

## 4 INFRASTRUCTURE AND COMMUNITY SERVICES

This section presents information on project effects on the infrastructure that makes provisions for basic needs in the study area communities, and on the governance arrangements that provide for delegation and exercise of authority.

Specific consideration has been given to project effects on:

- transportation types and availability
- utilities arrangements
- energy sources and supplies
- housing conditions and availability
- kinds and adequacy of recreation resources

Somewhat detailed information is provided on changes in governance in several devolution agreements now agreed to in principle and under consideration in ongoing negotiations.

See Section 5, Individual, Family and Community Wellness, for a discussion of other community services.

### 4.1 Transportation Infrastructure and Use

*How will the project affect the quality of transportation infrastructure and availability of transportation services?*

#### 4.1.1 Effect Pathways

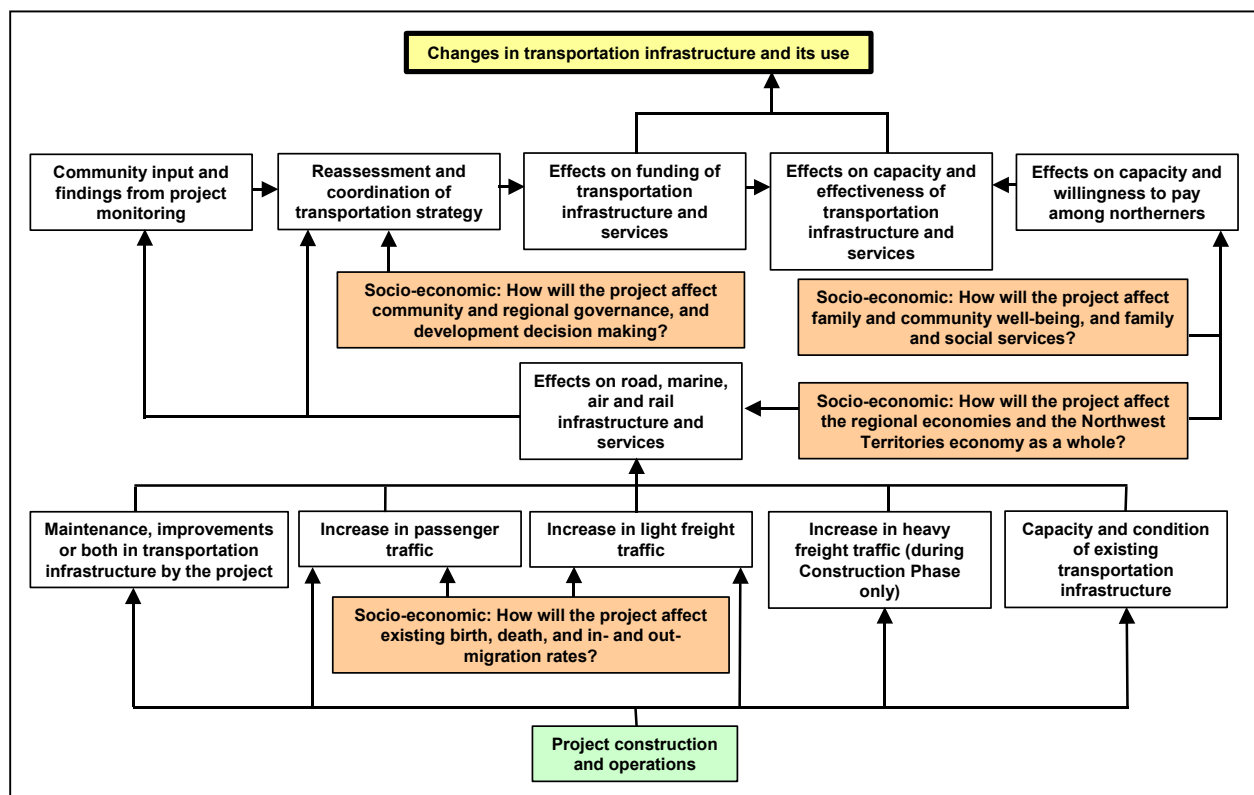
This section provides information about expected influences of the project on transportation infrastructure quality and availability in the Northwest Territories. The general project effects on highway, railroad, barging and air transportation infrastructure and services will be:

- 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 4-1 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.



**Figure 4-1: Project Effects on Transportation Infrastructure and Services**

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

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.

#### 4.1.2 Existing Baseline Conditions

Table 4-1 shows the current transportation infrastructure for the regional centres. In addition to the regional centres, data is presented for Fort Good Hope and Tulita because both will be sites of considerable barging activity and stockpiling.

**Table 4-1: Transportation Infrastructure (2001)**

Data Type	Inuvik	Norman Wells	Fort Simpson	Yellowknife	Hay River	Fort Good Hope	Tulita
Road access	All-weather road, seasonally restricted	330 km winter road from Wrigley	All-weather road, seasonally restricted	All-weather road, seasonally restricted	All-weather highway	480 km winter road from Wrigley	250 km winter road from Wrigley
Road Availability	All year but at freezeup and breakup	Mid-February to mid-March	All year but at freezeup and breakup	All year but at freezeup and breakup	All year	Mid-February to mid-March	Mid-February to mid-March
Average daily traffic	2001=1,120 2000=1,120 1999=1,150	1999=204 1998=1,476 1997=120	2000=911	2001=5,060 2000=4,980	2001=2,440 2000=2,420	1998=132 1997=648	1998=108 1997=240
Highway number	Dempster Hwy No. 8	Winter road	Fort Simpson access (off Mackenzie Hwy No. 1)	Highway Nos. 1 and 3	Highway Nos. 1 and 2	Winter road	Winter road
Road surface	Paved, dust-controlled gravel, untreated gravel	Winter road	Paved, dust-controlled gravel, untreated gravel	Paved, dust-controlled gravel, untreated gravel	Paved	Winter road	Winter road
Average opening and closing dates (1997–2000), ice bridges	Nov. 28 – Apr. 29	Jan. 11 – Mar. 16	Nov. 29 – Apr. 19	Jan. 2 – Apr. 17	Never seasonally closed	Jan. 6 – Mar. 16	Late Jan. – Mar. 16
Marine resupply available, or tonnage/year	7	8	No	Yes	No	4	4
Ownership of facility	T, P	2 by GNWT, 1 by Imperial Oil Limited	T	P	T, P	T	T

Table 4-1: Transportation Infrastructure (2001) (cont'd)

Data Type	Inuvik	Norman Wells	Fort Simpson	Yellowknife	Hay River	Fort Good Hope	Tulita
Resupply facility classification	A	1 for Imperial Oil Limited oil, 2 classed as A	C	A	A	B	C
Small boating facilities	Jet float dock, private docks, boat launch	Community use facility, beach landing	Jet float dock, community boat launch, private docks	City boat launch, private- and government-owned wharfs and floats	Porritt Landing, west channel beach landing and wharf, floating dock	Beach landing only	Public landing, beach landings
Air runway length	1,829 m	1,829 m	1,829 m	2,286 m, 1,524 m	1,829 m, 1,220 m	914 m	914 m
Runway surface	Asphalt	Asphalt	Asphalt	Asphalt	Asphalt, asphalt and gravel	Gravel	Gravel
Airfield owner	GNWT	GNWT	GNWT	GNWT	GNWT	GNWT	GNWT
Critical aircraft	B737	B737	B737-200	B737	B737	Twin Otter	Twin Otter
Weather and communication aids	FSS	FSS	FSS	FSS	FSS	CARS	CARS
Navigational aids	ILS, DME, NDB	DME, NDB	DME, NDB	ILS, DME, NDB	ILS, DME, NDB	DME, NDB	NDB
<p>NOTES:</p> <p>GNWT = Government of the Northwest Territories</p> <p>Water Transportation:  T = owned by federal government  P = privately owned</p> <p>Resupply Facility Classification:  A = &gt;10,000 t cargo and fuel in and out per year, protected access at all water levels, secure moorage for loading and unloading, access for heavy equipment, secure staging and marshalling site  B = 2,000–10,000 t cargo and fuel in and out per year, secure moorage at all water levels, access 4 hours/day, access for heavy equipment, secure staging and marshalling site  C = &lt;2000 t cargo and fuel in and out per year, access for loading and unloading 4 hours/day, access available for heavy equipment, secure staging and marshalling site</p> <p>Air Transportation:  CARS = Community Airport Radio Station  DME = Distance Measuring Equipment  FSS = Flight Service Station  ILS = Instrument Landing System  NDB = Nondirectional Beacon</p>							
<p>SOURCES: GNWT Transportation (1995, 2000, 2001), Infonorth (2002), Dempsey (2004, personal communication), Fort Simpson flight service personnel (2004, personal communication)</p>							

All the regional centres, except Norman Wells, have all-weather road connections to the south, although they are seasonally restricted in Inuvik, Fort Simpson and Yellowknife. Fort Good Hope and Tulita only have winter road connections. Before construction begins, the winter road north of Wrigley will be improved by

construction of permanent bridges over major watercourses on the route to Norman Wells and Fort Good Hope, with the exception of the Great Bear River.

