<ul style="list-style-type: none"> <li>• Camp maintenance trades and labourers</li> </ul>
Food services	<ul style="list-style-type: none"> <li>• Chef</li> <li>• Cook or baker</li> </ul>	<ul style="list-style-type: none"> <li>• Kitchen help</li> <li>• Food preparer</li> </ul>
Health and safety	<ul style="list-style-type: none"> <li>• Health, safety, environment coordinator</li> <li>• Safety professional (CRSP-certified)</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency medical professional</li> <li>• First aid technologist</li> </ul>
Logistics	<ul style="list-style-type: none"> <li>• Expeditors</li> <li>• Warehouse person</li> <li>• Parts person</li> <li>• Shipper and receiver</li> </ul>	<ul style="list-style-type: none"> <li>• Supercargo</li> <li>• Logistics coordinator</li> <li>• Logistics manager</li> </ul>
Office support	<ul style="list-style-type: none"> <li>• Office manager</li> <li>• Administrative assistant</li> <li>• Expenditures</li> </ul>	<ul style="list-style-type: none"> <li>• Flight planners</li> <li>• Contracts coordinator</li> </ul>
Security	<ul style="list-style-type: none"> <li>• Security guard (watchperson)</li> </ul>	
<b>Project Management</b>		
Management	<ul style="list-style-type: none"> <li>• Project manager</li> <li>• Production operations</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering manager</li> <li>• Information manager</li> </ul>
Procurement and purchasing	<ul style="list-style-type: none"> <li>• Procurement manager</li> <li>• Purchasing agent</li> </ul>	<ul style="list-style-type: none"> <li>• Materials coordinator</li> </ul>
Socio-economic specialists	<ul style="list-style-type: none"> <li>• Field coordinator</li> <li>• Cultural relations coordinator</li> <li>• Employment and training counsellor</li> </ul>	<ul style="list-style-type: none"> <li>• Traditional knowledge specialist</li> <li>• Community consultation and socio-economic coordinator</li> </ul>
Environmental specialists	<ul style="list-style-type: none"> <li>• Environmental monitor</li> <li>• Renewable resource technician</li> </ul>	<ul style="list-style-type: none"> <li>• Wildlife technician</li> <li>• Biologist</li> </ul>
NOTE: CRSP = Canadian registered safety professional		
SOURCE: Imperial Oil (2004e)		

Procurement and employment opportunities exist for qualified DCR businesses and labour force in the DCR and other regions where the project will be located. However, given the nature of most of the capital investment in the DCR, such as pipeline and compressor supplies, materials and installation, coupled with the limited scope and capacity of businesses and the economy in the region, significant project-related capital expenditures and associated employment for goods and services are expected to go to sources located outside the region and the Northwest Territories.

#### 4.1.2.2 Measures of Regional Economic Effects

Economic effects were assessed at a regional rather than a local level because a community-level assessment with any degree of accuracy would not be possible given small size, capacity constraints and data limitations for individual Northwest Territories communities, coupled with the magnitude, scope and complexity of a project of this nature. There are some exceptions where economic effects on regional centres can be estimated. Further, economic analysis for a project of this size, scope and capital cost is typically done at the territorial or provincial level. A regional analysis for this project was undertaken by extrapolating the territorial input-output model results, coupled with knowledge of the Northwest Territories regions and use of regional demographic models developed by Ellis Consulting Services of Yellowknife.

The regional economic project effects were analyzed for both construction and operations. Three variables were measured to determine the effects for each phase. These variables included:

- project expenditures for each region
- employment on both a location and residency basis for each region
- labour income on both a location and residency basis for each region

Total estimated effects include the direct effects associated with the on-site construction and operations of the project, and the effects generated by the spin-off from this activity. The spin-off economic effects are referred to as *indirect* and *induced* effects, and are the result of the multiplier effects on the Northwest Territories, and other provincial and territorial economies.

Economic multipliers trace the effect of a change in output or demand for a good or service. For example, an increase in demand for a commodity will produce three effects that are described by economic multipliers:

- *direct* effects – effects on industries (firms) that expand production to satisfy increased demand. For building the project, they are the effects associated with supplying major components and with construction contractors.

- *indirect* effects – ripple effects as the construction contractors purchase additional required inputs from other firms. In this case, these are the firms that supply goods and services to the construction contractors or those operating the pipeline and fields, such as expeditors, located in various communities in the Northwest Territories.
- *induced* effects – as all these firms expand production, they hire more staff and pay out wages, thereby increasing the income received by households. Households, after withdrawing a certain part for taxes and savings, spend this income, which in turn increases demand for other commodities.

Estimates of economic effects generated were determined from simulations using project estimates of employment and expenditures supplied by the project proponents. The simulations were done using Statistics Canada's Inter-Regional Input-Output Model (I-O Model). The model simulates direct and indirect effects. A second model run was done to estimate induced effects. The Statistics Canada I-O Model produces results at the territorial or provincial level only. The allocation of Northwest Territories effects by region was done using data produced by Ellis Consulting Services.

All dollar values in this analysis are measured in constant 2003 dollars. All employment is expressed in jobs or person-years. All direct employment generated during construction is expressed as *jobs* because much of the work will be short term or seasonal, whereas all indirect and induced employment is expressed in *person-years*. All operations employment is expressed in *person-years* because it will be full-time or full-time equivalent (FTE) employment.

It is important to note that the results of the economic models should be viewed only as estimates and not absolutes. A major deficiency of most input-output models is that they are not subject to capacity constraints. In short, the input-output model operates as if there is sufficient unused industrial and labour market capacity to meet all incremental demand resulting from new economic projects. In the case of the Northwest Territories, there is limited capacity. The problem is compounded because it is unlikely that new investments will be made to meet a short-term increase in demand generated by project construction that will take place only for three to four years. As a result, although the Northwest Territories might produce goods and services that will be demanded by the project, there will likely not be sufficient capacity to meet the normal market share met by Northwest Territories producers, plus the incremental demand generated by the project. This will mean proportionately more goods and services will have to be imported than is normally the case. As the input-output model is based on averages, it will tend to overestimate the actual effect on the Northwest Territories economy. Other information was used in this analysis to refine model results and help offset this problem.

## Demographic and Labour Market Estimates

To estimate the effects on the regional labour markets, labour market projections were developed for the affected regions using the latest labour market information (GNWT Bureau of Statistics 2002a) and a demographic projection model developed by Ellis Consulting Services. The demographic model uses average birth and death rates, and is based on the 2001 census adjusted for the *undercount*. Historically in the Northwest Territories, there has been net out-migration. However, with the recent improvement in the economy, net migration has generally levelled off at a slightly positive rate. The demographic model adopted the recent trend and assumed no net migration for each region. The population estimates produced by the demographic model are based on the net natural increase (births minus deaths) only.

However, the model was adjusted to reflect expected exceptions to this rule at the regional centres of Inuvik, Norman Wells, Fort Simpson, Hay River and Yellowknife. The model adjustments were made recognizing that there will be some in-migration to these centres:

- to fill jobs in regional centres because of business, community services and government agency expansions
- to replace northerners that choose to leave existing employment to pursue higher-paying or more fulfilling work on the project
- on speculation that taking up temporary or permanent residence in the Northwest Territories will improve chances of finding direct project employment, or spin-off indirect or induced employment generated because of the project

It is assumed that people from within northern regions will fill some of these jobs, but people from outside the Northwest Territories will also be recruited. Some of the incoming population will fill term positions, and rotate to and from their primary residences. Others will move to the Northwest Territories for the duration of construction and of those, some will take up permanent residence in the Northwest Territories.

In 2002, the GNWT Bureau of Statistics undertook a labour force survey in the Northwest Territories. Two definitions of unemployment can be derived from the 2002 survey:

- the first, which is used for the monthly national labour force survey released by Statistics Canada, requires that a person be actively seeking work to be considered unemployed
- the second includes all people who *want a job*, regardless of the reason they are not actively seeking work. The *want a job* definition expands the number

of unemployed because it draws into the labour force persons who have given up looking for work but want a job.

The *want a job* definition was adopted for this analysis because, in many of the small communities, people have given up looking for work because of perceived and real education barriers, and the small number of jobs that become available. It is expected that most people will be attracted back into the active labour market by the opportunities presented by the project and therefore the *want a job* definition is the more suitable measure of the potential size of the labour force. The *want a job* unemployed in the Northwest Territories represent the targeted labour market in the Northwest Territories.

However, it is recognized that there will be some currently employed northern residents that seek and find work on the project. These individuals could include employees of northern businesses contracted to undertake work on the project or they could be qualified people that choose to leave their current jobs to secure higher paying and possibly more fulfilling work on the project. No assumptions have been made in the economic modelling as to the size of this labour market. However, estimates of northerners leaving existing jobs in search of project employment have been considered in terms of effects on community and regional demographics in Section 4.2, Demography.

### **Definition of Migration**

In this economic analysis, employment demands in the Northwest Territories and in all other provinces and territories are assumed to be satisfied from the local labour supply. However, in the Northwest Territories, this is limited by the capacity of the local labour market. Consequently, the project will lead to no permanent in- or out-migration between provinces and territories, with the exceptions expected in the regional centres mentioned previously.

Although no permanent in- or out-migration is expected, there will be a significant movement of direct employees from designated points of hire in southern Canada to and from camps in the Northwest Territories. When in the Northwest Territories, they will live in camps and will not establish residency in the North. The effect of spending their wages and salaries will occur in their home communities in the south and not in the Northwest Territories. The movement of workers on a fly-in and fly-out basis is not considered in- or out-migration.

However, beyond these southern workers who will take up temporary accommodation in camps while working on construction, it is recognized that there will be some in-migration and establishment of residency (temporary and permanent) in Inuvik and, to a lesser extent other regional centres like Fort Simpson. Adjustments to the economic analysis to account for this in-migration are discussed in Section 4.2, Demography.

**4.1.2.3 Expenditures – Construction**

Most project construction will occur over the four-year period from 2006–2007 to 2009–2010. Construction after 2009–2010 is included in Section 4.1.2.5, Employment and Income – Operations, which describes operations effects.

About 45% of the gas pipeline and half of the compression facilities are located in the DCR. As shown in Table 4-3, this represents close to \$1.6 billion, or 25%, of the total project capital investment for 2006–2007 to 2009–2010.

**Table 4-3: Project Capital Investment in the Deh Cho Region**

Indicator	2006–2007		2007–2008		2008–2009		2009–2010		Total	
	(\$M)	(%)	(\$M)	(%)	(\$M)	(%)	(\$M)	(%)	(\$M)	(%)
Project total investment	1,409	100	2,261	100	1,907	100	671	100	6,247	100
DCR	398	28	605	27	444	23	111	17	1,559	25 <sup>a</sup>
Spending outside the DCR	388	97	587	97	428	96	108	97	1,511	97 <sup>b</sup>
Spending in the DCR	11	3	17	3	16	4	3	3	48	3 <sup>b</sup>
NOTES: a Percentage of total project investment b Percentage of DCR portion of total investment Figures are millions of constant \$2003 Numbers might not add up because of rounding										

Because of the small population base and workforce, and the limited number, size and scope of local businesses and contractors, it will be necessary for the selected construction contractors to recruit their workforce, and purchase goods and services from outside the region. The economic activity associated with the direct purchases outside the region will be leaked to where the goods or services are produced.

Although nearly \$1.6 billion of capital investment in project infrastructure will be located or put in place in the region, only a small part, amounting to about \$48 million, will be spent on purchases of goods and services in the region. Most of the direct project expenditures will take place outside the region. The expenditures within the region will be subject to further leakages because businesses in the DCR that are supplying these goods and services will buy inputs from businesses outside the region.

#### 4.1.2.4 Employment and Income – Construction

Construction of project components located in the DCR will require a large workforce with a variety of skills, and most work will take place during the four winter construction seasons. Given this construction scenario and the capacity limitations of the DCR labour force in terms of required skills, it is expected that much of the construction labour will have to be brought in from outside the region and the Northwest Territories.

Table 4-4 shows the 2002 Northwest Territories labour force indicator statistics used to determine the size of the DCR labour force potentially available to the project. Labour force participation is provided, along with employment and unemployment rates using the *want a job* definition of unemployment. DCR residents that meet the unemployed *want a job* definition represent the main regional labour pool available to the project.

**Table 4-4: Labour Force Indicators for the Deh Cho Region – Before Project Effects**

Indicator	Percentage (%)
Participation rate	77.7
Employment rate	56.8
Unemployment rate	26.9
SOURCE: GNWT Bureau of Statistics (2002a)	

Although those in the unemployed *want a job* category are the primary regional labour pool for the project, there are other residents in the region who will be available and qualified, and will seek project employment. These people are currently employed in DCR communities and businesses. They have not been included in the demographic modelling because there is no way of accurately predicting their numbers.

Table 4-5 shows the estimated size and composition of the regional labour market during construction before project effects. This forecast was developed using a demographic model to estimate population change, and applying the *want a job* rates from the 2002 survey results to the population projections. In addition, some project-related in-migration was factored into the estimate. The level of in-migration was based on the assumption that some skilled and experienced employees in the region will leave existing jobs and seek project-related employment.

**Table 4-5: Estimated Labour Force in the Deh Cho Region – Before Project Effects**

Indicator	2006–2007	2007–2008	2008–2009	2009–2010	Average
Total population (No.)	3,551	3,720	3,748	3,705	3,681
Net migration (No.)	0	140	0	-70	18
Population 15+ (No.)	2,680	2,837	2,877	2,857	2,813
Labour force (No.)	2,083	2,206	2,237	2,221	2,187
Employed (No.)	1,522	1,611	1,634	1,623	1,597
Unemployed (No.)	561	594	603	599	589
Not in labour force (No.)	596	631	640	636	626
Participation rate (%)	77.7	77.7	77.7	77.7	77.7
Employment rate (%)	56.8	56.8	56.8	56.8	56.8
Unemployment rate (%)	26.9	26.9	26.9	26.9	26.9
NOTE: Numbers might not add up because of rounding					

It is expected that during the peak winter construction season in 2007–2008, 140 people could migrate to the DCR because of the project. It is assumed that half of these people will leave the region when construction ends in 2009–2010. It is further assumed that all new in-migrants of labour-force age will be available to participate in project-related employment.

Before project effects in 2006–2007, it is estimated that there will be 561 unemployed persons in the region. Because of in-migration and a slight increase in labour force participation, the number of unemployed persons available during construction is expected to increase to an annual average of 589 people.

Table 4-6 shows an estimate of the maximum labour pool that could be available to fill direct project jobs, and jobs in other businesses that will supply goods and services to the project and its employees.

**Table 4-6: Estimated Maximum Potential Labour Pool Available for Project-Related Work in the Deh Cho Region**

Indicator	2006–2007	2007–2008	2008–2009	2009–2010	Average
Total unemployed persons (No.)	561	594	603	599	589
Will do rotational work (%)	82	86	82	81	83
Total unemployed persons adjusted for rotational work (No.)	462	510	496	483	488
NOTE: Percentages have been rounded to the nearest whole number and the adjusted number of unemployed persons might not add up because of rounding					

The annual average of 589 unemployed persons has been adjusted to reflect the number of unemployed persons who have indicated that they would be willing to do rotational work. The willingness to do rotational work was applied to about half of the unemployed workforce that *want a job* because this condition only applies to direct project jobs, which make up about half of the total number of project-related jobs created.

Table 4-6, shown previously, indicates some fluctuation in the percentage of unemployed workers that are willing to do rotational work. This fluctuation is attributed to the in-migration of 140 people to the region, some of whom will be of labour-force age and willing to undertake direct project rotational work.

It is estimated that during construction, an annual average of 488 persons will be available to seek direct project employment, and work with businesses that provide goods and services to the project and its workforce.

An estimate of direct employment demand for the region was derived by comparing the job type and occupation requirements for each project component in the region to the expected skills of the local labour force.

The Statistics Canada I-O Model was used to estimate the total employment demand that will be generated by the project for spin-off jobs in the Northwest Territories. The territorial estimates were then broken down into regions using project expenditure data.

Table 4-7 shows the results from the model for the estimated number of persons who will be employed from the region to work on project-related jobs, subject to no capacity limits. The employment estimates include direct project jobs and new jobs in businesses supplying goods and services to the project and its employees.

**Table 4-7: Project Employment Demand in the Deh Cho Region**

Indicator	Type of Demand	Number of Jobs					
		2006–2007	2007–2008	2008–2009	2009–2010	Total	Average
Modelled employment demand in the DCR without labour supply constraints	Direct	62	269	189	10	530	132
	Indirect	84	156	150	31	421	105
	Induced	27	40	36	8	111	28
	Total	173	465	375	49	1,062	266
Estimated employment demand in the DCR with labour supply adjustments	Direct	62	269	189	10	530	132
	Indirect	71	78	76	31	257	64
	Induced	36	39	38	8	120	30
	Total	169	387	303	49	907	227
NOTE: Numbers might not add up because of rounding							

It is estimated that with no limits to the size of the available labour force or business capacity, the project will generate a demand for an annual average of 266 jobs in the DCR during construction. However, when available labour force is taken into account, the region could meet an annual average demand of up to 227 jobs.

In the DCR, after taking into account supply constraints, there is a surplus of available labour during all four years of construction activities. These people could potentially work in other Northwest Territories regions where project-related labour shortages exist.

Project-related employment will lead to a rise in household income in the region, as shown in Table 4-8.

**Table 4-8: Estimated Project-Related Labour Income in the Deh Cho Region**

Type of Demand	2006–2007 (\$M)	2007–2008 (\$M)	2008–2009 (\$M)	2009–2010 (\$M)	Total (\$M)	Average (\$M)
Direct	3	12	9	0	24	6
Indirect	4	4	4	2	14	4
Induced	1	2	2	0	5	1
Total	8	18	15	3	44	11
NOTES: Figures are millions of constant \$2003 Numbers might not add up because of rounding						

It is estimated that construction will lead to an increase of \$44 million in labour income in the region throughout construction. This will consist of \$24 million in direct project-related income, \$14 million in indirect income and \$5 million in induced income earned by employees producing goods and services for the project and its employees.

Table 4-9 gives the effects of project-related employment on the regional labour market during construction. It is estimated that project-related employment will generate a demand for a potential maximum annual average of 227 jobs over the Construction Phase.

**Table 4-9: Estimated Project Effects on the Labour Market in the Deh Cho Region**

Indicator	2006–2007	2007–2008	2008–2009	2009–2010	Average
Total population (No.)	3,551	3,720	3,748	3,705	3,681
Net migration (No.)	0	140	0	-70	18
Population 15+ (No.)	2,680	2,837	2,877	2,857	2,813
Labour force (No.)	2,090	2,213	2,244	2,229	2,194
Employed (No.)	1,691	1,998	1,937	1,672	1,824
Other employed (No.)	1,522	1,611	1,634	1,623	1,597
Project employment (No.)	169	387	303	49	227
Unemployed (No.)	400	215	307	557	370
Not in labour force (No.)	590	624	633	629	619
Participation rate (%)	78.0	78.0	78.0	78.0	78.0
Employment rate (%)	63.1	70.4	67.3	58.5	64.9
Unemployment rate (%)	19.1	9.7	13.7	25.0	16.9
NOTE: Numbers might not add up because of rounding					

It is estimated that the labour force participation rate in the region will increase slightly from 77.7% in 2002 to 78.0% during construction because it is assumed that some additional people will be drawn into the labour force as the project draws closer. New training programs will become available and expectations for employment opportunities in the local communities will be raised, leading to greater involvement in the labour market.

Project-related jobs could increase the employment rate from an average of 56.8% (see Table 4-5, shown previously) to 64.9% in the DCR during construction. During the same period, the unemployment rate will decrease from an average of 26.9 to 16.9%. The noticeable increase in the unemployment rate in 2009–2010 is an incomplete representation of the labour market situation in that year because although construction activity is complete, the project has not ended. It is entering the next phase, which includes start-up and ongoing operations employment, described separately in Section 4.1.2.5, Employment and Income – Operations.

#### **4.1.2.5 Employment and Income – Operations**

Two compressor stations, a heater station and about 45% of the natural gas pipeline will be located in the DCR. Although, Norman Wells in the Sahtu Settlement Area (SSA) has been designated as the operations and maintenance centre for the gas pipeline and related facilities located in the DCR.

Table 4-10 shows that the annual average direct employment associated with operations and maintenance of the gas pipeline and associated facilities in the DCR will be four to five positions in the DCR from 2009 to 2030.

**Table 4-10: Annual Average Direct, Indirect, Induced and Total Employment in the Deh Cho Region**

Type of Demand	Number of Jobs				Annual Average
	2009–2015	2016–2020	2021–2025	2026–2030	
Direct	4	5	5	5	4
Indirect	1	2	2	2	2
Induced	1	1	1	1	1
Total	6	8	8	8	7
NOTE: Numbers might not add up because of rounding					

Total employment in the DCR during operations, including direct as well as spin-off indirect and induced employment, will range from six to eight jobs annually, and average seven positions from 2009 to 2030. Though residents of the region are expected to fill most, if not all, of these positions, it is unlikely that they will be living in Wrigley. However, the knowledge, experience and skill requirements for the available positions could result one or more jobs being filled by people from outside the region and the Northwest Territories.

To increase labour force capacity in the region, technical and trades training programs will be developed and delivered to regional residents before and during operations. With implementation of these training programs, it is expected that regional participation in the direct operations employment opportunities will increase throughout the life of the project.

Table 4-11 presents the estimated labour income associated with the jobs described in Table 4-10, shown previously. It is estimated that annual average direct labour income in the DCR will be about \$500,000 throughout 2009 to 2030. During the same period, annual total direct, indirect and induced labour income in the region will average about \$1 million.

**Table 4-11: Annual Average Direct, Indirect and Induced Labour Income in the Deh Cho Region**

Type of Demand	2009–2015 (\$M)	2016–2020 (\$M)	2021–2025 (\$M)	2026–2030 (\$M)	Annual Average (\$M)
Direct	0.4	0.5	0.5	0.5	0.4
Indirect	0.1	0.1	0.1	0.1	0.1
Induced	0.0	0.0	0.0	0.0	0.0
Total	0.5	0.6	0.6	0.6	0.6
NOTE: Figures are millions of constant \$2003 Numbers might not add up because of rounding					

### 4.1.3 Mitigation Measures

To build business capacity, and optimize project-related procurement and expenditures within the Northwest Territories, a conceptual procurement plan has been developed and is presented in Section 4.1.3.1, A Northern Procurement Plan.

To build capacity and optimize employment of Aboriginal and non-Aboriginal residents in the Northwest Territories, a conceptual program is also provided. This program includes principles and strategies that address education, training and employment.

Successful implementation of the plan will require project leadership by way of a project proponent employment and training coordination function, and the partnership, cooperation, support and involvement of:

- Aboriginal organizations
- northern communities
- education and training institutions
- relevant territorial and federal government agencies
- industry organizations
- contractors
- unions

Measures to reduce the number of southerners migrating to the Northwest Territories on speculation that this will improve their chances of securing project employment are addressed in Section 4.2.3, Mitigation Measures (Demography).

#### 4.1.3.1 A Northern Procurement Plan

The project proponents are committed to using Aboriginal, other northern and other Canadian suppliers of goods and services if they are:

- able to meet or exceed specified safety, environmental, technical and quality standards, and project timing requirements
- internationally cost competitive at the place and time where the goods or services are required

Recognizing that construction and operations will primarily occur in the Northwest Territories, the project proponents will give preference to qualified, competitive Aboriginal and other northern businesses for certain goods and services. In some instances, Aboriginal or other northern businesses might be invited to bid first.

### **Principles**

The project proponents will:

- provide full and fair opportunity for Aboriginal and other northern businesses to participate in business opportunities
- comply with relevant land claim settlements, and benefits and access agreements
- foster development of Aboriginal and northern business and human capacity that provides long-term benefits to the project proponents, such as meeting long-term sustained demand for goods and services
- ensure that suppliers of goods and services meet the project proponents' commitments to use Aboriginal and northern businesses

### **Strategy**

The project proponents will:

- assess northern market supply capacities, including the potential to grow to meet specific needs
- provide lead time for Aboriginal and other northern businesses to develop the ability to qualify and effectively compete for the work
- prequalify Aboriginal and other northern businesses, and offer feedback and assistance in understanding how to fill gaps in their qualifications
- hold workshops on bidding procedures, safety management and fitness for duty, including alcohol and drug policies, to help Aboriginal and other northern businesses effectively pursue business opportunities
- facilitate northern sourcing by structuring work packages and subpackages, where appropriate, to better align with the capacities of qualified northern businesses
- require bidders on major contracts to submit, as part of their bid, a local content plan that specifies how they will optimize participation of Aboriginal and other northern businesses in executing their work
- give particular emphasis to local content plans when evaluating bids and subsequently awarding work and supply packages for the project
- continue open communications with Aboriginal and other northern businesses about project requirements, including timing, and specification of goods and services required by the project

- supply information about Aboriginal and other northern businesses to potential contractors, in support of local content plans
- offer to communicate with unsuccessful bidders to help them bid more effectively in the future
- support transferring technology and knowledge to Aboriginal and northern businesses
- monitor implementation of local content plans to ensure that procurement contractor commitments are met, and adhere to terms in the benefits and access agreements

### **Education and Training for Employment**

This section outlines the principles and strategies that will be used to develop Aboriginal and other northern workers for, and employ them in, positions associated with construction and operations.

#### **Principles**

The project proponents are committed to the following:

- providing Aboriginal people and northern residents who are qualified, or who take the steps necessary to become qualified for work on the project, with the opportunity to work during construction, consistent with:
  - relevant land claims settlement agreements
  - benefits and access agreements
  - provisions of applicable human rights legislation
  - the Canadian Charter of Rights and Freedoms
- recognizing the role and responsibilities of governments, and cooperating with governments as they carry out their responsibilities
- early identification and communication of project employment opportunities
- taking a leadership role in the Pipeline Operations Training Committee (POTC), an initiative to develop and implement a system for early identification of education and training for potential trades and technical workers for pipeline operations and production operations for the three anchor fields

In 2004, the POTC initiative was used as the cornerstone for the oil and gas industry's Aboriginal Skills and Employment Partnership (ASEP) application to secure funding for support and development of Aboriginal workers for long-term jobs arising from a major project, and including opportunities from other projected activities in the oil and gas sector in the Northwest Territories. The oil

and gas industry ASEP application group includes members from the Sahtu Dene Council, Inuvialuit Regional Corporation, Deh Cho First Nations, Gwich'in Tribal Council, GNWT, Shell, ConocoPhillips, the Aboriginal Pipeline Group (APG) and Imperial Oil.

### **General Strategy**

The project proponents understand that contractors, unions, communities, educational institutions and government agencies share responsibility for developing and recruiting workers. They will take a leadership role, where appropriate, in coordinating:

- the participation of Aboriginal, government and educational institutions with business and industry organizations to:
  - promote understanding of northern employment opportunities relating to the project, and to the petroleum and pipeline industries
  - support worksite and life skills training and programs for workers
  - develop business management skills
- the participation of northern community organizations, contractors, labour groups and training agencies to effectively use government training support programs to assist with the timely development, communications and delivery of applicable training programs
- the participation of contractors, labour organizations, and oil and gas companies in the affected regions, to provide early and ongoing training opportunities, particularly for jobs and skills that will be sustainable after construction
- training of workers to operate northern production facilities and pipeline operations, through the POTC

The project proponents will participate in:

- identifying and communicating training and education requirements for project employment
- discussions with training institutions, school organizations and government agencies to share industry-specific needs to allow them to develop appropriate curricula, if required
- initiatives to encourage students to complete secondary school

- ensuring, where feasible, that qualified disadvantaged individuals or groups have full and fair access to training and employment opportunities without incurring unreasonable hardship for the project proponents
- encouraging northern and other contractor participation in providing meaningful employment for Aboriginal and other northern workers

The project proponents are committed to working with contractors, northern businesses, communities and government agencies to identify and capture opportunities for employment by:

- working with employment officers and staff in local communities, Aboriginal organizations and government agencies to help recruit qualified Aboriginal and other northern employees
- designing and implementing hiring practices to provide opportunities for qualified Aboriginal and other northern residents, such as considering equivalency to education requirements for some jobs
- working with major contractors, labour groups and subcontractors to identify and develop potential training opportunities and initiatives
- requiring contractors and subcontractors to structure Aboriginal and northern employment policies and plans, complete with reporting and monitoring systems, to comply with the project proponents' benefits plans and agreements, and with their commitments to use Aboriginal and other northern workers
- establishing on-the-job support systems and resources to help develop worksite and life skills

### **Strategy – Education**

The project proponents will communicate employment and career opportunities and educational requirements by:

- emphasizing that completion of high school could lead to employment and career opportunities with the project, and elsewhere in the oil and gas production and pipeline industries
- working with contractors and schools to reduce the number of students leaving school for short-term construction employment, and recognizing Northwest Territories legislation for age requirements on construction sites
- recommending modification of school programming to allow for participation in the project that might include school leaves and some credit for work experience

- consulting with government and educational institutions with regard to developing equivalencies
- coordinating support from the project and available government funding for education and training of potential operations and construction workers, through the processes of the POTC and ASEP initiatives
- promoting job market understanding by various means, such as providing:
  - employment and career opportunities information
  - summer employment and job shadowing opportunities
- requiring key contractors to provide priority access to their training and employment opportunities for Aboriginal and northern workers that might:
  - provide a high degree of sustainability after construction
  - be transferable into other industrial sectors
  - offer opportunity for advancement

### **Strategy – Training**

The project proponents will:

- work with construction and pipeline contractors, and within other oil and gas industry initiatives to provide training opportunities before and during construction, and into operations activities. The project proponents will ensure that project managers, contractors and unions support hiring, training and retention of Aboriginal and other northern workers.
- work with local communities to identify training candidates and training requirements
- communicate information about training program graduates to potential contractors
- facilitate development and implementation of support systems and resources for workers to help them adapt to the requirements and conditions of wage employment. Support systems will include life skills training, such as money management, workplace orientation and access to addiction counselling.
- support government programs to provide assistance to families and communities of workers
- require workers and managers to attend cultural awareness training

### Strategy – Construction

The project proponents will:

- maintain job responsibilities and budget within the project associated with the education and training for employment opportunities to coordinate, liaise and negotiate with northern communities, Aurora College, territorial and federal government agencies, contractors, and unions regarding training and employment
- coordinate construction worker training with project labour, contracting and procurement strategies
- continue to meet to discuss and seek input, support and funding for a training and employment strategy for all phases of the project with:
  - affected northern communities
  - Aurora College
  - government agencies
  - pipeline contractor associations
  - individual contractors
  - relevant national and international trade unions
- take a leadership role in the development and coordinated use of new or existing community-focused databases, or both, of potential project workers. The databases are intended to facilitate plans for training and employment of qualified workers, primarily for the construction period. The databases will be subject to privacy and other applicable laws.

The databases will be compiled from in-community interviews with individuals interested in gaining employment during project construction and operations. The interviews should be conducted by, or under the direction of, the project, using a standard interview questionnaire developed for the project.

Information collected will include education levels, training, certificates or licences and work experiences. This information will go into a master community-specific database retained by the project. The databases will be used for:

- early and ongoing discussions with Aurora College, industry operators and contractors to identify the skill requirements to be captured in the community potential worker databases
- review and identify skill requirements, specific training needs and steps required to implement community-based and regional training programs

- determine project-related education and training needs in each community, and working with the communities and regions to provide access to them
- provide information to contractors on bid lists for preconstruction and construction work packages, along with the message of the project's commitment to optimize training and employment opportunities for qualified Aboriginal and other northerners, and the need for a local-content plan
- work with the POTC and ASEP initiatives to coordinate the education and training resources to develop qualified workers in time for work during construction and operations
- prioritize the range of training offered, giving special consideration to skills that are transferable and portable beyond the project
- work with Aurora College, municipalities and the GNWT to identify and use civil projects that might provide work experience opportunities for potential construction workers, e.g. equipment operators, site supervisors, safety advisors, where practical
- collaborate with relevant project contractors, GNWT Apprenticeship and Occupational Trades Division and educational institutions to develop and implement systems to capture, record and provide credit for applicable qualifying work hours for apprentices
- work with the existing Aurora College program and offer trainee positions on current project field programs to provide additional opportunities for training in areas, such as basic labourer skills, construction trades, heavy equipment operation and truck driving
- request that Aurora College work with the affected communities to develop training in basic labourer skills, construction trades, heavy equipment operation and truck driving, using local capital projects as training venues wherever possible. Community contributions might be in-kind provisions of training space, tools, and equipment that does not include a built-in markup.
- request that Aurora College adult educators in the communities provide literacy and math upgrading and basic trades preparation training in conjunction with practical training
- work with Aurora College, contractors and community resources to provide nonapprentice training and experience, e.g., heavy equipment operators and expeditors, where practical, for the individuals to be hired by contractors for construction work

- work with Aurora College and community adult educators to consider scheduling the classroom sessions for apprenticeship training during the summer, when space is available in local communities and when instructors are potentially available outside their regular training program commitments
- require key contractors to work with the project, community resource personnel, Aboriginal organizations, Aurora College and others that might add value in recruiting and hiring qualified workers
- communicate training program details and expectations to candidates to promote their commitment to completing the program, and to verify that the training is consistent with their future employment or career objectives
- use experienced northern trainers, where practical
- assist in providing a student liaison when training is away from the home community, as appropriate. The responsibilities of this individual include:
  - assisting students with personal and family issues
  - chaperoning trainees away from home communities
  - helping remove barriers that might prevent students from attending classes and completing the training program

### **Strategy – Operations**

The project proponents will:

- contribute to Aboriginal and other northern capacity development by enhancing opportunities to participate in natural gas field and pipeline operations employment opportunities as qualified and skilled workers
- enhance understanding of, and preparedness for, project-related training opportunities by working with:
  - appropriate territorial and federal government departments
  - Aboriginal organizations
  - existing government training agencies
  - secondary and post-secondary education institutions
- use public and private training resources, including Aurora College, Petroleum Industry Training Services (PITS) and training contractors, where appropriate
- support applicable industry, government and Aboriginal organization collaborative training opportunities

- provide information about training opportunities and project proponent expectations to all study area communities
- participate with the GNWT, Aboriginal organizations, Aurora College and other industry operators in the recruitment and selection process
- support opportunities for qualified mature students for pretechnical training or direct entry into the Northern Alberta Institute of Technology (NAIT) or the Southern Alberta Institute of Technology (SAIT)
- provide mentoring to trainees while on the worksite
- support existing Aboriginal student support programs at NAIT and SAIT
- provide, in collaboration with the members of the POTC, applicable and relevant employment opportunities for trades apprentices enrolled in POTC-sponsored training
- continue to ensure operation training requirements are reflected in the activities of the POTC, which consists of representatives of the project, industry, Aurora College, territorial and federal government agencies, Aboriginal organizations and the APG

POTC activities include:

- identifying and recruiting 13 trade apprentices, with the first intake of six apprentices in mid-2004 as employees of participants or contractors. The key trades desired are: electrician and instrumentation, millwright, and heavy-duty mechanic.
- identifying and recruiting 38 technical candidates for programs at NAIT and SAIT. The first candidates for the Aurora pretechnical program were accepted for fall 2004, and on successful completion, will begin programs at either NAIT or SAIT in fall 2005.
- continuing intakes for the trades and technical streams in the following two years to enable accepted applicants to complete the employment programs required for operations and maintenance of the anchor fields, pipeline and associated facilities. Many of the newly trained workers are expected to be involved in start-up of the respective operations. Others will earn experience in project proponents' existing operations that might enable them, at a later date, to join the operating and maintenance workforce for the territorial operations.
- providing and coordinating offers of employment for qualified apprentices, technical summer students and graduates

### 4.1.3.2 Employment

#### Principles

The project proponents will:

- emphasize preferential employment of qualified Aboriginal and other northern residents during all phases of the project
- promote Aboriginal and other northern worker involvement in a range of skilled, unskilled, technical and professional job classifications, and provide opportunities for advancement on the basis of qualifications and performance
- provide ongoing support for Aboriginal and other northern hires that recognizes cultural differences at the worksites and in camps
- provide a workplace where all individuals are treated in a fair, equitable and respectful manner while working on the project

#### Strategy

The strategy identifies the specific mechanisms and initiatives that the project proponents will use to optimize northern hiring objectives. To this end, the project proponents will:

- encourage and support efforts by the territorial government to set up community-based training programs in personal finance and money management, focusing on informed consumption, savings and investment choices for increased incomes
- provide in-camp training programs in personal finance and money management, focusing on informed consumption, savings and investment choices for increased incomes consistent with programs offered in the communities by the territorial government
- require contractors and subcontractors to:
  - meet the obligations undertaken by the project proponents as part of benefits and access agreements for preferential hiring and employment of qualified Aboriginal and other northern workers
  - provide cultural awareness training to workers and managers
  - respect the rights of local communities to privacy
  - provide, if requested, the opportunity for Aboriginal artisans to display and sell their handicrafts in the camps, reducing potential social disruption

caused by project workers visiting local Aboriginal communities in search of handicrafts

- support worksite and life skills training and programs for workers
- articulate hours of work, work schedules, transportation to and from points of hire, transportation between camps and worksites, and camp lifestyle rules
- communicate employment opportunities and skill requirements to interested organizations, government agencies and communities, in an open, transparent and timely fashion, using such resources as local and regional print, radio and television media, and Internet-based electronic tools. This will be carried out in cooperation with Aboriginal and other community organizations and institutions.
- give priority to hiring qualified Aboriginal and other northern residents from study area communities
- encourage Aboriginal and other northern worker recruitment and employment for construction and operations by:
  - supporting development and use of existing and potential new databases as key sources of information about potential construction and operations workers
  - providing worker return transportation from designated points of hire to project work locations
  - providing flexible work schedules, to accommodate traditional harvesting and other Aboriginal cultural, family and community needs, where practical, recognizing that work flexibility will be limited in the peak winter construction seasons
  - considering equivalency to education or training in meeting qualification requirements for some construction and operations jobs
  - supporting programs to offer, where appropriate, pre-employment training to northern residents who do not have the required qualifications
  - providing formal worksite support programs and resources, and work with communities to promote development and retention of northern workers
  - providing, where required, on-the-job support, such as:
    - workplace essential skills upgrading
    - a workplace mentor program

- an Aboriginal-worker liaison program
  - cultural awareness training
  - pre-employment safety training
  - life skills guidance, such as money management, and alcohol and substance abuse prevention
- 
- ensure that camp meals periodically include country food, e.g., fish, moose and caribou, that has been government-inspected or purchased from an inspected facility
- 
- ensure contractors and subcontractors include the above-mentioned mechanisms and initiatives in their construction and execution plans

#### **4.1.3.3 Northern Employment and Wages**

The project proponents, local communities, chambers of commerce and Human Resources Skills Development (HRSD) will require information sharing, and to the extent practical, joint planning, to determine effective mitigation for the possible loss of qualified and employed northern workers to the project and potential wage increases, which is one consequence of this issue. This will also be necessary to recognize the potential extent of the effects in local communities and strategies designed to reduce the adverse effects.