All these communities have barging facilities and depend on river resupply. In terms of their resupply classifications:

- Inuvik, Norman Wells, Yellowknife and Hay River are all Category A – greater than 10,000 t cargo and fuel in and out per year, protected access at all water levels, secure moorage for loading and unloading, access for heavy equipment, and a secure staging and marshalling site
- Fort Good Hope is Category B – 2,000 to 10,000 t cargo and fuel in and out per year, secure moorage at all water levels, access four hours a day, access for heavy equipment, and a secure staging and marshalling site
- Fort Simpson and Tulita are Category C – less than 2,000 t cargo and fuel in and out per year, access for loading and unloading four hours a day, access for heavy equipment, and a secure staging and marshalling site

The number of resupply shipments these companies typically have received per year ranges from community to community. All have a small boat landing facility, although Fort Good Hope has only a beach landing.

The regional centres all have runways 1,829 m in length, except Yellowknife, which has a 2,286-m runway and a 1,524-m runway. Fort Good Hope and Tulita both have runways 914 m long. All these facilities are operated by GNWT. The regional centre runways can accommodate B737 aircraft (a B737-200 only in the case of Fort Simpson), but Fort Good Hope and Tulita are restricted to smaller aircraft. All the airports have the weather, communications and navigational aids indicated in Table 4-1, shown previously.

Table 4-2 lists the numbers of companies providing scheduled transportation services to these communities. All have water freight and highway freight services, although in the cases of Norman Wells, Fort Good Hope and Tulita, highway freight is available only during the 10-week period that the winter road can be used. Highway freight to Inuvik, Yellowknife and Fort Simpson is seasonally restricted. Only Hay River has railroad freight service.

All these communities are served by at least six scheduled flights per week by one or more companies. All the regional centres have courier services, typically by air, but by road to communities with highway connections.

**Table 4-2: Number of Companies Providing Scheduled Transportation Services in the Study Area, by Type of Service**

Service Type	Inuvik	Norman Wells	Fort Simpson	Yellowknife	Hay River	Fort Good Hope	Tulita
Scheduled bus service <sup>1</sup>	0	0	1	1	1	0	0
Highway freight service <sup>1</sup>	3	1	3	5	5	1	1
Road, air courier service <sup>1</sup>	4	1	2	8	3	0	0
Water freight service <sup>1</sup>	1	1	1	2	1	1	2
Rail freight service <sup>1</sup>	No	No	No	No	1	No	No
Scheduled air service <sup>2</sup>	11	7	6	40	15	6	9

SOURCES:  
<sup>1</sup> Northwest Territories Arctic Tourism (2003) and Northwestel (2001, personal communication)  
<sup>2</sup> Airline company personnel (2003, personal communication)

Of these communities, only Hay River is served by rail. The Mackenzie Northern Railway, owned by Rail Link Canada, has trackage between Edmonton, Peace River, High Level, Enterprise and Hay River. The current schedule has train movements between Edmonton and Peace River seven days per week. From Roma Junction, located near Grimshaw, to High Level, there are three trains per week. From High Level to Enterprise and Hay River there are two trains per week outside the fuel-hauling seasons. However, during the fuel-hauling seasons (January to March and May to July), there are three trains per week into Enterprise and Hay River.

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

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 in the ISR, GSA and SSA

- 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.

- if the barge-based option is chosen, the Niglintgak gas conditioning facility will be constructed off-site on an ocean-going barge, then towed to Kumak Channel, adjacent to Richards Island, by ocean-going tug by way of Bering Strait, Beaufort Sea and then through the Mackenzie Delta. The barge will be grounded in place in Little Kumak Channel.

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.

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

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 right-of-way. Also, a 19-km all-weather gravel road will be required to access the Inuvik area facility from the Mackenzie Highway near Inuvik, and a 26-km road will be required to connect the Trail River compressor station with the Mackenzie Highway. New winter-only and winter roads (two each) will also be required.

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. If the barge-based option is chosen, an ocean-going tug will tow an ocean-going barge containing the gas conditioning facility to Niglintgak by way of Bering Strait, Beaufort Sea, and several bays and channels in the Mackenzie Delta.

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 of Inuvik, Norman Wells and 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, such as Fort Good Hope, Wrigley and Trout Lake. In the hub communities of Yellowknife and Hay River, there will also be some increased use of commercial air service by project-related people, and some northern residents taking advantage of increased income to travel more widely.

At each of the proposed construction camps, an airstrip or helipad will be required for personnel travel, continuous camp resupply of perishable and urgently needed items, and emergency medical evacuation. It will be necessary to:

- extend and widen the existing air strips at Swimming Point, Little Chicago, Fort Good Hope and Little Smith Creek
- develop new gravel strips near the Little Chicago compressor site and Backwater River compressor site

- develop winter ice strips at Niglintgak and at selected locations along the pipeline route
- develop permanent airstrips at Taglu and Parsons Lake

It might be necessary to develop temporary facilities at or near the regional centre airports for personnel use if weather delays flights. These facilities must be heated, providing washrooms, seating, cots, food and beverages for construction personnel in transit.

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.

#### **4.1.4 Mitigation Measures**

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 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

#### 4.1.5 Transportation – Beaufort Delta Region

In this section, the focus is on examination of project effects on transportation in the BDR, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

In this portion on the BDR, the transportation issues of concern to both the Inuvialuit and the Gwich'in areas are combined. This region has a single hub, Inuvik, for transportation, government and service delivery. It serves the outlying two GSA and five ISR communities.

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

Inuvik is the regional focal point for road, marine and air traffic. In most cases, passengers and freight arriving from outside this region stop in Inuvik. Two exceptions are noteworthy:

- first, assuming the barge-based option is chosen, the ocean-going gas conditioning facility barge will be routed directly to Niglintgak by way of Bering Strait, Beaufort Sea, and various bays and channels in the Mackenzie Delta. If dredging in the Mackenzie Delta or channels is necessary to transport the gas conditioning facility barge to Niglintgak, the implications on traditional marine mammal harvesting and fishing will have to be evaluated. The potential effect of barging on the riverine environment, including whales and fish, is of particular concern to both Inuvialuit and Gwich'in people. Attendees at the first ISR–GSA regional technical workshop in April 2003, the NGO environmental impact assessment workshop in December 2003 and the second ISR–GSA regional technical workshop in February 2004, expressed this concern. It was also part of the discussion between project representatives and attendees of the Inuvialuit game council meeting in February 2004.
- second, drill rigs, pipe, material and equipment for the three anchor fields will be barged down the Mackenzie River directly to Niglintgak and Taglu, and to stockpile locations at Lucas Point, Tununuk Point (Bar-C), Camp Farewell and possibly Tuktoyaktuk

However, it is the operation of the Inuvik airport and barge landing that will be most affected.

According to present planning, project freight hauling over the Dempster Highway to Inuvik will be minimal compared with the volume of project fuel, camps, modules, and drilling and construction equipment transported by barge to Inuvik and the production area. Nevertheless, some increase in truck traffic must be expected, with a potential for increased road maintenance. Such an increase will likely be to the economic benefit of maintenance contractors in Inuvik and Fort McPherson.

#### 4.1.5.2 Mitigation Measures

In addition to management and mitigation already mentioned in Sections 4.1.3, Assessment and Management of Project-Specific Effects, and 4.1.4, Mitigation Measures, some specific mitigation measures that should be implemented include the following:

- if dredging is required, consulting and cooperating with government agencies, and regional game and resource councils will be necessary to address concerns over potential disruption of existing river and marine transportation
- scheduling any potential dredging activities to avoid beluga calving and traditional harvesting periods, where practical
- using the marine bypass road in Inuvik for truck movements between the barge landing, the Inuvik area facility and the large construction camp near Campbell Lake

The project proponents recommend that the responsible authority provides:

- pre-construction upgrading and other improvements where necessary
- additional ongoing road maintenance and dust suppression on the bypass road in Inuvik, and the Dempster Highway between Fort McPherson and Inuvik

Attendees of the second ISR–GSA regional technical workshop suggested involving government agencies, such as Fisheries and Oceans Canada and Canadian Wildlife Service, in scheduling barge-associated activities such as dredging.

#### 4.1.5.3 Residual Effects

As indicated in preceding discussions, without carefully planned mitigation, BDR residents are expected to be negatively affected by project effects on:

- air travel
- air and barge freight services
- local roads and the Dempster Highway

However, these adverse effects are relatively preventable, given planning that is properly implemented. Note that they are only relatively preventable, because there likely will be occasional disruptions because of unforeseen circumstances. Table 4-3 shows the project effect attributes based on these assumptions. The effects are expected to be more pronounced for the air and marine modes, i.e., moderate, than for roads, i.e., low, but in all cases are expected to last only during construction and are not significant.

Table 4-3: Transportation – Project Effect Attributes for the Beaufort Delta Region

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

#### 4.1.5.4 Operations Effects

The increases in road, marine and air transport throughout construction will decline once construction is complete. Drilling programs will continue in the anchor fields and exploratory drilling might increase at that time, but the effects on the transportation systems will be much less than during the construction years, and largely confined to the winter months and the use of winter roads. Also, the project could result in some increase in transportation capacity. Mitigation measures will largely include:

- additional maintenance of winter roads
- awareness and enforcement of speed limits for heavy truck traffic using these roads

No residual effects are expected during operations.

#### 4.1.6 Transportation – Sahtu Settlement Area

In this section, the focus is on examination of project effects on transportation in the SSA, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

Norman Wells is the focal point for marine and air traffic in the SSA. To a lesser extent, it is also a centre for winter road transport. Although it has no all-weather road, it does have a winter road connection to the south via Wrigley, and to the north and east via Fort Good Hope and Colville Lake. Virtually all passengers and most of the freight arriving from outside this region stop in Norman Wells, whether it or a small outlying community is the final destination. A clear exception is freight being barged directly to Tulita or Fort Good Hope. Therefore, although several smaller communities might experience effects on their airstrip operations as described in Section 4.1.3, Assessment and Management of Project-Specific Effects, operation of the Norman Wells airport will be most affected.

According to present planning, most project freight will be moved by barge. Perishable foods for the construction camps will be flown in, and other foods and

camp supplies not delivered by barge will be trucked in via winter road. The result will be an increase in traffic on the winter road to Norman Wells, but not enough to threaten transportation services to, or motor vehicle safety for, other SSA communities. However, residents in communities other than Norman Wells expressed concern about increases in traffic. During the first and second rounds of consultation meetings in Déline, reference was made to the increase in the number of vehicles in the Colville Lake area because of increased gas exploration. These people not only expressed concern about the increase in traffic, but the fact that some of the trucks were not being driven in a safe and courteous manner. Because there will be increased traffic on the winter road, there will be some increase in needed road maintenance. Participants at the Sahtu regional confirmation meeting in May 2004 also suggested that conversations with the RCMP should start now to develop an emergency preparedness plan for transportation incidents. They felt that by starting these conversations now, there could be an increase in the coordination of road and safety maintenance efforts among the GNWT, project proponents and Sahtu communities. This increase will likely be to the economic benefit of some people in Tulita, Norman Wells, Fort Good Hope and Colville Lake.

#### **4.1.6.2 Mitigation Measures**

The mitigation measures described in Section 4.1.4, Mitigation Measures, all apply to the SSA.

#### **4.1.6.3 Residual Effects**

As indicated in preceding discussions, without carefully planned mitigation, project effects on air travel, and air and barge freight services and travel on winter roads in the region could be severely disadvantageous to SSA residents. However, these adverse effects are relatively preventable, given effective planning that is suitably implemented. At the same time, it is acknowledged that there likely will be occasional disruptions because of unforeseen circumstances.

Positive effects on air transportation infrastructure in Norman Wells, i.e., early resurfacing of the runways and installation of an instrument landing system, and Fort Good Hope, i.e., an upgraded and extended airstrip that can accommodate larger aircraft service, might also be attributed to the project.

The project effect attributes, seen in Table 4-4, are based on all these assumptions. The effects are expected to be moderate magnitude for all modes of transportation, and will last only during construction.

Table 4-4: Transportation – Project Effect Attributes for the Sattu Settlement Area

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

#### 4.1.6.4 Operations Effects

Road, marine and air transport traffic, which will increase during construction, will decline dramatically once construction is complete. Exploratory drilling by other operators is expected to continue in the Colville Lake area. The two compressor stations in the SSA will be staffed during the startup and stabilization period, and then will become remote operations regularly visited by crews using helicopters. Similarly, pipeline monitoring and maintenance will be managed out of a base in Norman Wells, utilizing air and ground surveillance. As a result, operations effects on transportation in the SSA will be a fraction of that during the construction years. Also, the project could result in some increase in transportation capacity. Thus, there will be no need for additional mitigation beyond local and winter road maintenance, and dust suppression as needed. There will be no residual adverse effects in the SSA during operations.

#### 4.1.7 Transportation – Deh Cho Region

In this section, the focus is on examination of project effects on transportation in the DCR, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

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 next section (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, past Tulita to Norman Wells, and on to Fort Good Hope.

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 the smaller communities of Wrigley and Trout Lake.

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, particularly by residents of Fort Providence. Their 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, Fort Simpson Métis representatives in August 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.

Aboriginal communities along both the all-weather and winter roads 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.

#### **4.1.7.2 Mitigation Measures**

The mitigation measures described in Section 4.1.4, Mitigation Measures, all apply to the DCR.

The project proponents recommend that the responsible authority provide:

- pre-construction 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

**4.1.7.3 Residual Effects**

As indicated in preceding discussions, without carefully planned mitigation, project effects on air travel, and air and barge freight services could be disadvantageous to 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 4-5, are based on all these assumptions. The effects are expected to be moderate magnitude for the road and air modes, but only low magnitude for the marine mode. All will last only during construction.

**Table 4-5: Transportation – Project 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

**4.1.7.4 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 will be negligible, and there will be no need for additional mitigation and no residual adverse effects in the DCR during operations.

#### **4.1.8 Transportation – Industrial and Commercial Centres in the Northwest Territories**

In this section, the focus is on examination of project effects on transportation in the ICCs in the Northwest Territories, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

Yellowknife is the air-transport hub of the Northwest Territories. Flights from there proceed out to the larger communities in the Northwest Territories, Yukon and Nunavut. However, in terms of road transport, Yellowknife is virtually an end-of-the-road community, i.e., Highway No. 3 effectively ends there.

Hay River is the rail terminus from the south and the marine transport hub of the Northwest Territories. It is located on Great Slave Lake, providing access to the communities on the lake, notably Yellowknife, Fort Resolution and Rae-Edzo, and, most importantly, providing access to the Mackenzie River communities and beyond to the Arctic coastal communities.