The project proponents will:

- continue discussions between project proponents, local communities, Aboriginal organizations, chambers of commerce, major contractors, unions and HRSD regarding construction workforce requirements, a strategy(s) to meet the workforce requirements, and how to reduce adverse implications for northern communities, businesses and governments
- work with their prime contractors and potentially affected communities, where feasible, to develop ways to share use of local utilities and infrastructure maintenance service providers in recognition of the communities' reliance on these services

The project proponents recommend that local chambers of commerce, and public and community service providers develop a unified strategy on:

- how to retain key personnel with critical skills required by the project
- how to identify, attract and retain qualified replacement workers to fill jobs vacated by those in the local workforce that leave to pursue project employment
- working with HRSD offices in the North and south to identify replacement workers with the required skill sets and experience

#### 4.1.4 Residual Effects – Construction

With timely implementation of the mitigation measures described previously, business and labour force capacity will expand. About 25% of the capital expenditures and project-related procurement will be in the region (see Table 4-3, shown previously). In addition, labour force participation and employment rates will increase, and employment and labour income are expected to increase substantially.

The duration of capital expenditures, procurement and employment effects will be most noticeable during the 2007–2008 winter construction seasons. However, economic effects will continue throughout the four-year construction period. The increase in capacity among regional businesses and the labour force will continue well beyond construction. Table 4-12 shows that construction effects are expected to be positive and high in magnitude in the DCR, which includes Wrigley.

**Table 4-12: Procurement, Employment, Income and Regional Economic Effects – Construction Effect Attributes for the Deh Cho Region**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
DCR	Positive	High	Regional and beyond regional	Short term	Yes

#### 4.1.5 Residual Effects – Operations

With timely and ongoing implementation of the mitigation measures described previously, business and labour force capacity in the region could expand. However, qualified DCR residents, including residents from Wrigley, interested in pursuing project-related employment will likely have to relocate to the SSA or Gwich'in Settlement Area (GSA), where most of the project-related employment opportunities will be located. Regional labour force participation in direct operations employment will be very small, about four or five jobs, and only one or two additional indirect and induced jobs in the region are expected, and will probably be based out of Fort Simpson. As a result, operations effects in the DCR, which includes Wrigley, are expected to be positive and low in magnitude (see Table 4-13).

**Table 4-13: Operations Expenditures, Employment, Income and Regional Economic Effects – Operations Effect Attributes for the Deh Cho Region**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
DCR	Positive	Low	Regional and beyond regional	Long term	No

## 4.2 Demography

### 4.2.1 Effect Pathways

The effect pathway diagram in Figure 4-2 illustrates the projected influence of the project on birth, death, and in- and out-migration rates. All aspects of field development and project construction, which will create demands for labour, and needed goods and services, might initially affect all three rates. These demands will create an inflow of southern workers, both those with employment contracts and those looking for work, and with some bringing their families. As well, northern workers will be hired and purchases made from northern businesses. These directly employed southern and northern workers will contribute to indirect and induced income and employment effects. Quality-of-life expectations will be affected by increased demands for labour, goods and services, and by the direct, indirect and induced income and employment effects.

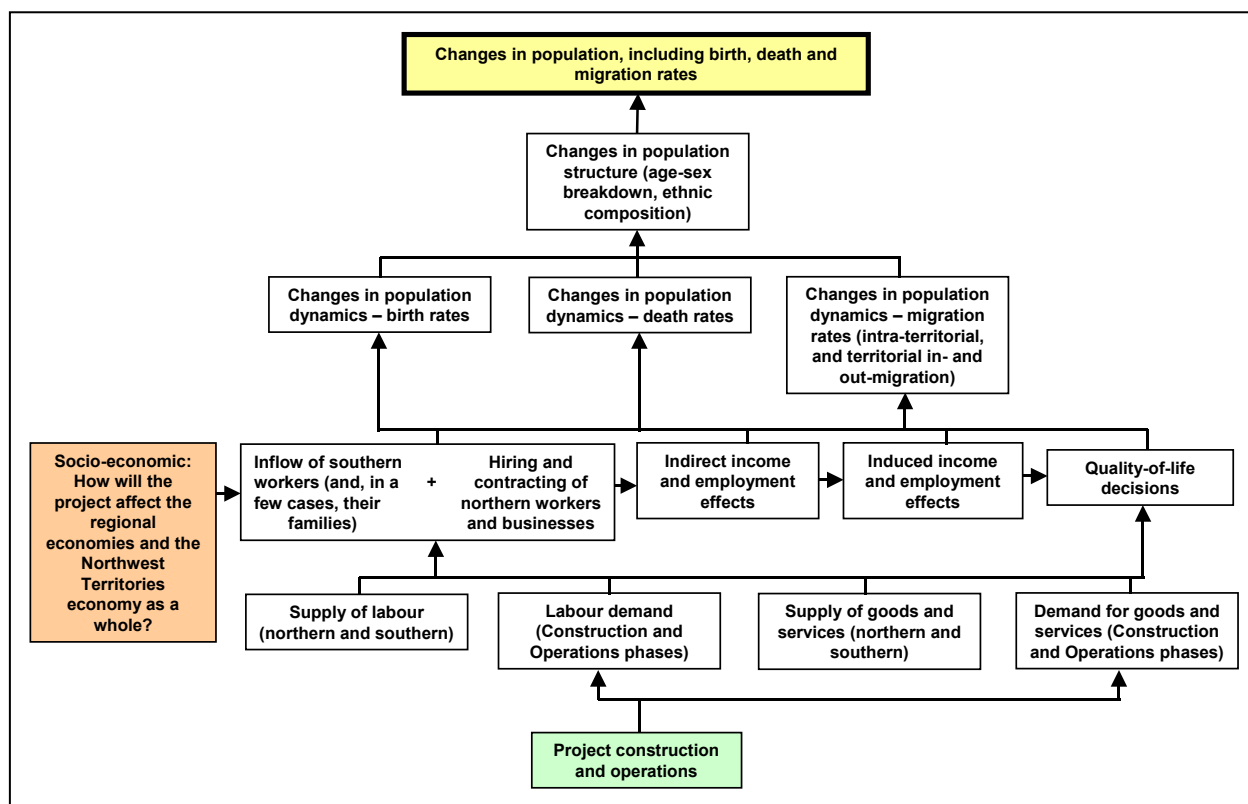


Figure 4-2: Project Effects on Population, including Birth, Death, and In- and Out-migration Rates

The importance of population change to the SEIA is as a key link between economic opportunities and social effects. Increases in population will increase demands on a wide range of public services and could affect social conditions. These effects will be addressed in subsequent sections.

This analysis of the effect pathways for project effects on in-migration from the provinces and population movement within the Northwest Territories is largely conceptual; there are empirical indicators for only a few of the links. As a result, the following analysis is largely based on current baseline information and the experience of other development projects.

#### **4.2.2 Assessment and Management of Project-Specific Effects – Construction**

With the loosening of social controls that could accompany project-related activity, there might be some increase in out-of-wedlock births. However, with construction lasting for only four years, the number of such births will have only a marginal effect on birth rates and the female work force. Project-induced effects on death rates will also be negligible.

As only negligible project-induced effects are expected on birth and death rates in the Northwest Territories, no relevant mitigation will be required and no further attention will be given to these components of demographic change. The following discussions focus on project effects on population mobility.

Project activities will create direct, indirect and induced employment opportunities during construction. Direct employment will involve construction associated with the project, and the workers recruited for these activities will be accommodated in construction camps.

There will be considerable project-induced business opportunities and employment in the DCR, but on a far smaller scale than in the Beaufort Delta Region (BDR). Moreover, alternative employment opportunities are accessible to DCR residents. As a result, there will be relatively fewer job-seeking Aboriginal people and perhaps southerners that might seek to relocate.

Although the project sites and related activities in the DCR are expected to attract only modest migration from outside the Northwest Territories, it is anticipated that none will move to the community of Wrigley. This might also be true of DCR Aboriginal migration. Only a few people from some of the very small outlying communities who either have relatives or lived at one time in Fort Simpson will likely be attracted to Fort Simpson by employment or by the excitement of the project activity.

However, there will still be some pressures associated with inter-regional migration within the DCR. Despite application of the common-practice mitigation, some Trout Lake residents might be attracted from their outlying home communities to the excitement or employment opportunities associated with the project in the DCR or other regions. Therefore, project efforts in Trout Lake will focus on reducing inter-regional movement.

Furthermore, the economic analysis for the DCR (see Section 4.1.2, Assessment and Management of Project-Specific Effects [Procurement, Employment and Regional Economic Effects]) suggests that the DCR could be an exporter of labour to other Northwest Territories regions during construction. This will also reduce in-migration effects.

Most of those attracted by pipeline-related activities, Aboriginal and southern job seekers alike, will be drawn to Fort Simpson because it will be the centre of activity in the DCR. Though there will be project activity near Wrigley, this small Aboriginal community offers little or no accommodations. Accordingly, it will attract few, if any, speculative job seekers.

Information found in the EIS, Volume 4 indicates that in contrast to the GSA and SSA, the DCR has experienced relatively low five-year averaged in-migration, at 17%. More than half of these people were from outside the Northwest Territories, and no doubt most were non-Aboriginal people working for the GNWT, or local governments or businesses. Wrigley experienced a similar pattern and most of the migrants were from inside the Northwest Territories.

### **4.2.3 Mitigation Measures – Construction**

The mitigation measures targeting potential southern in-migrants, based on common practices for influencing population movements associated with large development projects, will seek to convince the in-migrants that there will be few employment opportunities that can be accessed only in the Northwest Territories. This will involve the following procedures or actions:

- southern workers will be hired for project- and production-related positions in selected provincial cities, from contractor lists and via media advertising for positions in the Northwest Territories. Hiring in the North will be restricted to Aboriginal and other northerners - Northwest Territories, Nunavut and Yukon residents that meet the definition of a northern resident.
- HRSD offices will publicize this restriction. They will also provide the message that the only direct project hiring in the North will be of qualified people who have lived in the North for at least one year and have a Northwest Territories medical card.
- this message will also be publicized through television and radio news programs, and newspaper advertisements

The mitigation measures targeting potential migrants from within the Northwest Territories will emphasize that the prospects of good employment will be as good in their home communities as in the more central locations to which they might be attracted. This will involve the following actions:

- project representatives will continue to visit every community in the study area, on more than one occasion, to describe the employment opportunities available, and the terms and conditions of employment
- project or community representatives will interview interested individuals, and document qualifications and interests in relevant databases. Interested parties will be able to provide new or updated information for the databases.
- project or community representatives will provide database information to project contractors
- employment procedures for northern residents will be described in English and Aboriginal language news programs, and the dates when project representatives are scheduled to visit the individual communities will be advertised in advance
- transportation to and from the point of hire on a rotational work schedule will be provided, as will accommodation at job sites
- information will be provided regarding housing availability and rental costs in communities to which Northwest Territories residents might be attracted

**4.2.4 Residual Effects – Construction**

Although a sizeable part of project activity and the associated air of excitement will be in the DCR, Wrigley should experience limited in-migration of southerners. Although it will not be possible to eliminate all movement of DCR and Northwest Territories residents, the effects will be undetectable in Wrigley. Any effects will be limited to the winter periods during construction. Table 4-14 shows that construction effects in Wrigley, Jean Marie River and Trout Lake are expected to be adverse and low in magnitude.

**Table 4-14: Population Mobility – Construction Effect Attributes for Wrigley, Jean Marie River and Trout Lake**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Wrigley, Jean Marie River and Trout Lake	Adverse	Low	Regional	Short term	No

#### 4.2.5 Operations Effects

Most employment numbers and opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete.

None of the operations and maintenance employment positions will be located in the DCR. However, regional businesses could benefit from the long-term purchasing and contracting opportunities generated by the project, particularly for maintaining the facilities and parts of the right-of-way located in the DCR. It is expected that these opportunities will be largely met by existing or new northern businesses, based in larger DCR communities and will not be substantial enough to trigger noticeable in-migration from outside the region.

The result is that no residual population effects are expected in Wrigley, and no mitigation will be required.





## 5 INFRASTRUCTURE AND COMMUNITY SERVICES

### 5.1 Transportation

#### 5.1.1 Effect Pathways

This section provides information about expected influences of the project on transportation infrastructure quality and availability. The general project effects on highway, railroad, barging and air transportation infrastructure and services will be:

- direct, indirect and induced demands for short-term transportation services
- increased supply, because the project will provide for some of its own needs
- elevated demands on some local community transportation infrastructure, including operations and maintenance
- upgraded and increased operations of regional transportation infrastructure

The combined effects of project-induced increases in freight and passenger traffic, and the responses of transport infrastructure and service providers, will:

- determine effectiveness and capacity of infrastructure facilities and services
- result in changes to transport infrastructure facilities, services and use

Figure 5-1 shows that during construction, the project will induce increased demands on all transportation modes because of the many construction activities, in addition to increased project-related and -stimulated travel. The project will also encourage transportation infrastructure maintenance and improvement. These influences, along with project effects on the regional and territorial economies, will affect road, rail, marine and air infrastructure and services. These effects will stimulate community input and findings from project monitoring. The findings, along with the effects on transport infrastructure and services, and project effects on local governance, will influence transport infrastructure and services funding.

The level of funding will affect transport capacity and effectiveness. Also affecting capacity and effectiveness will be project effects on:

- construction-related transport and travel
- the regional and Northwest Territories economies
- people's quality of life and need for public services, which will drive the travel needs and affordable travel interests of northern residents

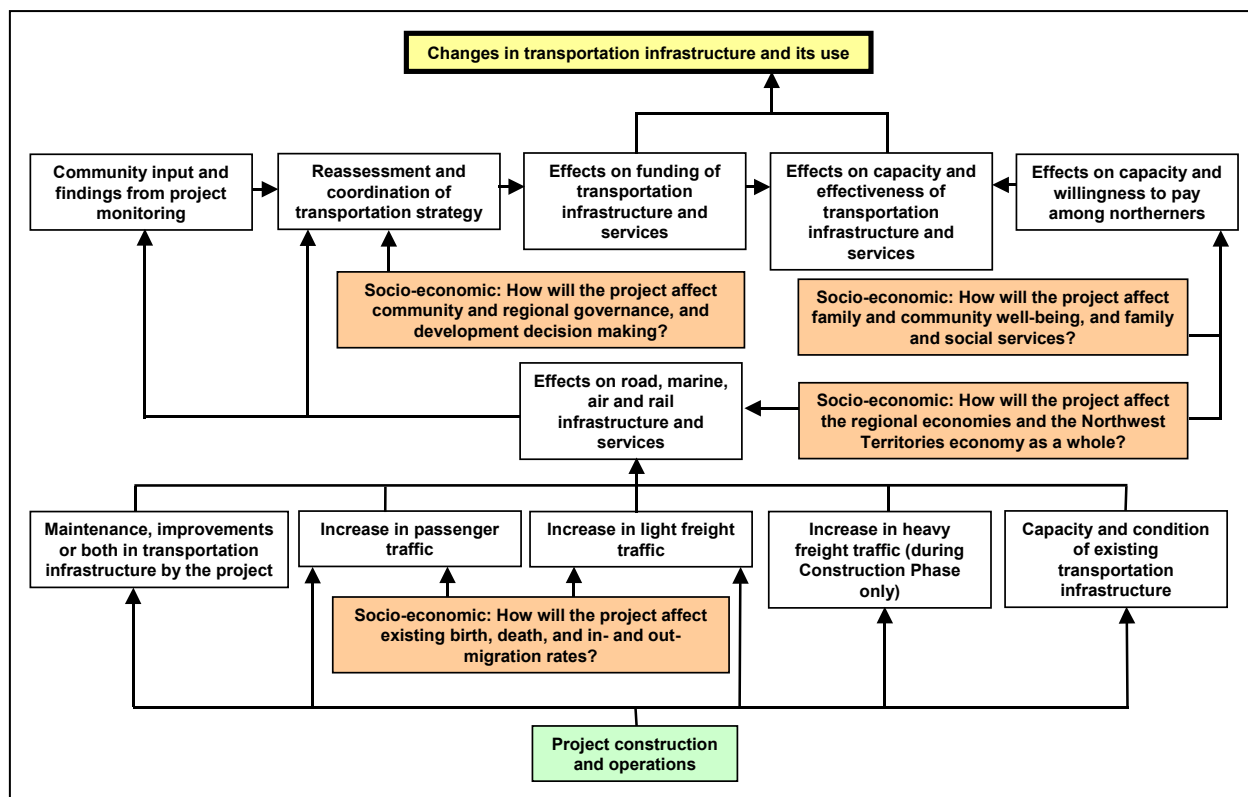


Figure 5-1: Project Effects on Transportation Infrastructure and Services

Project-induced changes in transportation infrastructure and usage will thus be a function of the levels of funding, and the freight and passenger demands on these facilities and services.

Analysis of the effect pathways for project effects on transportation is largely conceptual; empirical indicators exist for only a few links. However, it is clear that project-induced changes in demand for freight and passenger movement, population size and income levels will be important driving forces that affect transportation infrastructure and use in the study area communities.

### 5.1.2 Assessment and Management of Project-Specific Effects – Construction

Transportation and logistics planning is integral to project success, given the volume of people, materials and equipment that will be moved into areas of limited access during a relatively short construction period. Following are key statistics about the materials and equipment to be moved for the project that will affect existing infrastructure modes and services in the study regions:

- about 430,000 tonnes of pipe will arrive at Hay River from Alberta on about 6,000 railcars and then, via 340 barges, will move north from Hay River to about 15 barge landing sites and stockpile locations along the pipeline right-of-way

- over two years, about 84,000 tonnes of pipe will be offloaded from railcars at Hay River and loaded onto about 2,400 trucks for delivery to the southern section of the pipeline in the DCR (accessible by all-weather or winter roads)
- about 40,000 tonnes of pipeline construction machinery will be transported to Fort Simpson and about 15,000 tonnes to Hay River, primarily via the Mackenzie Highway, in about 1,300 truckloads, where most of the machinery will be loaded onto 90 barges for distribution to barge landings on the Mackenzie River near the appropriate pipeline sections
- about 350 truckloads of construction machinery will continue on from Fort Simpson to the southern section of the pipeline in the DCR (accessible by all-weather or winter road)
- about 230 million litres of diesel fuel will arrive at Hay River on 2,700 railcars from Alberta, where most of it will be loaded onto about 200 barges for delivery to project barge landings and existing bulk terminals along the Mackenzie River. The remaining 22 million litres of diesel fuel will be loaded onto about 460 trucks for distribution to the southern section of the pipeline in the DCR (accessible by all-weather or winter road).
- standard camp units and materials for the construction camps will move to Hay River via about 3,000 truckloads and then be shipped north on 100 barges to about 25 locations
- about 620 truckloads of camp units and materials will be transported directly to six locations along the southern section of the pipeline in the DCR that are accessible by all-weather or winter road
- 24,000 tonnes of large modules and facilities equipment will arrive in Hay River from the south via about 600 truckloads, where they will be partially assembled by work crews before being loaded onto 75 barges for the remainder of the trip north to barge landing locations, where they will be offloaded and trucked to the appropriate sites for installation
- about 20 truckloads of modules will go directly to the Trout River heater station site via winter road for assembly and installation
- about 180 truckloads of food will be transported via truck, aircraft and barge to about 25 construction camps over the four-year construction period. About 45 truckloads of fresh foods and perishables will be shipped via aircraft directly to the camp locations, whereas the remaining dry staples and frozen meat will travel by truck on the Mackenzie and Dempster highways and winter roads or via barge

- about 18,000 construction personnel over four years will be transported between their primary residences, camps and work sites by a combination of charter and commercial aircraft and buses
- Inuvik, Norman Wells and Fort Simpson will serve as the main air transportation hubs for incoming and outgoing construction personnel. From these hubs, personnel will travel on smaller charter fixed-wing aircraft or helicopters to the nearby camp sites or communities. Bus transportation will be provided between airstrips, camps and worksites.

Given these transportation logistical requirements, the project will add substantially to road, marine and air traffic during construction. It will be similar magnitude to transportation logistics requirements that occurred during the Beaufort Sea exploration during the mid-1970s. Virtually every road in the study area will experience a substantial increase in traffic volume, which will have two effects:

- as even the best roads were not designed to carry the tonnage to be transported during construction, territorial road conditions will deteriorate substantially without ongoing maintenance. Advance planning is necessary to ensure that the needed road repairs will be scheduled and completed to avoid delaying traffic.
- the expected volumes of traffic at ferry crossings could necessitate extending the hours of operation at three crossings, i.e., two on the Mackenzie River and one on the Liard River near Fort Simpson, which currently operate during only part of the day. It will be necessary to ensure the availability of trained ferry crews and licensed masters to operate the ferries for as many hours as necessitated by traffic volume. Also, the Ndulee Ferry at Camsell Bend on the Mackenzie River is a small ferry with limited capacity, which might create a bottleneck for truck traffic associated with the project. It might be necessary for GNWT Transportation to assign a larger ferry to this location.

Ten short stretches of new all-weather gravel road, i.e., 0.7- to 6-km long, will be constructed to move pipe, modules, camps and equipment from barge landings or airstrips to the anchor fields, facility sites or pipeline rights-of-way. Completion of the proposed Deh Cho Bridge will be inconsequential as far as the project is concerned because it is primarily important for improving access to Yellowknife. However, if complete before construction, it could make the Fort Providence ferry available for use at Camsell Bend crossing.

Most of the fuel, camps, modules, pipe and construction equipment needed for the project will be transported by barge, except in the DCR, where road access is available. Northern Transportation Company Limited (NTCL) at Hay River will carry all of the fuel, most of the pipe, and the field and facility modules. Cooper Barging Services at Fort Simpson will transport the heavy construction equipment.

The Mackenzie River is open to barge traffic only between June and mid-October. Accordingly, both barging companies will likely have to increase their tug and barge fleets to meet their commitments both to the communities they service and to the project. However, the existing NTCL barges have integrated tanks that enable them to transport fuel in the hulls and other cargo, such as pipe, camp equipment and modules, on the deck. This reduces the number of additional barges that might be needed to support the project. Further, logistics planners are considering early delivery and stockpiling of fuel, pipe and camp modules to reduce potential effects on existing transportation services and infrastructure in affected regions.

The project will have effects on charter and commercial air services, and airport and airstrip operations. There will be increases in the numbers of project-related flights into virtually every airport and airstrip in the study area. Chartered and scheduled Boeing 737 aircraft to the hub communities including Fort Simpson will transport construction workers from the south. From these communities, smaller chartered aircraft, e.g., Dash 8–100s, Twin Otters or Bell 212 helicopters, will transport the construction workforce to small airstrips located at construction camps or nearby communities, including Wrigley.

Most airstrips and airports in the study area will experience substantially increased traffic during construction. Accordingly, arrangements must be made to lengthen their hours of operation, and increase maintenance and snow removal on the airstrips. It might be necessary to recruit and train additional staff to operate radio communications, meteorological and snow-clearing equipment.

Arrangements for funding of these capacity adjustments will have to be agreed on between the project and the GNWT, recognizing the shared responsibility for the demands on these facilities and services.

Focal transportation functions in the DCR are divided between Fort Simpson and Hay River. Fort Simpson is centrally located in the DCR, and Hay River is an industrial and commercial centre (ICC). Hay River has the closest road connection to Alberta, and is the terminus of the railroad from the south and the base of NTCL's barge operations. It will function as an important transportation hub for project fuel, pipe, camps and modules. Similarly, Fort Simpson will serve as a transportation hub for moving construction machinery and crews to and from several project locations in the southern part of the Mackenzie Valley.

The transport functions of Hay River and Yellowknife are discussed in the EIS, Volume 6, Section 4.1.8, Transportation – ICCs in the Northwest Territories.

The Mackenzie Highway in the DCR will be the primary road link to the southern section of the pipeline for fuel, pipe, camps, modules and food. It will also provide road access into the SSA via a winter road that runs north from Wrigley. In the DCR, the project will create a noticeable increase in demand on air, marine and road transport, infrastructure and services. Fort Simpson's central location

ensures that it will be the air transport hub for construction staff living in most of the DCR communities, and there might be increased numbers of flights to and from smaller communities like Wrigley.

Some project materials will be hauled seasonally from the railhead at Hay River on the Mackenzie Highway north as far as Wrigley. Beyond Wrigley, a winter road provides access to the SSA communities. Except for perishable foods, most construction and camp supplies and materials in the DCR will be trucked to where they are needed via the Mackenzie Highway, the winter road to Trout Lake and temporary roads. As a result, the project will create a substantial increase in traffic on the Mackenzie Highway and the winter road that runs north of Wrigley.

Some construction materials might be barged from Hay River to Camsell Bend. During the two Deh Cho regional technical workshops, in October 2003 and May 2004, concern was expressed about this possibility. Participants' concerns related to the need to increase the number of barges (and possibly their sizes) to carry construction equipment. They feel the resultant wakes from the barges will increase the potential for sedimentation in the river and bank erosion, subsequently damaging local fisheries because of increased silt. Concern was also expressed about the potential damage from increased bank erosion on nesting areas and some traditional food sources.

The project-related traffic on the Mackenzie Highway, which was not designed for such heavy traffic, will damage the road surface and foundation, and will substantially increase needed repair and maintenance work. Likewise, although project-related traffic on the winter road will not be as heavy, it will require additional maintenance. The need for increased road maintenance was stressed during meetings with GNWT Transportation representatives in June 2003 and Wrigley representatives in September 2003. Wrigley representatives were particularly concerned about the need to consider the highway north of Wrigley as it is too narrow to safely accommodate both local and increased construction traffic.

With a good deal of project activity taking place in the DCR, Wrigley has the potential to experience transportation effects because of:

- its reliance on Fort Simpson as a transportation hub
- its proximity and use of the Mackenzie Highway (including the winter road north into the SSA)
- its location on, and use of, the Mackenzie River

Aboriginal communities along the Mackenzie Highway, including Wrigley, will have an opportunity to benefit from the needed increase in road maintenance, as they are the maintenance contractors for these stretches of the road network.

Table 5-1 provides information on air, barge and vehicle traffic expected from the project in the vicinity of Wrigley.

**Table 5-1: Traffic in the Vicinity of Wrigley**

Location	Units	Air Traffic (Number of Flights Per Month)	Barge Traffic (Barge Loads Per Month)	Vehicle Traffic (Per Month)	Vehicle Traffic From Barge Landing (Per Month)
Wrigley	Units per month	20	N/A	13	N/A
	Peak Year	2009	N/A	2009	N/A
Blackwater River compressor station (85 km N of Wrigley)	Units per month	25	7	N/A	240
	Peak Year	2009	2007	N/A	2007
Ochre River (bussed from Wrigley)	Units per month	N/A	13	13	202
	Peak Year	N/A	2007	2009	2007
NOTE: N/A = not applicable					

### 5.1.3 Mitigation Measures – Construction

All of the effects described in the preceding section are manageable, provided that:

- there is adequate and timely planning
- needed human and financial resources are available

Joint planning, information sharing, cooperation and coordination among the project proponents, project transportation and logistics functions, local communities and GNWT Transportation will be essential.

A timely, cooperative planning effort by the project proponents, relevant transportation logistics managers, GNWT Transportation, local community leaders and, in some cases, GNWT Municipal and Community Affairs, is required to design mitigation measures for the expected project effects on transportation. These efforts must focus on the steps to be taken, development of effective protocols and procedures, and the resources required to implement them.

Agreements between the project and the GNWT, and between the project and applicable municipalities, will be negotiated and will include provisions for the project's use of permanent and seasonal roads. The agreements will consider:

- coordination of road maintenance activities, recognizing:
  - the timing of highway and winter road maintenance
  - the need to install and maintain ice roads and bridges

- access restrictions
- coordination of road upgrading where required
- options that could include making contributions in kind, such as constructing winter roads, maintaining and repairing highways, or contributing to a portion of maintenance costs

Other general mitigation measures will include:

- continuing discussions with barge service providers to provide them with ample lead time to ensure sufficient capacity to meet community requirements and project demands
- continuing discussions with air transportation providers to provide them with ample lead time so that northern carriers can expand their aircraft inventories to meet existing community requirements and project demands
- coordinating with the GNWT and other responsible authorities to provide construction air and barge traffic demand projections, including provisions for assessing the need for, and completing, upgrading and other improvements to regional and municipal airports, airstrips and barge landings
- continuing discussions with the Mackenzie Northern Railroad so that the Mackenzie Northern Railroad can complete railbed upgrades and add new sidings, where required, to meet existing transportation requirements and project demands
- using pilot vehicles when transporting oversized truck loads (on public roads), where appropriate
- observing road bans before winter freezeup and during spring breakup, unless otherwise approved
- posting and enforcing speed limits for project vehicles on project access roads, and having project vehicles adhere to speed limits on public roads
- developing plans for truck traffic routes, as required
- providing bus transportation of construction workers, where required
- sharing information about new borrow sites in the region with GNWT Transportation and local communities for negotiation of post-project use of, and responsibility for, those sites

The project proponents recommend that the responsible authority provide:

- preconstruction planning, upgrading and other improvements to the Mackenzie Highway west of the Highway No. 3 junction
- increased ongoing road maintenance and dust suppression where necessary

**5.1.4 Residual Effects – Construction**

As indicated in preceding discussions, without carefully planned mitigation, project effects on air travel, and air and barge freight services could be disadvantageous to Wrigley and DCR residents. However, these adverse effects are relatively preventable, given effective planning that is properly implemented. Note that they are only relatively preventable, because there likely will be occasional disruptions because of unforeseen circumstances. The project effect attributes, seen in Table 5-2, are based on all these assumptions. The effects on the DCR, which includes Wrigley, are expected to be moderate in magnitude for the road and air modes, but only low in magnitude for the marine mode. All will last only during construction.

**Table 5-2: Transportation – Construction Effect Attributes for the Deh Cho Region**

Mode of Transportation	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Road	Adverse	Moderate	Regional	Short term	No
Marine	Adverse	Low	Regional	Short term	No
Air	Adverse	Moderate	Regional	Short term	No

**5.1.5 Operations Effects**

Road, marine and air transport traffic, which will increase during construction, will decline dramatically once construction is complete. Operations effects on transportation in the DCR generally will be a very small proportion of that during the construction years. Small operations and maintenance crews will regularly visit the two compressor stations and heater station, and inspect the pipeline via fixed-wing or helicopter aircraft, and ground surveillance as required. Furthermore, the project could result in some enhanced regional transportation capacity. Therefore, project-related transportation effects are expected to be negligible, and there will be no need for additional mitigation and no residual adverse effects are expected in Wrigley or in the DCR during operations.

## 5.2 Energy and Utilities

### 5.2.1 Effect Pathways

Figure 5-2 shows the expected influences of the project on community infrastructure, and availability of utilities and energy. In summary, the project might have effects on infrastructure, utilities and energy supply in some study area communities.

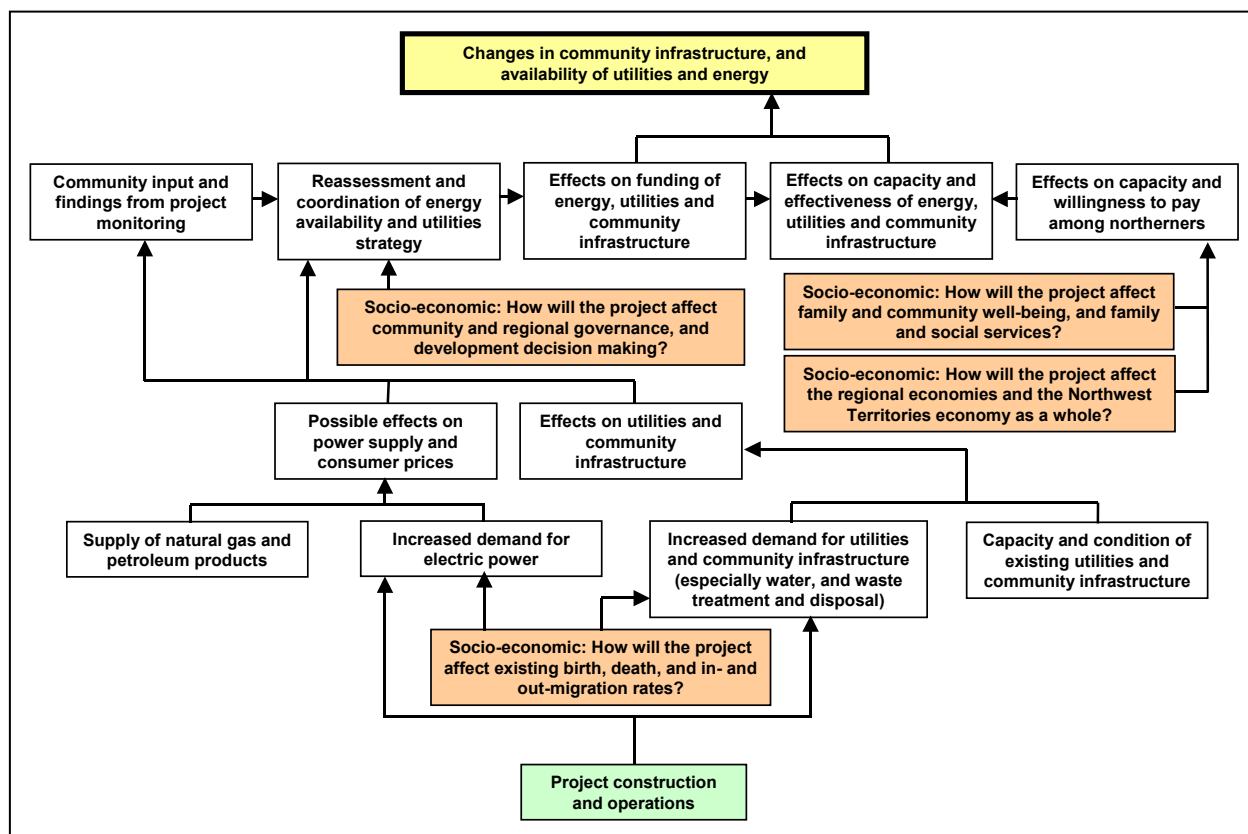


Figure 5-2: Project Effects on Community Infrastructure, and Availability of Utilities and Energy

During both construction and operations, there could be effects on power supply and consumer prices because of:

- demand for electric power
- the available supply of natural gas and petroleum products
- project demographic effects

Likewise, utilities and community infrastructure might be affected by:

- project-induced increases in demands on utilities and community infrastructure, especially water and waste disposal

- the capacity and condition of the existing utilities and community infrastructure
- project demographic effects

Whether or not project effects will result in a community population increase, and if so how large an increase, is central to this assessment.

These two potential effects, i.e., power supply and prices, and utilities and infrastructure, will affect community input to, and findings from, project monitoring and reassessment of the energy availability and utilities strategy. This reassessment, also affected by potential project effects on community and regional governance, will drive funding of energy, utilities and community infrastructure. Project effects on quality of life, social infrastructure, and the regional and Northwest Territories economies will affect the capacity and willingness of northern residents to pay for energy and utilities. The effects on funding, and on ability and willingness to pay, will jointly affect the capacity and effectiveness of energy, utilities and infrastructure. This, along with effects on funding of energy, utilities and infrastructure, will induce changes in energy availability, community infrastructure and utilities.

Project-induced changes in energy, utilities and infrastructure will be a function of the levels of funding, and the community and regional demands on energy, infrastructure and utilities.

The effect pathway of the project on communications infrastructure is not presented here, but it is generally similar to that described previously. The project will affect the demands for communications facilities and services, and the ability and readiness of northern residents to pay for them. These will affect the funding available, and the capacity and effectiveness of these services that, jointly, will determine the changes in the availability of the communications services.

### **5.2.2 Assessment and Management of Project-Specific Effects – Construction**

There will be about 50 to 60 construction camps in the Northwest Territories study area, ranging in capacity from 20 to 30 persons to 1,350 persons. All of the larger camps, with the possible exception of camps located close to communities, will be self-sufficient in terms of power, water supply, water treatment, sewage and solid waste treatment and disposal, and communications capabilities. In instances where camps are located near communities, the project and the community, with the possible involvement of the GNWT, could enter into an arrangement whereby the project is permitted to use community infrastructure. Such arrangements will only take place if both parties stand to benefit, and the capacity of the infrastructure to meet current and future community needs is not compromised. Some of the small camps will haul wastes to approved sites or facilities.

Therefore, the project is expected to have no adverse effects on nontransport community infrastructure, i.e., utilities, energy sources or communications facilities, in Wrigley.

**5.2.3 Mitigation Measures – Construction**

As no adverse effects on nontransport infrastructure are expected in Wrigley, no mitigation measures will be required.

**5.2.4 Residual Effects – Construction**

As no adverse effects on the nontransport infrastructure are expected in Wrigley, no residual effects are expected.

**5.2.5 Operations Effects**

No adverse effects on any nontransport infrastructure resulting from project activities are expected in Wrigley. As no population increase in Wrigley is expected during operations, there will be no need for mitigation of project effects and no residual effects are expected in Wrigley during operations.

### 5.3 Housing

#### 5.3.1 Effect Pathways

Figure 5-3 shows the expected influences of the project on housing availability and quality in the Northwest Territories. In summary, project effects on housing and short-term accommodations will be:

- direct and indirect demands for short- and long-term accommodation
- reduced short-term accommodation demands through provision of construction camps
- potentially increased demand if some existing short- and long-term accommodation becomes unsuitable because of shortages of the skilled trades required to perform major repairs

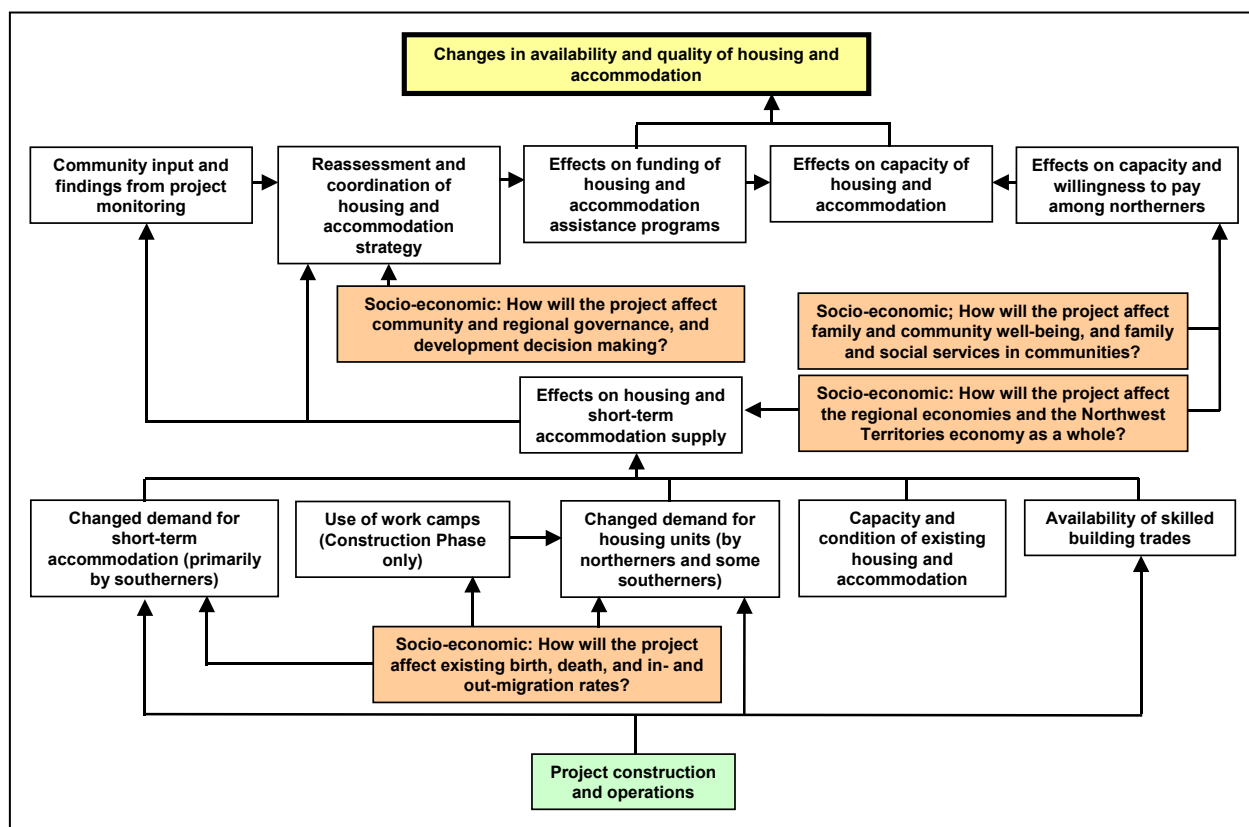


Figure 5-3: Project Effects on Availability and Quality of Housing

The resulting effects on short-term accommodation and housing, and project effects on the regional and Northwest Territories economies, might be apparent in relevant inputs from communities and findings from monitoring project effects. This information could prompt reassessing and coordinating the current GNWT housing and accommodation strategy, which might affect funding for repairs, and housing and accommodation assistance programs. These, in association with northern residents' capacity and willingness to pay for housing, driven by project influences on the regional economy and quality-of-life expectations, will influence housing and accommodation capacities.