The Yellowknife airport experienced high levels of traffic during the extensive exploration activities of the 1970s and 1980s. As most construction personnel for the project will come from the south on chartered or scheduled Boeing 737s and fly directly to the hub communities of Inuvik, Norman Wells and Fort Simpson, there will be no need to stop at Yellowknife. However, as a large percentage of the potentially available northern labour in the project study area resides in Yellowknife, it is expected that the volume of commercial air passenger traffic between Yellowknife and the hub communities in the Northwest Territories study area will increase substantially. The airport facility should be able to handle the expected incremental traffic load.

The marine transport function of Hay River will increase substantially during construction. However, this is not a cause for concern, either to the small communities that depend on barge services for marine resupply or to project planners.

NTCL and Cooper Barge Services are already involved in preliminary discussions concerning the loads and delivery schedules required for construction of the pipeline and associated project components. Both NTCL and Cooper officials have indicated that they will expand their tug and barge fleets sufficiently to ensure timely compliance with all schedules. The need for staging and marshalling sites is satisfactorily met by facilities currently in Hay River.

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 the affected regions.

#### 4.1.8.2 Mitigation Measures

The mitigation measures described in Section 4.1.4, Mitigation Measures, all apply to the ICCs.

The project proponents recommend that the responsible authority provide:

- pre-construction planning, upgrading and other improvements to the Mackenzie Highway and Highway No. 2 near Hay River
- increased ongoing road maintenance and dust suppression where necessary

#### 4.1.8.3 Residual Effects

As indicated previously, without carefully planned mitigation, project effects on air travel, and air and barge freight services could be disadvantageous to 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, shown in Table 4-6, are based on all these assumptions. The effects are expected to be of moderate magnitude for the marine mode, but only low for the road and air modes. All will last only during construction.

**Table 4-6: Transportation – Project Effect Attributes for the Industrial and Commercial Centres in the Northwest Territories**

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

#### 4.1.8.4 Operations Effects

The increases in marine and air transport and the more modest increases in road transport in the ICCs throughout construction will decline once construction is complete. There will be continued oil and gas exploration and production drilling, which might increase after construction. Most of this activity will be along the Beaufort coast, and the effects on transportation in the ICCs will generally be less than that during the construction years. Also, the project could result in some enhanced transportation capacity. Therefore, there will be no need for additional mitigation and no residual adverse effects in the Northwest Territories ICCs during operations.

#### **4.1.9 Transportation – Dene Tha’ First Nation in Northwestern Alberta**

In this section, the focus is on examination of project effects on transportation in the DTFN area of northwestern Alberta, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant. The discussion applies to both NGTL and Mackenzie Gas Project activities.

As NOVA Gas Transmission Ltd. (NGTL) is continuing to both develop its project plans and consult with potentially affected communities, the following is based on preliminary information and could change.

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

None of the Dene Tha’ communities have marine access, and the residents are not dependent on air carriers for access or supply, as are some communities in the Northwest Territories. Thus, the possible adverse project effects on transport are restricted to road traffic.

At its closest point, construction activity in northwestern Alberta will be about 120 km northwest of the Meander River community. The nearest construction camp will be about 70 km northwest of Chateh, according to current planning. It now appears that the pipeline construction equipment and materials will be hauled to the right-of-way on the Zama Road. Residents of Meander River, north of High Level on the Mackenzie Highway, could experience higher traffic levels as there will be a stockpile and transshipment site close to the Zama Road junction. Residents of Bushe River, close to High Level, will experience any elevated risks of crossing the Mackenzie Highway and the railroad because of the increased truck and train transport. Chateh residents will be unaffected because they use Highway No. 58 when traveling to High Level or communities to the south. Similarly, trucks turning from Highway No. 35 onto the Zama Road should have no adverse effects on Meander River which lies about 15 km south of this road junction.

For the most part, the traffic-related problems in High Level, described in Section 4.1.10.1, Assessment and Management of Project-Specific Effects – Construction, will be experienced during construction by Dene Tha’ residents who travel to the regional centre for shopping or recreation because of increased project traffic on the Mackenzie Highway or the Zama Road.

##### **4.1.9.2 Mitigation Measures**

The mitigation measures described in Section 4.1.4, Mitigation Measures, all apply to the DTFN area. NGTL will develop its own mitigation measures for approval by the appropriate authorities, based on their detailed project development and consultation programs.

**4.1.9.3 Residual Effects**

The discussion of residual effects in Section 4.1.10.3, Residual Effects, is generally applicable to the effects Dene Tha' community residents might experience when they travel to High Level. Traffic conditions should improve, following the planned-for widening of Highway No. 35 where it passes through High Level. Parking for passenger vehicles and pickup trucks in the town will benefit from parking control measures.

Table 4-7 shows project effects on transportation on DTFN residents in northwestern Alberta. The effects are expected to be of low to moderate magnitude with respect to highway congestion, i.e., a nuisance or inconvenience effect, but only of low magnitude for public safety issues. There should be no significant residual effects when travelling close to the communities of Chateh, Meander River or Bushe River.

**Table 4-7: Transportation – Project Effect Attributes for the Dene Tha' First Nation in Northwestern Alberta**

Transportation Issue	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Highway congestion	Adverse	Low	Regional	Short term	No
Safety at highway and railway crossings	Adverse	Low	Local	Short term	No

**4.1.9.4 Operations Effects**

After construction, oil and gas exploration and production drilling in both the Northwest Territories and in northwestern Alberta will likely increase. However, traffic conditions in the Dene Tha' communities are expected to return to near-normal levels during operations, and there will be no need for additional mitigation, and no residual adverse effects. If mitigation measures discussed previously are implemented, they will result in enhanced transportation capacity.

**4.1.10 Transportation – Industrial and Commercial Centres in Northwestern Alberta**

In this section, the focus is on examination of project effects on transportation in the ICCs in northwestern Alberta, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

**4.1.10.1 Assessment and Management of Project-Specific Effects – Construction**

None of these ICCs have marine access, and the residents are not dependent on air carriers for access or supply, as are some communities in the Northwest Territories. Thus, the possible significant adverse project effects on transport are restricted to road traffic.

Construction activity in northwestern Alberta will be about 100 km northwest of Rainbow Lake and 65 km northwest of Zama City. According to current plans, pipeline construction equipment and materials will be hauled to the right-of-way on the Zama Road. This road, branching to the west off Highway No. 35, the Mackenzie Highway about 70 km north of High Level, is a main transport route for trucks to the oil and gas development area farther west, passing through Zama City on the way. The project will increase trucking traffic on this road, but without noticeable adverse effects on Zama City because the road bypasses the hamlet. Only the very few residents of Zama City might be aware of the increased traffic when going to High Level.

Rail carloads transporting fuel and pipe, and trucks transporting construction equipment, facility modules, drilling rigs and food will be used over a period of several months during each of the construction years. The Mackenzie Highway is currently the eastern boundary of High Level, and the railway track runs parallel to the highway on the east side. Both truck and train traffic will thus be on the east side of High Level. A large number of trucks and lengthy freight trains will be skirting High Level with unusual frequency during the months when pipeline goods are being delivered. This increase in traffic could pose a nuisance or safety concern, or both, particularly at crossings and intersections.

There are currently no stoplights on the highway passing the edge of High Level, or anywhere else in town. This roadway is actually somewhat elevated and narrower in width where it passes through town. The congestion and related problems of the highway are recognized, and the town has suggested to Alberta Transportation that this two-lane road be increased to four lanes where it passes through town. The Alberta government is considering this recommendation.

Four roads cross the railroad track, Highway No. 58 and three smaller roads in High Level. The highway crossing has a flashing red light when a train is approaching. The other three roads each have a sign calling attention to the railroad crossing.

Project effects on transportation in northwestern Alberta will be most pronounced in High Level, as this town is the regional centre of the area. Rainbow Lake and Dene Tha' residents travelling to this regional centre for shopping or recreation might experience an increase in traffic congestion in High Level throughout construction.

#### **4.1.10.2 Mitigation Measures**

The transportation problems currently in northwestern Alberta relate primarily to congestion on the two-lane Mackenzie Highway where it passes through High Level. Inadequate truck parking space in the town and the increased risks of incidents during periods when there is much heavier project-related truck and train transport passing through High Level are safety concerns.