As a result, two influences, i.e., the capacities of housing and accommodations, and funding of housing assistance programs, will determine changes in the availability and quality of housing and accommodation.

Analyzing the effect pathway for project effects on housing is largely conceptual; there are empirical indicators for only a few links. However, project-induced changes in population size and income levels could be important driving forces that affect housing availability and conditions in the study area communities.

### **5.3.2 Assessment and Management of Project-Specific Effects – Construction**

Project-induced changes in population size and income levels are important driving forces that affect housing availability and conditions. As it is expected that DCR residents will be moving to other regions to find employment, and the community of Wrigley is small and offers little in the way of attracting outside residents, migration into the community will be undetectable. In fact, residents in the community will experience increased incomes that will potentially be used to improve existing housing conditions. Therefore no adverse effects on housing are expected in Wrigley.

### **5.3.3 Mitigation Measures – Construction**

As no adverse effects on housing are expected in Wrigley, no mitigation measures will be required.

### **5.3.4 Residual Effects – Construction**

As no adverse effects on housing are expected in Wrigley, no residual effects are expected.

### **5.3.5 Operations Effects**

No adverse effects on housing are expected in Wrigley as a result of project activities during operations. Therefore, no mitigation measures will be required and no residual effects are expected in Wrigley during operations.

5.4 Recreation Resources

5.4.1 Effect Pathways

Figure 5-4 shows the influence of the project on increased incomes of some Aboriginal workers and in-migrant non-Aboriginal workers, along with potential direct project effects on preservation of traditional language, culture and knowledge. There may be effects on the culture and lifestyle preferences of some northern workers and their families. Some in-migrants might become new users of nontraditional cultural and recreational facilities such as community recreation centres, playgrounds, sports fields and libraries.

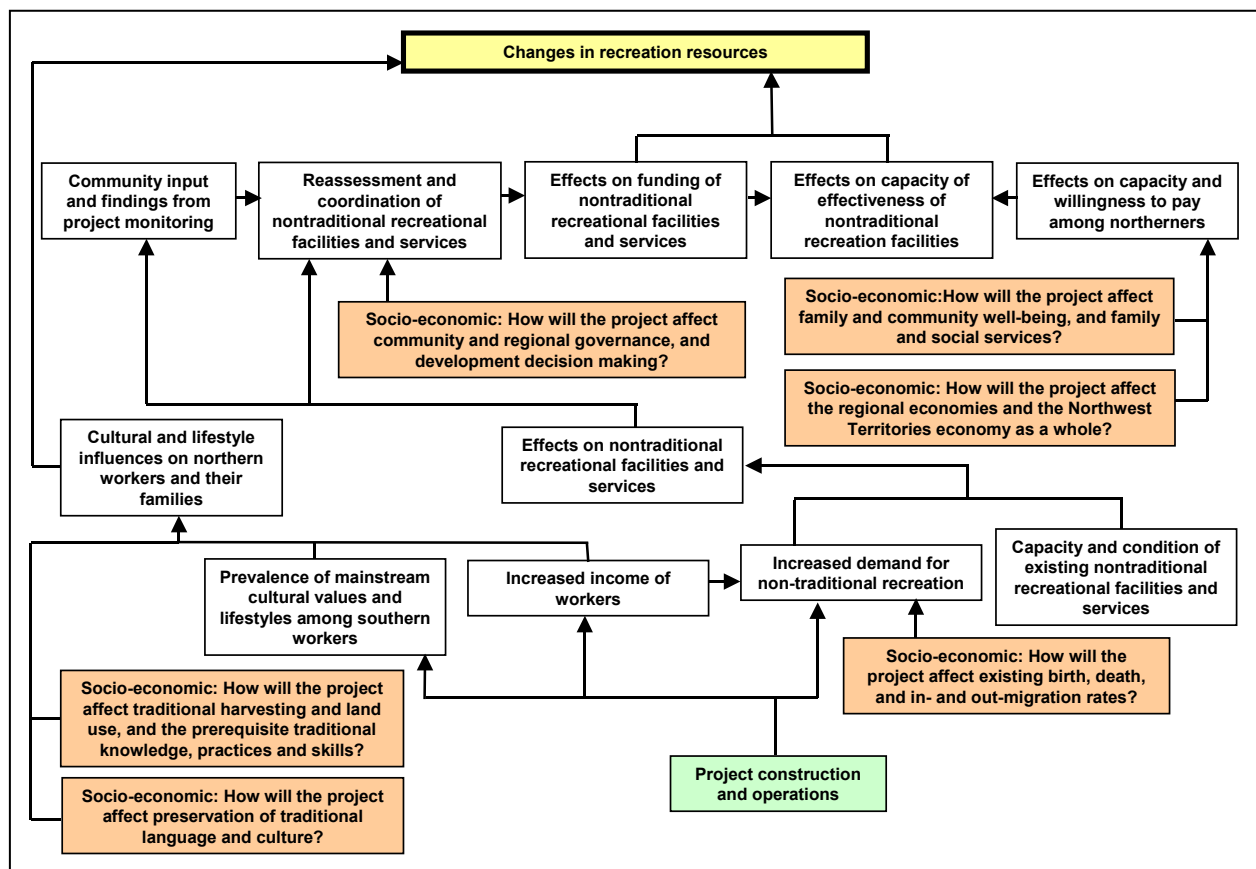


Figure 5-4: Project Effects on Recreation Resources

Project-induced increased demands for recreation from in-migrants and new northern users, and the capacity and condition of existing recreation facilities and services, will determine project effects on these facilities and services. This might drive community input and findings from project monitoring and, with evolving governance arrangements, could promote reassessment of recreation facilities and services. This reassessment might influence funding for recreation facilities and services, thus affecting the capacity and adequacy of these facilities.

Changes in the recreation resources might result from:

- effects of demands of project-induced in-migrants
- effects of cultural and lifestyle influences on northern workers and their families
- capacity and effectiveness of recreation facilities

The capacity and effectiveness of recreation facilities are related to:

- the funding available for these facilities
- the capacity and willingness of northern residents to pay for recreation and culture facilities and services
- the demands of new in-migrants

This analysis of the effect pathways for project effects on recreation resources is largely conceptual; empirical indicators exist for only a few links. Project-related in-migration and increases in income could be important driving forces affecting recreation resources.

This section does not deal with participation in activities or use of resources for which capacity and utilization information is either unavailable or less directly linked to the causal factors previously described. These activities could include various outdoor pursuits such as hiking, boating, camping and snowmobiling. To the extent that these activities relate to designated areas or the tourism sector activity, they are discussed in Section 8, Nontraditional Land and Resource Use.

#### **5.4.2 Assessment and Management of Project-Specific Effects – Construction**

Project-induced increased demands for recreation from in-migrants and new northern users, and the capacity and condition of existing recreation facilities and services will determine project effects on these facilities and services.

As no net migration into Wrigley is expected, adverse effects are not expected on recreational facilities and services in community.

#### **5.4.3 Mitigation Measures – Construction**

As no adverse effects on recreation facilities are expected in Wrigley, no mitigation measures will be required.

#### **5.4.4 Residual Effects – Construction**

As no adverse effects on recreation facilities are expected in Wrigley, no residual effects are expected.

#### **5.4.5 Operations Effects**

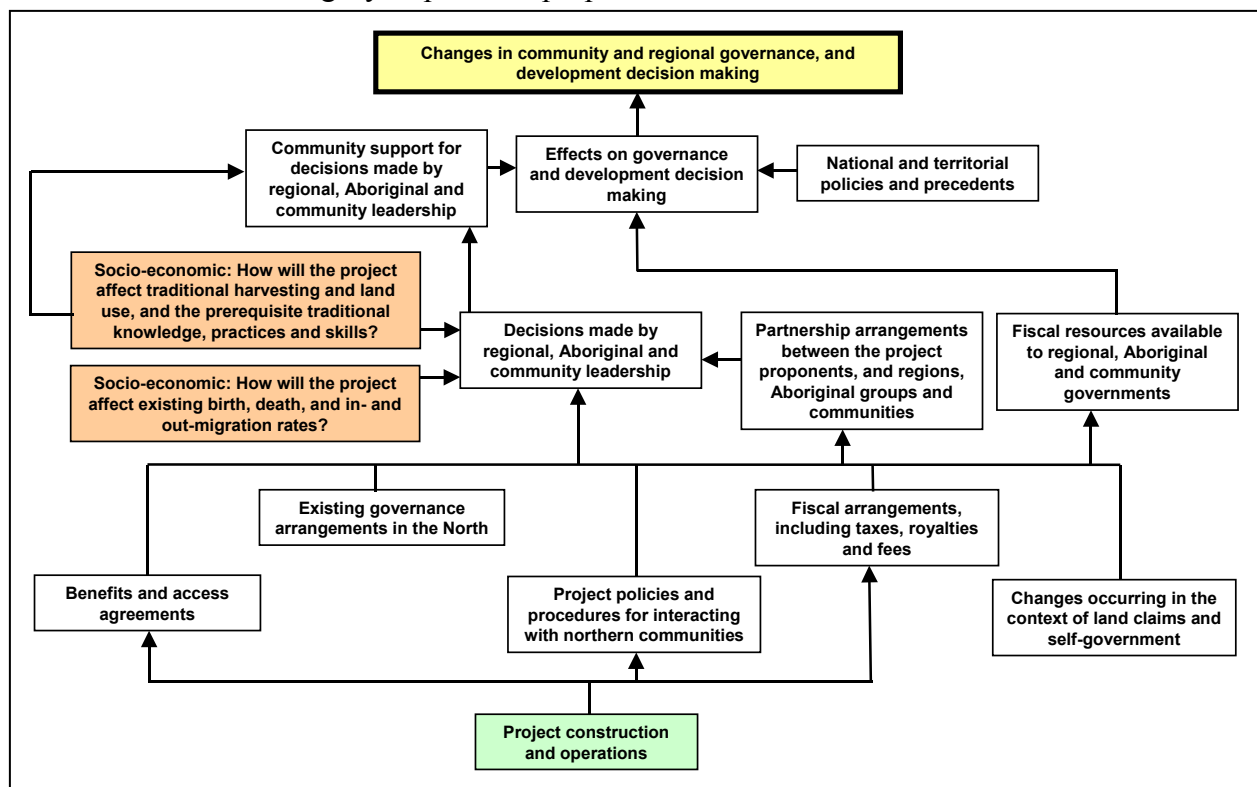
No adverse effects on recreation facilities are expected in Wrigley as a result of project activities during operations. Therefore, no mitigation measures will be required and no residual effects are expected in Wrigley during operations.

## 5.5 Governance

### 5.5.1 Effect Pathways

Figure 5-5 shows the expected influences of the project on community and regional governance in the Northwest Territories. Existing influences, independent of the project, include:

- existing governance arrangements in the North
- changes occurring in the context of land claims and self-government
- the legacy of previous proponent interactions with northern communities



**Figure 5-5: Project Effects on Community and Regional Governance, and Development Decision Making**

Additional project construction influences will include:

- benefits and access agreements signed by the project proponents with the regions and the GNWT
- the fees, taxes and royalties that might accrue to governments in the study area
- project policies and procedures for dealing with northern communities

Collectively these will influence:

- partnership arrangements between the project, and northern regions, Aboriginal groups and communities
- decisions made by senior governments, and regional, Aboriginal and community leaders

Possible project effects on the traditional commitments of Aboriginal people and population dynamics will also influence leadership decisions. The decisions made by leaders, along with potentially changing traditional cultural valuations, will determine community support of leadership decisions. This degree of support, along with the funding available to the decision-making bodies, and national and territorial policies and precedents, will have effects on governance and decision making, which might induce changes in governance and development decision-making procedures.

What has been analyzed in this section is a process of change that is perhaps always occurring in democratic decision making. Relevant influences change, and as they change, people's expectations and reactions change as well. The result might be to stimulate changes in governance. One of the most powerful sources of change is an increase or decrease in available funding that is not just based on external political influences, but is often dependent on economic influences as well.

In the recent past, non-Aboriginal interests, e.g., government, industry, religious bodies and others, have exercised great influence against which Aboriginal people have had little recourse. With the signing of land claim agreements and the associated transfer of powers, Aboriginal groups now have more political control in their regions.

Throughout the community participation process for the EIS, and with the project consultation program in general, Aboriginal communities have been demanding that their mastery in their own houses be respected. They have also asserted their respective desire and intent to work with project representatives, and the territorial and federal government representatives in addressing effects associated with pipeline construction and operation. These desires and intentions were expressly registered at such meetings as the two nongovernmental organization (NGO) workshops in December 2003 and March 2004, the ISR (Inuvialuit Settlement Region)–GSA (Gwich'in Settlement Area) regional technical workshops in April 2003 and February 2004, the Sahtu confirmation meeting in May 2004, and the Deh Cho regional technical workshops in October 2003 and May 2004.

Signing of these agreements and transfers of power have increased the number and complexity of demands on Aboriginal governing authorities, and have inevitably increased the numbers of people with authority to make decisions. The

project will likely increase the numbers, or the salience of issues for the regions and communities, further challenging the capacities of regions and communities to deal with these issues.

Despite these very significant ongoing changes, senior governments could still exert considerable influence because the Aboriginal bodies are not yet financially independent.

### 5.5.2 Relevance to the Project

Two governance issues are most important to the project:

- Which levels of government have the authority, funding and human resources to deal with the range of possible project effects?
- Will the levels of government charged with the responsibility for dealing with possible project effects have sufficient resources, with sufficient lead time, to deal with likely project effects on the physical and social infrastructure of the communities and regions that might be affected by the project?

In this context, physical infrastructure refers to:

- all of the facilities, roads, barge landings, airstrips and other items that might require maintenance or repair
- all of the facilities that might have a shortened lifespan because of project-related activities

Social infrastructure refers to the health, social wellness and education facilities and services that might require enhancement or expansion because of project-related activities.

The remainder of this section focuses on:

- currently evolving changes in governance in the Northwest Territories
- how these changes might affect the sources, adequacy and timeliness of funding needed for project effects

Governmental decision making related to review and approval of the project itself is not addressed in this document. This process is complex and has been determined by the regulator's *Cooperation Plan for the Environmental Impact Assessment and Regulatory Review of a Northern Gas Pipeline Project through the Northwest Territories* (Northern Pipeline Environmental Impact Assessment and Regulatory Chairs' Committee 2002). The analysis in the EIS focuses on the post-decision governance implications of the project.

### 5.5.3 Changing Governance – Devolution and Self-Government Negotiations

The existing governance relationships between the federal and territorial governments, and the Aboriginal people, their organizations and communities in the Northwest Territories are in the process of change through ongoing negotiations. These changes are recognized in the effect pathway diagram in the influences identified as *Changes occurring in the context of land claims and self-government* and *National and territorial policies and precedents*. These ongoing processes involve negotiations to achieve devolution of authority, and to confer self-government responsibilities on Aboriginal peoples.

*Devolution* refers to ongoing negotiations between the Government of Canada, the GNWT and the Aboriginal Summit that will transfer the current Indian and Northern Affairs Canada (INAC) control over land, water and resources to northern governments. The Aboriginal Summit is a negotiating body composed of virtually all the organized Aboriginal groups in the Northwest Territories except the Deh Cho First Nation, which is not participating at this time.

The self-government negotiations primarily involve the GNWT, the Government of Canada and each of the Aboriginal settlement areas. The Deh Cho Process will also address self-governance. The result of the devolution negotiations will be to transfer jurisdiction over land, water and resources, and therefore control over these possible sources of revenue, to the northern governments. The result of the devolution and self-government negotiations will be to substantially increase the relative political and fiscal autonomy of the Gwich'in, Inuvialuit, Sahtu and eventually Deh Cho people.

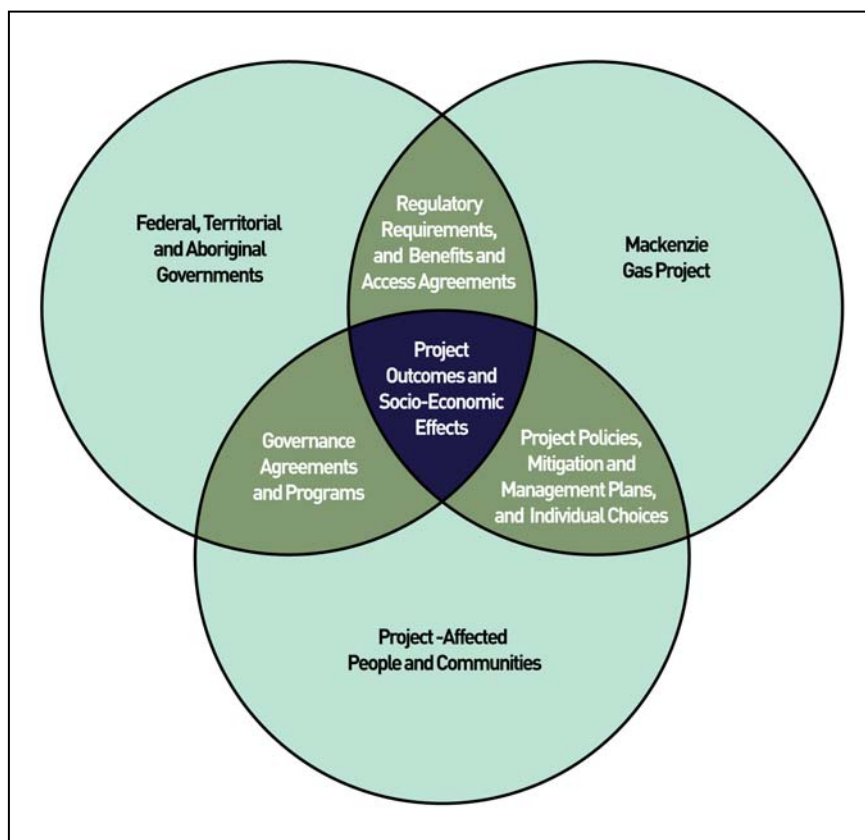
Further relevant information on Aboriginal self-governance is contained in the region-specific discussions on governance in the EIS, Volume 4, Socio-Economic Baseline.

### 5.5.4 Assessment and Management of Project-Specific Effects

The GNWT and the Aboriginal Summit are trying to expedite devolution of land and resources from the federal government because royalty and tax revenue from diamond, mineral, and oil and gas production are now flowing out of the Northwest Territories to Ottawa. The territorial government still spends more than it collects to address Northwest Territories' needs to expand and improve community and regional infrastructure, education, and health and social services to provide for a rapidly growing population. However, under the current fiscal arrangements, the GNWT cannot take full advantage of the increased revenue potential related to resource development. By gaining province-like powers over Northwest Territories lands and resources, the GNWT could have substantial additional resources available for addressing growth-related needs and concerns.

Because of the self-government process, the regional and community governments will have the responsibility and authority to deal with some of the effects of development.

The local communities, Aboriginal governments, GNWT and project managers will all have responsibilities for managing the social and physical infrastructure needs, and the human implications of this project. This shared responsibility for effects management is a consequence of the nature of socio-economic issues. The project proponents will cooperate with communities and different levels of government but cannot, and should not, make unilateral decisions in areas that are the responsibility of others. Figure 5-6 illustrates that all parties must cooperate to achieve the common objective of optimizing project effects on people.



**Figure 5-6: Shared Responsibility for Effects Management**

Some important and difficult issues with respect to effects management will involve measures requiring substantial funding. The ongoing devolution and self-government negotiations will provide access to additional funding, if the relevant final agreements are signed and implemented in time. The GNWT will then receive royalty and tax revenue from development projects. Regional and community governments will be able to access needed funding following final

signing of self-government agreements, once they are authorized to pass the necessary legislation.

Although it is possible that the devolution agreement could be implemented before construction, this is far from certain. It is problematic whether any self-government agreements will be implemented by the time construction begins. Both the GNWT and current settlement area governments might be challenged to adequately fund their social (health, social wellness and education services) and physical infrastructure (facilities such as roads, barge landings and airstrips) needs.

Therefore, given the likely time frames for implementing both self-government and devolution agreements, the magnitude and timing of funding needed to provide for project-related public service demands are pressing concerns.

The project will provide a substantial source of revenue to the various levels of government from:

- benefits and access agreements
- direct taxation
- payment of royalties

During construction, the project will generate \$136 million in personal taxes from activity in the Northwest Territories. The GNWT share, after adjustment for the Formula Financing Grant (FFG) is taken into account, is estimated to be \$9.8 million. Estimates of corporate tax flows have not been included. During project operations, total taxes generated from activity in the Northwest Territories will amount to about \$399 million annually. Again, the GNWT share, after the FFG is taken into account, is estimated to be \$22 million. The GNWT share varies from 7% of the total during construction to only 5% during operations.

Before implementation of a final devolution agreement, the largest part of this revenue will accrue to the federal government. However, the likely costs of the project for infrastructure and services will impinge on the local, regional and territorial governments. The communities and regional authorities that will experience project-related effects on infrastructure will not have the resources to pay for needed increases and public services expenditures under current programs and budgets.

It is timing that becomes a pressing issue. The costs of possible public service and infrastructure enhancement and repair will be incurred and must be paid before or during construction. These costs are difficult to predict in advance and governmental budgetary processes take long lead times. Although payments for benefits and access, and some direct tax revenue will begin with the onset of construction, governments will begin to receive most of project royalty fee and tax revenue only during operations.

Expenditures on social and physical infrastructure will likely be necessary before and during construction, and project taxes and royalty fees to government will only maximize during operations, when any unusual public expenditure demands will fall to a minimum. Therefore, it is both a timing and an incidence issue. Project revenue to governments might arrive too late and might not accrue to the level of government that will experience demands for increased expenditures.

This issue is an ongoing one that is currently the subject of much deliberation and negotiation. However, the project and the associated regulatory review process will bring it into the public eye. The project proponents can do little to address the main concerns, beyond recognizing and providing for their own direct needs and fulfilling their obligations as corporate citizens.

This suggests the need for a front-end funding agreement among governments so that needed social and physical resources are in place with the onset of construction, and can be maintained during the construction years. The affected parties should negotiate agreements at the community, regional, territorial and federal government levels, specifying the sources and uses of this needed funding. Failure to achieve and implement these agreements will likely cause hardship to people living in areas where construction effects will be experienced. In recent years, the GNWT has often publicly suggested that the FFG should be amended to ensure greater revenue sharing related to resource development.

These effects are essentially the same throughout the Northwest Territories study area, and therefore no regional-specific effects are presented.

This section has focused on high-level decision-making issues and the fiscal implications of these decisions. The potential project effects on the human resources necessary to deliver governance are discussed under employment effects in Section 4.1, Procurement, Employment and Regional Economic Effects, and in various other sector-specific sections dealing with public service delivery, e.g., health care and social services delivery.

### **5.5.5 Residual Effects**

The result of ongoing devolution and self-government negotiations will be empowerment of community and regional governments, in terms of much increased authority and fiscal autonomy. This has relevance for timely restoration and enhancement of physical and social infrastructure, where these are necessary during construction. Table 5-3 shows that adverse project effects on governance are expected to be moderate magnitude in the Northwest Territories and limited to construction. In the longer term, the demand for government programming responses will return to near normal and revenue streams will be enhanced. Therefore, the capacity and autonomy of regional governments should increase.

**Table 5-3: Governance – Project Effect Attributes for the Northwest Territories Study Area Communities**

Phase	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Construction	Adverse	Moderate	Regional and beyond regional	Short term	No
Operations	Positive	Low	Regional and beyond regional	Long term	No



6 INDIVIDUAL, FAMILY AND COMMUNITY WELLNESS

6.1 Community Well-Being and Delivery of Social Services

6.1.1 Effect Pathways

As indicated in Figure 6-1, project activities might attract transient job seekers and northern residents from other areas, and will employ many people. They will stay in work camps and will periodically return to their families. Those employed will have increased income to spend, in ways that can affect the quality of life and well-being of individuals, families and communities. They can affect demands on family and social services as well. Project-related migration trends and work camp life can also affect family and community quality of life, and family and social services.

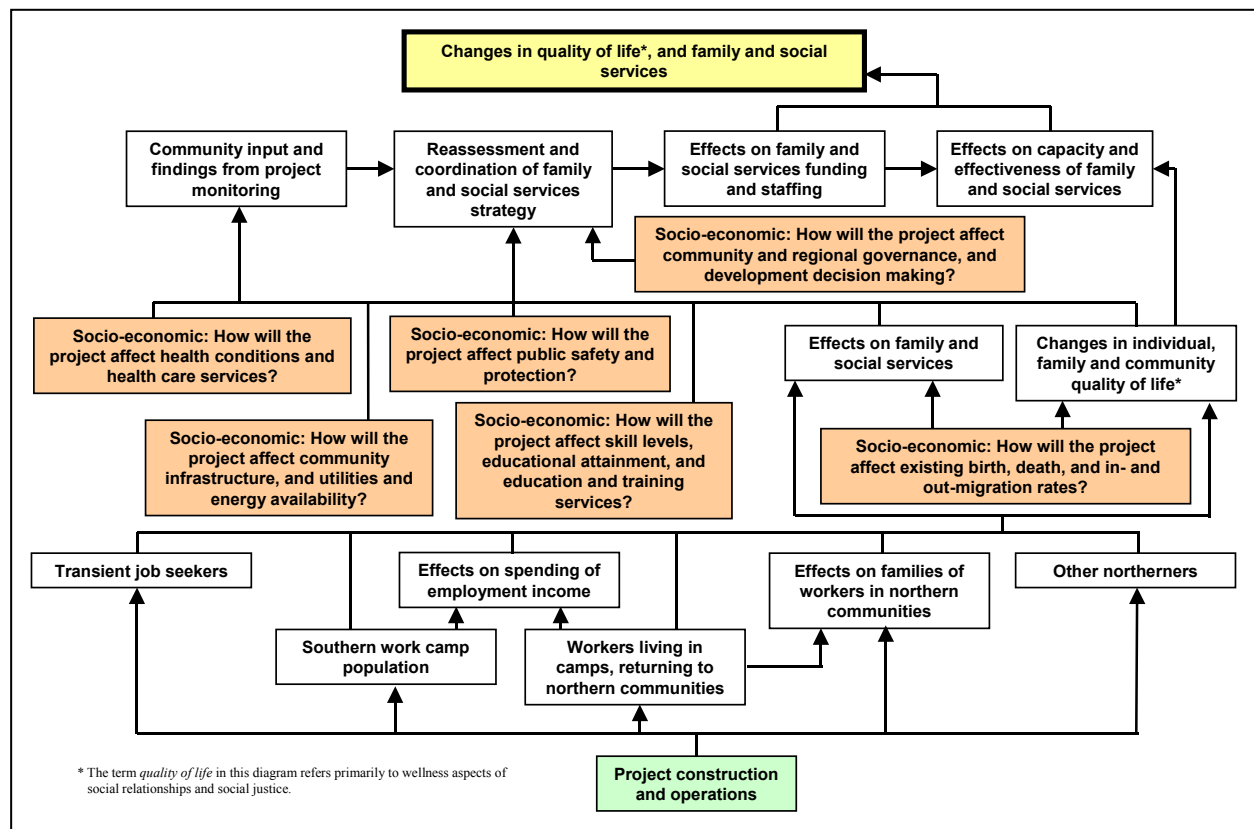


Figure 6-1: Project Effects on Family and Community Well-Being, and Family and Social Services

Many other possible project effects, discussed elsewhere in this report, and quality-of-life conditions and effects on family and social services, will affect assessments of conditions coming from community sources and project monitoring. These other influences include effects on:

- community infrastructure and utilities
- physical and mental health
- health care services
- public safety and protection services

The assessments of conditions from community sources and project monitoring, and changes in community well-being, demands on social services and regional governance influences will stimulate reassessment of delivery procedures. Reassessment will affect funding and staffing of family and social services, and the resulting changes will affect the capacity and effectiveness of family and social services delivery, as will changed service demands resulting from changes in quality of life.

Changes in family and social services delivery, and hence changes in individual, family and community wellness, will be brought about by the interaction of staffing and funding changes with:

- effects on family and social services capacity and effectiveness
- changes in demands from increased income

This analysis of the effect pathway for community well-being and social services delivery is largely conceptual; there are empirical indicators for only a few links.

The primary analytically relevant driving forces affecting well-being conditions include:

- income levels, particularly how individuals spend increased disposable income
- duration of work period separations from home
- family and community levels of stress
- availability of alcohol

Well-being conditions, and migration and resourcing responses to changes in demand are the primary drivers affecting the workloads of social service personnel, and thus the delivery of social services.

The effects of income on well-being might be beneficial. Increased income can lead to purchases of amenities that make possible more comfortable, enjoyable living, and more efficient resource harvesting. During 2001 and 2002, many

people in the BDR communities bought large diesel pickup trucks, snow machines, boats and outboard motors with their earnings. There were increased sales of home entertainment equipment, appliances and furniture. Under these conditions, the quality of life and effective resource harvesting might both improve, and demands on family and social service agents might be modest. These positive influences tend to increase as work and income stabilizes, and families learn to manage their increased income.

However, increased earnings can make possible increased gambling or spending on alcohol that might jeopardize the purchase of necessities. Substance abuse can have serious adverse effects on family and community relationships, and well-being.

Workers experiencing lengthy work-induced separations want and need rest and recreation upon returning home. Their spouses, having managed the household and child-rearing alone, need and look forward to sharing these responsibilities with the workers upon their return. Such incompatible needs can often lead to more serious conflicts. When stresses and mistrust in families or communities are combined with new sources of conflict and easy access to alcohol, the result can be abusive and violent relationships. Family and community solidarity and well-being, and indeed community social controls, can suffer.

In-migration increases the number of people who might become social service clients. Excessive demands, beyond the effective response capabilities of social service agents, can be associated with these conditions. Such adverse effects also increase the demands on protection services (analyzed in Section 6.5, Public Safety and Protection Services). Under these conditions, resourcing (primarily staffing levels) can determine the relative adequacy of the treatment that clients receive.

### **6.1.2 Assessment and Management of Project-Specific Effects – Construction**

The project will provide health care facilities in every construction camp, but these will have no effect on nonhealth-related wellness problems. Because of the relationship between increased income and increased alcohol abuse, widely cited by residents and leaders in public participation workshops, Royal Canadian Mounted Police (RCMP) officers, and social workers, the project will have some adverse effects on community wellness. Alcohol abuse will result in various forms of family abuse and violence in the community, and in emotional and family relationship problems experienced by victims of abuse and violence. Social services delivery will thus have to deal with the effects of increased alcohol abuse, and perhaps increased gambling as well. Participants in all of the regional technical workshops linked increased income from the project with expected increases in alcohol and drug abuse. The result is expected to be increased social disorder and conflict, and increased policing burdens for the RCMP.

Concerns have been voiced in some Aboriginal communities that project workers should be kept away from their communities, fearing that such visits would prove to be disruptive.

Some individuals might experience such heavy gambling losses that insufficient money remains to pay for food, clothes, utilities, rent and other important financial obligations. This situation could be exacerbated when construction is complete. Those individuals who do not find another job or have not saved sufficient money during their employment could experience stress from lack of income and employment, which, in turn, could also affect their families.

Project effects on well-being conditions will largely be influenced by:

- income levels and related spending patterns
- length of work separations from home
- family and community levels of stress and mistrust
- ready availability of alcohol
- access of southern workers to some Aboriginal communities

Volume 4, Socio-Economic Baseline provides relevant evidence on the limited effectiveness of social services for substance abuse prevention in the DCR, and the steps advocated in a GNWT-commissioned study to improve this service.

To plan realistically for possible project effects, it must be assumed that adverse effects on wellness will likely be more severe in those communities where the indicator rates presented in the EIS, Volume 6, Section 5.2.2, Existing Baseline Conditions (Community Well-Being and Delivery of Social Services) are high. In these communities, it appears that community social controls and social support are relatively weak. The project-related increases in income, which most Northwest Territories communities will experience, will likely lead to increased alcohol consumption and abuse, and to various consequences that might challenge community resources. According to the indicator data, and the reports of many nurses, social workers and RCMP officers, communities differ considerably in their resources for dealing with additional stresses, jealousies and conflicts. Such communities will have heightened vulnerability to adverse project effects on community wellness.

The rates of violence in the home and children taken into care are the most potent available indicators of impaired family wellness. Some of these indicators are not available for Wrigley because, lacking a local RCMP detachment, there is no community-specific offence data. Also, because the population is so small, some data is suppressed to protect confidentiality. The significance of the indicator rates available for Wrigley, shown in Volume 4 of the EIS, can be best assessed by comparing the indicator rates for the other communities. Rates of hospitalizations for alcohol-related illnesses, the only indicator available for Wrigley, are only about half as large as the rates for the total DCR in 1997–1999 through 1999–2001, the most recent data available.

The project will likely pose challenges to the well-being of study area communities and residents, and the delivery of social services. Participants at the regional technical workshops recognized the pressures that the project might place on social service agencies and communities. At the second NGO workshop in March 2004, those attending questioned whether existing agencies could deal with the increase in problems that might result from the project. Any incremental project effects might thus be seen as seriously disruptive, unless they are forestalled by implementing suitable mitigation measures.

Because of possible problem conditions resulting from poor spending decisions that lead to disruptive behaviour, as workers and their families learn to better manage income, the positive influence of economic opportunities on wellness conditions increases. This tendency is expected to be greater as the length of employment increases, especially relative to operations opportunities.

The Deh Cho residents have general concerns that increased income will exacerbate existing alcohol problems, and specific concerns about alcohol and drug abuse in the camps. People attending the Deh Cho regional technical workshops in October 2003 and May 2004 expressed these concerns.

Wrigley might experience project effects on community wellness if many residents accept project-related employment. Perhaps more important, the project facilities sited at Wrigley will include fuel storage and pipe stockpile facilities, and use of the existing airport and perhaps the barge landing. As well, a 950-person construction camp will be sited about 28 km from the community. Workers travelling to and from this camp might be using the Wrigley airstrip.

The project will induce levels of highway, airport and likely barge traffic through Wrigley which, relative to the size of this very small community, will be substantial. Wrigley and Fort Simpson differ in relative size and degree of isolation, but both will experience similar closeness to project construction camps and facilities, and increased highway traffic. Accordingly, relative to their differences in size, both communities might experience similar project effects, including effects on community well-being.

Health care in Wrigley is delivered by a health station, staffed by a half-time community health worker, who consults by telephone with a registered nurse in Fort Simpson whenever the need arises. This service could easily be overwhelmed by the needs of several patients requiring care during a brief period of time.

Forecasts of project-induced effects based on these relatively moderate indicator standings, and on some prior experience with high income levels, suggest that much of project earnings might be spent on improving lifestyles. Elevated spending in support of a traditional lifestyle is likely particularly true of the smaller and more isolated DCR communities like Wrigley. However, some increased earnings might also be spent on alcohol, and there might be some

resulting increase in adverse social effects, likely only minor in most DCR communities.

Despite having some experience in the DCR with diamond mine employment, the social services in some of these communities might experience a variety of project effects from increased alcohol abuse and perhaps increased gambling as well. At the first Deh Cho regional technical workshop in October 2003, community participants suggested that gambling is as much an addiction as drugs and alcohol, and also requires serious attention.

### 6.1.3 Mitigation Measures – Construction

Different mitigation measures are indicated to address project-induced effects on family and community wellness, and on delivery of social services. Measures that are effective in mitigating effects on family and community wellness will also reduce effects on the delivery of social services. Similarly, improvements in the quality of social services and their delivery will help to contain the effects on wellness.

The mitigation measures for wellness threats will be less effective than those described for social service delivery. The measures to inhibit wellness-threatening behaviour are dependent on the decisions and actions of many individuals, whereas the social services delivery measures can be implemented administratively. However, project effects tending to increase family and community wellness problem rates will add to the workloads of service providers.

Because of the extent to which alcohol abuse is associated with abusive and violent relationships (RCMP officers in numerous communities 2002 and 2003, personal communication), measures to reduce alcohol abuse will reduce wellness problem rates. Effective measures to reduce alcohol abuse will involve efforts by the project, communities and GNWT.

The most effective efforts to protect wellness are those which communities themselves might implement. At a regional confirmation meeting in May 2004, an Elder expressed the most eloquent concern about present wellness conditions and management of possible project effects:

*Things are not right on our land, our environment, wildlife and culture. Drugs and alcohol have always been an issue for us, not enough has been said about it. They have disrupted our lives. When we were hunting and trapping, we had good lives. We want something done about the drugs and alcohol in our communities, but nothing ever seems to happen. We're the ones that have to repair our damages, not anyone else. If the Elders don't let go of the alcohol, and be good role models, we won't be able to help our youth. Who will help us fix our problems? We are grateful to live*

*on this land, but now we have a vulnerable lifestyle, and we need communication to live in peace. When we didn't have alcohol, we had a good life. Now, we're dishonest with one another. We need to work together to fix the damages of the past, and to be good role models for future generations.*

*Now money doesn't help us – it just leads to the abuse of alcohol and drugs. We need to work together to help support one another. So, let's start working together to end the abuse of alcohol and drugs. We continue talking and talking about this, but we don't know what will happen to our people, to our land. We need to continue to educate one another on the effects of what will happen. Need to have compassion for one another – it is the only way to fix things. Nobody wants to see anything damaged – no damage to our wildlife and our fish. Let's support one another.*

The project will implement the following measures to contribute to this shared responsibility:

- initiate a program such that workers can choose to assign part of their wages to a savings account, to reduce the potential for negative lifestyle choices
- establish on-the-job support systems and resources to help develop worksite and life skills, such as:
  - workplace essential skills upgrading
  - a workplace mentor program
  - an Aboriginal worker liaison program
  - cultural awareness training
  - pre-employment safety training
  - life skills guidance, such as money management, and prevention of alcohol and substance abuse
- respect a community's right to privacy and discouraging workers from entering any community which asks for privacy
- provide, if requested, an opportunity for Aboriginal artisans to display and sell their handicrafts in the camps, reducing potential disruption caused by project workers visiting local Aboriginal communities in search of handicrafts
- encourage and support efforts by the territorial government to set up community-based training programs in personal finance and money management, focusing on informed consumption, savings and investment choices for increased incomes. These programs should be made available in the construction camps.

- support government programs to provide assistance to families and communities of workers
- ensure contractors and subcontractors implement alcohol, drug and other safety programs that meet project proponent requirements
- inspect the luggage of workers upon arrival for work
- enforce policies for alcohol- and drug-free workplaces and camps
- provide a workplace where all individuals are treated in a fair, equitable and respectful manner, specifically including issues of harassment, privacy and acceptable social relationships
- apply actions for noncompliance with camp policies, which could be up to and including dismissal

Participants at each regional technical workshop supported these measures. Attendees at the second DCR regional technical workshop in May 2004 specifically recommended the alcohol and drug control measures.

The communities could:

- enact a bylaw, if one does not already exist, that limits the amount of alcohol that can be purchased or imported per trip
- police themselves in respect to alcohol and drug use. This was recommended by some in attendance at the first Deh Cho regional technical workshop in October 2003. For example, they insisted that this should be a community, rather than a territorial government, responsibility.
- implement a realistic campaign to inform residents of the human and financial costs to the community of substance abuse, enlisting the whole community, and particularly the moral authority of the Elders, in this effort

The territorial government could:

- initiate community-based training programs in personal finance and money management, focusing on informed consumption, savings and investment choices for increased incomes
- ensure that all community wellness centres in the study area are adequately staffed
- implement the recommendations to improve treatment services contained in the Chalmers & Associates (2002) study of substance abuse

- formally establish a consistent RCMP policy for detaining those so inebriated as to be at risk of physical injury to themselves or others
- ensure adequate staffing of community RCMP detachments to consistently enforce alcohol control policies and take action against bootleggers
- formally establish a consistent law enforcement policy in which the RCMP are empowered to lay charges in all cases of physical abuse, irrespective of the wishes of the victim
- plan (GNWT Health and Social Services [HSS]) for the likely increase in the stresses and family conflicts often associated with employment absences, and provide additional training to GNWT HSS personnel to help them better prevent and effectively deal with these conditions
- prioritize the need for child and Elder care support in communities with a substantial number of females employed in rotational positions
- promptly act on the GNWT HSS initiatives that address the frustrations, concerns and professional needs of GNWT HSS service providers in communities, to improve the morale and effectiveness of its personnel

The recent GNWT Strategic Plan states (GNWT 2004: 5):

*Creating an environment that supports healthy people is truly a shared responsibility and requires each of us to do our part. This means that governments must deliver effective public policies and adequate resources to support social programs. It means that communities should support individual members to achieve healthy lifestyles and behaviour. It also means that families and individuals must make healthy lifestyle choices . . .*

Dealing with community well-being problem conditions is the responsibility of social service personnel and the RCMP. The mitigation measures needed to safeguard the morale and effectiveness of GNWT HSS personnel are detailed in *Health and Social Services Action Plan, 2002 to 2005* (GNWT HSS, no date). The measures designed to enhance the effectiveness of RCMP officers are reported in Section 6.5.3, Mitigation Measures (Public Safety and Protection Services).

The project will likely attract no more than a few curious former members to Wrigley, and these would probably be short-term visitors. The mitigation measures described in Section 4.2.3, Mitigation Measures (Demography), will be relevant, and are presumed in the following discussion.

Community well-being conditions and social services delivery likely to be affected by the project already represent considerable challenges to study area communities and residents. Therefore, any project-induced incremental effects can be perceived as particularly disruptive, unless they are prevented by implementing suitable mitigation. The most important of these responses can only be made by governments and by the communities themselves. This is considered to represent a very serious challenge, requiring a concentrated effort by all.

Measures will be implemented that might help sustain community wellness, and are available to the project. Workers assigning part of their wages to savings, and consistent RCMP adherence to a policy of enforcing liquor ordinances and preventive detention of impaired persons could substantially reduce individual and community wellness problems. However, most wellness problems are alcohol related, and alcohol and other substance abuse are behaviours for which western social science has no sure cures, and which many GNWT HSS personnel are ill-trained to address (Chalmers & Associates 2002).

At the first Deh Cho regional technical workshop in October 2003, those attending stressed the need for communities to police themselves regarding alcohol and drug use. This need should not be the responsibility of the territorial governments. It was further recommended at the second DCR regional technical workshop in May 2004 that a policy of no drugs or alcohol should be enforced at all project construction camps.

The commitments which the project will implement to contribute to the shared responsibility for managing these issues are described above. The mitigation measures described in this section are very important for the DCR. The steps available to the project to safeguard community wellness are less effective than those available to the GNWT and local communities. Therefore, it is essential that the GNWT, and especially the local communities, do all they can to control substance abuse, and any resulting conflict and violence. The government and communities should also focus on sustaining the family relationships that might be stressed by absences associated with camp-based employment.

#### **6.1.4 Residual Effects – Construction**

Although no project staff will relocate to Fort Simpson during construction, the town could experience some increase in transient project-related personnel, and likely some other Aboriginal and non-Aboriginal transients attracted by increased activity in the town. Increased cash flow, and levels of employment and activity can lead to increased drinking and alcohol abuse, and the associated problems of conflict and violence. There might be similar but attenuated problems in a few other DCR communities.

The difficulties in controlling alcohol abuse and the serious social consequences of substance abuse have been addressed in previous sections. Implementing the recommended measures for social services personnel will increase the effectiveness of wellness centres in dealing with project effects. However, because some increase in the workloads of these centres is likely, they might respond to wellness problems with reduced effectiveness.

Some adverse effects of construction could persist for a limited period after construction ends. Those locally employed individuals who do not find another job, or have not saved money during their employment, could experience frustration from lack of income and employment that, in turn, could be taken out on members of their families.

The attributes of these project effects on community wellness conditions are seen in Table 6-1. All effects are expected to be adverse in Wrigley and moderate in magnitude, as wellness could be affected by the closeness of a large camp and yet closer staging and marshalling sites. Although the effects described for Wrigley are considered serious concerns, they are not expected to be significant.

**Table 6-1: Well-Being Conditions – Construction Effect Attributes for Wrigley**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Wrigley	Adverse	Moderate	Local	Short term	No

High income levels from project jobs and family separations caused by camp-based employment could have adverse effects on wellness, and thus on the workloads of social workers. Whereas some will spend their increased income to improve traditional and nontraditional lifestyles, others will spend heavily on substance and gambling abuse. As a result, some high-income families will experience economic hardship, physical battering, and sexual and emotional abuse. *It is the women and children who will suffer most*, as many GNWT HSS staff have emphasized.

The craving for rest and enjoyment of industrial workers, home from long demanding work shifts, conflicting with the needs of their homebound spouses for help in parenting and household management, pose additional difficult challenges for social workers. The workloads of GNWT HSS personnel are expected to increase substantially in some DCR communities, and there are no ready solutions for the difficult problems they must address. As a result, there will be a very real risk that overburdened social workers might experience burnout.

Social service delivery effects in some DCR communities will be influenced by the limited but relatively long-term experience of some DCR communities with diamond mine employment.

As Table 6-2 shows, moderate-magnitude, adverse effects are expected on service delivery in Wrigley, because of relative nearness to project construction sites and activities, and because it is dependent on Fort Simpson for most services.

**Table 6-2: Delivery of Social Services – Construction Effect Attributes for Wrigley**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Wrigley	Adverse	Moderate	Local	Short term	No

The social service needs of Wrigley could worsen for a brief interval when construction employment ends. Those locally employed individuals who do not find another job, or have not saved money during their employment, could experience stress from lack of income and employment that, in turn, could be taken out on others.

### **6.1.5 Operations Effects**

Most employment and opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. There will be about five pipeline contract maintenance jobs based in Fort Simpson. However, this much-reduced level of income-generating opportunities, which will be relatively long term and stable in nature, is not expected to result in elevated wellness problem conditions. The population increase associated with this activity is expected to be negligible and should generate no additional demand for social service delivery.

As project effects will be restricted to construction, there will be no need for mitigation and no residual effects are expected in Wrigley during operations.

## 6.2 Health Conditions and Health Care Services

### 6.2.1 Effect Pathways

Project effects on the health conditions and effectiveness of GNWT health care services are addressed in this section. Both might be affected by several project-induced influences, shown in Figure 6-2.

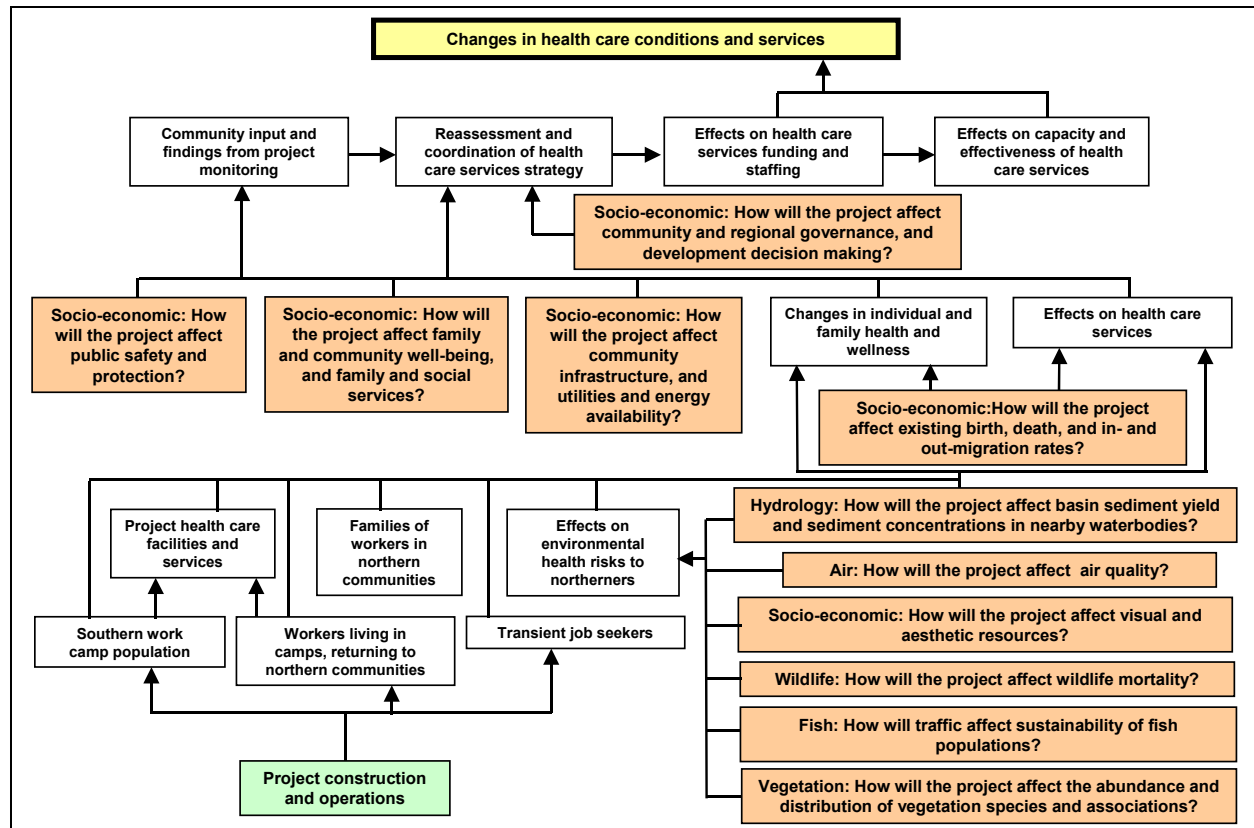


Figure 6-2: Project Effects on Health Conditions and Health Care Services

Project activities will lead to the association of northerners from study area communities with each other, with project workers from the south, and on occasion with transient job seekers. After a variety of such contacts, northern workers will return home. These project-related effects and associations with others, on or off the job, might adversely affect health through the following:

- exposure to contagious diseases, including sexually transmitted infections (STIs)
- increased consumption of unhealthy food

- possible influences on how project earnings are spent, i.e., excessively on alcohol, leading to vehicle incidents or family violence
- lessons learned from dangerous behaviour of role models

Project construction-related and -induced activities might benefit the health of individuals and groups when project earnings are:

- spent on improving traditional or nontraditional lifestyles
- spent on a better, more nutritious diet
- spent on better climate-appropriate clothing
- spent on healthier housing arrangements or facilities
- saved for future opportunities

When project-influenced associations with others result in knowledge from new role models that promote health or safety, health conditions will benefit.

Other possibilities that might affect health include project effects on:

- family and community well-being
- family and social services
- public safety and protection

The health of individuals can be affected by environmental health risks, resulting from possible project effects on:

- water quality
- ambient air quality
- health of wildlife, fish and vegetation species

Project-induced effects on GNWT health facilities and services can include increasing their workloads by providing treatment to persons affected by the project because of:

- ill health resulting from risks to human health from the quality of air, water or soil, game and other wild foods, and from noise
- illness brought home by camp workers that infects others in the workers' families
- any health condition of a camp worker which the camp health service could not address
- mental or emotional disorders induced by various conditions, including:
  - family separation

- costs and inaccessibility of child care
- other stresses associated with employment absences and workplace issues, including harassment, safety, low pay and undervalued work
- transient job seekers, attracted by the project, and their families who are ill or injured

Project-induced changes in health conditions or health centre workloads might give rise to community reactions and relevant project monitoring findings, possibly leading to a reassessment of the health care services strategy. Such a reassessment could influence health care funding and staffing, in turn affecting the capacity and effectiveness of health care services. Together, these could lead to changes in health care services, and to possible changes in health conditions in the local population.

This analysis of the pathways for project effects on individual health and health care services is largely conceptual; there are empirical indicators for only a few links. The primary, analytically relevant driving forces affecting health conditions are:

- project-induced or -related exposures to disease-causing contagion conditions
- project-induced or -related changes in income levels and associated spending patterns
- physical risk levels
- stress levels, which might increase emotional or mental disorders

The primary drivers affecting the workloads of health centres, and thus the delivery of health care services, are:

- local health conditions
- diseases of returning workers which spread to family members
- migration and resourcing responses to changes in demand

Any increases in the number of potential patients and resourcing, primarily staffing levels and staff morale, will determine the relative adequacy of the treatment that patients receive.

### **6.2.2 Assessment and Management of Project-Specific Effects – Construction**

Project effects on health conditions will largely be influenced by increases in:

- populations, both in communities and in camps

- income levels, which can have both beneficial and adverse effects, depending on spending and investment choices
- physical risk levels
- stress levels
- infectious disease conditions

The data in Volume 4 of the EIS indicates that STIs, accidental deaths and mental disorders are all health problems in the Northwest Territories, although the rates vary between settlement areas. Possible project influences affecting the health conditions of workers, their families and other residents in Wrigley will include:

- a possible very small population increase
- increases in income levels which might be spent on improving traditional or nontraditional lifestyles, or increasing socially detrimental behaviours
- reductions in incidents resulting from activities with high physical risk levels (seen in Volume 4 of the EIS) because project work might be safer than resource harvesting
- increases in relationship stresses between spouses because of their conflicting needs when one is absent from home for employment
- increases in infectious disease contagions, associated with having many people in the camps and with increased travel between communities
- increases in population and mobility of people, possibly leading to increased numbers of casual sexual encounters and likely increased rates of STIs
- increases in numbers of the pre-existing dysfunctional conditions that currently exist in communities, including:
  - substance abuse
  - drug addiction
  - teen pregnancy
  - foetal alcohol syndrome/foetal alcohol effects (FAS/FAE)
  - sexual abuse
  - possibly human immunodeficiency virus (HIV) or auto immune deficiency syndrome (AIDS) and hepatitis
- increases in stress levels among women residing in large work camps, where they are a minority, because of:
  - lack of privacy
  - potential for harassment

- inability to maintain acceptable social relationships
- concern regarding physical safety

There are lessons to be learned from the experiences and consequences of women's employment at the diamond mines. Although there are strict mine policies to the contrary, many women employed by the contractors who provide commissary and housekeeping services at the mines report being harassed and exploited, at times being asked to work overtime without overtime payment. Some women working at the mines also experience relationship issues with their stay-at-home spouses. Child protection workers report that there are some families in which both parents, having remote site employment, leave their children to fend for themselves when both are away at work. As increasing numbers of northern mothers are employed and families have moved to new communities where they have no relatives to give assistance, day care for children is often a problem. Most communities do not have a day care program, and where one does exist, the cost is often too high for Aboriginal mothers (Status of Women Council of the Northwest Territories 2003, personal communication; Native Women's Association of the Northwest Territories personnel 2003, personal communication).

As project-related employment is expected to be at high levels in some communities, it is possible that the effects on both physical and emotional health conditions might be higher in these communities. Demands on health service delivery might also increase in these communities. This could be the result of health conditions in the service area, migration and resources staffing levels.

The project will provide health care facilities in conformity with the *GNWT WCB Safety Regulations* (GNWT Workers' Compensation Board 2000), which specify the health care staffing and facilities required for camps of varying sizes, depending on the distance of the camp from a health centre. The project and its contractors will implement *best-practice* levels of staffing and facility equipment, and thus ensure the capability of stabilizing trauma victims or seriously ill patients for air evacuation to hospitals, even in small camps.

Nevertheless, additional demands on local health centres for project-related treatments can be expected when:

- injured or ill northern workers, following treatment at camp facilities, are sent to their Northwest Territories homes until again able to work, as the local health centres must take over convalescent care
- workers who are not living in camps experience job-related injuries or illnesses
- there is an increase in mental or emotional disorders resulting from the stresses associated with project employment

- the misuse of alcohol potentially affects injury rates, relationship issues, STIs and unwanted pregnancies

Health care in Wrigley is delivered by a health station, staffed by a half-time community health worker, who consults by telephone with a registered nurse in Fort Simpson whenever the need arises. This service could easily be overwhelmed by the needs of several patients requiring care during a brief period of time.

The data in Volume 4 of the EIS indicates that in Wrigley, the three-year averaged 2000–2002 rates for respiratory illnesses, infectious and parasitic diseases, sexually transmitted illnesses, and accidental injuries are all quite low in comparison with these rates in other DCR communities. However, the averaged 1994–1998 rate of accidental deaths in Wrigley, 5.6 per 1,000 population, is quite high, as is the rate of treatments for mental disorders. During construction, the rates of STIs, accidental death and mental disorders might increase somewhat because of project-related incidents and stresses, and increased alcohol consumption.

As indicated earlier, during construction Wrigley will experience much increased highway, airport and barging traffic, as it is about 28 km from a 950-person camp. It will also have fuel storage, pipe stockpile, barge landing, and staging and marshalling facilities about 5 km away, and the Wrigley airstrip might be used by project flights. This activity close to Wrigley will likely stimulate the interest and curiosity of some locals, leading to some degree of interaction and possibly a resulting risk of disease contagion.

It is unlikely that the health effects of project-related employment will be at particularly high levels in the DCR communities because of some level of prior experience with employment in the diamond mines. However, Wrigley might be an exception because although the influences on this community will be somewhat weaker, it is a very small community.

The workload that nurses in Fort Simpson will experience might have eventual adverse effects on the quality of service available to smaller communities. The ability of the half-time community health worker delivering health care in Wrigley to consult with a nurse in Fort Simpson might be adversely affected if nurses there became overloaded with demands. In any case, the community health worker in Wrigley would be swamped by any real increase in local health problems.

If the Wrigley health station was to be overburdened by increases in the patient load from the local community, the cases creating the heaviest care needs could be evacuated to a regional hospital.

Participants at the first Deh Cho technical regional workshop in October 2003 stressed that the health care needs of construction workers should be provided for

in the camps. There should be no risk of overloading the health care capabilities of local health centres.

### 6.2.3 Mitigation Measures – Construction

Various mitigation measures are indicated to address project-related issues with respect to the health of individuals, families and communities, and health service workloads in either camps, local communities or with the GNWT HSS. As noted previously, effective mitigation should reduce the burdens of health centres and hospitals.

Measures to reduce alcohol abuse are indicated because of the extent to which alcohol abuse is associated with violence and various forms of abuse, accidental and violent injuries, and often mental and emotional disorders. The measures proposed to reduce alcohol abuse and other health-related wellness concerns involving efforts by the project, communities and GNWT are described in Section 6.1.3, Mitigation Measures (Community Well-Being and Delivery of Social Services).

The number of GNWT HSS staff and environmental inspectors will need to be expanded to address the increased demand for their services. Given the size of the project, the number of contractors, camps and construction workers, and the need to comply with regulatory requirements and project proponent corporate standards, there is a need for a coordinated and consistent health plan for the project.

The project proponents will work with GNWT HSS to:

- design project health and work environment guidelines, procedures and protocols for:
  - medical alert and quarantine protocols
  - fitness to work assessments
  - assessment and care of ill or injured workers
  - camp food and waste handling and storage
- facilitate communications and cooperation among medical personnel in the camps, the GNWT HSS, environmental monitors and inspectors, and the regional health authorities
- ensure joint planning, by construction camp operators, health care personnel and hospital administrators, of the relevant steps and procedures for accessing mental health counsellors or transferring a patient from the camp health care facility to a hospital, if this should become necessary. This planning will also cover situations when it is necessary to send several patients to the hospital at the same time.

- ensure construction contractors and subcontractors are bound to the guidelines, procedures and protocols developed by the project proponents and the GNWT HSS
- compile a comprehensive list of contacts containing the names and contact information of construction contractors, camp management and senior medical personnel, and share it with GNWT HSS in Yellowknife and the regional health authorities. The project proponents, construction contractors and camp medical staff will be provided with a comprehensive list of contacts for the GNWT HSS and the regional health authorities.

Based on the size of the camps, the medical staff at these facilities might include appropriate qualified nurses licensed in the Northwest Territories or experienced physician assistants qualified at the 6B level, and other qualified medical staff appropriate to camp size and location.

The GNWT HSS will identify and track appropriate public health indicators, including notifiable diseases.

Pre-employment fitness for work assessments and screening protocols will be standardized and implemented for all project and contractor employees. Screening and immunizations will be appropriate for the risks identified.

Section 6.1.3, Mitigation Measures (Community Well-Being and Delivery of Social Services) provides other complementary mitigation measures that should be undertaken by the project, the GNWT and local communities to reduce the potential for alcohol abuse.

Other measures the territorial government could take that are specifically relevant to health conditions and health services delivery includes:

- ensuring that all the health centres in the study area are fully staffed
- working with the project and other service delivery stakeholder representatives to develop the appropriate procedures for dealing with health crises in construction camps, and overload situations in health centres and hospitals
- promptly and fully implementing the GNWT HSS initiatives that address the concerns and professional needs of GNWT health service providers in communities that are detailed in *Health and Social Services Action Plan, 2002 to 2005* (GNWT HSS, no date)

Because of the difficulties in controlling alcohol abuse, and the many health consequences of this abuse, the best mitigation measures will only be moderately effective. As well, the stresses of long work shifts over extended periods are

inescapable for workers, and the long periods of lone household management and child rearing are stressful for workers' spouses. Over-tired workers might have increased vulnerability to disease, which members of their families could catch. Increased alcohol abuse might lead to increased numbers of snowmobile and all-terrain vehicle incidents, which can be very serious.

These mitigation measures will be less effective for individual health than will those described for health care delivery. The measures for individual health are dependent on the decisions and actions of many individuals, whereas the health care delivery measures can be implemented administratively. However, project effects tending to increase health problem rates will potentially add to the workloads of health care services.

#### **6.2.4 Residual Effects – Construction**

Increased income levels might well induce both positive and negative consequences. The health benefits could include improved lifestyles, depending on the spending, savings and investment decisions made by individuals. The individual effect risks discussed in this section reflect the concerns expressed by the public and health care professionals, and the related judgement of the assessment team.

The health conditions and services likely to be affected by the project represent considerable existing challenges to Wrigley residents. Therefore, any incremental effects might be perceived as particularly disruptive, unless suitable mitigation responses are implemented. Governments and the communities themselves must make the most important of these responses.

Wrigley residents will likely be at an elevated risk of project effects on health conditions because of:

- increased levels of alcohol abuse, facilitated by ease of access to alcohol
- number of local people employed on the project
- contacts with persons in transit, at the airport

Accordingly, the mitigation measures described previously will have less moderating effects for individual health than will those described for health care delivery, as the measures for individual health are dependent on the actions of many individuals, whereas health care delivery measures can be implemented administratively. However, project effects that increase health problem rates will inevitably add to the workloads of health care facilities.

With modest numbers of DCR residents now employed in the diamond mines, there might be less project-related alcohol abuse than in the other settlement areas. One result might be fewer snowmobile and all-terrain vehicle incidents than in the other areas.

The attributes of project effects on DCR health conditions are seen in Table 6-3. These effects are expected to be adverse and moderate in magnitude in Wrigley. Project effects are expected to be restricted to the local community and last only during construction.

**Table 6-3: Health Conditions – Construction Effect Attributes for Wrigley**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Wrigley	Adverse	Moderate	Local	Short term	No

Project effects on health care services in Wrigley are expected to be adverse and of moderate magnitude (see Table 6-4). In all cases, these effects are expected to be local and last only during construction.

**Table 6-4: Health Care Services – Construction Effect Attributes for Wrigley**

Location	Effect Attributes				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Wrigley	Adverse	Moderate	Local	Short term	No

### **6.2.5 Operations Effects**

Most employment and opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. There are currently no plans to locate full-time operations personnel in the DCR. There will be about five pipeline contract maintenance jobs based in Fort Simpson. However, this much-reduced level of income-generating opportunities, combined with their longer-term and stable nature, is not expected to result in elevated health problem conditions. No noticeable population increase is expected to be associated with this, and therefore no additional demand for health service delivery is expected.

As project effects are expected to be restricted to construction, there will be no need for mitigation and no residual effects are expected in Wrigley during operations.

### 6.3 Human Health Risks

Project-related risks to human health for residents of Wrigley are described here. Project workers might also be exposed to contaminants, but such exposures are regulated and these regulations will be met.

A comprehensive evaluation of potential direct effects on human health from all components of the project during construction and operations is provided in the EIS, Section 5.3 of Volume 6.

For this assessment, the environment is divided into three categories: air, water and soil.

#### 6.3.1 Effects on Air Quality – Construction

##### 6.3.1.1 Diesel Engine Emissions

A substantial increase in diesel-fuelled vehicular traffic transporting equipment and materials is anticipated, along with diesel emissions from diesel engines used to power off-road vehicles, and various types of construction and excavation equipment. There will be an increase in diesel-fuelled vehicular traffic in Wrigley over present levels, but it will be temporary and at a low level. Where these increases occur in remote areas with very low human habitation, the atmosphere will dilute the particulate and gaseous emissions, and human exposure will be very low to nonexistent.

While diesel exhausts are known to contain potentially dangerous polycyclic aromatic hydrocarbons and metals, they are in such relatively small quantities in any construction scenario that they do not present a substantial threat to vegetation, or to animals and humans consuming that vegetation.

Diesel particulate matter, in these situations, would be added to the ambient suspended particulate matter normally present from such activities as wood and refuse burning, wind-generated resuspension of soil and contaminated soil, and emissions from fixed electric power stations.

There are several actions that the project will take to reduce general public exposure to the toxic components of diesel exhaust. These actions include:

- encouraging the use of late-model diesel-powered vehicles
- avoiding idling vehicles near camps and communities, except under extreme cold conditions
- using railroad and barge transportation systems instead of trucks to move materials and equipment, where practical

- using by-pass roads through and around settlements where available
- using low-sulphur diesel fuel

### **6.3.1.2 Construction Camp Emissions**

With the nearest construction camp located 28 km from Wrigley, there need be no concern about camp emissions affecting Wrigley residents.

### **6.3.1.3 Conclusions Regarding Air Quality Effects from Construction Activities**

Construction activities will result in increased traffic and heavy machinery in and around Wrigley. The adverse effect of these traffic-associated emissions on air quality is expected to be temporary and associated with seasonal atmospheric phenomena, such as inversions, that naturally cause air quality degradation. In addition, construction effects on air quality will be very localized and occur over a relatively short time frame. Mitigation measures can be instituted to reduce exposure of individuals and the general population to these types of emissions.

Air emissions from camp incineration should have a minimal effect on air quality at camps and communities located close to the camps. The camp incinerators will be operated in accordance with permit requirements and in compliance with air quality standards.

### **6.3.2 Effects on Air Quality – Operations**

Gas venting or flaring could occur several times per year as part of regular maintenance operations. In addition to flaring, routine operation of the various individual facilities associated with the project will emit small amounts of airborne contaminants. However, since Wrigley will be 60 km from the nearest compressor, gas flaring will have no effects on this community.

All compressor stations, the heater station and the interconnect facility had maximum predicted sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO), respirable particulate matter (PM<sub>2.5</sub>), nitrogen dioxide (NO<sub>2</sub>), benzene, and benzene, toluene, ethyl benzene and xylene (BTEX) concentrations for all averaging periods below the air quality standards established by the Northwest Territories guidelines, federal guidelines or both, to protect human health.

Wrigley is approximately 80 km from the nearest compressor station, so no project effects on human health are expected in Wrigley from compressor stations.

### **6.3.3 Effects on Water Quality**

#### **6.3.3.1 Construction**

During construction, the greatest potential for project effect on water quality along the project route will be at construction camps, related to disposal of surface run-off and treated sewage, and at major river crossings as related to bottom disturbance and resuspension of bottom material during pipeline installation.

Effects on human health via pollution of surface waters will not occur because stationary camps are designed to process wastewater in a modern, state-of-the-art manner. Wastewater disposal from the camps will be treated to established criteria before discharge to the environment. Another important feature of these camps is that they are temporary, as will be any construction-related effect on water quality.

The mobile camps will be equipped with potable water filtration and grey water treatment systems, or they might have tanks to store these fluids for trucking to appropriate treatment facilities.

#### **6.3.3.2 Operations**

Reclamation of rights-of-way, including major river crossings, will result in greatly reduced project effects on surface water quality and downstream users. Emissions of airborne contaminants will meet the standards designed to protect both air and surface water quality.

Assessment of any potential for the degradation of water quality because of pipeline malfunction will involve identifying downstream water users and the detailed nature of the pipeline malfunction.

Further information on emergency response protocols, cleanup and remediation is provided in the EIS, Volume 7, Environmental Management.

### **6.3.4 Effects on Soil Quality**

#### **6.3.4.1 Construction**

Possible contamination of soil because of project construction will normally be limited to spills of liquids, e.g., fuels. Emergency spill response protocols will limit the extent of contamination, and cleanup and remediation techniques will eliminate the potential for human health effects through ingestion of traditional foods from the spill area. Airborne transport of contaminants from fixed facilities will be so dispersed as to be indistinguishable from background levels.

Community landfills will be used only with approval from the municipality, or solid waste will be removed to approved landfills.

### 6.3.4.2 Operations

Accumulation of trace elements and metals in air emissions from routine operation of various project facilities might result in very localized soil contamination. However, it is more likely that the dispersion of emissions from each facility will ensure that substantial concentrations of these components will not cause substantial soil contamination or contamination of natural food sources commonly harvested by local people.

Inadvertent substance releases from small-scale leaks and spills will have the potential to contaminate soil along the project route with both inorganic and organic compounds. Emergency response protocols, and cleanup and remediation techniques will eliminate the potential for human health effects from ingestion of traditional foods from the area experiencing the dysfunction.

### 6.3.5 Effects of Noise

The noise levels encountered during construction will generally be greater and of a wider variety compared with any routine project operational activity. As the construction period will be relatively short compared with the operational life of the project, the noise levels emitted during construction do not pose a serious health threat to Wrigley.

With respect to operational noise levels in the outdoor environment surrounding project facilities, the project proponents have committed to a noise level maximum of 45 dBA at 1.5 km from any project facility. As a result, no effects on human health or environmental health are expected from project operations.

### 6.3.6 Summary of Human and Environmental Health Effect Attributes

#### 6.3.6.1 Construction

The direction, magnitude, geographic extent and duration of diesel engine exhaust and noise during construction are shown in Table 6-5. All effects are expected to be low in magnitude and local in extent.

**Table 6-5: Human and Environmental Health – Construction Effect Attributes**

Human and Environmental Health Key Indicators	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Diesel engine exhaust	Adverse	Low	Local	Short term	No
Noise	Adverse	Low	Local	Short term	No

**6.3.6.2 Operations**

The direction, magnitude, extent and key antagonists of concern during operations are shown in Table 6-6. All effects are expected to be low in magnitude and local in extent.

**Table 6-6: Human and Environmental Health – Operations Effect Attributes**

Human and Environmental Health Key Antagonists	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
SO <sub>2</sub> , NO <sub>x</sub> , CO	Adverse	Low	Local	Long term	No
PM <sub>2.5</sub>	Adverse	Low	Local	Long term	No
Benzene and BTEX	Adverse	Low	Local	Long term	No
PAI	Adverse	Low	Local	Long term	No
Noise	Adverse	Low	Local	Long term	No
NOTES: SO <sub>2</sub> = sulphur dioxide NO <sub>x</sub> = oxides of nitrogen CO = carbon monoxide BTEX = benzene, toluene, ethyl benzene and xylene PM <sub>2.5</sub> = respirable particulate matter PAI = potential acid input					

## 6.4 Accidents and Malfunctions

The following section provides information on potential accidents and malfunctions that could affect communities close to the project.

### 6.4.1 Introduction

Accidents and malfunctions can result from numerous causes, including pipeline and equipment failure, human error, and natural perils. It is necessary to have in place procedures to deal with the potential effects of accidents and malfunctions on people, property and the environment.

Prior to undertaking construction and operation of the project, the project proponents will be preparing a formal accidents and malfunctions assessment, as discussed in CAN/CSA-Z731-95, *Emergency Planning for Industry* (Canadian Standards Association 2002), which will include:

- *identification and documentation of worst-probable accidents and malfunctions involving the specific products being used or transported*
- *a determination of what can go wrong, its effects, its likelihood of occurrence, how often it could occur and the location of occurrence*
- *consideration of the dangers arising from human activity, such as fire, explosion, environmental contamination, hazardous substance release or pipeline ruptures, in addition to natural perils*
- *an evaluation of the potential for multi-accidents and malfunctions emergencies, e.g., natural gas line breaks, causing fires and explosions, which result in injury and property damage*
- *measures that could reduce or eliminate the potential for the accident or malfunction*

This assessment will be used as the basis for developing emergency response plans for the different components and phases of the project.

At this stage, the project proponents have identified the types of accidents and malfunctions that might occur as a consequence of project activities. See, for example:

- Section 10 of the application for approval of the development plan for the Taglu field
- Section 11 of the application for approval of the development plan for the Niglintgak field
- Section 11 of the application for approval of the development plan for the Parsons Lake field
- Volume 7, Section 5 of the EIS

In addition, the project proponents have considered the potential effects of accidents and malfunctions, and have identified those areas that would be particularly susceptible to such effects.

#### **6.4.2 Identification of Potential Accidents and Malfunctions**

The project proponents will use an assessment decision-making process to evaluate the potential for accident and malfunction occurrence during all phases and components of the project. This assessment decision-making process follows industry-proven practice, and federal expectations and standards, including:

- National Energy Board (NEB) All Company Letter, File 172-A000-73, Security and Emergency Preparedness and Response Programs (24 April 2002)
- CAN/CSA-Z731-03, Emergency Preparedness and Response Standard (Canadian Standards Association 2002)

The discussion of accidents and malfunctions, as presented in the balance of this section, follows common industry processes that include:

- identification of the accident or malfunction event(s)
- evaluation of who or what may be exposed (effects)
- impact or consequence of the accident or malfunction occurrence

Actions taken after identifying accidents and malfunctions may include modifying project engineering, construction and operations planning, revising engineering design, and including the potential accidents and malfunctions into project emergency preparedness response and preparedness plans. Critical in this planning is the understanding of the possible influences that local conditions may have on the capacity of the project to implement necessary emergency response,

and how those same local conditions, e.g., harvesting, cultural conditions and weather, may affect the long-term recovery requirements after the event has been brought under control, and the business and commercial considerations have been satisfied.

Project specific scenarios are developed to examine potential incidents in the context of site-specific locations and construction or operations conditions anticipated for the project. The scenario-based accidents and malfunctions assessments are used in the developing emergency response plans, and may also identify potential human health, community or social, environmental, and engineering and operations impacts and consequences.

Accident and malfunction identification involves identifying and understanding realistic events that may occur in connection with the various phases and components of the project. The possible categories of project accidents and malfunctions that may occur during engineering, construction or operations are as follows:

- materials design failure – metal and fabrication requirements for the project do not achieve the specified properties or are unable to endure the stress of the operating conditions, including climate
- construction accidents and malfunctions – impact to the facilities and pipelines during installation
- operations accidents and malfunctions – metal failure due to unanticipated operating conditions, inadequacy of engineering design features or change in operating conditions, and equipment malfunction
- third party – potential impact of nonproject-related activities on project components
- environmental hazards – soil settlement, thaw subsidence, frost heave, erosion and slope failure, flooding and scour at water crossings, and weather
- equipment events – traffic accidents and equipment failures

The potential accidents and malfunctions identified for the project as the basis for project engineering planning, and construction and operations emergency preparedness and response may include, but not be limited to, the following:

- Fire and explosion:
  - equipment operation at infrastructure facilities, borrow areas, along the pipeline right-of-way

- fuel loss during transfer, vehicle accident
- natural gas or natural gas liquid (NGL) leak or pipeline rupture
- wildfire, threatening project personnel and equipment
- fuels or flammable materials storage, transportation or transfer
- vehicle or equipment accident
- NGL or natural gas pipeline rupture
- well blowout
- Hazardous materials loss or spills:
  - transportation accident, vessel or equipment failure on rail, truck or barge
  - materials transfer failure of equipment, e.g., valves, hoses, fittings and gauges
  - storage equipment failure of tanks, equipment, e.g., valves, fittings and gauges
  - pinhole leak, resulting in release of natural gas or NGLs
  - well blowout, resulting in loss of natural gas and NGLs
  - leak from facility piping, storage or processing vessels, resulting in release of natural gas or NGLs
  - rupture of pipeline gathering system and flow line, resulting in release of natural gas, NGLs
  - spills of lube oils (unused and waste), solvents, glycol, methanol, degreasers, and transmission and brake fluids
  - failure at equipment, hoses or tanks, resulting in release of untreated industrial and domestic wastewater
  - loss of containment in storage facility and release of hazardous waste
  - transportation accident, resulting in loss of or spill of hazardous waste
  - placement of hazardous waste into nonapproved community waste management facilities

- Vehicle or equipment accidents:
  - single vehicle accident with other project vehicle, nonproject vehicle, human or animal
  - multi-vehicle accident with other project vehicle, nonproject vehicle, human or animal
  - vehicle collision with project equipment or facility, or non-project equipment of facility
- Environmental hazards:
  - flooding of project facilities
  - slope erosion, causing pipe exposure, sediments into watercourses
  - slope failure and subsidence because of disturbance of permafrost conditions
  - effect of cold on equipment
  - unseasonable weather conditions, limiting access to facilities and project right-of-way

The possible project-related accidents and malfunctions, as presented in the above list, may impact or affect local biophysical and social components found along or traversing the pipeline right-of-way and associated facilities. The following section identifies the biophysical and social components being considered by the project in its accidents and malfunctions analysis.

### **6.4.3 Sensitive Biophysical and Social Components**

Biophysical and social components were identified within the project area in order to determine possible impacts of project-related accident and malfunction events on the environment and communities. Information regarding the use of site-specific components, such as water sources and traditional harvesting areas, will provide the basis for the community-level planning activities to be included in project emergency response planning.

Biophysical components included:

- air quality
- noise
- soil and landforms (permafrost)
- vegetation
- wildlife

- water and aquatic environment

Social components included:

- community resources
- community wellness
- land and resources, in particular traditional harvesting activities and protected areas
- community safety

For any given accident or malfunction event, not all components would be affected. An explosion would likely not affect water quality, while a loss of containment may not affect air quality. However, either of those events could affect traditional land uses.