Enactment by appropriate government agencies of the Town of High Level’s recommendation that the Mackenzie Highway be widened to four lanes where it passes through town should alleviate the town bottleneck. It might be necessary to install stoplights at the points where Highway No. 58 intersects, but does not cross, the Mackenzie Highway from the west, and farther north where it intersects, but does not cross, the Mackenzie Highway from the east. Such lights would likely provide greater safety at the intersections.

Construction will likely increase local travel within the region and increase the risk of an incident at one of the High Level railway crossings. Mitigation will involve upgrading the warning devices at the crossings. The flashing red light device at the Highway No. 58 crossing could be replaced by a barrier that lowers to block the road when a train approaches, and the warning signs found at the smaller crossings could be replaced by flashing red lights.

New overflow truck parking should be provided.

**4.1.10.3 Residual Effects**

Traffic and truck parking problems in High Level will be reduced by the projected control measures. Table 4-8 shows project effects on transportation in the ICCs in northwestern Alberta. The effects are expected to be of low to moderate magnitude with respect to highway congestion, i.e., a nuisance or inconvenience effect, but only of low magnitude for parking and public safety issues, and truck parking space. There will be a substantial increase in the numbers of trains passing through High Level at certain seasons during construction. Accordingly, traffic controls at railroad and highway crossing points in High Level might be upgraded, if currently unavailable information on numbers and frequencies of north- and south-bound trains, and relevant highway traffic counts, indicate that this would be appropriate. Project effects at these crossing points are expected to be low magnitude, adverse and local in extent. In all cases, these effects will last only during construction.

**Table 4-8: Transportation – Project Effect Attributes for the Industrial and Commercial Centres in Northwestern Alberta**

Transportation Issue	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Highway congestion	Adverse	Low to moderate	Regional	Short term	No
Inadequate truck parking space	Adverse	Low	Local	Short term	No
Safety at highway and railway crossings	Adverse	Low	Local	Short term	No

4.1.10.4 Operations Effects

With termination of construction, there will be a sharp decline in the truck and train traffic passing through High Level. There will be continued oil and gas exploration and production drilling in both the Northwest Territories and in northwestern Alberta, which will likely increase after construction. However, traffic conditions in the northwestern Alberta ICCs are expected to return to near-normal levels during operations, and there will be no need for additional mitigation and no residual adverse effects. If mitigation measures discussed previously are implemented, they will result in enhanced transportation capacity.

4.2 Energy and Utilities

*How will the project affect community infrastructure, and availability of utilities and energy?*

4.2.1 Effect Pathways

Figure 4-2 shows the expected influences of the project on community infrastructure, and availability of utilities and energy in the Northwest Territories. In summary, the project might have effects on infrastructure, utilities and energy supply in some study area communities.

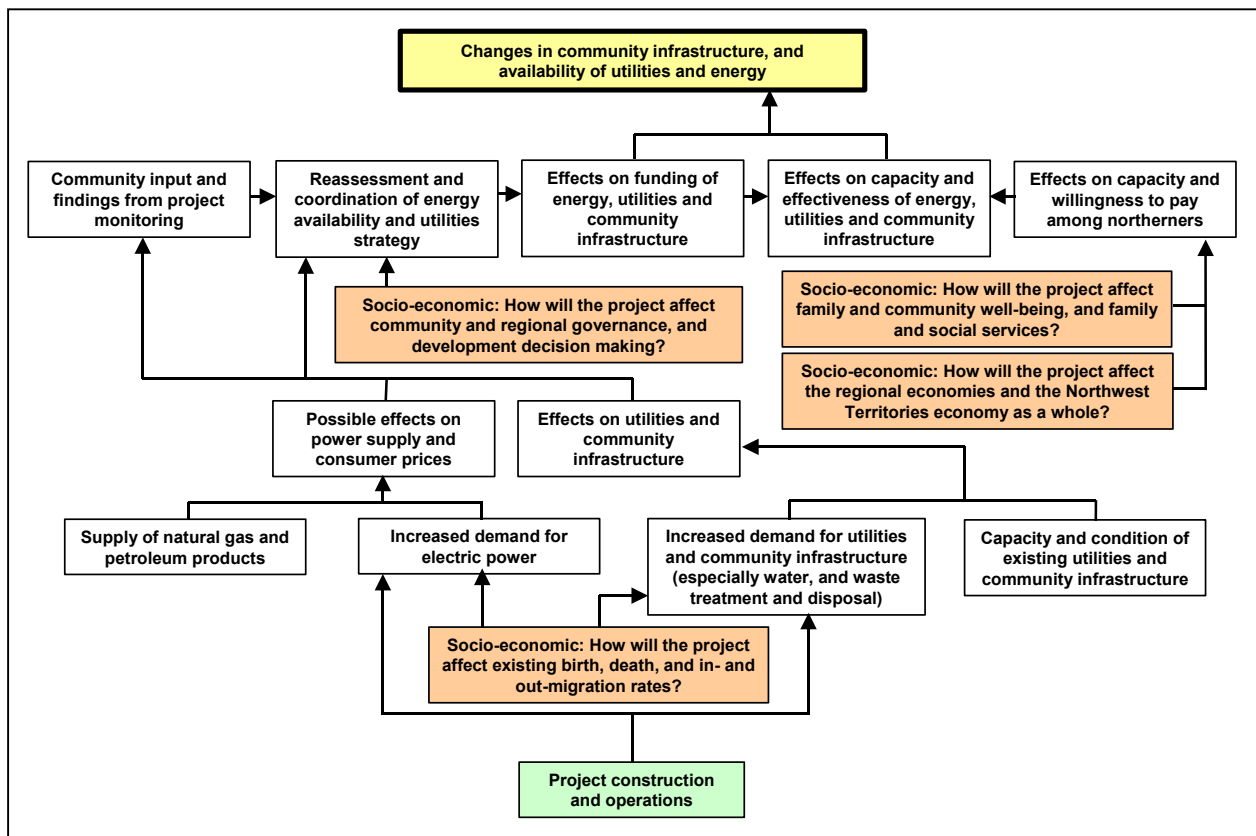


Figure 4-2: Project Effects on Community Infrastructure, and Availability of Utilities and Energy

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

- the effects of demands 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.

#### 4.2.2 Existing Baseline Conditions

Table 4-9 shows the existing utilities, infrastructure and energy supply conditions found in the regional centres, Fort Good Hope and Tulita. Water from a lake or river is both piped and trucked to recipients in all these communities, except Hay River, which has only piped delivery, and Tulita, which has only trucked delivery. This information provides an inventory of available community infrastructure. There has been no analysis of the suitability of the community infrastructure for project use.

All these communities, except Tulita, have treatment facilities that range in quality from acceptable chemical quality in Norman Wells, to excellent chemical quality in Fort Simpson. The water in Tulita is described as satisfactory except at times in the spring.

Liquid waste is piped or pumped out of holding tanks in all the regional centres, and some is bagged for pickup in Inuvik and Yellowknife. In Fort Good Hope and Tulita, disposal is by pump-out trucks. Discharge is into a sewage lagoon or wetlands area functioning as a sewage lagoon (Hay River) except in Fort Simpson, where ultraviolet chemically treated sewage is discharged into the Mackenzie River, and Fort Good Hope, which uses a gravel esker.

Local generators supply electrical power in most of the Northwest Territories communities. However, Yellowknife and Hay River depend on hydro plants. Local generators are diesel-powered, except in Inuvik and Norman Wells, where there are natural gas-fired generators with diesel backup. In all cases, the installed capacity exceeds the peak load requirement.

P-50 fuel oil is used for home heating in all the communities (see Table 4-9, shown previously). Locally supplied natural gas is also used in Inuvik and Norman Wells, propane in Yellowknife and Hay River, and wood and electric heat in Fort Simpson.

Table 4-10 shows that the regional centres in the study area generally have the same communication infrastructure as in southern communities of comparable size, with some exceptions. Norman Wells has no cellular telephone service. Fort Simpson and Fort Good hope have no radiotelephone service. All the communities have radio, television and newspaper coverage.

Table 4-9: Water, Sewage, Solid Waste and Electrical Infrastructure, and Types of Heating Fuel (2001)

Utility Type	Inuvik	Norman Wells	Fort Simpson	Yellowknife	Hay River	Fort Good Hope	Tulita
<b>Water</b>							
Delivery system	Trucked or piped	Trucked or piped	Trucked or piped	Trucked or piped	Piped	Trucked	Trucked
Water source	Winter – Mackenzie River, summer – Three-Mile Lake	Mackenzie River	Mackenzie River	Yellowknife River	Great Slave Lake	Pumped from the Mackenzie River into a reservoir	Bear River; the intake system installed in 2002 is now problematic
Water treatment	Treatment plant has a capacity of 5,239 m <sup>3</sup> /day and can serve a population of 8,000	Class 2 treatment, plant filtration and chlorination	Flocculation, sedimentation, chlorination, filtration and fluoridation	Chemical feed equipment treats water with chlorine and fluoride	Absorption clarifiers, chemical systems, automatic process valves and controls, air scour and automatic control systems	Wallace and Tierman Model 745 hypo-chlorinators	Chlorinated while delivery truck is being filled. Some water boiling required in the spring.
Water quality	Good chemical quality for domestic use	Acceptable chemical quality for domestic use	Excellent chemical quality	Good to excellent quality	Good chemical quality for domestic use	Good chemical quality	Satisfactory, except at times in the spring
<b>Liquid Waste</b>							
Type of system	Bagged or piped	Piped or pumpout	Piped or pumpout	Bagged, pumpout or piped	Pumpout or piped	Pumpout	Pumpout
Sewage disposal	Sewage lagoon, discharges through a natural channel into the Mackenzie River	Sewage lagoon, discharged every two years into a natural stream	Ultraviolet chemically treated sewage is discharged into the Mackenzie River	Long-retention sewage lake-lagoon discharges into Great Slave Lake	Sewage discharged through a 6.5-km drainage ditch into a wetlands treatment area, then into Great Slave Lake	240 m x 300 m waste management area on a flat gravel, i.e., 12-m thick, esker	Sewage lake-lagoon, outlet to Mackenzie River upstream from community
<b>Solid Waste</b>							
Solid waste disposal	Solid waste site; compacted and covered as required	Modified landfill site, six-year life on current facility, expansion plan to 2020	Modified landfill located 4 km from community; compacted weekly	Landfill site with baler system	Landfill site 8 km southeast of community, compacted daily when possible	Cell disposal method – waste is compacted and covered until cell is full	Modified landfill site

Table 4-9: Water, Sewage, Solid Waste and Electrical Infrastructure, and Types of Heating Fuel (2001) (cont'd)

Utility Type	Inuvik	Norman Wells	Fort Simpson	Yellowknife	Hay River	Fort Good Hope	Tulita
<b>Electrical Power</b>							
Installed capacity	10,920 kW	3 large Imperial Oil Limited generators, and 1,600 kW backup	4,270 kW	61,000 kW hydro, 30 mW diesel	21,000 kW	1,230 kW	1,080 kW
Provided by	NWT Power, 2 new natural gas engines and 4 diesel backups	Imperial Oil Limited generators, 2 – 800 kW units backup	NWT Power, 4 generators	Northern Utilities Limited delivers power obtained from the NWT Power Commission Snare System hydro plant	Northern Utilities Limited delivers power obtained from the NWT Commission Snare System hydro plant	NWT Power, 3 generators	NWT Power, 3 generators
Peak load requirement	5,000 kW	1,564 kW	1,581 kW	N/A	N/A	593 kW	440–450 kW
Types of heating fuel	P-50, natural gas, local supply	Natural gas, P-50, both locally supplied	P-50, fuel oil, wood, power	P-50, propane	P-50, propane	P-50	P-50
<p>NOTES:</p> <p>N/A = not applicable</p> <p>kW = kilowatt</p> <p>NWT = Northwest Territories</p>							
<p>SOURCES: GNWT Municipal and Community Affairs (2002), Northwestel personnel (2001, personal communication), Northwest Territories Power Corporation (2002)</p>							

Table 4-10: Selected Communications Infrastructure (2002)

Communications Infrastructure	Inuvik	Norman Wells	Fort Simpson	Yellowknife	Hay River	Fort Good Hope	Tulita
Cellular telephone	Yes	No	Yes (satellite)	Yes	Yes	No	No
Radio telephone	VHF	–	No	VHF	VHF	No	–
Internet	Sympatico, 10 public	Sympatico, no public	Private	Yes, also high-speed available	Sympatico, public	No private, 2 public	No private, 3 public
Transmission of telecommunications	Microwave	N/A	–	Microwave	Microwave	–	–
Radio	CBC, local production centre	CBC, Vancouver station, CGMI	CBC, CKLB	CBC regional production centre, CJCD, CKLB, French language radio station	CBC, CJCD, community radio station	CBC, community radio station	CBC AM and FM service, 1 community FM station
Television	CBC via cable	CBC, cable	CBC, cable	CBC via Anik satellite, cable (75 channels)	CBC via Anik satellite, 3 Cancom channels	CBC, cable, satellite	Private satellite
Newspaper coverage	<i>News/North, Inuvik Drum</i>	<i>News of the North, Hub, Edmonton Journal, Edmonton Sun</i>	<i>News/North, Deh Cho Drum</i>	<i>News/North, Yellowknifer, L'Aquilon</i>	<i>News/North, Hay River Hub</i>	<i>News/North</i>	<i>News of the North</i>
Frequency of mail delivery/week	5	5	5	5	6	3	3
NOTE: – = data not available VHF = very high frequency							
SOURCES: GNWT RWED (1999), Northwestel (2001, personal communication), GNWT Municipal and Community Affairs (2002)							

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

There will be about 50 to 60 construction camps in the ISR, GSA, SSA and DCR, ranging in capacity from 20 to 30 persons to over 1,300 persons. Also, there will be a 350-person camp for project workers near Hay River. 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 should have no adverse effects on nontransport community infrastructure, i.e., utilities, energy sources or communications facilities, in any study area community. All communities have sufficient relevant capacities to provide for any foreseeable demands created by the projected level of in-migrants or transients the project might attract to the study area.

#### **4.2.4 Mitigation Measures**

According to the previous discussion in Section 4.2.3, Assessment and Management of Project-Specific Effects – Construction, there will be no adverse project effects on nontransport infrastructure in any study area community, and therefore no mitigation measures will be required.

#### **4.2.5 Residual Effects**

As there will be no adverse effects on the nontransport infrastructure of any study area community, no residual effects are expected.

#### **4.2.6 Operations Effects**

As reported in the previous sections, there will be no adverse effects on any nontransport infrastructure in any of the study area communities resulting from project activities. During operations, there is expected to be a total study area population increase of only 420 persons related to project operations and maintenance. Therefore, there will be no need for mitigation of project effects and no residual effects during operations.