#### **6.4.4 Potential Impacts of Identified Accidents and Malfunctions**

This qualitative analysis summarizes the more common accident and malfunction events as:

- fire and explosion
- hazardous materials and fuels spills
- human error or equipment-related incidents

Environmental accidents and malfunctions are anticipated to influence project activities throughout all phases and components. Fires associated with the project may occur:

- along the right-of-way
- at facilities, camps or storage facilities
- in equipment or vehicles

Explosions may involve the:

- pipeline
- facilities
- wellheads
- camps
- storage facilities
- equipment or vehicles

Hazardous materials loss or spills may include:

- pipeline leaks or ruptures
- spills of hazardous materials, such as fuel, freeze depressants, wastewater, and drilling and completion fluids

Human error and equipment-related events may result from:

- collisions
- traffic noncompliance
- incidents with equipment

They may involve air, water or land vehicles. Preventative measures, or safeguards, will be put in place to reduce the likelihood of events that may impact the surrounding lands and communities.

The identified accidents and malfunctions are considered applicable for all project components and phases. Several events are considered to be more likely to occur than others, e.g., a fuel spill during construction is considered more likely to occur than a pipeline explosion.

The project proponent's accident and malfunction event planning assumes that the most common accident or malfunction will be a leak or spill of hazardous materials, with a focus on:

- fuels, such as diesel
- wellsite events (drilling or maintenance)
- natural gas and NGL release as a result of processing facilities or compressor station events (leaks or release from vessels or piping)
- natural gas or NGL release from the operating pipelines

#### **6.4.4.1 Accident and Malfunction Effects**

The possible consequence of an accident or malfunction will usually depend upon the:

- extent of the loss of pipeline or storage system integrity (leak or rupture)
- extent of loss to the infrastructure pipeline, compressor station, or protection or processing facilities (explosion, fire)
- location

- seasonal or weather variables at the time of the event

The consequences of an event are generally categorized as impact to:

- health and safety – the loss of life, injury or impairment of health to the public, an employee or a contractor as a result of event
- public and community disruption – the degree to which the general public and the local communities located close or adjacent to project components may be inconvenienced
- financial aspects – the economic loss associated with:
  - project schedule
  - drilling or processing facilities interruptions or pipeline system repair
  - additional operations costs
  - property damage
- biophysical components, such as air, water, soil, fauna or flora

The following sections discuss accident and malfunction events identified from this qualitative assessment that might occur during the life of the project, and identifies potential impacts of those events on the environment and communities.

### **Fire and Explosion**

Of the possible accidents and malfunctions, the project proponents consider fire to have the greatest potential impact on communities and harvesting activities. Negative impacts from fire may include altered vegetation and wildlife habitat, which could affect the harvesting ability of communities. However, the impacts on vegetation and habitat may not be considered negative by the community, and those plants favoured by wildlife are early successional and colonize areas quickly after fire.

A fire could negatively affect air quality and community health, although a decrease in air quality is anticipated to be similar to short-term air quality impacts from wildfires regularly experienced in the project area. Land stability and access to the land may be affected, although access would only be restricted during and immediately after the fire. Effects on access will be dependent on the location of the event in relation to the community and harvest area, and the conditions at the time of the event. Fires associated with accidents and malfunctions may negatively impact air quality and community health. Potential impacts to local communities will be determined by:

- closeness to the community
- local weather conditions, e.g., wind direction

- the possible hazardous nature of the materials
- the time of the event

As the pipeline is below ground, external fires should not impact it. Following a right-of-way fire, ground stability and the insulating materials that are part of the pipeline integrity system will be checked to ensure maintenance of condition. Facility fire protection systems, gravel pads and firebreaks should allow for effective fire management at the facilities and infrastructure sites.

The effects of the explosion will depend on the magnitude and location of the explosion. In the event of an explosion, it is expected that the effect will be localized with a loud noise, a hole in the ground in the area of the explosion and a fire. This localized impact could result in the possible obstruction of surface drainage and possible burning of vegetation, which could threaten the local community or nearby residences if the fire is allowed to get out of control. Access to the area around the explosion and possible fire would be restricted during the event and repairs, which would impact a community's access to harvesting areas for a period of time. Effects on access will be dependent on the location of the event in relation to the community and harvest area, and the conditions at the time of the event.

Disturbance from the NGL-related explosion is expected to be similar to those attributed to the natural gas pipeline event. In all instances, the communication element of the project proponents' emergency response plan would be activated, and residents of any adjacent communities advised of the nature and seriousness of the event. Community and worker safety would only be affected if a person was in the immediate area of the explosion. Current pipeline routing makes it unlikely that there would be any major impacts to a community from a pipeline explosion.

An explosion involving hazardous materials, such as diesel fuel, would likely result in a fire. It is anticipated that such an event would have similar short-term impacts on local air quality as a pipeline explosion.

Harvesting areas and natural areas of particular value are unlikely to be affected by an explosion. However, access to the area around the explosion would be restricted during the event and repairs, which would impact a community's access to harvesting areas for a short time. Effects on access will depend on the location of the event in relation to the community and harvest area, and the conditions at the time of the event.

### **Hazardous Materials Loss and Spills**

The effects of a hazardous material loss or spill will depend on the volume lost and location of the spill. Air quality could be negatively affected, particularly if a vapour cloud forms, and could have some impact on community and worker safety, and community wellness. Wildlife in the area could also be affected. However, the vapour cloud would likely dissipate within hours, and thereafter would not pose a threat to human or wildlife health. Access to the area around the rupture and where the vapour cloud is located would be restricted for a short time, and could affect a community's access to harvesting areas. Soil and vegetation near the rupture would be negatively impacted. Land stability could be affected if the rupture were to occur on a slope or in a thaw-sensitive area, and could affect access routes to harvesting and traditional land use areas.

Communities could be affected by a hazardous material, e.g., diesel fuel, spill. Project activities involving fuel transport and transfer are the most likely situations where a loss of containment would occur. A spill to a flowing watercourse has the potential to distribute the material along the banks of the watercourse, necessitating additional cleanup efforts. The spill may result in short-term loss of community water intake until the plume from the spill has passed the intake point, and may prevent communities from harvesting from the watercourse. If the spill were to occur on land, the soil and vegetation would likely be negatively affected, particularly in the immediate area around the spill.

The pipeline trench will initially contain any leak from an NGL pipeline. Where the NGLs come to surface and disperse over the land surface, it is anticipated that they will contaminate soils and have possible short-term effects on vegetation.

### **Equipment Accidents**

The effects of a transportation event will be dependent on the number of people involved and the location of the incident. The primary concern with a vehicle incident is community and worker safety. Vehicle incidents may involve more than a single vehicle, and may occur in or near a community. A vehicle incident could require the support of community resources, such as nursing stations or hospitals, and RCMP detachments. Community access to such resources could be negatively impacted for a short time.

Harvesting areas and natural areas of particular value are unlikely to be affected by a vehicle incident. However, access along the travel corridor where the incident occurred would be restricted for a short time, and could affect a community's access to harvesting areas.

### 6.4.5 Accidents and Malfunctions Event Probability

Data on accident and malfunction event occurrence for the oil and gas, and the natural gas pipeline industries is tracked and maintained by regulatory authorities in Canada, the United States and Europe. The data allows for representation of probable accident and malfunction occurrence for:

- drilling activities
- operating pipeline systems
- transportation and worker incident and accident events
- the loss or spill of hazardous materials

Transportation, worker incident and spill events are not specific to the oil and gas, and the pipeline industries, but are considered relevant as they provide the basis for the consideration of events with a greater likelihood of occurrence because of increased traffic and equipment activity during construction.

#### 6.4.5.1 Project Components Consideration

##### Drilling

Drilling programs at the anchor fields will incorporate applicable industry standards and will meet regulatory requirements. Information on potential drilling activity accidents and malfunctions is presented in the EIS supplementary information report, *Worst-Case Scenarios in the Inuvialuit Settlement Region*, submitted to the JRP in November 2004.

##### Pipelines

Pipeline accident and malfunction events may be a leak of the product or a rupture that releases the natural gas or NGLs. The NEB, indicated that regulated pipelines such as the project pipeline have 0.049 rupture events per 1,000 km of natural gas pipelines and 0.063 ruptures per 1,000 km for liquids pipelines (approximately one event per 20 years) (NEB 2004). The data also indicates that many of the rupture events are because of external corrosion and stress corrosion events. The same data indicates fewer ruptures from material failure on new pipelines, attributable to improved quality of materials and construction methods.

##### Facilities

Probability data for facilities (gas processing, Inuvik area facility and compressor stations) is not as readily available as data used for drilling and pipeline probability assessments. For facility accident and malfunction assessments, the project proponents have assumed that events would be similar to those for the pipeline system. Probable events are anticipated to be as a result of operations or equipment malfunction, human error, or third-party damage.

#### 6.4.5.2 Fire and Explosion

Fire may occur as a result of project activities or from an external nonproject-related source during any project phase. Project facility and infrastructure site emergency response systems are designed to industry standards that provide response capabilities in the event of a fire.

Data suggests that external fires may be a greater concern than project-related fires, and are very likely to occur within the project area during the life of the project. Between 1988 and 1999, there were 236 fires within a 300 km corridor centred over the pipeline route (Natural Resources Canada 2002). Lightning was the cause of 231 fires, human error the cause of four, and one was of unknown causes.

Facility gravel pads and metal buildings are anticipated to reduce or prevent the possible impact of fire on the integrity of the facilities and infrastructure sites. The depth of pipeline burial, in conjunction with clearing the right-of-way, will prevent fires from having an impact on pipeline integrity. However, fires associated with fuels or other hazardous materials will likely result in short-term smoke and facility disruption.

Explosions may be associated with various project components, including the pipelines, facilities, production wells, storage and infrastructure sites, and equipment and vehicles, and may occur during any project phase. Explosions may be caused by a variety of situations:

- improper handling of explosives required during construction
- pipeline failure, e.g., corrosion
- vapour release, e.g., of NGLs, or at fuel storage sites
- failed electrical grounding systems
- failure to follow hazardous conditions operating procedures, e.g., during pigging, material transfer

An explosion associated with fuel or other hazardous material would likely result in a fire, potentially causing smoke and facility disruption.

A pipeline explosion would result in the release of natural gas or NGLs, and ignition of the natural gas or NGLs would be likely. The NGLs will be a low vapour pressure product consisting of greater than 86% pentane plus (C<sub>5+</sub>), butane (C<sub>4</sub>) and a small component of propane (C<sub>3</sub>). If there is any methane (C<sub>1</sub>) or ethane (C<sub>2</sub>) present, it will only be in trace amounts. If the NGL line were to explode without ignition of the products, liquids would likely evaporate into a

vapour cloud because of the pressure in the pipeline. If the explosion were to occur in a low-lying area, or if there was little wind, the vapour cloud could remain in the area for several hours.

### **6.4.5.3 Hazardous Materials Loss or Spills**

Hazardous materials loss or spill assessments include transporting, handling, storing and transferring products identified from a review of Northwest Territories data from 2001 to 2004 (GNWT RWED 2001, 2002b, 2003, 2004), and include:

- chemicals
- fuels, e.g., gasoline and diesel
- lube oils, e.g., unused and waste
- untreated industrial and domestic wastewater
- other products, e.g., crude oil and drilling mud)

This data indicates that wastewater and fuels, followed by crude oil and drilling mud, comprised the greatest materials volumes lost over the three-year reporting period reviewed. This list of hazardous materials provided the basis for the project accident and malfunction assessments that will be conducted for all project phases and components. Accident and malfunction assessments for handling construction-related explosives and other chemicals, such as glycols and methanol, will be developed in consultation with suppliers.

### **6.4.5.4 Equipment Accidents**

Accident events associated with equipment operations, materials transfer and transport can result in injury to personnel or obstruction to roadways. Data from Alberta Human Resources and Employment (2004) suggests that traffic loads and vehicle activity associated with construction sites (data is not specific to pipeline industry) is a common factor in increased traffic and vehicle accidents.

### **6.4.5.5 Environmental Hazards**

Environmental hazards have the potential to impact project schedules and activities associated with all project phases and components. The US Department of Transport data for 2002 to 2003 indicates that of 180 incidents reported for gas transmission pipeline systems, 12 of the events were from natural or environment-related events (US Department of Transportation 2002, 2003). Events identified included:

- flooding
- stream bank failure and slumping
- soil and slope failures
- settlement

#### 6.4.6 Summary

This section has identified, from industry data, accident and malfunction events of fire and explosion, loss of containment, and equipment incidents that may occur during all phases and components of the project. Of the events identified, fire and loss of containment, e.g., fuels or other hazardous liquids, have the greatest potential for long-term impacts on the environment, human health, community harvesting and social or cultural elements. Project emergency response preparedness planning, developed using proven industry processes, will incorporate the information identified in this response to ensure ongoing project accountability for the identified environmental and social components. This information is also included in the project proponents' Additional Information Report, provided in response to the JRP letter dated December 3, 2004:

## 6.5 Public Safety and Protection Services

### 6.5.1 Effect Pathways

As indicated in Figure 6-3, project activities could attract transient job seekers and northern residents from other areas, and will affect camp-based workers, their families and their spending patterns. These influences in combination, along with project-induced demographic effects, will affect public safety conditions and the demands on protection services. These two effects could lead to relevant community inputs and findings from project monitoring, and to potential reassessment of the public safety services strategy. Community inputs on project monitoring, and project effects on community wellness and wellness services might also influence this reassessment process.

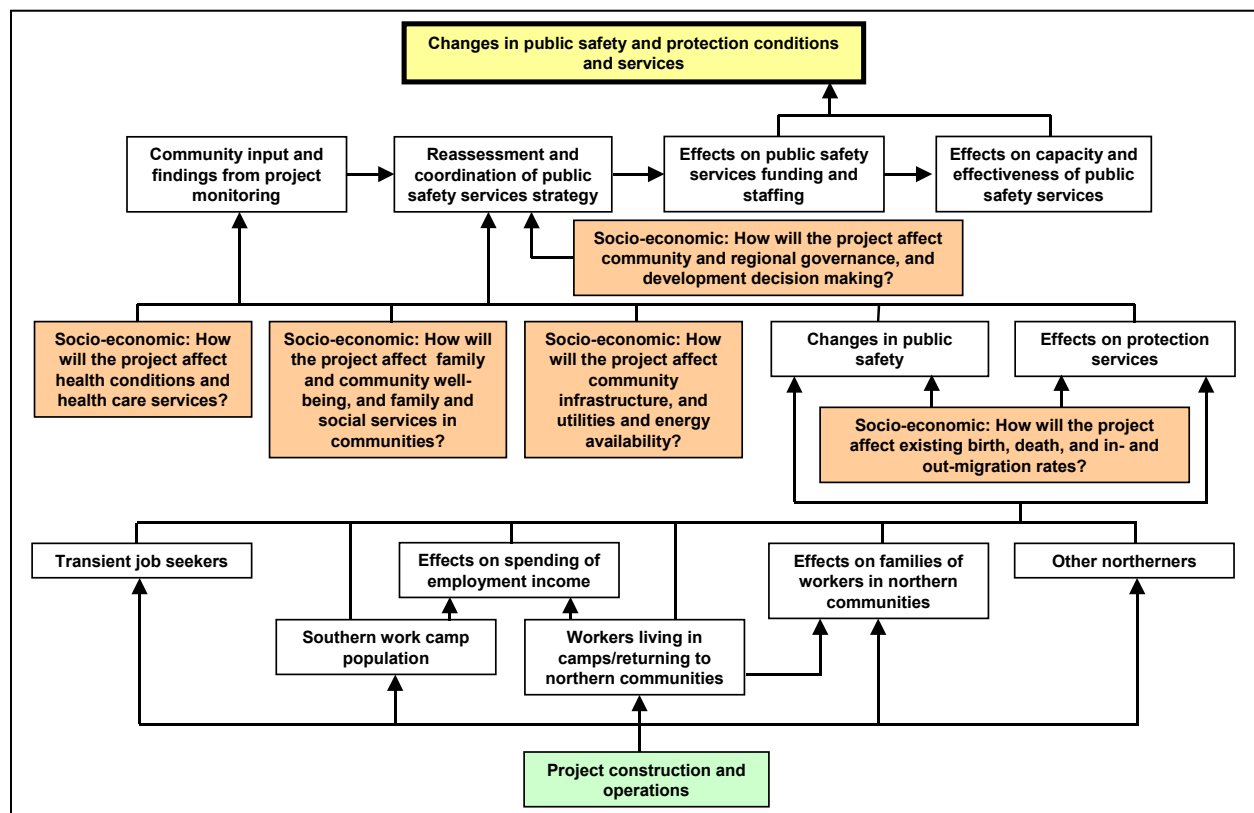


Figure 6-3: Project Effects on Public Safety and Protection Services

Reassessment of public safety services strategies might lead to effects on public safety services funding and staffing, which in turn would affect the capacities and effectiveness of these public safety services. Jointly, these can result in changes in public safety and protection conditions and services. Note that this analysis focuses on how policing is affected by the project. Project-related effects on community fire protection services should be undetectable and within the normal range of variation, for two reasons:

- most construction activities are scheduled during winter months
- the project will have emergency response plans, on-site equipment and personnel trained in fire suppression

This analysis of the effect pathways for project effects on public safety and protection is largely conceptual; there are empirical indicators for only a few links. It is clear that project-induced increases in income could result in increased substance abuse, increased violence and incremental demands on protection services.

The process, depicted in Figure 6-3, shown previously, could be beneficial or adverse. Project-induced changes in public safety and protection services can lead to reassessments, with resulting increased capacity and effectiveness of public safety services. However, there are no familiar empirical examples of this.

### **6.5.2 Assessment and Management of Project-Specific Effects – Construction**

The workload of an RCMP detachment in the Northwest Territories is sensitive to the incidence of alcohol abuse, the size of the population in the community(s) it serves and the number of officers in the detachment. During construction, camps will be sited in the service areas of many detachments. There will also be increased incomes, more substance abuse in most communities and perhaps modest increases in population in some. The Fort Simpson detachment, which provides policing to Wrigley, will experience increased calls for service, from the camps and the communities in their service areas. These demands might make it necessary for the detachment to delay or cancel some scheduled visits to Wrigley.

The workloads of RCMP detachments in this area will be affected by:

- the number of expected project camps
- project effects on the DCR communities
- the number of officers available for dealing with policing issues

Wrigley will have neighbouring project facilities – a camp, and associated fuel storage, pipe stockpile or contractor storage and marshalling sites – within 30 km of the community. Even so, the only people likely attracted to Wrigley might be a few previous residents. However, the relative closeness of the construction camp

to Wrigley might perhaps be an occasional source of policing problems. The severity of problems in any of these communities might be exacerbated by the fact that Wrigley is policed by the Fort Simpson RCMP detachment. Given the likelihood of an increased policing workload in Fort Simpson, and the amount of project activity near Wrigley, the needs of this small community should be consistently monitored, and backup arrangements put in place for provision of services.

Current practice in northern isolated camps, irrespective of size, is for the camps to have a main entry point, staffed with a gatekeeper to answer questions and monitor entry. Commonly there are no security personnel, nor are camps fenced. Although few in number, there have been instances in such isolated construction camps of camp residents acting in a manner that violates camp safety and security. Experienced camp managers state that, in such instances, security personnel in addition to those responsible for gate security would be required.

Experienced camp managers also state that it is possible to administer a safe, secure and productive camp, and to reduce the possibility for breaches of security within a camp, without the presence of security personnel, by providing:

- high-quality food, accommodations and recreation facilities
- effective controls on drugs and alcohol
- a broadly representative camp relations committee, with the aim to respond to camp resident dissatisfaction and discontent

Some managers note that the presence of uniformed security personnel is helpful in that it serves as a visual reminder to camp residents of the policies and rules, and active enforcement agencies.

Despite the presence of uniformed security personnel, even camps that are well administered and satisfy worker expectations for safety might encounter challenges to security, including:

- theft
- violence
- alcohol and drug abuse

Many of these problems will require police investigation, and will need to be dealt with promptly in order to ensure that the number of incidences does not increase. Further, some of the causes of these problems, such as stress from working long hours in winter conditions, will need to be explored to determine how they can be reduced.

The project will therefore add to the policing burdens of the Fort Simpson RCMP detachment, and the total burden could be substantial because of the number of workers in the camps.

However, more significant than the camp-based calls will be project effects on calls from local communities. The increased income levels in these communities from project employment will lead to benefits, but there will also be additional problems.

The greatest threats to delivery of protection services result from increases in alcohol and drug abuse, brought about by an increase in project-related income levels. Dealing with the many problems associated with alcohol abuse can lead to police overwork and elevated stress. If these further affect the ability of RCMP officers to perform their duties, relationships with community residents might be compromised. A high RCMP officer turnover rate might ensue as police request transfers to other posts.

Increased numbers of transients and increases in local employment and earnings in a community often lead to increased abuse of alcohol or drugs, thus adding to policing burdens. Temporary residents will be away from home, and from the familiar and relatively effective personal social controls of their home communities. Workers headed for home after long work periods might spend time drinking in a regional centre if they are delayed in transit by weather, although stopover facilities might be provided next to airports. All of these possibilities can considerably increase the number of calls for the local RCMP.

It is noteworthy that during the Deh Cho regional technical workshops in October 2003 and May 2004, general concerns were heard that with increased income will come a worsening of present alcohol problems.

### **6.5.3 Mitigation Measures – Construction**

The mitigation measures required to reduce project effects on the calls for RCMP services from construction camps will be somewhat different from those measures relevant to needs originating in the various communities. In this section, the measures appropriate to dealing with the direct construction and camp effects on RCMP are detailed first. This is followed by a description of the varied measures for reducing project effects on community wellness that will add to detachment workloads. Project transportation activities in the vicinity of Wrigley could affect RCMP workloads. The following measures will be taken to improve safety. The project will ensure that:

- safety is the highest priority for the project
- transportation equipment is regularly inspected for safety
- safety is taken into account when planning contractor delivery schedules

The project will be responsible for security of project camps and for setting policies regarding behaviour in project camps. The project proponents will continue discussions with the RCMP regarding project activities and plans that could influence RCMP work loads, communications between camp management and the RCMP, and the efficiency of RCMP responses to calls for service from the camps.

The general purpose of this consultation would be to improve communication between camp management and the detachment, and forestall possible misunderstandings, to reduce the likelihood of incidents requiring police action and improve the efficiency of RCMP response to calls for service from the camp. The topics on which understandings should be reached include:

- communication procedures, including after-hours communications
- precise specifications of the reason for a call, the urgency of the call and the details relevant to how the RCMP should be prepared to respond
- indication of normal response time and best possible response time to an emergency

The mitigation measures needed to control increased policing workloads in Wrigley should target alcohol abuse and overburdening the Fort Simpson detachment through incremental staffing.

Measures to reduce alcohol abuse are detailed in Section 6.1.3, Mitigation Measures, (Community Well-Being and Delivery of Social Services), and are not repeated here.

Although the project can dependably organize and implement the mitigation measures under its control, this might be less true of those measures under GNWT and local community control. Governments are handicapped by funding protocols in dealing with clearly impending problems until after the problems have grown to troublesome proportions – as the current overloads of the RCMP in Yellowknife and Inuvik, and the limited effectiveness of the territorial substance abuse program demonstrate (Chalmers and Associates 2002).

Wrigley does not have restrictions on alcohol imports or purchases. Given the very frequent association of alcohol abuse with policing problems, an effective way to reduce project-induced overburdening of police might be to restrict alcohol availability in the communities where there are currently no restrictions. As a first step toward enacting bylaws limiting the volume of liquor imports, hamlet councils could inform their communities of the costs of substance abuse and the control measures available to the communities.

The most effective efforts are those which communities themselves might implement. The idea of shared responsibility in dealing with substance abuse problems was an underlying component in many discussions at the regional technical workshops.

Attendees at the first Deh Cho regional technical workshop in October 2003 voiced the need for communities to police themselves in respect to alcohol and drug use. They believed that this should not be the government's responsibility. Similarly, recommendations were made during the May 2004 second Deh Cho regional technical workshop that no drugs or alcohol be allowed in any of the construction camps. It was thought that this would forestall movement of drugs from construction camps into some Aboriginal communities.

Participants also endorsed mitigation measures to provide money management training opportunities for workers. They suggested the need for drug and alcohol abuse programs adapted specifically to the situations of project workers. Alcohol abuse is the single major source of the problems in the DCR communities. Measures to reduce project-induced overburdening of protection services should seek to control such abuse. In Fort Simpson, restricting the alcohol supply is not a possibility because there is a local liquor store and two restaurant lounges that serve alcohol. However, the liquor store has a restriction on the amount of alcohol that can be bought at one time.

Several proactive mitigation measures are currently available to the GNWT. The *Liquor Act* permits laying charges for over-serving patrons in a bar or restaurant. However, statistics for Fort Simpson indicate that the rates of charges laid have declined steadily during recent years. This can be attributed to limited policing staff, and prioritizing of law enforcement and protection services.

Fort Liard and Nahanni Butte are noteworthy in restricting alcohol imports, but there are no restrictions in Fort Providence, Jean Marie River, Trout Lake or Wrigley. An approach to curtailing alcohol abuse in these communities would be for the band councils to emphasize to their residents the costs of alcohol abuse and the control measures they could impose. An effective measure might be to enact bylaws limiting the volume of liquor that can be imported at one time.

#### **6.5.4 Residual Effects – Construction**

Everything that affects the workload of the Fort Simpson RCMP detachment might affect the availability of officers to deal with policing issues that might arise in Wrigley.

Residual effects on protection services will be a function of the increases in transport activities, temporary and semi-permanent population increases, and alcohol-related problems. The policing consequences of the Fort Simpson based-transportation hub activities are inescapable, although careful planning to

optimize traffic flows will be helpful. Similarly, although common-practice measures will be implemented to reduce transient and opportunistic in-migration, these will have limited effectiveness.

The important role of monitoring and related adjustment of mitigation and management measures was discussed previously and need not be repeated.

As indicated in Table 6-7, it is expected that Wrigley will experience moderate-magnitude, adverse, short-term effects on protection services because of the likely increase in policing problems in this community, and the overburdening of the Fort Simpson detachment, which may result in delays in responding to calls for service from Wrigley.

**Table 6-7: Protection Services – Construction Effect Attributes for Wrigley**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Wrigley	Adverse	Moderate	Local	Short term	No

**6.5.5 Operations Effects**

Most employment opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. There are no current plans to base any of the full-time operations staff in the DCR. About five pipeline contract maintenance jobs are expected to be based in Fort Simpson. However, the smaller number of income-generating opportunities, combined with their longer-term and stable nature, is not expected to result in elevated protection problem conditions. No population increase is expected to be associated with this activity and there should be no noticeable additional demand for policing.

As project effects will be restricted to construction, there will be no need for mitigation and no residual effects are expected in Wrigley during operations.

6.6 Education Attainment and Services

6.6.1 Effect Pathways

Figure 6-4 demonstrates how both delivery of education and training, and education and training achievements of northern residents might be affected by the project. During construction, the demands for labour, goods and services, and northern- and southern-available supplies of labour, goods and services will drive hiring, contracting and training strategies, and procurement and contracting strategies. These strategies will also be influenced by benefits and access agreements, government policies, and inputs from various stakeholders, including communities and governments. Jointly, these will induce:

- demands for improved skill levels and educational attainment
- effects on education and training services

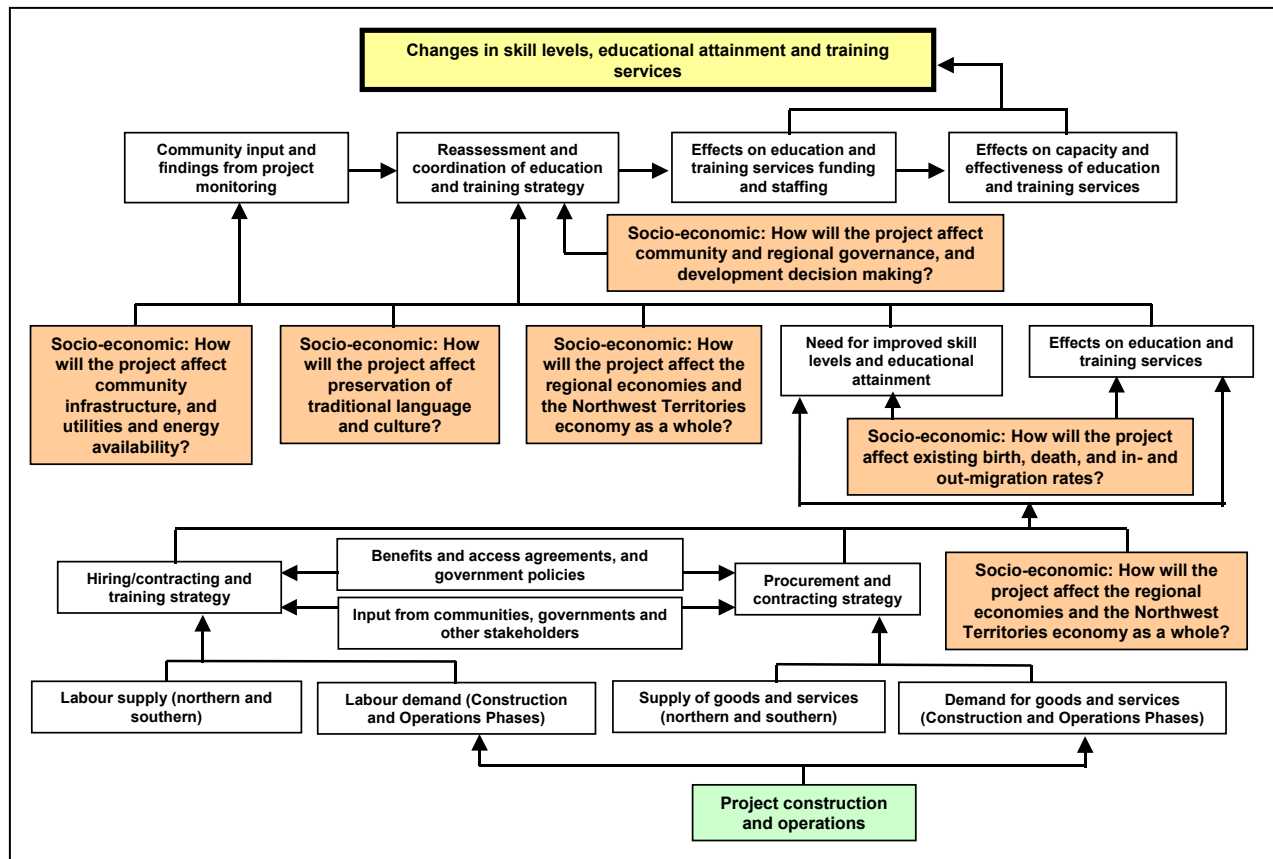


Figure 6-4: Project Effects on Skill Levels, Educational Attainment, and Education and Training Services

These two influences will affect community and project monitoring inputs, and the need for coordination of education and training strategies. Education and training services will also be influenced by community and monitoring inputs.

Education and training services in the study area might be affected by the project because of an increase or decrease in student enrollments, and changes to education and training programs offered. In turn, the changes could affect the numbers of teachers and training instructors required.

This analysis of the effect pathways for education and training services and attainments is largely conceptual; there are empirical indicators for only a few links. It is clear that the kinds of job and career opportunities generated by the project, and the resulting wages and opportunities to increase incomes, will be important driving forces. These could affect the rates of retention of adolescents in school, education and training staff members, and the scope of education and training provided. The resulting effects can be beneficial or adverse.

Rates of high school completion and enrolling for post-secondary training will serve as relevant indicators of project effects on education attainment. The best indicators of recent and present education achievement are the rates of high school graduation, and of those with some post-secondary training among adults.

The GNWT Bureau of Statistics provides information on graduates and post-secondary training recipients for persons aged 15 years or over (although virtually all who graduate do so only at a later age). These rates of graduation and having post-secondary training per 1,000 people aged 15 years and over are thus indicators of education achievement, not actual rates of people who graduate or have advanced training at some time in their lives. These are valid indicators, however, increasing when the proportion of graduates increases in the population, for example, and declining when the proportion falls.

Possible project effects on education facilities and services translate into effects on classroom availability and teacher workloads. The project might affect enrollments through effects on migration, on school retention, and perhaps demands that additional subjects be taught. The utilization rate for a school, the actual number enrolled divided by the total capacity, is an appropriate indicator of the space resources available for responding to increased enrollment or pressures to increase subject offerings. It is assumed, generally, that additional teachers can be readily recruited if there is need and funding is available.

### **6.6.2 Assessment Criteria**

Separate criteria are required for project effects on education attainment, and education facilities and services.

Positive project effects will:

- reduce the tendency for students to drop out of school or post-secondary training
- increase the tendency for dropouts to return to school and others to enroll in or complete post-secondary education or training programs

Adverse project effects will:

- increase the tendency for students to drop out of school or post-secondary training
- reduce the tendency for dropouts to return to school and others to enroll in or complete post-secondary education or training programs

With respect to education facilities and services, project effects are adverse if they:

- cause enrollment or staffing changes incompatible with currently available facilities
- reduce needed teaching staff
- lead to staff-student ratios in excess of GNWT Education, Culture and Employment norms

All other project effects on facilities and services are expected to be neutral.

Young peoples' tendencies to remain in school, drop out or return to school might be affected by such influences as:

- their present interests
- their perceptions of the earnings opportunity costs of remaining in school
- the future earnings opportunity benefits of returning to school
- the persuasions of people who might influence them

It is assumed that in regions with higher levels of education attainment, the tendency of young people to leave school early might be less than in regions with lower levels of education attainment.

Likewise, the tendency of persons or families to remain home or move to a regional centre is influenced by:

- their present interests
- their perceptions of the earnings opportunity costs of remaining at home

- the present and future opportunity benefits and costs of moving
- the persuasions of people who might influence them

Teachers' tendencies to continue teaching or to resign in favour of better-paying project employment opportunities are affected by very similar influences.

It is not possible to assess the net result of these various influences on young people, teachers or those considering moving to a regional centre. There have been no studies of people in situations resembling those resulting from the project to provide relevant guidelines. Accordingly, the strategy in this section is to identify and discuss the relevant influences with respect to leaving school early (dropping out), moving or resigning from teaching, in regionally relevant terms where possible.

However, because of the numbers of relevant operative influences and the lack of relevant prototypical examples, the final evaluations must be seen as informed but largely intuitive assessments.

### **6.6.3 Assessment and Management of Project-Specific Effects – Construction**

The relevant issues include the potential project effects on education facilities and services, and project-induced employment and earnings opportunities on student enrollment.

The various project activities will create substantial employment opportunities for both men and women, including teenagers. Project effects on education services and attainment might include increased student enrollments from dropouts returning to school to get the education and pre-employment training needed to access jobs. Alternatively, enrollments might decrease if students leave school with the hope of securing well-paying project jobs. Either could give rise to staffing concerns if student enrollments affect educational funding and teaching resources.

Because of the temporary and seasonal nature of construction work, coupled with the qualifications and skills required to access these jobs, it is assumed that there will be no detectable loss of teaching staff that could be attributed to the project beyond the normal range of variation.

Interest in employment in Wrigley might well be driven by the closeness of project facilities and activities, including a 950-person camp to be located 28 km from this community, and fuel storage, pipe stockpile staging and marshalling, and a barge landing site. Job opportunities that attract adolescents and perhaps former residents will be associated with these facilities and activities.

The discussion of project-induced effects on population in Section 4.2, Demography concludes that even with relevant mitigation measures in place, communities such as Wrigley might experience some in-migration in excess of the normal range of variation.

Accordingly, the Wrigley school system might experience some increase in enrollments. There is currently 75% surplus capacity in Wrigley schools. Recruitment might be a problem if additional staff is required, or if some teachers resign to pursue project-created opportunities, but is unlikely.

The relatively modest rates of high school and post-secondary education attainment of DCR Aboriginal community residents might be indicative of a low interest in education. This could increase the tendency of adolescents to drop out of school to take project-related employment. However, with suitable persuasion, young people might increasingly stay in school to qualify for higher-paying, transferable, skilled jobs.

#### **6.6.4 Mitigation Measures – Construction**

Measures will be designed to counter the attractions of perceived unrestricted access to project-induced economic opportunities for older students and also the disinterest in classes often found in this age group. The measures must emphasize the interesting and remunerative employment and career opportunities which high school and relevant post-secondary training or technical and trade certification would make accessible during and after the project.

The measures taken by the project proponents will include:

- before construction, continuing to promote awareness among residents and secondary school students in affected northern communities about construction and operations employment and career opportunities, and also the education and qualifications needed to access these opportunities
- working with school organizations, secondary schools and students to promote employment and career opportunities associated with the project, and the oil and gas and pipeline industries, while emphasizing the need to complete high school to qualify for these and other post-secondary learning, employment and career opportunities
- raising the level of understanding about oil and gas production and pipeline opportunities such that northern residents can make informed choices about employment and career opportunities

As seen in Section 4.1.3, Mitigation Measures (Procurement, Employment and Regional Economic Effects), the project proponents are involved in a variety of initiatives to prepare Aboriginal people, females and other northern residents for professional- and technical-level long-term employment opportunities.

To be successful, community support and involvement are essential. The POTC recognizes this. Its intent is to seek community input into both program development and delivery, and candidate recruitment.

Delivering a coordinated stay-in-school message must be the collective responsibility of the educators, families, community leaders and project proponents. This message will be reinforced when project representatives meet with the communities to inform them of the skills required to access project employment opportunities, and the need for education and training to acquire these skills. Emphasis must also be placed on recruiting and training women for nontraditional jobs, given the:

- educational attainment of women, which is often better than the attainment of men throughout the North
- under-representation of women in most job categories related to project requirements

The project will request that:

- HRDC, Aboriginal Human Resource Development Strategy Delivery Agents and training providers work with the project to develop training in basic labourer skills, construction trades, heavy equipment operation and truck driving, using local capital projects as training venues wherever possible
- education and training providers develop training programs specifically geared toward the long-term employment of women in these nontraditional occupations
- GNWT agencies (Transportation, and Municipal and Community Affairs) and private contractors cooperate with and support hands-on experience for the trainees
- education and training providers consider training in the summer season to avoid conflict with employment opportunities during project construction months. This will also permit using instructors who might be unavailable for this training during the regular school year.

In summary, through the cooperation and support of POTC members and northern communities, the training strategy can reinforce the stay-in-school message and provide long-term, transferable employment opportunities without adversely affecting existing educational institution resources and program delivery.

**6.6.5 Residual Effects – Construction**

Measures to discourage migration from outlying communities to centres of project activities will reduce, but not eliminate, such migration, which will likely target Fort Simpson. The effects on school facilities and services in these communities could be adverse.

Although in-migration and former dropouts returning to school could increase school enrollments, even the most effective of mitigation measures could fail to prevent some adolescent students from taking advantage of project opportunities. Therefore, as indicated in Table 6-8, the post-mitigation project effects on school enrollment could be positive and adverse, and low to moderate in magnitude in Wrigley.

**Table 6-8: Education Attainment and Services – Construction Effect Attributes for Wrigley**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
<b>Education Attainment</b>					
Wrigley	Positive and adverse	Low to moderate	Local	Short term	No
<b>Facilities and Services</b>					
Wrigley	Neutral	No effect	Local	Short term	No

The likely effects on education facilities and services of migration and leaving school early would tend to cancel each other out, one tending to increase and the other to decrease enrollments. In any case, the duration of effects is expected to be limited to construction.