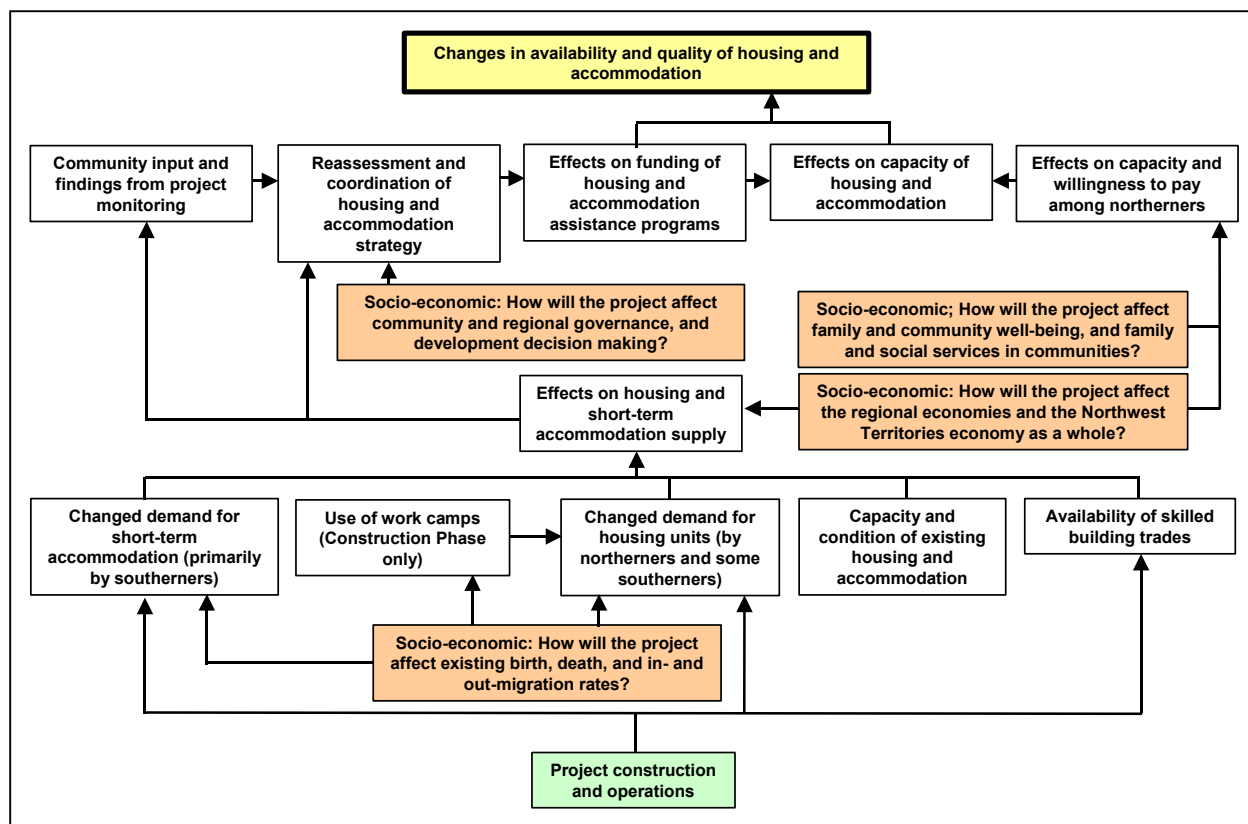
### **4.3 Housing**

*How will the project affect the availability and quality of housing?*

#### **4.3.1 Effect Pathways**

Figure 4-3 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 4-3: 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.

### 4.3.2 Existing Baseline Conditions

The data relevant to the key question includes:

- a 2003 inventory of short-term accommodation available in the study area regional centres
- community- and region-specific 2001 Census figures on houses in need of major repairs
- projections on housing demands in the regional centres for the years 2002, 2006 and 2009

Construction camps will provide for the expected project-related demands for accommodation, not only for construction workers, but also for all persons having project responsibilities that do not require their presence in a study area community. Others will require temporary accommodation in one of the larger study area communities.

Table 4-11 shows that in September 2003 there were many short-term rental rooms available in Yellowknife, Hay River and Inuvik.

**Table 4-11: Available Short-term Accommodations (September 2003)**

Community	Total Rooms Available	Total Possible Persons Accommodated
Inuvik	156	333
Norman Wells	83	117
Fort Simpson	90	134
Yellowknife	570	–
Hay River	159	–
NOTE: – = data not available		
SOURCES: Northwest Territories Arctic Tourism (2003)		

Also relevant to housing availability is the current condition of housing in the communities. The proportions of housing in need of major repairs in 2001 ranged from 20% in the ISR as a whole to 27% in the SSA Aboriginal communities and 35% in Fort Good Hope (see Table 4-12 and Figure 4-4).

Table 4-12: Housing Availability and Housing in Need of Major Repairs (2001)

Region	Availability	Needs Major Repairs (%)
ISR total	–	20
GSA Aboriginal communities total	–	21
SSA Aboriginal communities total	–	27
DCR total	–	21
Aklavik	Limited	18
Fort Good Hope	Limited	35
Fort Simpson	Adequate	20
Inuvik	Very limited	18
Norman Wells	Very limited	11
Tuktoyaktuk	Very limited	20
Yellowknife	Limited	10
Hay River	Adequate	21

NOTE:  
 – = data not available  
 Characterization of housing availability categories (as described by local residents):  
 Adequate – housing is available without difficulty  
 Limited – housing is hard to find  
 Very limited – housing is so scarce that there are reports that it is an obstacle to employment of needed service delivery people  
 Unavailable – no housing is available

SOURCES: Statistics Canada (2001), local informants (2002, 2003)

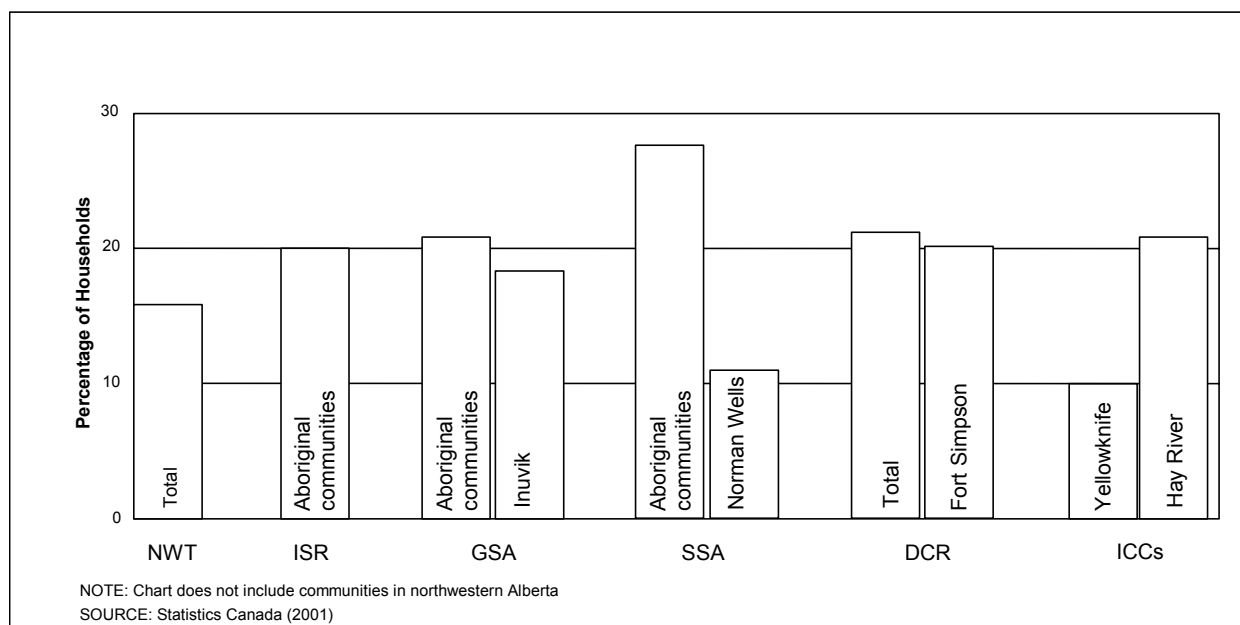


Figure 4-4: Housing in Need of Major Repairs in the Northwest Territories (2001)

In 2002, Ellis Consulting was commissioned by the GNWT and others to project the sizes of the populations of Inuvik, Norman Wells, Hay River and Yellowknife for the years 2002 through 2011. These projections were based on informed assumptions (see also Section 3.3, Demography). However, much more is now known about these factors, and therefore these projections should be reviewed with caution (Ellis 2004, personal communication).

Ellis Consulting used these population projections to estimate the additional dwellings that would be needed in these communities for 2002 through 2011. The dwelling additions indicated in Table 4-13 are cumulative figures. That is, the 149 additional dwellings required for Inuvik by 2006 include the additional 27 required in 2002, the 30 required in 2003, the 32 in 2004, the 32 in 2005 and the 28 in 2006.