**6.6.6 Operations Effects**

There are no plans to base any of the technical operations staff in the DCR, although it is expected that existing DCR contractors will be contacted to provide maintenance services. This limited employment of local people during operations will have little effect on student motivation. No effects on education attainment or facilities and teaching services are expected in Wrigley. Therefore, no mitigation measures will be required and no residual effects are expected in Wrigley during operations.



7 TRADITIONAL CULTURE

7.1 Traditional Harvesting and Land Use

7.1.1 Effect Pathways

Figure 7-1 shows the various ways in which project-related and -induced activities might affect traditional harvesting and land use. The effects of project influences can be positive or adverse, thereby strengthening or weakening traditional harvesting and land use.

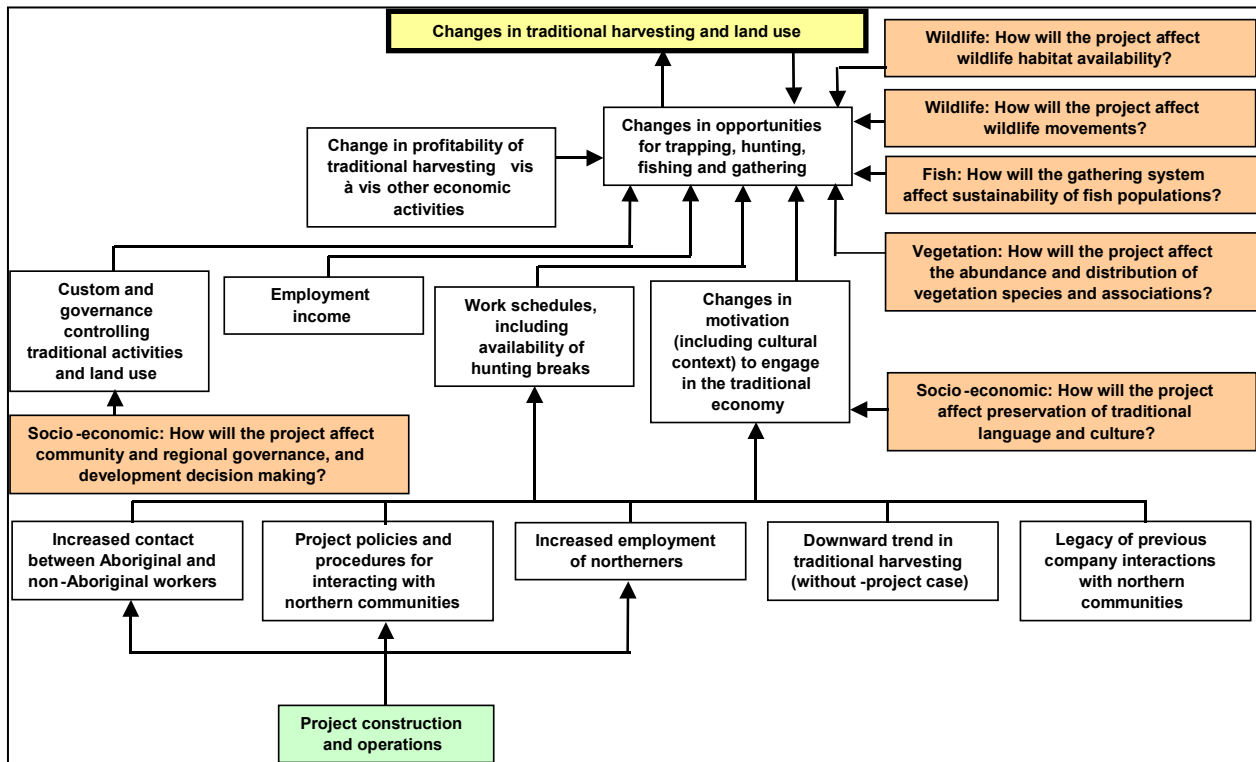


Figure 7-1: Project Effects on Traditional Harvesting and Land Use

Ongoing project consultations, and benefits and access agreement negotiations will determine policies and procedures for interacting with northern communities during construction. However, there will be an increase in employment of northern residents, and the number of Aboriginal and non-Aboriginal employees working together. Project policies and procedures – jointly with increased employment, Aboriginal and non-Aboriginal work-based associations, and the downward trend in traditional harvesting – can induce changes in motivation to engage in traditional harvesting and will determine project work schedules, including possible hunting leaves.

The requirements for labour during operations are so modest that the project will have no noticeable effects on traditional harvesting and land use. Traditional harvesting motivation might also be affected by possible project-induced changes in the transmission of TK practices and skills, and in Aboriginal language and culture preservation. Changes in opportunities for traditional harvesting, and thus changes in actual traditional harvesting and land use patterns, will be caused by project work schedules and induced changes in traditional harvesting motivation, together with:

- employment income
- customary and governance limitations on traditional harvesting and land use
- changes in the relative profitability of traditional harvesting and other sources of income
- project effects on the distribution and abundance of vegetation, fish and wildlife

Traditional harvesting and land use is driven by opportunities and motivation to participate. Opportunities are driven by:

- project effects on the land and wild food supplies
- changes in the time and resources available to engage in traditional activities

Motivation of Aboriginal harvesters could be affected by:

- strength of commitment to traditional culture
- favourable or unfavourable reactions to on-the-job associations with non-Aboriginal workers
- amount of income from other sources
- profitability of traditional harvesting relative to other income sources

The effect pathway diagram (see Figure 7-1, shown previously) provides a conceptual analysis of the influences affecting traditional harvesting and land use. However, there are empirical indicators for only a few of the links. As a result, the following analysis is mostly based on:

- relevant literature
- the experience and judgement of the analysts
- consultations with potentially affected groups or individuals

Information from project traditional knowledge studies has not yet been included as these studies are ongoing.

### **7.1.2 Assessment and Management of Project-Specific Effects – Construction**

The project will affect traditional harvesting through effects on the relevant time and resources available to Aboriginal people for harvesting, and on their motivation to do the harvesting work. Large project demands for workers, and a range of employment opportunities, will be found throughout the study area. There is concern that increased employment could reduce time spent on harvesting activity. However, earnings from this well-paying employment also could make possible the purchase of new and better equipment, such as snow machines, all-terrain vehicles, boats and outboard motors, to make resource harvesting more efficient and more productive.

The opportunities presented by the project will affect the full-time, seasonal and recreational harvesters differently, and might cause shifts from one category to another.

Project effects on resource harvesting are best understood in terms of three broad groupings of harvesters:

- full-time
- seasonal
- recreational

To full-time harvesters, the most traditional type, harvesting activity is centrally important to their lives. It is key to their sense of identity.

The lives of seasonal harvesters are invested in both harvesting activity and monetary employment. Harvesting sustains their Aboriginal identity and supplies the food their families prefer. Wage work is seen as necessary to maintain their quality of life.

Recreational harvesters, like non-Aboriginal hunters or anglers, enjoy getting out, stalking game or catching fish, while gaining their livelihood from monetary employment. However, harvesting is still central to their sense of Aboriginal identity.

Project-induced employment can increase harvesting motivation among all three harvester types. Those who spend some of their earnings on harvesting equipment, e.g., boats, outboard motors, snowmobiles and rifles, will be eager to use their equipment. The full-time and seasonal harvesters will be most eager to invest in upgrading their equipment, whereas the recreational harvesters will likely be interested in a broader range of expenditure options.

For many Aboriginal people, harvesting is both a source of food and of cultural sustenance, and will not decrease because of wage employment.

Alternatively, harvesting motivation might be reduced by substantial incomes, often earned in work activities and settings more physically comfortable than those associated with the dual economy harvesting component. Those most vulnerable would be the full-time harvesters who might be attracted by the number and diversity of jobs not previously available to them. Alternatively, the behaviour of non-Aboriginal supervisors or work associates and the work place culture will likely be less emotionally comfortable for most full-time harvesters than when they are out hunting. Depending on their experiences working on the project, seasonal harvesters might experience a strengthening of either their harvesting or their wage employment interests, or both.

The relative importance of these contradictory influences and motivations is determined by peoples' backgrounds, aptitudes, skills and obligations. The full-time harvesting commitment of a hunter on whom several households depend for game food will not likely be reduced by the prospect of employment. However, an older adolescent, who is a seasonal hunter because wild foods are needed to supplement inadequate, occasional wage income, might be tempted, by the right opportunities, to become a recreational hunter. An additional influence that can erode harvesting interest is seen in some areas where store food has a higher status than country food.

It is not possible to fully evaluate the importance of these competing influences and motivations. The increase between 1993 and 2002 in percentages of households primarily dependent on country foods also indicates continued demand and motivation for full-time and seasonal harvesters. If mitigation is effective and such harvesters respond with suitable decisions, potential harmful effects can be limited and benefits realized.

Many Deh Cho people will want to and will obtain some form of project-induced employment that could involve unusual demands on their time. If this results in reduced traditional harvests, it would affect the 79% of Deh Cho Aboriginal community households, exclusive of Fort Simpson, where at least half of their diet was country food in 2002, a substantial increase over the 49% rate for 1998.

This level of dependence might sustain the continuing obligation and motivation of many to continue harvesting wild foods. This increase in percentages of households primarily dependent on country foods demonstrates the commitment to traditional harvesting despite competing activities, interests and motivations.

### 7.1.3 Mitigation Measures – Construction

Although the project can have both facilitating and inhibiting influences on traditional harvesting, project effects could accelerate the slow, ongoing decline in traditional harvesting activity. Mitigation should focus on inhibiting any such tendency. Relevant efforts can be made by the GNWT and the project. Local communities can continue to expect and consume the traditional harvesting bounty, and encourage and reward the harvesters with praise and status.

GNWT Resources, Wildlife and Economic Development (RWED) has devoted much effort to facilitating traditional harvesting, including programs to *grubstake* trappers and send their furs to auction. It also publishes a trapper newsletter, and several well-illustrated, region-specific booklets showing how to butcher the game available in the area and how to cook the various cuts of the meat. It is recommended that these programs and publications be continued.

Given the significance of country food gift exchanges with relatives, friends and other communities, it is important to provide opportunities for bountiful harvests through participation in harvesting activities.

Measures that will be undertaken by the project proponents include:

- providing flexible work schedules to accommodate traditional harvesting and other Aboriginal cultural, family and community needs, where practical, recognizing that work flexibility will be limited in the peak winter construction seasons
- supporting community-based traditional lifestyle initiatives that promote traditional harvesting and positive relationships with communities, such as:
  - traditional harvesting training camps for young people
  - traditional skill proficiency demonstrations or competitions
- supporting cultural activities and events that are consistent with the project proponents' principles and practices for community involvement

It is expected that harvester compensation agreements will be negotiated. The purpose of the harvester compensation agreements is to address actual and potential future wildlife harvest loss resulting directly from project construction and operations. The specific terms and provisions of the agreements will be negotiated by the project proponents with the hunters' and trappers' committees or other relevant authorities in the settled land claim regions, and the affected communities in the DCR.

The bases for the project program are:

- prevention

- mitigation
- compensation
- dispute resolution

The project proponents will recognize or participate in industry common practices, especially in areas where there are multiple project activities, e.g., drilling and production facilities, the gathering system, pipeline, and other exploration and development activities, to reduce duplicate, overlapping or questionable claims.

#### 7.1.4 Residual Effects – Construction

The harvesting component of the dual economy is sufficiently flexible to permit scheduling of harvest leaves. Table 7-1 summarizes the residual effects of the project on traditional harvesting. It is assumed that the project will support harvesting leaves, where possible, and that the GNWT will continue relevant programs.

**Table 7-1: Traditional Harvesting – Construction Effect Attributes for the Deh Cho Region**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
DCR (except Fort Simpson)	Adverse	Low	Regional	Short term	No

As indicated, the residual effects after mitigation, given the expected mix of beneficial and adverse effects on different people, are expected on balance to be very slightly adverse. Effects in the DCR, excluding Fort Simpson, are expected to affect traditional harvesting activity only marginally, i.e., low magnitude, and are expected to last only during construction.

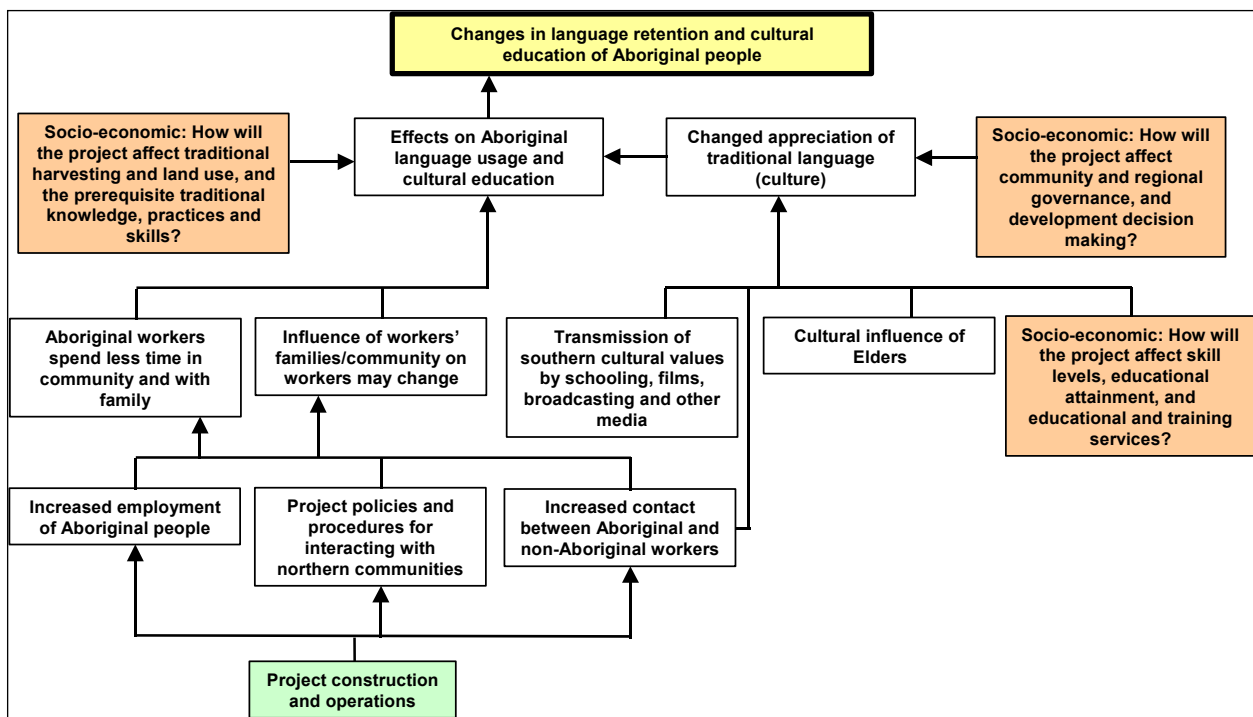
#### 7.1.5 Operations Effects

Most employment and opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. There are no technical operations jobs planned for the DCR, although there might be about 10 contract maintenance opportunities based there. Project effects are expected to be restricted to construction. Therefore, there will be no need for mitigation and no residual effects are expected in Wrigley during operations.

## 7.2 Preservation of Traditional Language and Culture

### 7.2.1 Effect Pathways

Figure 7-2 shows the various ways in which project-related and -induced activities can affect language and culture preservation. The effects of project influences might be either positive or adverse, strengthening or weakening language and culture preservation. More likely, both effects might result from the same experience for different individuals. This question addresses how the project might affect survival of the prerequisites for successful language and culture preservation.



**Figure 7-2: Project Effects on Traditional Language and Culture**

Ongoing project consultations, and benefits and access agreement negotiations during construction activities will determine policies and procedures for interacting with northern communities. There will be an increase in employment of Aboriginal people, and an increase in their on-the-job associations with non-Aboriginal workers. These influences will reduce the time workers spend in their home communities with their families, and might change the influence of the family and community on workers. Collectively, these influences, plus project effects on traditional knowledge, practices and skills, and the harvesting that gives them functional importance, could affect Aboriginal language use and cultural education.

Influences unrelated to the project include transmission of southern interests and values through the school system, films, television and other media, and the competing cultural influence of the Elders. These influences, plus project effects on education and training services and achievements, and on community and regional governance, can induce changes in the appreciation of traditional language, culture and lifestyle. These changes could also affect Aboriginal language use and cultural preservation.

Therefore, possible changes in inter-generational transmission of language and culture will depend on:

- time spent with family and home community residents
- time spent with non-Aboriginal fellow workers
- the competing influences of southern media and schooling, and the Elders

Influences on the amount of time spent in traditional contexts will interact with influences affecting possible changes in appreciation of traditional language and culture. The current level of language and culture preservation is also important in affecting its resistance to erosive influences.

Analysis of the effect pathways for project effects on preservation of traditional language and culture is largely conceptual; there are empirical indicators for only a few links. As a result, the following analysis is largely based on:

- available current baseline data
- consultations with potentially affected groups and individuals
- the broad experience of the analysts

Data from ongoing traditional knowledge studies will be used to update this analysis as the studies are completed. It is likely that project-induced employment experiences and increases in income will add to existing influences, affecting transmission of traditional language and culture to future generations.

## **7.2.2 Assessment and Management of Project-Specific Effects – Construction**

The project will affect language and culture preservation through effects on the time available for Aboriginal people to spend with others in their home communities. Their motivation to engage in shared activities, such as communal hunting, will also be important, because their language has particular relevance for these activities. Large project demands for workers, and likely a broad range of employment opportunities, will be found throughout most of the study area. Those responding to these opportunities will find their time with family and home community could be substantially reduced for two or more years. Their opportunities to speak their Aboriginal language will thus be reduced.

For some, project-induced employment and the resulting interactions with non-Aboriginal fellow workers might increase their valuation of traditional language and culture. For others, these relationships with fellow workers might be valued as friendly, interesting, challenging or giving promise of access to new opportunities. Substantial project-related earnings, often in work activities and settings more physically comfortable than those associated with traditional harvesting, might exacerbate this tendency.

However, there are also counterbalancing forces, including the strong influences of Elders favouring traditional ways, the support implicit in Aboriginal language taught in the schools, and also the mistrust many Aboriginal people feel from their dealings with some non-Aboriginal officials and individuals, perhaps a result of faulty communication.

The project will affect language and culture preservation through effects on the time available for DCR residents to spend with others in their home communities, and their motivation to engage in shared activities, such as communal hunting. Many Deh Cho residents will likely have project-related employment, and their time with family and home community could be substantially reduced for two or more years. They will thus have fewer opportunities to speak their Aboriginal language.

That 92% of Wrigley residents were able to speak South Slavey in 1999 indicates there is much less use of English than in other regions, particularly in the smaller communities. Despite this relative strength, existing trends and influences on language and culture preservation plus project effects might be slightly adverse. These influences might reduce traditional language retention, although to a lesser extent than in other regions.

### **7.2.3 Mitigation Measures – Construction**

An implication of the trends described previously is that although the project can have both facilitating and inhibiting effects, project-related employment might add to the slow, ongoing decline in language and culture preservation. Relevant mitigation efforts can be made by the project and the GNWT. The project will take steps to reduce its effect on this process. Language and culture can be strengthened when local communities esteem Elders and the way of life they advocate, and honour those who are knowledgeable in traditional language and culture.

The project will implement the following initiatives:

- providing cultural awareness training to all workers on the project. The goal will be to provide the trainees with information on the traditional Dene cultures, and their values, norms and conceptions of human nature and suitable human behaviour. The result of this training is to facilitate smooth, friendly interaction between Aboriginal and non-Aboriginal employees at work and in camp and, more importantly, promote appreciation and respect for Aboriginal people and their culture.
- providing flexible work schedules to accommodate traditional harvesting and other Aboriginal cultural, family and community needs, where practical, recognizing that work flexibility will be limited in the peak winter construction seasons
- supporting community-based traditional lifestyle initiatives that promote traditional culture and positive relationships with communities, such as:
  - traditional harvesting training camps for young people
  - Aboriginal language proficiency demonstrations or competitions
- supporting cultural activities and events that are consistent with the project proponents' principles and practices for community involvement
- periodically providing country foods in the construction camps
- providing access to Aboriginal language reading material, and Aboriginal language radio and television broadcasts, tapes and CDs where available
- providing an opportunity for Aboriginal artisans to display and sell original handicrafts in camps, if local communities favour this. Such exhibits would enable camp workers to buy a memento of their northern work experience, provide Aboriginal craft-workers with a large market for their work and forestall any need for workers, wanting to buy Aboriginal handicrafts, to visit a local community.

The GNWT has encouraged local school boards to provide Aboriginal language instruction in schools. Aurora College offers several courses designed to help perpetuate traditional skills and activities. These programs should be continued.

### 7.2.4 Residual Effects – Construction

The residual effects of the project on language and culture preservation are summarized in Table 7-2. These effects are based on the assumption that the required provision for Aboriginal preferences and interests in construction camps and the process for authorizing harvest leaves are in place, and that the relevant GNWT programs will be continued. Without this mitigation, language and culture preservation might suffer because it is the younger Aboriginal men who will be most vulnerable to the adverse influences previously described.

**Table 7-2: Language and Culture Preservation – Construction Effect Attributes for the Deh Cho Region**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
DCR	Adverse	Low	Regional	Short term	No

The post-mitigation residual adverse effects on language and culture preservation in the DCR, which includes Wrigley, will be low in magnitude, regional and short term, as Table 7-2 shows.

Relevant influences in Wrigley include:

- the strength of English language influences in the Northwest Territories
- the employment of many Deh Cho residents during the last five years in the diamond mines, where communication is in English
- the decline in fluency in an Aboriginal language between 1989 and 1999

Therefore, given the relatively short duration of project-induced influences, the combined effects of the project on Wrigley are expected to be low in magnitude, local and undetectable from the language and culture preservation historical trend. These effects are expected to occur only during construction.

### 7.2.5 Operations Effects

Most employment and opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. There will be no technical operations jobs based in the DCR, although there might be about 10 contract maintenance positions based there. Therefore, project effects are expected to be restricted to construction. There will be no need for mitigation and no residual effects are expected in Wrigley during operations.



## 8 NONTRADITIONAL LAND AND RESOURCE USE

This section provides a discussion of the potential effects of the project on nontraditional land and resource uses, protected areas, and visual and aesthetic resources, focusing on the community of Wrigley.

As part of the assessment of nontraditional land and resource use, a regional study area (RSA) was selected within which project effects are expected to be noticeable. The RSA selected for nontraditional land and resource use consisted of a 15-km buffer placed on the pipeline route. This resulted in a 30-km-wide corridor within which baseline information was gathered and project effects were assessed. The assessment found that all project effects are expected to be limited to the RSA or less. Further details on study areas for nontraditional land and resource use can be found in the EIS, Volume 6, Section 7, Nontraditional Land and Resource Use.

### 8.1 Effects on Nontraditional Land and Resource Use

#### 8.1.1 Effect Pathways

The effect pathway diagram in Figure 8-1 illustrates the projected influence of the project on nontraditional land and resource use. These pathways will be used throughout the analysis of effects to determine what level of effects could occur.

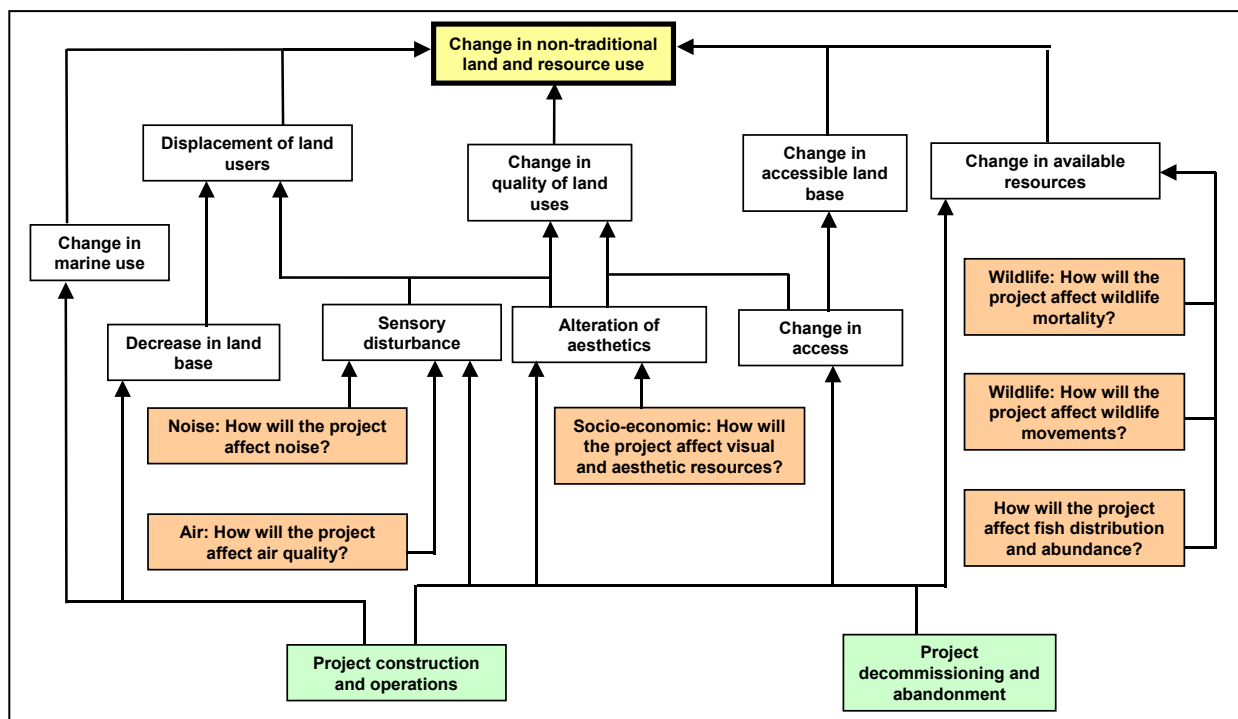


Figure 8-1: Project Effects on Nontraditional Land and Resource Use

The first level in the diagram shows the project phases, construction and operations, and decommissioning and abandonment. The second level identifies the key areas for potential project-specific effects of these activities on nontraditional land and resource use. These effects will directly apply to the VCs for nontraditional land and resource use. The third level of the diagram shows indirect effects and will be discussed in terms of the VCs. The fourth or top level indicates that the expected outcome of all these direct and indirect effects will be a change in nontraditional land and resource use.

### **8.1.2 Assessment and Management of Project-Specific Effects**

The following sections discuss the expected effects of all project components throughout the project area in the DCR, including the community of Wrigley.

An overall effect of project construction in the DCR will be a decrease in the available land base for other land and resource uses. Nontraditional land uses that could be affected by installation and operation of the project include:

- borrow operations
- timber harvesting
- mining
- oil and gas activities
- resource harvesting
- other commercial activities
- tourism and recreation

The loss of available land base is a long-term effect for facilities and above-ground pipeline structures, and therefore will continue through to decommissioning. However, for areas of buried pipeline, borrow sites and infrastructure sites, there will be limited effects during operations as reclamation will start after construction is complete.

Infrastructure sites, borrow sites and most access roads will be used during construction. Some sites will continue to be used during operations. Once the sites are no longer needed, they will either be abandoned and reclaimed, or left for community uses. If they are left in place for community use, these lands will continue to be kept out of the land base. However, the positive effects of leaving them for the community will likely outweigh the loss of land base. If the sites are abandoned, it is expected that these lands could again be fully available for other land uses.

During decommissioning, above-ground pipe and structures will be removed, and the lands will be reclaimed to a capability similar to the surrounding area. Where feasible, it is expected that some of the granular material used for pads and airstrips will be removed and reused. Below-ground facilities and pipelines will be left in place. Lands successfully reclaimed will be available for use. It is expected that there will be very few sites that cannot be completely reclaimed.

The project effects for each VC are discussed below.

**8.1.2.1 Land Ownership**

No project effects are expected on land ownership in the DCR. There are Sahtu private lands located within the DCR boundary. For federal Crown and Sahtu private lands, it is expected that the necessary permissions for project components will be obtained from the Government of Canada or the Sahtu Land Corporation.

**8.1.2.2 Granular Resources**

The pipeline right-of-way or other project components might cross some granular resources. Although the pipeline will cross few resources, this will effectively remove these resources from availability to the communities for the life of the project. However, after decommissioning, these resources should once again be available for extraction and use by the local communities. More importantly, the pipeline right-of-way and new roads will open up access to new areas and could lead to improved access to granular resources in existing or new borrow sites.

Project construction activities could block access to existing granular operations. Project effects will only be adverse if existing operations are temporarily closed or inaccessible for community use during construction. However, because extensive granular resources are required for the project, it is more likely that current use and access to existing operations will increase substantially and there will be continued access allowed to residents for local use of granular materials.

There will also be positive effects related to increased northern benefits because of expansion of existing borrow sites and development of new borrow sites (see the EIS, Volume 2, Section 7, Borrow Sites).

Table 8-1 provides estimates of the total percentage of granular resources that will be used from the primary borrow sites identified for the project. Based on the numbers provided, granular materials available are more than adequate to meet project needs and to allow for future granular resource needs in the project area. Further details on primary borrow source demand and supply can be found in Volume 2, Section 7, Borrow Sites.

**Table 8-1: Primary Borrow Source Demand and Supply Estimate**

<b>Granular Materials Use</b>	<b>DCR</b>	<b>Project Total</b>
Total required (1,000 m <sup>3</sup> )	945	5,206
Total available (1,000 m <sup>3</sup> ) <sup>1</sup>	131,384	405,254
Percentage required of total available (%)	0.7	1.3
NOTE: 1 Excludes supply estimates for 13 primary borrow sites where data is not available		

Removal of some of the granular resources from borrow sites will be permanent. This will result in a depletion of a small percentage of granular materials present in the regional area. However, some infrastructure pads could be decommissioned after construction in 2009, and the gravel will either be used again by other projects or the community, or left in place. In addition, following decommissioning, most borrow material used for facilities and the remaining infrastructure sites could become available for re-use.

During operations, additional granular resources could be required periodically for maintenance and repairs. Although this will further reduce the total amount of granular materials available for extraction, the amounts required will be much less than that needed for construction. Because granular resources will continue to be removed during operations, the cumulative effect will still increase. However, the primary effect from the project will occur during construction. As mentioned previously, the granular resources used for infrastructure sites could once again be available for local use following decommissioning of the sites, and materials used at facility sites and the remainder of the infrastructure sites could become available following project decommissioning.

Based on the positive and adverse effects discussed previously, the net effect of the project on granular resources over the life of the project is expected to be adverse, but low in magnitude. Although some granular materials will be permanently removed from availability, the overall effect of a long-term loss of gravel will be reduced because of positive economic effects, such as:

- development of new sources
- potential hiring of local contractors for project-related granular operations
- opportunity for relatively easily accessible granular materials, i.e., those used for infrastructure and facility sites, could be available for community use following decommissioning

### **8.1.2.3 Timber Resources**

The project will have no major project effects on forestry operations as there are none occurring in the regional study area (RSA). However, existing timber harvesting practices for local firewood supply or building materials could be disrupted because of restricted access to areas in and around facilities, infrastructure sites, borrow sites and the right-of-way during construction. In addition, clearing of timber along the pipeline right-of-way and project sites will result in a decrease in the available supply of firewood and construction materials for residents in the RSA. However, if the project can enter into an agreement with the communities, timber cleared from the site that is not required for the project will be set aside for the local communities.

During operations, there could be a positive effect for timber harvesters because of increased access to previously unavailable timber. Operations and maintenance activities could occasionally require removal of timber, which would adversely affect the available supply of timber for use by local residents and communities.

#### **8.1.2.4 Mineral Resources**

There are several mineral claims in the RSA near Fort Simpson. The project proponents will inform the owners of these claims and permits about project plans, to ensure any potential conflicts with the project are addressed. There are few other mineral showings currently identified in the Deh Cho, so the potential for effects on future mining opportunities is low.

#### **8.1.2.5 Oil and Gas Activities**

With the exception of the Norman Wells pipeline, there is very little oil and gas activity taking place in the RSA, so no adverse effects in other oil and gas operations are expected. However, there is the possibility that the project will encourage oil and gas activity because of the promise of an efficient method of moving product. The current Norman Wells pipeline, which is loosely paralleled by the project pipeline, is not likely to be adversely affected by the project.

#### **8.1.2.6 Nontraditional Resource Harvesting**

Construction of the project components could interfere with nontraditional resource harvesting by affecting fish and wildlife species inhabiting or migrating through the local study area (LSA). Restricted access to lands traversed by the project could disrupt nontraditional resource harvesting in the RSA during construction. Fish and wildlife species inhabiting or migrating through the RSA could be displaced by construction activities, such as increased noise from machinery and increased human activity. This displacement could lead to a decrease in harvest success, and nontraditional resource harvesters could be inconvenienced by having to conduct their activities in different areas.

Deh Cho participants at the first regional technical workshop in October 2003 expressed concern that noise in the Blackwater area might affect the moose population. In the subsequent regional technical workshop held in May 2004, they identified possible effects of noise on salmon spawning and over-wintering fish.

Following construction, nontraditional resource harvesting along the pipeline right-of-way should return to normal, except during intermittent ground operations activities that could temporarily displace wildlife or block access to lands near the activity. Once borrow and infrastructure sites are removed from use and reclaimed, nontraditional resource harvesting at these sites should return to normal.

Disturbance to wildlife is expected to be at its peak during construction activities. The level of disturbance from noise and human activity will be reduced during operations in the RSA, but disturbance to wildlife could still occur in the local area. There could be a disruption of nontraditional resource harvesting in the local area of the project facilities during operations. Wildlife species inhabiting or migrating through the LSA could be displaced because of the noise created by the facilities. This displacement could lead to a decrease in harvest success in the local area of these facilities, thereby adversely affecting resource harvesters by requiring them to hunt and fish in different places.

Increased access to wildlife or fisheries resources could be provided by the presence of the various project components, particularly the access roads and right-of-way, resulting in a positive effect for local resource harvesters. Although regional harvesting levels are not expected to increase because of improved access, it could encourage a change in the locations of where harvesting occurs. Further information regarding the potential project effects on wildlife can be found in the EIS, Volume 5, Section 10, Wildlife.

Traffic and activities on winter roads or the Mackenzie River could also displace wildlife from the LSA during construction and operations. In addition, collisions with vehicles on access roads could cause some mortality to wildlife. This should not lead to a decrease in harvest success, but traffic effects of the project can be reduced by decreasing the number of vehicles that must travel on access roads, e.g., by using multi-person vehicles such as buses.

Minimal effect on local resource harvesting is expected during operations because there will be fewer operations staff than construction staff, and there will likely be very few who would partake in hunting or fishing. The small number of long-term new residents that will be employed by the project are not expected to affect hunting and fishing pressure in the region.

#### **8.1.2.7 Other Commercial Activities**

Operation of other commercial activities, e.g., transportation of supplies to communities, and business travel by residents and nonresidents, could be altered because of project traffic during construction. Barge traffic on the river will increase quite substantially during construction, which could result in delays for unrelated barging traffic. It is expected that agreements will be made between the project and transportation companies to ensure nonrelated transportation services remain largely unaffected by the project. The improved access created for the project could provide an opportunity for other commercial activities to be initiated.

### 8.1.2.8 Tourism and Recreation

Tourism and recreation activities could be affected during construction because of restricted access or changes to existing travel routes. Most tourism activities occur during the summer months and pipeline construction will take place over the winter. However, there will be some construction activities in summer months for development of infrastructure sites and borrow sites.

Sensory disturbance because of increased traffic, noise and emissions during construction could adversely affect the quality of tourism and outdoor recreation activities, particularly those activities enjoyed by local community members, such as snowmobiling or cross-country skiing. However, it is expected that these activities will primarily occur near established communities and there will be less recreational use in the more remote areas. The increased access provided by the project could have a positive effect on recreational users by allowing them access to lands that were previously difficult to reach.

The sensory disturbance encountered during construction will no longer be present in most of the RSA following pipeline construction and the subsequent decommissioning and reclamation of many of the borrow and infrastructure sites. Noise produced by facility sites could affect tourism and recreation into operations in the LSA. However, few of these activities occur in the local area of the Blackwater River or Trail River compressor stations because of their relatively remote locations. Further information on the effects of noise can be found in the EIS, Volume 5, Section 3, Noise.

It is recommended that controls be in place to manage construction worker participation in local tourism and recreation activities. Ample recreational opportunities will be provided in the camps. However, if southern workers participate in tourist activities during their free time, e.g., days before or following work assignments, the tourism industry would benefit from an increased volume of visitors.

Following completion of construction activities, there could be a positive effect on recreation because of access to previously inaccessible areas along the pipeline right-of-way and other project-related clearings, like access roads.

### 8.1.3 Mitigation Measures

Several mitigation measures for nontraditional land and resource use were assumed before assessing project effects, including:

- all necessary access and land use permits will be obtained and their conditions followed

- access management will be used, to the extent practical and where identified by the communities, regulatory authorities or other concerned parties, to inhibit other potential land users, i.e., nontraditional hunters, timber harvesters and tourists, from using project infrastructure as a method of accessing resources that were previously inaccessible. These access controls will be left in place for operations, and decommissioning and abandonment, if needed.
- at locations directed by the project proponents' representative, access management techniques could include the following:
  - rolling back slash and timber to prevent access along the pipeline right-of-way
  - installing slash berms across the pipeline right-of-way, or winter road easements
  - planting trees or shrubs at potential access points, to visually screen the pipeline right-of-way or road easements
- hunting and fishing by workers will be prohibited while on the job site
- timber will be salvaged for use by the project or where agreements have been made with a community
- the project proponents will inform other nontraditional land and resource users about the pipeline route and construction schedule before beginning construction
- compensation will be negotiated, where required, with granular resource owners for removal of granular resources from their lands
- a plan for abandoning infrastructure and borrow sites will be developed that will include public consultation on alternative uses for the infrastructure and the sites. Local cultural, land use and environmental principles will be incorporated in project planning and implementation decisions.
- once a borrow site is no longer required by the project, it might be available for use by communities or abandoned and reclaimed by the project

#### **8.1.4 Residual Effects**

Table 8-2 summarizes the expected project effects in the Deh Cho, which includes Wrigley, and the direction, magnitude, extent and expected duration of those effects, discussed previously. No effects are expected to be significant.

Table 8-2: Nontraditional Land and Resource Use – Project Effect Attributes for the Deh Cho Region

Valued Component	Effect	Effect Attribute				Significant
		Direction	Magnitude	Geographic Extent	Duration	
Land ownership	Contravention of zoning bylaws or land access requirements	Neutral	No effect	N/A	N/A	No
Granular resources	Decrease in available land base for granular extraction	Neutral to adverse	No effect to low	Local	Short term to long term	No
	Change to existing granular operations	Positive or adverse	Moderate	Local to regional	Short term	No
		Positive	Low	Regional	Long term	No
	Loss of granular resources	Adverse	Moderate	Regional	Short term to long term	No
		Adverse	Low	Regional	Long term	No
Net effect on granular resources	Adverse	Low	Regional	Long term	No	
Timber resources	Decrease in available land base for timber resources	Adverse	Low	Local	Short term to long term	No
	Disruption to existing forest industry practices	Neutral	No effect	N/A	N/A	No
	Changes to existing timber harvesting practices	Adverse	Low	Regional	Short term	No
		Neutral to positive	No effect to low	Regional	Long term	No
Loss of timber resources	Adverse	Low	Local to regional	Long term	No	
Mineral resources	Decrease in available land base for mining	Neutral to adverse	No effect to low	Local	Short term to long term	No
	Disruption to existing mining operations	Neutral	No effect	N/A	N/A	No
Oil and gas activities	Decrease in available land base for other oil and gas activities	Adverse	Low	Local	Short term to long term	No
	Changes in other oil and gas activities	Positive to adverse	No effect to low	Local to regional	Short term to long term	No
Nontraditional resource harvesting	Decrease in available land base for resource harvesting activities	Adverse	Low	Local	Short term to long term	No
	Change in nontraditional hunting and fishing success	Adverse	Low to moderate	Regional	Short term	No
		Neutral to adverse	No effect to low	Local	Long term	No
Change in resource harvesting opportunities	Positive or adverse	Low	Local	Short term to long term	No	

**Table 8-2: Nontraditional Land and Resource Use – Project Effect Attributes for the Deh Cho Region (cont'd)**

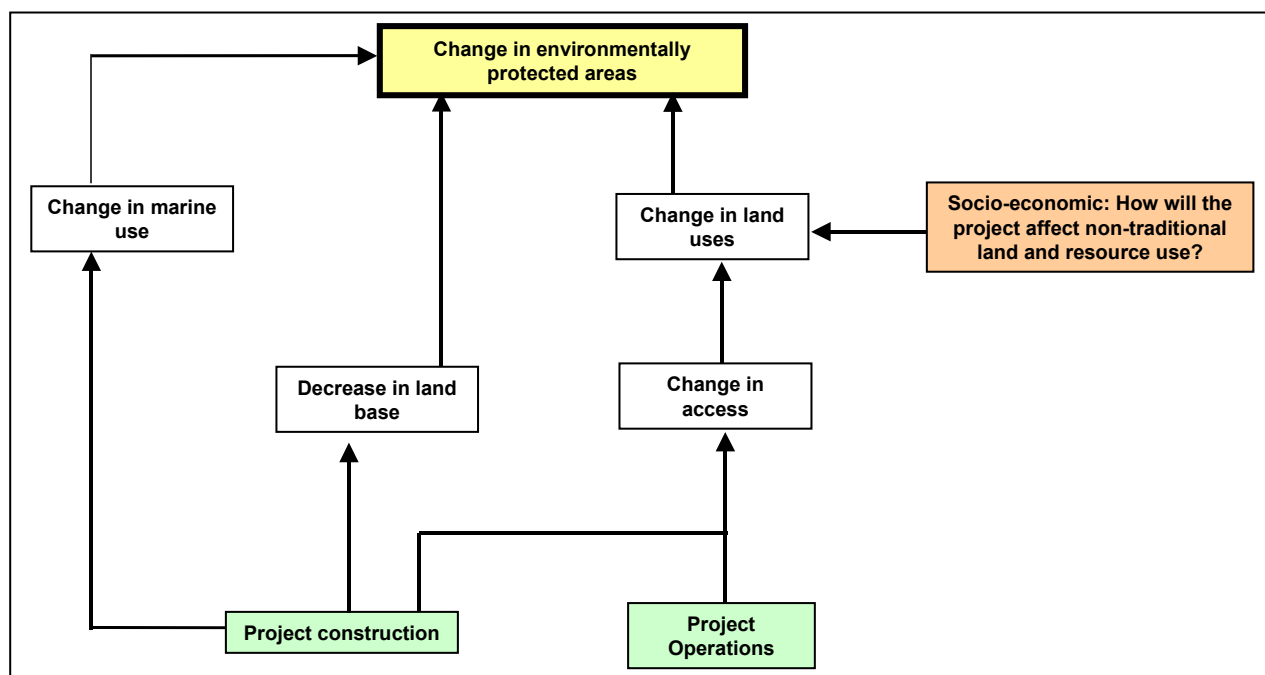
Valued Component	Effect	Effect Attribute				Significant
		Direction	Magnitude	Geographic Extent	Duration	
Other commercial activities	Decrease in available land base for other commercial activities	Neutral to adverse	No effect to low	Local	Short term to long term	No
	Change in other commercial activities	Neutral to adverse	No effect to low	Regional	Short term	No
		Positive to adverse	No effect to low	Regional	Long term	No
Tourism and recreation	Decrease in available land base for tourism and outdoor recreation activities	Neutral to adverse	No effect to low	Local to regional	Short term to long term	No
	Change to tourism and recreation activities	Neutral to adverse	No effect to low	Local to regional	Short term	No
		Positive to adverse	No effect to low	Local to regional	Long term	No
	Change in quality of tourism and outdoor recreation	Neutral to adverse	No effect to low	Local to regional	Short term	No
		Positive to adverse	No effect to low	Local to regional	Long term	No

NOTES:  
N/A = not applicable

## 8.2 Effects on Protected Areas

### 8.2.1 Effect Pathways

The effect pathway diagram (see Figure 8-2) shows how construction and operations activities are expected to affect protected areas. The first level in the diagram shows the project phases, construction and operations, and the second level identifies the expected project-specific effects of these activities on protected areas. For example, construction activities in protected areas will lead to a decrease in available land base because of site clearing, and installation of the pipeline, facilities and associated infrastructure. Construction of new permanent and temporary roads for the project will lead to an increase in access to protected areas.



**Figure 8-2: Project Effects on Environmentally Protected Areas**

The third level in the diagram shows a change in land use in the protected areas as a potential indirect effect. The increased access because of the project could lead to increased use of the areas and new types of land uses could be proposed in these areas. The fourth level of the diagram shows the predicted effect – a change in environmentally protected areas.

The analysis used to assess the magnitude of effects on nontraditional land and resource use is largely qualitative. This is because of several factors, including the inability to quantitatively determine effects on VCs that are not easily defined by numbers. For example, although the project’s encroachment on protected areas

can be measured quantitatively, it is difficult to predict a numerical change in recreational activities, or the change in perceived enjoyment. Therefore, professional judgment, supplemented by the results of the EIS public participation process and linkages with other disciplines, was used to determine effect predictions.

### 8.2.2 Assessment and Management of Project-Specific Effects

A part of the pipeline right-of-way and one borrow site are in the Edézhíe Candidate Protected Area. Project component construction will result in a loss of available undisturbed land base in this area. Lands in the Edézhíe Candidate Protected Area have been withdrawn, meaning no new developments are permitted in this area for five years. However, a 4-km development corridor, centred on the existing Enbridge pipeline, has been excluded from the land withdrawal. This development corridor encompasses the existing Mackenzie Highway, and the current project route and borrow site location in the Edézhíe Candidate Protected Area.

A part of the proposed pipeline, the Blackwater River compressor station, the Ochre River and Smith Creek infrastructure sites, and several borrow sites, are located in the Pehdzeh Ki Deh Area of Interest. In addition, a part of the proposed pipeline, the Trout River heater station, the Trout Lake infrastructure site and four borrow sites are located within the Smbaa K'e Area of Interest. Project component construction will result in a loss of available undisturbed land base in these areas. In addition, the pipeline generally parallels the existing Enbridge pipeline, Mackenzie Highway and a winter road. Currently, no restrictions to development are in place in the Pehdzeh Ki Deh Area of Interest and the Smbaa K'e Area of Interest.

The Liard Ferry Crossing infrastructure site is located near Liard River Crossing Territorial Park, which is adjacent to the Mackenzie Highway, a major transportation route in the area. Activities in and around Liard Ferry Crossing could disturb individuals using the park. However, most of project activity in this area will occur in the winter, and the Liard River Crossing Territorial Park is used primarily in the summer. As most of project activities will occur when the park is not in use, effects will be greatly reduced. However, some activities will still take place during the summer, and this could affect users of the park. If necessary, discussions will be held with GNWT RWED to ensure that disturbance to this park is reduced.

Development of project components, particularly the pipeline and access roads, could provide increased access to the protected and proposed protected areas traversed by the right-of-way. This could result in changes to other land uses already present in these areas or an increase in other land uses. It is expected that other land users will also follow the requirements for development in protected or proposed protected areas.

### 8.2.3 Mitigation Measures

For protected areas, access management will be the primary mitigation measure for controlling the extent that other potential land users, i.e., nontraditional hunters, timber harvesters and tourists, use project roads to access protected areas that were previously inaccessible.

At locations directed by the project proponents’ representative, access management techniques could include the following:

- rolling back slash and timber to prevent access along the pipeline right-of-way
- installing slash berms across the pipeline right-of-way or winter road easements
- planting trees or shrubs at potential access points, to visually screen the pipeline right-of-way or road easements

These access controls will be left in place through operations, if needed. In addition, all government guidelines and regulations for activities in protected areas will be followed or, if this is not practical, the project will submit a request for a variance of the guidelines or regulations, if permissible.

### 8.2.4 Residual Effects

Table 8-3 summarizes the expected project effects on protected areas in the in the DCR, which includes Wrigley, and the direction, magnitude, extent and expected duration of those effects. No significant effects are expected.

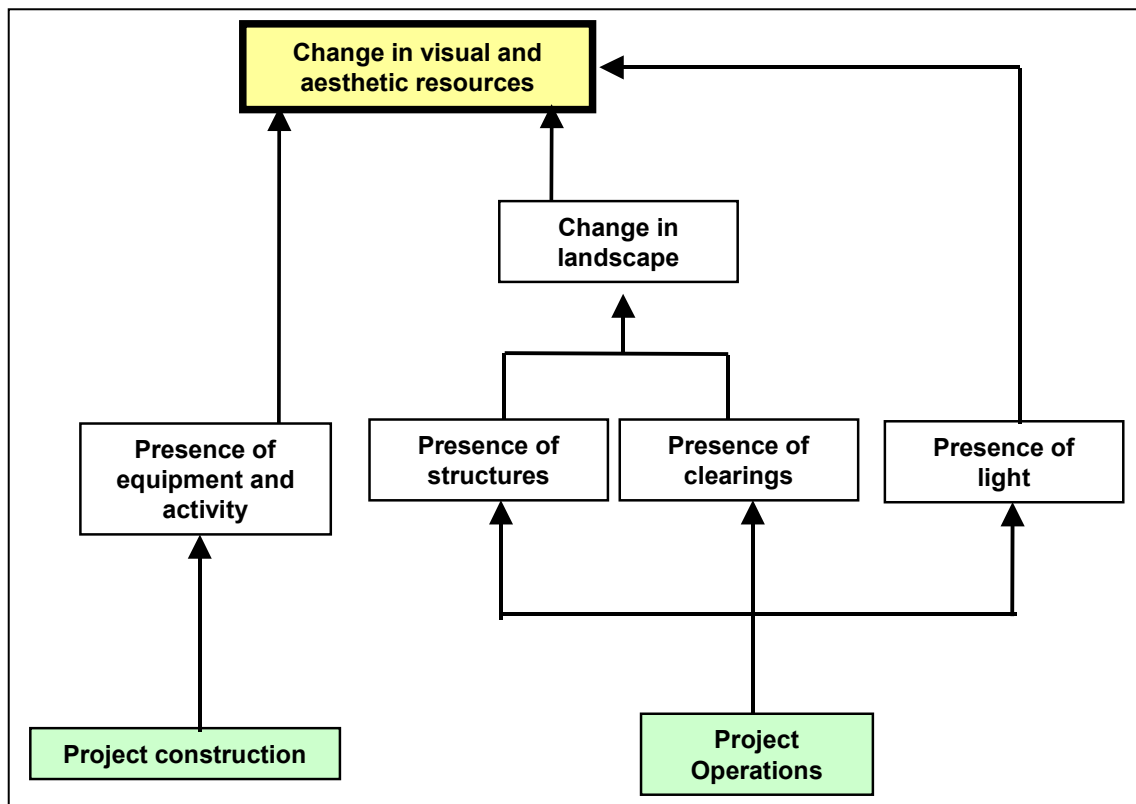
**Table 8-3: Protected Areas – Project Effect Attributes for the Deh Cho Region**

Effect	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Loss of available land base in protected areas	Neutral to adverse	No effect to low	Regional	Short term to long term	No
Disturbance to protected areas	Adverse	Moderate	Local and regional	Short term	No
	Adverse	Low	Local	Long term	No

### 8.3 Effects on Visual and Aesthetic Resources

#### 8.3.1 Effect Pathways

Figure 8-3 shows the predicted effect pathways for visual and aesthetic resources.



**Figure 8-3: Project Effects on Visual and Aesthetic Resources**

The effect pathway diagram shows how construction and operations activities are expected to affect visual and aesthetic resources. The first level shows the direct effects. For example, construction will bring about the presence of equipment and activity in an area that has been previously undisturbed. This could cause sensory disturbance to people using the area or observing it from above.

Operations will bring about structures, clearings and lights, which in turn will lead to a change in the landscape. There could be ice fog during cold weather, lights will be visible during the winter dark season and flares could be present.

Decommissioning will reduce the effect on visual and aesthetic resources by removing structures, traffic and the human presence of the project, except for the footprint left on the landscape. This could take longer to return to baseline conditions, because of the length of time required for revegetation in the northern climate.

### 8.3.2 Assessment and Management of Project-Specific Effects

Viewshed modelling was not done for the DCR because the area around the facilities is forested and visibility of the sites from the ground will be limited.

Most effects will be felt during construction, when facilities and other project components are first installed. Construction of the pipeline corridor, and facility, infrastructure and borrow sites will involve:

- site clearing
- terrain modification
- noise
- traffic
- smoke and exhaust
- lights
- a general change in the landscape

This will lead to an adverse effect on visual and aesthetic resources. However, for the most part, the effect will be local. Locating infrastructure sites on previously disturbed areas or at existing sites will greatly reduce the potential effects associated with developing a new area. Where practical, lighting will be placed to light only required areas.

Effects on visual and aesthetic resources during operations will be most strongly associated with facilities, as there will be noise, lights, and other sources of visual and aesthetic disturbance. The effect could be adverse for those who are disturbed by the presence of light on the landscape, or could be positive for those who use the light as a landmark or navigational aid. Where practical, lighting will be placed to light only required areas. Presence of the pipeline right-of-way will cause some effect because of the wide clearing, but the effects should be local.

Progressive reclamation will help reduce effects on visual and aesthetic resources. However, climate and terrain limitations will restrict the short-term benefits of reclamation activities. Following completion of construction, and decommissioning and abandonment, some seeding and revegetation efforts will speed up the recovery of native vegetation in disturbed areas. This will help reduce visual project effects. Seeding and revegetation will follow the reclamation strategies and guidelines in the EIS, Volume 7, Environmental Management.

During decommissioning and abandonment, there will be construction activity and equipment in some areas to remove facilities, roads and other features. Although borrow sites will be recontoured and revegetated, there will still be obvious clearings where sites were located. Reclamation of all project features will be ongoing, and the degree of effect on visual and aesthetic resources will depend on the time it takes for reclamation to bring the land back to a condition similar to the surrounding land.

### 8.3.3 Mitigation Measures

Mitigation techniques will be used to decrease the effect of project components on visual and aesthetic resources, including:

- using existing disturbed areas for infrastructure sites to reduce development effects, where practical
- using terrain features or vegetation, e.g., forest in the southern regions of the project, to screen ground facilities from view of other land and resource users, where practical. Guidelines for installing a visual screen to reduce line-of-sight are included in the EIS, Volume 7, Environmental Management.
- placing lighting to illuminate only required areas, where feasible
- managing the need for, and duration of, flaring
- seeding and revegetating disturbed areas after construction and decommissioning to speed up recovery of native vegetation, and reduce effects on visual and aesthetic resources. Revegetation guidelines and the reclamation strategy are described in detail in the EIS, Volume 7, Environmental Management.

### 8.3.4 Residual Effects

Table 8-4 summarizes the expected project effects on visual and aesthetic resources in the DCR, which includes Wrigley, and the direction, magnitude, extent and expected duration of those effects. No significant effects are expected.

**Table 8-4: Visual and Aesthetic Resources – Project Effect Attributes for the Deh Cho Region**

Effect	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Effect of change in landscape along pipeline corridor on people travelling in the area or on local land users	Adverse	Low to moderate	Local to regional	Short term to long term	No

## 9 HERITAGE RESOURCES

The following information is a community-specific presentation of the heritage resource site data which is closest to the community of Wrigley.

Directly affected communities are those communities that are located within or adjacent to the proposed development areas and pipeline corridor. As heritage resources investigations were completed only in association with the proposed development, most of the heritage resources are likely identified with these communities.

The community of Wrigley is listed as a directly affected community for the project EIS within the DCR.

### 9.1 Effect Pathways

Figure 9-1 shows a linkage diagram developed to understand the mechanisms through which the project could affect heritage resources.

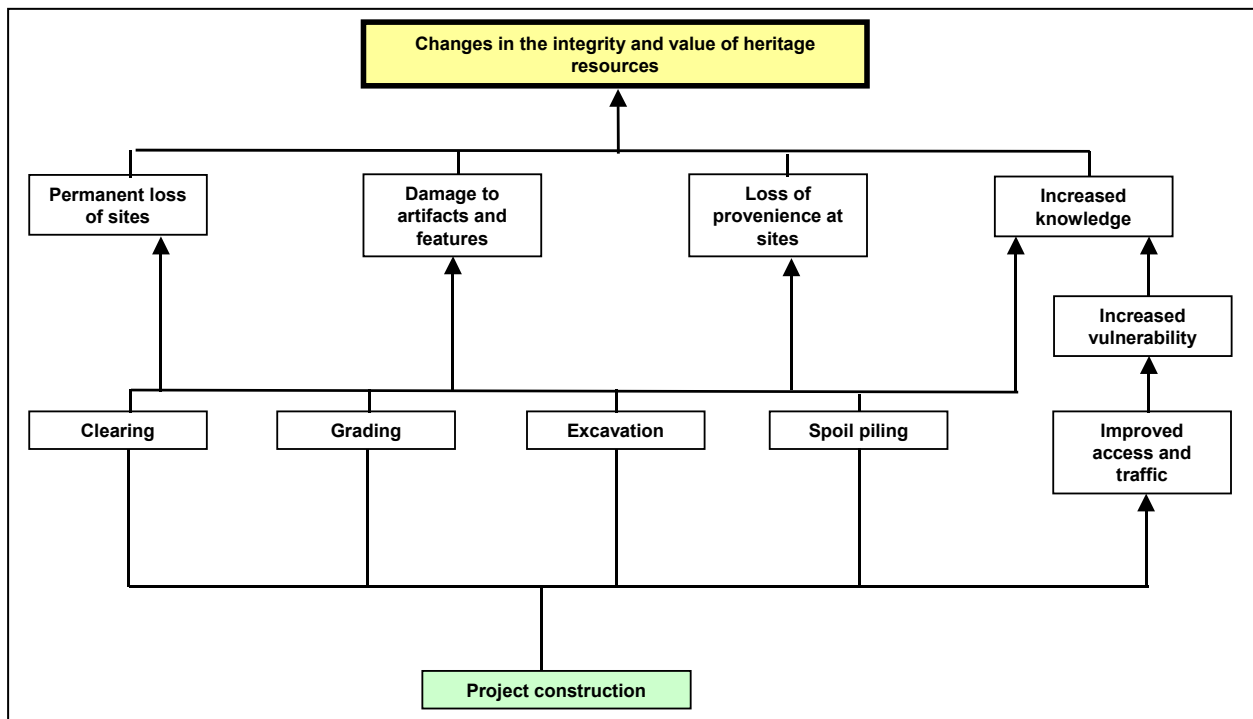


Figure 9-1: Project Effects on Heritage Resources

Heritage resources are nonrenewable resources that might be located at, or near, the ground surface and therefore are highly susceptible to any activities that result in disturbance to the ground. Consequently, the linkages between project development activities and potential effects on heritage resources focus on surface disturbances that will take place within the project footprint. They also include effects in a regional context because of potential indirect effects of the heritage resources investigation.

## **9.2 Context**

### **9.2.1 Environmental Context**

In general, the DCR is situated in the South Taiga Plains Ecological Zone, which is dominated by the Mackenzie River and its tributaries, and consists of a series of low-lying plains with a diverse array of fauna and flora. It represents the transitional zone between the boreal coniferous forest to the south and tundra to the north.

### **9.2.2 Cultural Context**

#### **9.2.2.1 Prehistory**

The sequence of prehistoric (11,000 to 220 before present [BP]) occupation of the DCR is reasonably well defined because of archaeological studies conducted in the Fisherman Lake area by MacNeish (1954), Millar (1968) and Fedirchuk and Millar (1981). The sequence of occupation outlined previously for the GSA is mostly based on this work, and also applies to the DCR (see the EIS, Volume 6, Section 8.3.1.2, Cultural Context – GSA).

#### **9.2.2.2 History and Cultural Groups**

Member communities of the Deh Cho First Nation include:

- Acho Dene Koe in Fort Liard
- Deh Gah Got'ie First Nation in Fort Providence
- Ka'a'gee Tu First Nation in Kakisa
- K'atlodeeche First Nation in Hay River
- Liidlii Kue First Nation in Fort Simpson
- N'ah adehe First Nation in Nahanni Butte
- Pehdzeh Ki First Nation in Wrigley
- Sambaa K'e First Nation in Trout Lake
- Ts'uehda First Nation in West Point
- Tthe'K'ehdeli First Nation in Jean Marie River

The Métis members include the Fort Liard, Fort Providence and Fort Simpson Métis Nations (Deh Cho First Nation 2002).

Anthropologists identified the territory of the Slavey at the time of contact, extending from the western edge of Great Slave Lake along the Mackenzie River to the current site of Fort Norman (Osgood 1936). This area sustained a population of about 1,250 at the time of contact (Kroeber 1939). Small lakes and rivers in low-lying plains with tree cover of jack pine, white spruce and birch characterized the area. This environment was a rich source of fish (Asch 1981). Moose, woodland and barren-ground caribou, black bear, beaver, marten, waterfowl, and hare provided much of the livelihood for the Slavey, as did edible plants (Asch 1981). However, because the area was not particularly ecologically diverse, the Slavey likely stayed in small groups for most of the year, gathering once a year at a central meeting place (Asch 1981).

The material culture of the Slavey included snares, bows and arrows or spears used to take large and small game, and nets and weirs for harvesting fish. Clothing was usually from moose hide, with personal adornment in the form of tattooing, wood and bone jewellery, and nose piercings. Housing was usually of two types:

- a teepee-like structure of bark or moose hide (Lamb 1970)
- log-style cabins chinked with moss and covered with spruce boughs (Mason 1946)

Like other cultural groups in the region, travel was by snowshoe and toboggans in winter, and by foot or bark canoe in the snow-free months.

The Chipewyan or Cree likely introduced trade goods in the mid-eighteenth century. Certain trade goods were found to be useful to the Slavey, including metal goods, guns, tea, flour, rice and tobacco (Asch 1981). The fur trade disrupted traditional land use patterns, including travel routes and settlement areas, and the Cree began to move northward in response to trade rivalries (Lamb 1970). After Alexander Mackenzie's initial contact with the Slavey in 1789, trade expansion saw establishment of posts throughout the region. By the late 1800s, the Slavey traded at seven posts (Asch 1981):

- Fort Norman, now Tulita
- Wrigley
- Fort Simpson
- Fort Providence
- Hay River
- Fort Nelson
- Fort Liard

The South Slavey name for Wrigley is Pehdzeh Ki, which means *clay place* (Prince of Wales Northern Heritage Centre [PWNHC] 2002). The first site of this community, about 30 km north of the present location, was called Old Fort Island. Dene people settled there after the North West Company's closure of Fort Alexander, its post at Willowlake River. When famine and tuberculosis killed nearly one third of the residents of Old Fort Island, the families established a new site for the community near a landform known as Roche-qui-trempe-a-l'eau, *the rock that plunges into water*. The site is now known as Old Fort Wrigley, as the community was moved to its present location on higher ground in the 1970s (Northern News 2002). To the south is Trout Lake. Fort Simpson is located at the confluence of the Mackenzie and Liard rivers, and is the oldest continuously occupied trading post on the Mackenzie River (Northern News 2002). Jean Marie River began as an outpost camp in 1935 as part of a traditionalist movement. Wrigley became a base for Slavey people after 1905, where they continued their traditional lifestyle (GNWT 2003).

The nineteenth and twentieth centuries witnessed rapid change for the Deh Cho. The influx of fur traders and missionaries was followed by the Klondike gold rush to the west, and arrival of the Northwest Mounted Police and steam-powered boats along the river. Airplanes, the Mackenzie Highway and a pipeline to support war efforts also dramatically changed the face of the region. Treaty 8 was negotiated in the southern reaches of Slavey territory in 1900 at Fort Resolution and Fort Vermillion, and at Fort Nelson in 1911. Treaty 11 was not signed until 1921, with the Slavey residing north of the Great Slave Lake and Mackenzie Valley. Disputes surrounding Treaty 11 have continued since that time and came to a head during the proposed Berger Inquiry in 1977. Negotiations regarding a land claim in the DCR continue to the present day.

### **9.2.3 Baseline Conditions**

Baseline conditions and investigations within the Wrigley area are similar to those described in the EIS, Volume 6, Section 8.5.2, Baseline Conditions (Heritage Resources – DCR).

#### **9.2.3.1 Pipeline Corridor and Associated Facilities**

Areas examined during the 2002 and 2003 field reconnaissance included a variety of landforms within the pipeline corridor. Several previously recorded sites were identified in the prefield research as being associated with the pipeline corridor. These sites, and those recorded as part of the project, are variable in type and age. They include:

- palaeontological finds
- historic camps
- burials

- prehistoric sites
- traditional use sites

The five heritage resource sites identified that are geographically closest to Wrigley, and in potential conflict with the pipeline corridor and associated facilities are summarized in Table 9-1. Their general locations are illustrated in Figure 8-5, found on page 8-58 of Volume 6, Section 8 of the EIS.

**Table 9-1: Heritage Resources in Potential Conflict with Pipeline Corridor and Associated Facilities in the Wrigley Area**

Heritage Resource	Type	Landform Association	Project Component
KIRm 002	Historic cabin	Edge of Mackenzie River	Pipeline corridor
KIRm 010	Historic cabin	Mackenzie River	Pipeline corridor
KeRj 024	Historic camp	Bank of Willowlake River	Pipeline corridor
03MGP-DCR02	Historic hunting camp	Elevated terrace above a Hodgson Creek tributary	Pipeline corridor
03MGP-DCR05	Traditional trap line, traps	Bank of Willowlake River	Pipeline corridor

### 9.2.3.2 Infrastructure

Thirteen infrastructure locations were inspected in the Wrigley area as part of the 2002 focused reconnaissance, and 11 were inspected in 2003. Definitive alignments were not usually available for the access roads associated with the infrastructure locations. Therefore, few access routes were inspected.

Two sites are in potential conflict with the proposed infrastructure locations and include a historic cabin (KiRl 008) and a trap (03MGP-DCR01). Their general locations are illustrated in Figure 8-5, found on page 8-58 of Volume 6, Section 8 of the EIS.

### 9.2.3.3 Borrow Sites

Thirty-six borrow sites were inspected in the Wrigley area as part of the granular resource component of the 2002 reconnaissance, and an additional 12 were inspected in 2003. Investigation concentrated on a limited area for most of these locations. Because of scheduling issues, definitive alignments were not available for the access roads associated with the borrow site locations. Therefore, few access routes were inspected. The potential borrow sites were primarily elevated, well-drained landforms, including moraines and other glacial features.

No sites were identified in potential conflict with the proposed borrow sites in the Wrigley area.

### 9.3 Project-Specific Effects

During the 2002 and 2003 field seasons, the archaeological team recorded previously unknown heritage resource sites, and also revisited previously recorded heritage resource sites, which were subsequently found to be outside of any proposed impact areas because of changes in the configuration of the project components. A total of 13 heritage resource sites were investigated and recorded in the Wrigley area. All of the heritage resource sites recorded in the Wrigley area and their assessed significance are summarized in Table 9-2. Significance in this table incorporates the cultural, historic and research values of archaeological sites. For a full definition of significance, see the EIS, Volume 6, Section 8.1.2, Valued Components.

**Table 9-2: Heritage Resources Investigated During the 2002 and 2003 Focused Reconnaissance Program in the Wrigley Area**

Heritage Resource	Type	Landform Association	Project Component	Significance
KIRm 018	Lithic scatter	Bank of Mackenzie River and an existing barge landing	N/A	High
DCR 006	Recent camp site	Clearing along Willowlake River	N/A	Limited
KIRm 002	Historic cabin	Edge of Mackenzie River	Pipeline corridor	Moderate
KIRm 010	Historic cabin	Mackenzie River	Pipeline corridor	Moderate
KeRj 024	Historic camp	Bank of Willowlake River	Pipeline corridor	Moderate
03MGP-DCR01	Trap	Low terrace above the confluence of Mackenzie and Ochre rivers	Infrastructure	Limited
03MGP-DCR02	Historic hunting camp	Elevated terrace above the Hodgson Creek tributary	Pipeline corridor	Limited
03MGP-DCR03	Historic camp	Elevated terrace above Mackenzie River and a small unnamed creek	Borrow site	Limited
03MGP-DCR05	Traditional trap line, traps	Bank of Willowlake River	Pipeline corridor	Moderate
KeRj 002	Historic fort	Bank of Willowlake River	N/A	High
KeRj 035	Historic camp	Along Willowlake River	N/A	Limited
KeRj 036	Historic camp	Along Willowlake River	N/A	Limited
KiRI 008	Historic cabin	Confluence of Mackenzie and Ochre rivers	Infrastructure	Limited
NOTE: N/A = not applicable				

## 9.4 Mitigation Measures

When complete information on current resources and expected effects can be provided, mitigation programs can and will be implemented to offset or reduce predicted negative effects. Without the information that will be available as the project is approved, mitigation can only be discussed in generalized terms. Mitigation strategies are usually devised when full information on effects is known, and are made in consultation with the regulatory agency responsible for heritage resource management in the Northwest Territories, the PWNHC. These strategies are outlined as requirements for development approval. For further information on proposed project management plans for heritage resources, see Section 9.3.1, Heritage Resource Management Plan.

Because every heritage resource is unique, mitigation strategies are based on case-by-case recommendations provided during the assessment stage of a heritage resources management program, considering the significance of the resource and the severity of the predicted effect. In most cases, the preferred strategy for mitigating negative effects on significant resources is avoidance through project redesign. This is often possible when there is design flexibility in development, such as an access road, well pad location or small-diameter pipeline. However, it might be possible to avoid a site when developments lack design flexibility if, for example, placement of fill over a significant resource would offset the effect of a road or drilling under a heritage resource, avoiding the negative effects of a pipeline. Potentially, no physical development-related effects would result on the resource.

In other cases, development effects might be unavoidable. The most common mitigation in these circumstances is information recovery and preservation. For prehistoric and palaeontological sites that are typically concealed in bedrock or mineral soil horizons, these procedures include excavation to recover samples of information and materials before an effect occurs. The required analysis and interpretation of recovered information and submission for permanent conservation is intended as compensation for the negative effects of development activities. These procedures usually result in recovery of a representative sample of information from a particular resource, with all or some of the remainder being consumed by the approved development. These losses are considered acceptable by the regulatory agency responsible for management of the resource.

In cases where a resource of limited significance is predicted to be affected, the information and materials obtained at the assessment stage might be considered sufficient to offset the loss of this resource during development. This limited level of mitigation is usually applied in situations where resources of a similar character occur commonly throughout a region and their distribution is considered as or more important than their content.

Other less typically applied forms of mitigation could include public interpretation programs. These are developed to provide benefits to local and regional communities to help offset the loss of resources during development. Alternatively, types of specialized analyses can be conducted to augment interpretation of a particular resource in a scientific framework. These types of procedures usually accompany more standard forms of mitigation and will be designed on a case-by-case basis, depending on the character of the resource in question.

## **9.4.1 Heritage Resource Management Plan**

### **9.4.1.1 Introduction**

The objective of the heritage resource investigations conducted in association with the project is to identify, assess and, if necessary, apply mitigation measures to all archaeological sites before construction. Impact assessments will be completed before construction in:

- the gathering system rights-of-way
- development footprints within the anchor fields and pipeline right-of-way
- infrastructure facility footprints
- borrow pits
- other development-related impact zones

It is not possible to guarantee that the impact assessment procedures will record every site, because of the following characteristics of heritage resources:

- they are typically buried
- they might contain only a few recognizable artifacts
- they can have a diffuse distribution throughout the site

Input from local people, in the regions affected by the project, will be sought, and each assessment crew will have representation from the local communities. However, as archaeologists are dealing with thousands of years of prehistory, it is unlikely that local assistants will know of all the heritage resource locations in their areas. Therefore, a management plan will be provided for field personnel not formally trained in archaeology, including monitors and inspectors, to assist them in archaeological site recognition, and to serve as a guideline for site protection in the event of a discovery. This plan is not meant to be used as a replacement for trained staff, but as a supplement, to protect northern heritage resources.

Archaeological investigations of the proposed pipeline and related facilities will be conducted when sufficient location details become available. Issues raised during the community consultation and regional workshop sessions, and the traditional knowledge programs will also guide the field program. The current

status of these investigations and an assessment of potential effects were presented previously.

The procedures outlined in this plan are synopses of a more detailed guide that will be provided to project contractors, outlining a course of action to be followed should any unexpected archaeological remains be identified during the course of the project. The guide will facilitate monitoring of construction activities in conjunction with such finds. Cultural resource monitoring is not to be conducted instead of heritage or historical resource impact assessments, which are required by territorial or provincial regulatory agencies. This approach to managing unexpected heritage resource finds will be adopted to ensure protection of archaeological resources that could be adversely affected by the project.

#### 9.4.1.2 Regulatory Compliance

These procedures result from the principles outlined in the *Northwest Territories Archaeological Sites Regulations* (Government of Canada 2001). In addition, they have been adapted from the guidelines for archaeological permits. The authority responsible for managing and protecting archaeological resources in the Northwest Territories is the PWNHC. Regional and district authorities also have responsibility for heritage resources and will be contacted when necessary.

As a class of heritage resources, archaeological sites are managed according to legislation. In the Northwest Territories, legislation includes the:

- *Northwest Territories Archaeological Sites Regulations* (Government of Canada 2001)
- *Mackenzie Valley Land Use Regulations* (Government of Canada 1998a)
- *Mackenzie Valley Resources Management Act* (Government of Canada 1998b)
- *Inuvialuit Lands Administration Rules and Procedures* (Inuvialuit Land Administration 1986)
- *Territorial Land Use Regulations* (Government of Canada 2003b)
- *Canada Oil and Gas Geophysical Operations Regulations* (Government of Canada 1996)
- *Historical Resources Act* (GNWT 1997)

Information about the location of heritage resources can be protected under the *Access to Information and Protection of Privacy Act* (GNWT 1994).

The heritage legislation in both jurisdictions confers automatic protection to archaeological sites, regardless of whether they have been previously identified and recorded. In the Northwest Territories, overlapping legislation, as referenced previously, protects heritage resources. For example, Section 16 of the *Northwest Territories Archaeological Sites Regulations* (Government of Canada 2001) states:

*Where, in the course of a land use operation, a suspected archaeological site or burial ground is unearthed or otherwise discovered, the permittee shall immediately,*

- a) Suspend the land use operation on the site*
- b) Notify the Engineer or an inspector of the location of the site and the nature of any unearthed materials, structures or artifacts*

Project personnel will be notified that personnel cannot wilfully disturb or remove archaeological or historic artifacts or materials from sites unless they have a permit under the *Northwest Territories Archaeological Sites Regulations*. Collection of such artifacts is strictly forbidden. Failure to comply might result in prosecution and fines.

#### 9.4.1.3 Types of Heritage Resource Sites

Although not consistently outlined in the legislation, an important heritage resource category includes the remains of sites that reflect traditional use by Aboriginal people. Traditional use sites are often locations that do not fit into the legislated definition of archaeological sites, but can contain important resource information regarding the traditional land use practices of the local people. Unlike people in some parts of North America, the people of the North are still very much linked to the land. These sites often blend with past land use occupancy practices, as the use of the land changes through time. Understanding current land use is integral to the correct interpretation of the past. Traditional use sites might be:

- in excess of 50 years old but have an unbroken chain of possession
- traditional hunting or camping locations, but it cannot be established that their age is sufficient to be considered an archaeological site

The following are examples of some heritage resource site types:

- camp sites – a common site type in all environments. They can be associated with fishing, hunting and quarrying.

- stone feature sites – tent rings, caches and cairns often occur in Arctic and sub-Arctic environments.
- artifact scatters – perhaps the most common site type, these comprise a concentration of archaeological materials often including stone tools or thin, sharp chips, observed on the surface or in association with buried surfaces. Visibility of surface materials depends on several factors, including vegetation cover, density and distribution of the archaeological or historic materials and pre-existing disturbances. Artifact scatters can indicate more extensive cultural occupations requiring detailed assessment.
- isolated artifacts – single artifact finds that are often interpreted as lost or discarded tools. Typical isolated finds include flaked stone knives, arrows or spear points (projectile points), adze blades, net-sinker stones, hand mauls and hammer stones, and also unshaped fragments of flaked stone. In areas of good preservation, wooden and bone artifacts might also be identified. Such tools reflect hunting and fishing, gathering plant resources, and traditional forest use.

Three principal types of historic archaeological remains can be expected:

- structural remains – standing or ruined historic structures. Traditional use structures can include cabins or their collapsed remains, smoke houses, meat-drying or hide-stretching racks and cemeteries or isolated graves.
- historic refuse – the historic equivalent of a Prehistoric Period midden, which can be associated with non-Aboriginal habitation or Aboriginal traditional use, represented by materials, such as:
  - bottles and windowpane glass
  - tin cans
  - fragments of ceramic dishes and crockery
  - cartridge casings and bullets
  - ash and charcoal
- isolated artifacts – single artifacts, such as tools and bottles, or larger objects, such as boats.

#### 9.4.1.4 Recognizing Archaeological Remains

##### Burial Places

Burial places often have negligible surface visibility and can be encountered in many locations. Human bones, in an archaeological context, are normally light brown to dark brown, and are often easily distinguishable from surrounding sediments. In contrast to most of the animal bones that would be present in a

midden deposit, human bones are usually intact. However, many human burials can be incomplete or contain scattered, partially decayed bones that fragment easily. All burial sites will be reported immediately and avoided.

### **Archaeological Deposits**

Typical soils in these areas are acidic and contain dissolved organic residues that help to identify archaeological deposits in other regions. However, archaeological deposits can be darker than surrounding sediments and can be distinguished from natural soils by the following attributes, individually or in combination:

- black soil
- patches of reddish brown or yellow-brown fire-stained (oxidized) sediments
- scatters or concentrations of fire-altered rock
- complex soil stratigraphy

#### **9.4.1.5 Archaeological Specifications**

##### **Preconstruction Planning**

Before construction of the gathering system, pipeline and associated facilities, a preconstruction heritage resources impact assessment (HRIA) will have been completed and, subsequent to any requirements for mitigation, approval to proceed with construction will have been granted. However, realignment of the pipeline or changes in locations of facilities might be necessary. If this occurs, plans will be shown to the archaeological consultant for advice about the need to communicate with PWNHC to obtain any necessary approvals required to proceed.

##### **Construction Monitoring and Archaeological Assessment**

Subsurface excavations in selected areas will be subject to inspection and monitoring by the archaeological consultant. If the contractor or its employees encounter actual or suspected archaeological remains during any part of the project, the archaeological consultant will be contacted to assess the archaeological remains and identify suitable procedures. The contractor should discontinue work in that area until the archaeological consultant and a local community member are able to assess the remains and identify suitable procedures for site mitigation.

If, at any time, the archaeological consultant determines that archaeological remains occur, the contractor and environmental inspector will be notified immediately and suitable management procedures will be identified. The contractor must cease work immediately in that particular location on instruction from the archaeological consultant, and move on to other work until:

- the required archaeological studies are complete
- the contractor has been advised by the project proponents to resume work

The contractor will ensure that supervisory personnel, subcontractors and employees are aware that:

- archaeological remains might be encountered
- work in a location suspected to contain such remains will immediately cease until the site is inspected by the archaeological consultant and the required studies are completed

The contractor will ensure that supervisory personnel, subcontractors and employees are instructed not to collect archaeological remains, including artifacts of traditional Aboriginal or industrial, Euro-Canadian origin. The contractor will ensure that the original location of any archaeological find is accurately recorded on suitably scaled maps and forwarded to the archaeological consultant.

### **Effect Management Procedures**

If suspected archaeological remains are found, the find location must not be disturbed until it is first inspected and documented by the archaeological consultant. The *Mackenzie Valley Land Use Regulations* (updated to April 2003) and the *Territorial Land Use Regulations* state that no one shall conduct a land use operation within 30 m of a known monument or a known or suspected historical, archaeological site or burial ground. It is proposed, for the purpose of this management plan, that the *affected location* be defined as an area no less than the area encompassed by a 30 m buffer around the outermost known site dimensions. A professional archaeologist must determine the actual site dimensions. Therefore, further disturbance to the site area will be prevented by implementing a 120 m no-work zone surrounding the affected location until it is assessed by an archaeologist accompanied by a community member.

If archaeological remains are encountered, the procedures to be adopted are described, as follows.

### ***Human Remains***

Human remains must be accorded full dignity and respect. Under no circumstances should burial places be disturbed. However, unmarked graves could be inadvertently unearthed during construction activities. The archaeological consultant will be contacted immediately to inspect the location. As required, the archaeological consultant will contact the applicable government agencies, which include the RCMP and the PWNHC, to receive instructions. If required by the PWNHC, the archaeological consultant will design a recovery protocol in consultation with applicable Aboriginal communities that meets with full PWNHC approval.

The following procedures must be followed if suspected human remains are found:

1. Cease work in the affected location immediately.
2. Contact will be made with the archaeological consultant.

If the affected location is busy or has high public visibility:

3. Assign an employee to stand watch until the archaeological consultant arrives.
4. Stake or flag off the affected location to prevent further disturbance.
5. Cover any exposed bones with plastic sheeting, tarpaulin, blanket or other clean covering, not backfill, until the archaeological consultant is present.

If excavated fill has been loaded into a truck:

6. Empty the excavated fill at a nearby secure location for the archaeological consultant to inspect.

The contractor will only resume work in that area once:

- the archaeological study is complete
- clearance has been granted by the appropriate regulatory agency
- the project proponents have advised that work can continue

### ***Archaeological Deposits***

Archaeological deposits include items such as buried archaeological components, camp sites, scatters of artifacts or fire-broken rocks. Such sites can be extensive or localized. The archaeological consultant should be contacted to inspect the area. If feasible, the archaeological consultant will devise a plan to avoid such deposits through project redesign or capping them with clean, suitable fill. If avoidance strategies are not feasible, it might be necessary to conduct archaeological excavations, i.e., systematic data recovery, on threatened sites. The probability of encountering an undiscovered, large site is considered to be low because an HRIA will have been conducted by the time construction is initiated.

The following procedures are to be adopted when unexpected archaeological deposits are encountered:

1. Cease work in the affected location immediately.
2. Stake or flag off the affected location to prevent additional disturbances.
3. Contact will be made with the archaeological consultant.

If excavated fill has been loaded into a truck:

4. Empty the fill at a nearby secure location for the archaeological consultant to inspect.

The contractor will only resume work once the archaeological study, including all necessary discussion with the appropriate regulatory agencies, is complete and the archaeological consultant has advised the contractor that work can resume.

### ***Isolated Artifact Finds***

Single artifact finds can be as important as large sites for understanding Precontact land use, as they emphasize that Aboriginal people were widespread throughout the landscape. Artifacts should be readily identifiable by nonarchaeologists. Size, shape and colour, which often contrasts with the surrounding matrix, are some key indicators of artifacts. If an isolated artifact is observed, the following procedures should be adopted.

If the artifact is in imminent danger of being destroyed or damaged:

1. Collect the artifact and mark its location with a stake or flag.
2. Leave the artifact on the ground where it was found, whenever possible, and mark the location with a stake or flag.
3. Notification will be provided to the archaeological consultant that the location might require an archaeological inspection.

The contractor will:

4. Ensure that other workers in the vicinity are aware that the affected location is to be avoided until inspected by the archaeological consultant.

The archaeological consultant will:

5. Inspect the affected location and conduct all necessary investigations and regulatory interaction.
6. Advise the contractor that construction can proceed.

### ***Historical Remains***

All types of historical archaeological materials are included in this category, including deposits of household refuse, i.e., glass, metal and ceramics, ruined structures, abandoned cabins and isolated historical artifacts. Historical remains are easy to recognize as artifacts, but determining their historical importance is more difficult. Such appraisals can sometimes be made on the basis of verbal reports, but field inspections might be required for some finds.

When historical remains or suspected historical archaeological remains cover an extensive area or appear to be quite deep, such as a refuse dump, the following procedures will be adopted:

1. Stop work in the affected location.
2. Stake or flag off the affected location to prevent additional disturbances.
3. Contact will be made with the archaeological consultant.

The archaeological consultant will:

4. Determine if the found materials are of historical significance.

The contractor will resume work once the archaeological study and regulatory interaction are complete and the project proponents have advised the contractor that work can begin.

### ***Historic Artifacts***

If suspected historic archaeological artifacts are observed, the following procedures should be followed.

If the artifact is in imminent danger of being destroyed or damaged:

1. Collect it and mark its location with a stake or flag.
2. Leave the artifact on the ground where it was found, whenever possible.
3. Notify the archaeological consultant.

The archaeological consultant, in consultation with the appropriate regulatory agency, will:

4. Determine if an inspection and study is required.

The archaeological consultant will:

5. Advise the contractor when construction can continue.

### ***Emergency Contacts***

Before construction, complete details will be provided about the names of archaeological consultants and regulatory agencies that can assist with unexpected finds.

## **9.5 Prediction Confidence**

As indicated in previous sections, the effects of the project on heritage resources cannot be positively determined at this time for several reasons. The degree of uncertainty present in the ability to predict the heritage resource effects of the project requires that confidence be discussed in broad qualitative rather than quantitative terms.

Because precise footprints for all project-related disturbance zones could not be identified, high-quality information relating to potential effects was not consistently available for assessment during the 2002 and 2003 parts of the heritage resources study. However, the quality of the information on the resources investigated during the work completed for the program is reasonably high. Wherever possible, known archaeological sites will be avoided by the development.

Because it was not possible to conduct a full assessment of the effects of the project, the investigations completed in 2002 and 2003 did not provide sufficient information for defining the full range of variability in heritage resources that might be affected by the project. Consequently, although the significance of those resources investigated can be made with a reasonable level of confidence, predictions on the precise effects of the project must await completion of a full HRIA. Predictions would be subject to a high degree of potential error if they were based on the information currently available. For example, the effect of tree clearing and using a location for storing machinery or stockpiling pipe will have a very low-magnitude effect on a small buried site that comprises stone artifacts. However, that same site and location could suffer significant effects if grading or excavation were to occur.

The results of the 2002 and 2003 heritage resources study provide a basis for a general understanding of the character and distribution of heritage resources near the proposed development zones. These results could be used as a foundation for

structuring subsequent stages of project heritage resource studies. However, the information available does not allow accurate predictions about the precise effects of the project, such that specific mitigation could be designed to offset any negative effects.

By implementing a comprehensive series of mitigation measures involving project design modification or information recovery programs, or both, potential negative project-related effects could be offset for the resources investigated during the 2002 and 2003 heritage resource program. However, until a full assessment of development zones and the resources that might occur close to them has been completed, it is uncertain if mitigation measures would be successful in reducing all of the heritage resource effects of the project.

## **9.6 Future Study Considerations**

Observations made relative to heritage resource characteristics and distributions during the 2002 and 2003 heritage resources program tend to confirm many of the principles typically employed in assigning archaeological potential throughout the region, and support their use in future parts of the HRIA. These include recognition of the:

- importance of the Mackenzie River, and its value as a travel corridor and a source of resources
- significance of fish-bearing lakes
- potential of well-elevated terrain in the delta as travel corridors for people and animals

Areas such as these that occur close to, or are intercepted by, elements of the project should continue to be a focus of future assessment strategies.

Distribution of prehistoric resources continues to reflect use of, and association with, flowing and standing waterbodies. In future assessments, consideration will be given to closeness to water as one of the major factors in selecting areas for examination. This factor is less important in the Mackenzie Delta because of the common occurrence of water and the temporary nature of flow regimes.

However, the considerable distances from potable water observed at several sites identified in this program indicate that closeness to water should not be an exclusive determinant of landscape potential in future studies. Major terrain breaks also represent areas that should be examined in future stages of the program.

Important observations about site distribution made in the 2002 and 2003 program relate to those of historic or cultural character. A wide range of significant sites of cultural character was recorded in landscapes that would not normally be considered to have high potential for archaeological resources. These sites can reflect important land use patterns that have ancient origins or analogues, the remnants of which might not be easily discoverable by archaeologists because of their nonrepetitive nature, wide distribution and use of perishable materials.

It is difficult to predict the locations of some sites using standard terrain analysis. Many sites identified during the current study were because of advice and information shared by the Aboriginal coparticipants in this project. Therefore, it is considered vital that future parts of this study continue and enhance the mutual sharing of information between knowledgeable Aboriginal community members and archaeologists, and particularly through results of ongoing traditional knowledge studies and the public participation program. Effective information sharing will be the best way of ensuring effective heritage resource management in conjunction with the project.

**9.7 Residual Effects**

Table 9-3 summarizes the residual effect categories considered with regard to the heritage resource effects of the project. The indefinite nature with respect to the specific location of some project components makes the determination of significance difficult for heritage resources. Until project locations can be cross-referenced with site locations, this assessment remains largely hypothetical. Consequently, the following discussion cannot provide a ranked determination of the significance of project-related effects.

**Table 9-3: Heritage Resources – Project Effect Attributes**

Component	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Heritage resources	Positive and adverse	Unknown	Local	Short term to long term	–
NOTE: – = not available (cannot be determined) at this time					

Factors contributing to this assessment include the following:

- the direction of effects is likely to be both positive and adverse
- studies completed to date have identified some heritage resources likely to be affected by the project. These consist largely of trails that traverse the full width of the development corridor for the project.

- other sites might be affected depending on the final configuration of project facilities
- because of the locational requirements of some elements of the project, such as infrastructural facilities, borrow sites and the large-diameter pipe that comprises the main delivery system, it can be predicted that a range of heritage resources will be affected by land surface disturbance associated with development
- although avoidance might be possible in some instances, it is likely that mitigation measures will be required to offset adverse development effects when resources of scientific or cultural significance are encountered

Positive effects of development-related investigations have already been realized. Knowledge of the character and distribution of regional heritage resources was increased because of the 2002 and 2003 heritage resource studies. These benefits will increase as further studies take place. Additional heritage resources will be identified and will be subject to management procedures. When implemented, mitigation measures will substantially increase the detailed information available for the regional heritage resource base, and the information and materials conserved because of completing these programs will remain as sources of potentially productive scientific research for generations. The information recovered regarding the use of the landscape by Aboriginal peoples will serve as a valuable record of past and ongoing cultural practices, and assist in reinforcing the unique character of these cultures.

The magnitude of project-related effects cannot be predicted with confidence until development zones can be specified and a full heritage resource impact assessment can be conducted. Considering the wide distribution of prehistoric and historic or cultural resources in the region and the extent of the proposed development area, it is expected that future stages of the heritage resource study will identify many heritage resources that will be affected by the project. In addition, it is expected that continued consultation with local communities will result in identifying historic period remains relating to past cultural use of the project development zone. Depending on the significance of these resources, it is expected that most resources will require management.

Based on the findings to date, it is expected that most of the adverse effects could be managed by mitigation measures implemented before development as outlined in Section 9.3.1, Heritage Resource Management Plan.

The geographic extent of the effects of project-related developments on heritage resources is likely to be mostly localized because heritage resources are static resources that will be subject to adverse effects primarily within actual development zones. Unless a unique and highly significant heritage resource is identified in a situation where an effect cannot be avoided, most of the heritage

resources expected to be in potential conflict with development are likely to reflect highly localized use patterns and have a high probability of occurring in similar contexts in the surrounding regions.

However, in situations where a highly significant resource that has bearing on regional history or prehistory is directly affected by project development activities, the effects of loss of this resource could have regional implications. It is assumed, that effective mitigation programs will be implemented to offset this loss through conservation of materials and information, and an increase in understanding and appreciation for the past of the Mackenzie Delta and Valley.

In addition, positive effects are currently accumulating regionally because of the heritage resource studies. Improved understanding of regional heritage resource character and distribution might assist in improved management of adjacent areas relative to future developments, and could result in mostly positive consequences both locally and regionally.

Any adverse effects resulting from project-related developments will occur immediately, with landscape disturbance during construction. Consequently, duration is evaluated as having a negligible environmental consequence for assessing the effect on heritage resources.

In summary, although considerable information has been collected during the 2002 and 2003 heritage resource study, the uncertainties of the precise effects of the project preclude providing a complete assessment of these effects. Future studies and consultation with regional communities will refine the information available and will result in a more comprehensive assessment for which an effective mitigation program can be designed. The project proponents are committed to completing a thorough heritage resource assessment that will discuss the effects of the project, and will abide by any regulatory requirements established by the GNWT relative to heritage resources.

To determine the significance of the effects that various elements of the project might have on heritage resources, the following information should be available:

- precise locations and nature of development disturbance
- numbers and significance of the heritage resources that might be affected
- effectiveness of mitigation strategies that can be devised to offset negative effects

Until resolution of these uncertainties is achieved, the significance of the project on heritage resources cannot be effectively assessed.



## 10 MONITORING AND FOLLOW-UP

### 10.1 Introduction

The purpose of this section is to describe the proposed Socio-Economic Monitoring Plan. This plan is intended to meet regulatory requirements for follow-up on effects identified previously in this volume. A project of this magnitude will generate a range of positive and negative effects during construction. Because of the nature, scope and magnitude of the expected project-related effects, and in recognition of shared responsibility for effects management, the mitigation measures, management plans and programs that address the effects will require a coordinated and collaborative response from the project proponents and their contractors, affected communities, including Wrigley, and territorial and federal government agencies. Mitigation measures, management plans and programs will need to be monitored throughout project construction and initial operations to:

- determine their effectiveness in reducing adverse effects and enhancing positive effects
- enable adjustments to be made where necessary
- develop new mitigation plans and programs, where required

The proposed Socio-Economic Monitoring Plan applies only to the Mackenzie Gas Project. The NOVA Gas Transmission Ltd. (NGTL) ancillary project in Alberta will develop and implement its own socio-economic programs, in consultation with affected parties.

### 10.2 Objectives

The objectives of the Socio-Economic Monitoring Plan are to:

- verify the accuracy and completeness of the socio-economic effects described in this volume and identify any additional effects
- determine the effectiveness of mitigation measures, management plans and programs in reducing or eliminating potential adverse effects
- determine the effectiveness of mitigation measures, management plans and programs in enhancing socio-economic benefits associated with the project
- adjust or develop new mitigation measures, as required
- provide direct and timely feedback to project managers, contractors, affected communities and government agencies

### 10.3 Monitoring Plan Strategy

#### 10.3.1 Key Elements

The plan will use and supplement reporting required by regulators, the public, GNWT, and Aboriginal organizations and agencies.

The plan will use participative monitoring methods, recognizing that managing many socio-economic issues can only be effective if done with the full cooperation of the project proponents, affected communities and government agencies. Decisions about suitable actions will require joint consideration by multiple stakeholders.

Regional-level committees will be created to monitor and report on:

- selected project-related effect indicators
- the effectiveness of mitigation measures, management plans and programs
- any unexpected effects that are identified

It is expected that three such committees would be required, one each for the BDR (ISR and GSA combined), the SSA and the DCR. Monitoring committee composition should be based on the project-related effects selected for monitoring, and the agencies responsible for mitigating and managing the effects.

The monitoring committees will function as working groups and should be limited in size. Committee membership will be selected in consultation with affected communities, and the committees could have representatives, or could access information from:

- the project
- communities
- regional health care and social services authorities
- local or regional RCMP detachments
- the pipeline working groups
- the GNWT, e.g., policy, resourcing and trans-regional issues coordination regarding:
  - transportation
  - economic development
  - education, culture and employment
  - health and social services
- local businesses
- local schools and Aurora College

Monitoring activities under the plan need to reflect the potential for community, regional and territorial socio-economic circumstances to change because of:

- normal growth
- the influences of other economic and political developments during construction and operations

Monitoring and analysis must attempt to distinguish between these effects and those of the project. The indicator information collected must be directly linked to the project.

An independent facilitator could be on each monitoring committee. The facilitator's responsibilities could include:

- arranging and facilitating committee meetings
- recording and circulating meeting minutes and assignments
- preparing annual monitoring reports for the committee
- liaison with the facilitators associated with the other regional committees to:
  - ensure consistency of purpose, process and intended outcomes
  - compare results

The monitoring committees should meet at least twice a year, more frequently if required.

As the project enters operations, and project-related activities and effects decrease, monitoring committee meetings could be reduced in frequency, until it is determined that the monitoring plan and committee are no longer needed.

Initial steps in developing and implementing the plan include:

- development of a conceptual plan
- meetings with study area communities to discuss the conceptual socio-economic monitoring plan, and the proposal for the regional committees to execute the plan
- regional workshops to identify and seek consensus on the conceptual plan, including:
  - project-related effects to be monitored
  - indicator data to be collected and reported on
  - composition of regional monitoring committees
  - schedules and locations of committee meetings

- nominating and selecting committee members in each region, to be completed at least six months before construction starts
- initial committee meeting in each region, scheduled before construction starts, to review and agree on the committee's mandate, tasks, process, schedules and intended outcomes
- developing operating budgets for the committees and determining responsibility for costs

The regional committees will be active before and during project construction. When project operations begin, it is expected that committee activities will decline, as described in Section 10.5, Project Effects Measurements – Operations.

#### **10.4 Project Effects Measurements – Construction**

The plan to monitor socio-economic effects during construction would include the list of effects identified previously in this volume. The process would require committee agreement on:

- project effects to be monitored
- indicator data for each effect
- frequency with which data readings are to be taken
- process of evaluating the indicator data and deciding what, if anything, needs to be done in addition to mitigation measures in place
- frequency with which the evaluations will be made
- period during which the effects are to be monitored

Four broad categories of project socio-economic effects were identified for monitoring. Each of these categories includes several topics. The committees might wish to focus on selected effects of concern because too many categories and subtopics could be unmanageable.

The four broad categories are:

- economic effects, including migration
- infrastructure, community service and governance
- individual, family and community wellness
- traditional culture

The indicator data for these effects includes relevant statistical data and reliable qualitative data. Primary reliance should be on quantitative data, with qualitative data used to help interpret the quantitative data. Where possible, simultaneous collection and analysis of quantitative and qualitative data is preferable, because each can serve as a check on the reliability of the other. Selecting indicators should take into account the availability of preproject baseline data, comparability across regions, and existing administrative data collection and reporting protocols.

The committee, or its designate, will write a report at the end of each construction year that describes:

- actual versus predicted effects
- effectiveness of mitigation and optimization measures
- recommendations for further mitigation or optimization measures, if warranted
- concerns that were addressed, related to socio-economic effects
- what management adjustments were made and with what effect

The committee, or its designate, will produce a final report describing:

- issues and challenges encountered during construction and first two years of operations
- responses
- effects of responses

This report will have relevance:

- when any project component is expanded or enlarged
- during future construction of a similar project, or similar project components

## **10.5 Project Effects Measurements – Operations**

At the end of construction, and after the associated cleanup and site restoration, most employment and opportunities induced by the project will end. There will be ongoing well drilling activities, and operations and maintenance activities associated with the anchor fields, pipelines and associated facilities. The employment levels associated with these operations activities will be a small fraction of the peak construction workforce.

Therefore, throughout operations, there will be no substantial residual effects on infrastructure, family and community wellness conditions and services, or preservation of any aspects of traditional culture. There will be no resulting need for mitigation measures, and no need for committees to monitor project effects.

The operations and maintenance employment generated will contribute to local capacity in only a few communities and will be long term. Training and employment for the long-term positions will be captured in indicator data before and during the first year or two of operations. Similarly, northern procurement for operations and maintenance of the anchor fields, pipelines and associated facilities will be established over the initial one or two years of operation. Beyond this period, project effects are expected to be largely undetectable and there would be limited value in continuing the socio-economic monitoring activities. The committees might choose to continue monitoring socio-economic information. However, the project's role will decline.

Ongoing reporting of benefits data will take place, consistent with any relevant requirements of project benefits and access agreements and the GNWT Socio-Economic Agreement.

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## GLOSSARY

<b>abandonment and reclamation</b>	The act of permanently stopping operations, removing facilities and restoring land to a productive state.
<b>Aboriginal person</b>	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.
<b>Aboriginal community</b>	A small community that is not a regional centre, in which 80% or more of the population is Aboriginal.
<b>Aboriginal Summit</b>	Negotiating body composed of virtually all the organized Aboriginal groups in the Northwest Territories, except the Deh Cho First Nation, which is not currently participating.
<b>adverse effect</b>	The impairment of, or damage to, the environment or health of humans, or damage to property, or loss of reasonable enjoyment of life or property.
<b>aesthetic resources</b>	The visual appearance of the natural landscape.
<b>AIDS</b>	The abbreviation for auto immune deficiency syndrome.
<b>anchor fields</b>	The three natural-gas fields, Niglintgak, Taglu, and Parsons Lake, whose production will provide the initial volume of gas shipped in the project pipelines.
<b>APG</b>	The abbreviation for Aboriginal Pipeline Group.
<b>archaeological site</b>	Where an archaeological artifact is found.
<b>artifact</b>	Any tangible evidence of human activity that is more than 50 years old, in respect of which an unbroken chain of possession cannot be demonstrated.
<b>ASEP</b>	The abbreviation for Aboriginal Skills and Employment Partnership.
<b>baseline</b>	A surveyed condition that serves as a reference point to which later surveys or assessments are coordinated or correlated.
<b>BDR</b>	The abbreviation for Beaufort Delta Region.

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<b>biophysical</b>	Referring to the air, noise, aquatic (groundwater, hydrology, water quality and fisheries) and terrestrial (soils, landforms, permafrost, vegetation and wildlife) conditions in the project area.
<b>borrow site</b>	An area that could be excavated to provide material, such as gravel or sand, to be used, where required, by the project.
<b>BP</b>	The abbreviation for before present.
<b>BTEX</b>	The abbreviation for benzene, toluene, ethyl benzene and xylene.
<b>COGOA</b>	The abbreviation for <i>Canada Oil and Gas Operations Act</i> .
<b>combined effects</b>	The total effect of the three anchor fields, the gathering system and the pipeline corridor.
<b>compressor station</b>	A facility containing equipment that is used to increase pressure to compress natural gas for transportation in a pipeline.
<b>Construction Phase</b>	The phase of a project preceding the Operations Phase, during which project facilities and infrastructure are assembled and installed, and connected and tested to ensure that they operate as designed.
<b>country food</b>	Food traditionally harvested and eaten by local Aboriginal residents.
<b>critical habitat</b>	The habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species, according to the <i>Species at Risk Act</i> .
<b>CRSP</b>	The abbreviation for Canadian registered safety professional.
<b>cumulative effects</b>	Changes to the environment caused by an action, including projects and activities, in combination with other past, present and future human actions.
<b>DCLUPC</b>	The abbreviation for Deh Cho Land Use Planning Committee.
<b>DCR</b>	The abbreviation for Deh Cho Region.
<b>debitage</b>	Remains of stone tool manufacture and use.

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<b>decommissioning</b>	The act of taking a processing plant or facility out of service and isolating equipment, to prepare for routine maintenance work, suspending or abandoning.
<b>devolution</b>	Ongoing negotiations between the Government of Canada, the GNWT and the Aboriginal Summit that will transfer the current INAC control over land, water and resources to GNWT or Aboriginal settlement area governments.
<b>direct economic effect</b>	Effect on industries (firms) that expand production to satisfy increased demand created by the project.
<b>direct employment</b>	Employment related to a direct economic effect.
<b>direction</b>	Referring to an effect, the ultimate long-term trend of the effect. It can be adverse, neutral or positive, or a combination of these.
<b>duration</b>	Referring to an effect, how long an effect will occur for, or how long it will take a valued component to recover from an impact.
<b>EIS</b>	The abbreviation for environmental impact statement.
<b>employment rate</b>	Percentage of persons 15 years of age and over who are employed.
<b>environmental effect</b>	Any effect of any project-induced change on: <ul style="list-style-type: none"><li>• economic conditions</li><li>• social and cultural conditions</li><li>• the current use of lands and resources for traditional purposes by Aboriginal people</li><li>• any structure, site or thing that is of historical, archaeological, paleontological or architectural significance</li></ul> Also, any change to the project that might be caused by the environment.
<b>environmental impact assessment</b>	The process of evaluating the biophysical, social and economic effects of a proposed project.
<b>environmental impact statement</b>	A report containing the environmental impact assessment.

<b>environmentally protected areas</b>	Areas with special designations that, through legislation or other means, are protected in some form or are given special status.
<b>environmentally sensitive area</b>	An area designated in regional or local land use plans, or by a local, regional, provincial or federal government body as being sensitive to disturbance, or identified by an applicant as being sensitive for some reason.
<b>facilities</b>	Structures of the gathering and gas pipeline systems, including compressor and pump stations, block valves, pigging facilities, heater stations and meter stations.
<b>FAS/FAE</b>	The abbreviation for foetal alcohol syndrome/foetal alcohol effects.
<b>FFG</b>	The abbreviation for formula financing grant.
<b>five-year mobility status</b>	Referring to migration, the relationship between a person's usual place of residence on the census date compared to the previous five years.
<b>FTE</b>	The abbreviation for full-time equivalent.
<b>gas conditioning facility</b>	A facility located at each anchor field, which collects raw gas from the wells, and dehydrates and conditions the product for transport through the gathering system.
<b>gas pipeline</b>	The proposed gas pipeline that would extend from the Inuvik area facility, parallel to the NGL pipeline along the Mackenzie River to Norman Wells, and continue south to connect to an extension of the existing Alberta system south of the Northwest Territories–Alberta boundary. Also known as the <i>Mackenzie Valley Pipeline</i> .
<b>gathering pipelines</b>	Four pipelines, also known as laterals, that transport natural gas and NGLs from the anchor fields to the Inuvik area facility. These include the Niglintgak lateral, Taglu lateral, Parsons Lake lateral and Storm Hills lateral.
<b>gathering system</b>	A system of pipelines and associated facilities that include four gathering pipelines, the Inuvik area facility, the NGL pipeline and related facilities, such as valves, pig launchers and receivers.

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<b>geographic extent</b>	Quantitative measurement of the area within which an effect occurs.
<b>GNWT</b>	The abbreviation for the Government of the Northwest Territories.
<b>granular resources</b>	Sand, gravel, clay, quarry materials and silt.
<b>grub stake</b>	Investment in consumables and other supplies required to support traditional harvesting.
<b>GSA</b>	The abbreviation for Gwich'in Settlement Area.
<b>heritage resources</b>	Cultural, historic, archaeological and palaeontological resources, including pre-contact and post-contact features.
<b>historic archaeological resources</b>	Sites, artifacts, structures and documents that relate to the influx of Euro-Canadians in the region, and date to the last 250 years.
<b>HIV</b>	The abbreviation for human immunodeficiency virus.
<b>HRIA</b>	The abbreviation for heritage resources impact assessment.
<b>HRSD</b>	The abbreviation for human resources skills development.
<b>HSS</b>	The abbreviation for Health and Social Services, a department of the Government of the Northwest Territories.
<b>human health</b>	A state of complete physical, mental and social well-being, and the ability to adapt to the stresses of daily life.
<b>human health assessment</b>	Determining the effect of hazardous substances, environmental factors and exposure conditions on local and regional populations, including qualitative and quantitative analyses.
<b>ICC</b>	The abbreviation for industrial and commercial centres.
<b>INAC</b>	The abbreviation for Indian and Northern Affairs Canada.
<b>indirect economic effect</b>	The result of project contractors and suppliers purchasing additional required inputs from other firms.
<b>indirect employment</b>	Employment related to an indirect economic effect.

<b>induced economic effect</b>	The result of firms expanding production because of direct and indirect effects, hiring more staff and paying out wages, thereby increasing household income. Households, after withdrawing a portion for taxes and savings, spend this income, which in turn increases demand for other commodities.
<b>induced employment</b>	Employment related to an induced economic effect.
<b>infrastructure</b>	Basic facilities, such as transportation, communications, power supplies and buildings, which enable an organization, project or community to function.
<b>international migrants</b>	Individuals who move between countries.
<b>inter-provincial migrants</b>	Individuals who move between provinces and territories.
<b>intra-territorial migrants</b>	Individuals who move within communities in the Northwest Territories.
<b>Inuvik area facility</b>	The processing facility to be located near Inuvik where gas and liquids will be processed and separated, then delivered to the gas and NGL pipelines.
<b>I-O Model</b>	The abbreviation for the Statistics Canada input–output model.
<b>ISR</b>	The abbreviation for Inuvialuit Settlement Region.
<b>JRP</b>	The abbreviation for Joint Review Panel.
<b>km</b>	The metric symbol for kilometre.
<b>labour force</b>	Individuals 15 years of age or older that are working or actively seeking employment.
<b>lateral</b>	A gathering pipeline that connects the production area facilities to the Inuvik area facility.
<b>leakage</b>	Portion of investment in a region or jurisdiction that results in the import of a good or service.
<b>lithic</b>	Of, or pertaining to, stone.

<b>local study area</b>	A 1-km-wide buffer or corridor around each of the three lease areas, gathering pipelines rights-of-way, facility infrastructure sites, gas pipeline right-of-way and borrow sites.
<b>LSA</b>	The abbreviation for local study area.
<b>Mackenzie Gas Project</b>	A project that will develop three onshore natural gas anchor fields in the Mackenzie Delta and transport natural gas by pipeline to market in northwestern Alberta by 2009. The project comprises the anchor fields, wells, gathering pipelines and associated facilities, work camps, material stockpiling and shipping sites, roads, borrow sites, and other associated infrastructure.
<b>magnitude</b>	Relating to an effect, the severity or intensity of the effect. It is rated as low, moderate or high.
<b>Métis</b>	A person with a mixture of Aboriginal and non-Aboriginal ancestry.
<b>migrants</b>	Individuals who move to a different community.
<b>migration</b>	Moving from one jurisdiction to another to establish a permanent residence in the new jurisdiction.
<b>mitigation</b>	The elimination, reduction, or control of a project's adverse effects, including restitution for any damage to the environment caused by such effects through avoidance, replacement, restoration, compensation or other means.
<b>monitoring</b>	Periodic inspection to meet the following objectives: <ul style="list-style-type: none"><li>• observe and report on compliance with approval conditions</li><li>• confirm effectiveness of approved protection measures</li><li>• verify the accuracy of impact predictions</li><li>• identify any effects not predicted in the impact assessment</li></ul>
<b>movers</b>	Individuals who have changed their community of residence.
<b>NEB</b>	The abbreviation for National Energy Board.
<b>NAIT</b>	The abbreviation for Northern Alberta Institute of Technology.

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<b>natural gas</b>	A compressible mixture of hydrocarbons with a low specific gravity that occurs naturally in a gaseous form.
<b>natural gas liquids</b>	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.
<b>NGL</b>	The abbreviation for natural gas liquids.
<b>NGL pipeline</b>	The pipeline connecting the Inuvik area facility with the Enbridge Pipeline facilities at Norman Wells.
<b>NGO</b>	The abbreviation for nongovernmental organization.
<b>NGTL</b>	The abbreviation for NOVA Gas Transmission Ltd.
<b>Niglintgak field</b>	The anchor field to be developed by Shell Canada Limited, which includes three well pads, one gas conditioning facility, flow lines and supporting infrastructure. The gas conditioning facility might be barge-based or land-based.
<b>Niglintgak lateral</b>	The gathering pipeline connecting the Niglintgak gas conditioning facility to a connection point on the Taglu lateral at the outlet of the Taglu gas conditioning facility.
<b>nonmigrants</b>	Individuals who move only within their community or do not move at all.
<b>nonrenewable resources</b>	Resources, such as fossil fuels, i.e., oil, gas, coal and minerals, that occur naturally but cannot be replaced once exploited.
<b>nontraditional land use</b>	Land and resource use for residents and nonresidents of the Northwest Territories, including hunters and fishers, tourists, and government and industry representatives.
<b>nontraditional resource harvesting</b>	Includes hunting, fishing and trapping pursued by non-Aboriginal residents for domestic, sport or commercial purposes.
<b>NTCL</b>	The abbreviation for Northern Transportation Company Limited.
<b>Operations Phase</b>	The phase of a project during which the pipeline and associated facilities are operated.

<b>PAI</b>	The abbreviation for potential acid input.
<b>palaeontological sites</b>	Sites bearing evidence of multi-cellular invertebrate and vertebrate faunal remains, and plant materials that have been fossilized or otherwise preserved.
<b>Parsons Lake field</b>	The anchor field to be developed by ConocoPhillips Canada (North) Limited and ExxonMobil Canada Properties. Initially, the field will consist of the north pad, which will have one pad for the well sites and gas conditioning facility. A second well pad will be developed five to 10 years after the north pad.
<b>Parsons Lake lateral</b>	The gathering pipeline connecting the Parsons Lake gas conditioning facility to a connection point at the Storm Hills pigging facility.
<b>participation rate</b>	Percentage of persons 15 years of age and over who are in the labour force.
<b>pipeline corridor</b>	The 1-km-wide area that centres on the combined right-of-way for the gas and NGL pipelines, from the Inuvik area facility south to the NGTL interconnect facility in Alberta, defined for the purpose of the EIS biophysical baseline and effects assessment studies.
<b>PITS</b>	The abbreviation for Petroleum Industry Training Service.
<b>PM<sub>2.5</sub></b>	Respirable particulate matter, with a nominal diameter of 2.5 µm or smaller.
<b>POTC</b>	The abbreviation for Pipeline Operations Training Committee.
<b>potential acid input</b>	The sum of the wet and dry deposition of sulphur and nitrogen compounds that have the potential to contribute to acidification of the receiving environment.
<b>potential labour supply</b>	Composed of people who are unemployed and those not in the labour force who do want a job, less those who, because of disability, age, illiteracy, lack of education, skills or training and lack of interest in employment, could be considered unemployable.
<b>prehistoric archaeological resources</b>	Archaeological sites, objects and affiliated materials that represent occupation by Aboriginal peoples before the arrival of European goods, people and the historic records that characterize their culture (in North America).

<b>production area</b>	The area that encompasses all project components located north of the Inuvik area facility, including the Niglintgak, Taglu and Parsons Lake fields, the gathering pipeline and associated facilities, infrastructure, and the 1-km buffer area surrounding each of these project components.
<b>project components</b>	The three anchor fields, Niglintgak, Taglu, and Parsons Lake, the gathering system and the gas pipeline.
<b>project proponents</b>	The five organizations (Imperial Oil Resources Ventures Limited, the APG, ConocoPhillips Canada (North) Limited, Shell Canada Limited and ExxonMobil Canada Properties) that are undertaking the Mackenzie Gas Project.
<b>project-specific effect</b>	An effect caused by the project. Such effects are sometimes referred to as direct effects as they only include the project's contribution to the effect (as opposed to cumulative effects, in which case other projects would contribute to the effect).
<b>project, the</b>	The abbreviation for the Mackenzie Gas Project.
<b>PWNHC</b>	The abbreviation for Prince of Wales Northern Heritage Centre.
<b>RCMP</b>	The abbreviation for Royal Canadian Mounted Police.
<b>reclamation</b>	The process of re-establishing a disturbed site to a former or other productive use, not necessarily to the same condition that existed before disturbance. The land capability might be at a level different, i.e., lower or higher, than that which existed prior to the disturbance, depending on the goal of the process. Reclamation includes the management of a disturbed site and revegetation where necessary.
<b>regional study area</b>	A 15-km-wide buffer around the three anchor fields, on either side of the gathering pipelines rights-of-way and on either side of the gas pipeline right-of-way.
<b>renewable resources</b>	Natural resources, e.g., forests, fresh water, fish, that can renew themselves and are normally replaced or replenished by natural processes. These resources are not depleted by moderate use.
<b>resident, northern</b>	A Canadian citizen or landed immigrant who has been living in the Northwest Territories (NWT) for at least one year and has a NWT health card.

<b>residual effects</b>	Environmental or socio-economic effects that remain after mitigation. Effects that are present after mitigation has been applied.
<b>right-of-way</b>	The pipeline easement in which the pipeline will be installed and operated. The pipeline right-of-way width for the project will vary from 30 to 50 m, depending on pipe size and the number of pipes to be installed in the trench.
<b>RSA</b>	The abbreviation for regional study area.
<b>RWED</b>	The abbreviation for Resources, Wildlife and Economic Development, a department of the Government of the Northwest Territories.
<b>SAIT</b>	The abbreviation for Southern Alberta Institute of Technology.
<b>SEIA</b>	The abbreviation for socio-economic impact assessment.
<b>social infrastructure</b>	Health, social wellness and education services that might be affected by project-related activities.
<b>socio-economic effect</b>	Any effect of the project on a social or economic condition or service, including direct effects as well as effects resulting from a change in the environment.
<b>specific effects</b>	Effects of a specific component or activity of a project.
<b>SSA</b>	The abbreviation for Sahtu Settlement Area.
<b>STI</b>	The abbreviation for sexually transmitted infection.
<b>Storm Hills lateral</b>	The gathering pipeline connecting the Storm Hills pigging facility to a connection point at the inlet of the Inuvik area facility.
<b>study area</b>	The area within the spatial boundaries of the scope of the socio-economic effects assessment.
<b>Taglu field</b>	The anchor field to be developed by Imperial Oil Resources Limited, consisting of one site that will include the well pads, gas conditioning facility, flow lines and supporting infrastructure.

<b>Taglu lateral</b>	The gathering pipeline connecting the Taglu gas conditioning facility to a connection point at the Storm Hills pigging facility.
<b>TK</b>	The abbreviation for traditional knowledge.
<b>traditional knowledge</b>	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.
<b>UHF</b>	The abbreviation for ultra high frequency.
<b>unemployment rate</b>	Percentage of the labour force that is unemployed.
<b>utilidor</b>	An insulated linear container for municipal utility services such as water and sewerage.
<b>valued component</b>	Characteristic or feature that represents important socio-economic conditions identified by assessment specialists, communities or stakeholders.
<b>VC</b>	The abbreviation for valued component.
<b>VHF</b>	The abbreviation for very high frequency.
<b>visual resources</b>	Land, water, vegetation, animals and structures that are visible on the land.
<b>waterbody</b>	A body of water up to the high-water mark, including canals, reservoirs, oceans and wetlands, but not including sewage or waste treatment lagoons.
<b>well-being</b>	Everything that affects the experience of life, including the circumstances of physical existence and the quality of relationships.
<b>wellness</b>	Includes physical, emotional and mental health, and relationship well-being.