**Table 4-13: Projected Numbers of Required Additional Dwellings**

Regional Centre	Total Estimated Required Dwelling Additions, Cumulative by Year		
	2002	2006	2009
Inuvik	27	149	233
Norman Wells	2	5	7
Yellowknife	132	481	871
Hay River	19	114	166
SOURCE: Ellis Consulting (2002a, 2002b, 2002c, 2002d)			

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

As described in Section 2, Project Expenditures, the project-induced employment and business opportunities in the ISR and GSA will be driven by construction and drilling activities relating to the three anchor fields and gathering pipelines near Inuvik, the gas conditioning facility near Inuvik, and the gas and natural gas liquid (NGL) pipelines running south. As a result, there will be a noticeable concentration of employment opportunities in this region for job-seeking male and female Aboriginal and non-Aboriginal people. In the balance of the study area, these opportunities are related to the pipelines and related facilities. Southern residents will fill many of the direct employment opportunities. Southern job seekers might be attracted to Inuvik and the other regional centres, but they will avoid the other communities, knowing they will be unlikely to find work in Aboriginal communities.

The following discussion of potential project effects on housing presumes that the common-practice measures to reduce migration into and within the Northwest Territories, described in Section 3.3, Demography, will be in place. Some migrants might be attracted by the excitement and expectations of project-related employment from their outlying home communities to centres of project activity.

This could lead to overcrowding and low vacancy rates in all such communities. Also, other projects have shown that, when a demand for housing occurs, prices increase, thereby negatively affecting those on fixed income, many of whom are single mothers or widows.

Housing availability in some communities is limited and, in 2000, many houses needed major repair (see Table 4-12, shown previously). Any substantial number of in-migrants, even those moving in with relatives for the short term, could have adverse effects on housing in these communities. However, many in-migrants are not expected. Those that might come are expected to concentrate in the regional centres, and these effects are discussed in the respective regional sections that follow.

#### **4.3.4 Mitigation Measures**

Community concern about managing this issue was expressed during the public participation program. For example, participants at the Sahtu confirmation meeting in May 2004 suggested that liaison officers be hired for the Sahtu to start working with the GNWT and project representatives to clearly define the housing needs of the communities and the project. They felt that by starting this work as soon as possible, existing housing shortages could be addressed and future ones prevented before project construction.

The project recognizes that direct and indirect project-related demand on short-term accommodation in transportation hubs, i.e., Inuvik, Norman Wells, Fort Simpson and Hay River, and in other communities located near the project could surpass existing capacity. As a result:

- self-contained camps will be provided for all components of the project. The camps will be sized to accommodate the direct workforce and others indirectly involved in the project, such as project managers, inspectors, environmental monitors, consultants and regulators.
- mitigation measures should reduce demand for housing and increase housing supply in these communities. The mitigation measures for minimizing the project-related migration that will elevate housing demand are described in Section 3.3, Demography.

To increase the housing supply, the GNWT could:

- initiate or provide incentives for major housing repairs needed to ensure that the existing housing shortage is not exacerbated by increased deterioration, causing some occupied housing to become unliveable

- initiate or provide incentives for needed repairs to abandoned housing where feasible to make it liveable again, therefore expanding the supply of available housing
- provide tax or other incentives to prompt construction of new housing in communities where there is limited housing

It is expected that once the project has been approved, many owners of short-term rental housing will be eager to upgrade and expand their accommodations in anticipation of project-related demand.

#### **4.3.5 Housing – Inuvialuit Settlement Region**

In this section, the focus is on examination of project effects on housing in the ISR, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A general discussion of project effects on housing which is relevant to the ISR is found in Section 4.3.3, Assessment and Management of Project-Specific Effects. An assessment of the migration influences that could affect housing availability in the ISR is found in Section 3.3.6, Demography – ISR.

It is expected that some ISR migrants might be attracted from their outlying home communities to the BDR by the excitement associated with the project. Some might be drawn by interest in diverse employment opportunities. Many might choose a destination community where they have relatives who can provide accommodation.

Housing in Tuktoyaktuk is almost unavailable. In 2000, 20% of the housing there was in need of major repair (see Table 4-12, shown previously). In Aklavik, housing is limited and 18% of houses needed major repairs. Any substantial number of in-migrants, even those moving in with relatives for the short term, could have adverse effects on housing in either community, but large numbers are not expected. Also, other projects have shown that when a demand for housing occurs, prices increase, thereby negatively affecting those on fixed income, many of whom are single mothers or widows. These effects would be most severe in Tuktoyaktuk, to which most migrants from Holman, Paulatuk and Sachs Harbour likely will be attracted.

##### **4.3.5.2 Mitigation Measures**

The mitigation measures described in Section 4.3.4, Mitigation Measures, all apply to the ISR.

### 4.3.5.3 Residual Effects

Most of the natural gas production-related activities, e.g., anchor field development, gathering pipelines, gas conditioning facility, extensive borrow site development, logistics activity, and the associated air of excitement will be in the ISR. Self-contained camps will be provided, sized to accommodate southern and northern workforces. However, it will not be possible to eliminate all movement to Tuktoyaktuk and Aklavik, and project effects on housing in these communities could be adverse. However, as Table 4-14 shows, these effects are expected to be low magnitude for the region, moderately affecting housing only in Tuktoyaktuk. The duration of effects will be limited to construction.

**Table 4-14: Housing – Project Effect Attributes for the Inuvialuit Settlement Region**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
ISR	Adverse	Low	Regional	Short term	No
Tuktoyaktuk	Adverse	Moderate	Local	Short term	No
Aklavik	Adverse	Low	Local	Short term	No

### 4.3.5.4 Operations Effects

Most employment opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. There will be continued well-drilling activities, but these, along with project operations and maintenance jobs for northern residents in the BDR, will not be large enough to induce noticeable migration. That which does occur will concentrate in Inuvik and is discussed following. As a result, project effects will be restricted to construction. There will be no need for mitigation and no residual effects during operations.

### 4.3.6 Housing – Gwich'in Settlement Area

In this section, the focus is on examination of project effects on housing in the GSA, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A general discussion of project effects on housing is in Section 4.3.3, Assessment and Management of Project-Specific Effects. See Section 3.3, Demography for an assessment of the migration influences that could affect housing availability in the GSA.

The projected need for additional dwellings for Inuvik, presented previously in Section 4.3.2, Existing Baseline Conditions, is derived from population projections assuming that:

- nearly all oil and gas activity will generate the need for temporary accommodations, primarily in construction and exploration camps
- Inuvik will grow slowly but steadily over the next decade as governments, oil companies and construction firms relocate some staff to the region in anticipation of development, coupled with an increase in business capacity in Inuvik as the regional service centre

Ellis Consulting (2002b) projects the need for a cumulative total of 149 additional dwellings in Inuvik by the end of 2006, and 233 additional dwellings by the end of 2009.

There will be a concentration of indirect and induced project-related employment and business opportunities in the GSA. It is expected that the excitement associated with the project and employment prospects might attract some migrants from Tsiigehtchic, and potentially from Fort McPherson. Their destination will be Inuvik, particularly if they have local relatives to provide accommodation. Also, other projects have shown that when a demand for housing occurs, prices increase, thereby negatively affecting those on fixed income, many of whom are single mothers or widows.

Housing in Inuvik is very limited and in 2000, 18% of the housing was in need of major repair (see Table 4-12, shown previously). Any substantial number of in-migrants moving in with relatives in Inuvik for a short term could have adverse effects on housing in the community.

It is expected that as many as 450 persons could migrate to Inuvik during peak construction activity. However, an expansion of both permanent housing units and temporary accommodation is also expected to occur by that time.

#### **4.3.6.2 Mitigation Measures**

The mitigation measures described in Section 4.3.4, Mitigation Measures, all apply to the GSA.

#### **4.3.6.3 Residual Effects**

Most natural gas production-related activity, e.g., anchor field development, gathering pipelines, gas conditioning facility, some borrow site development, logistics activity, and the associated air of excitement will be in the BDR. It will not be possible to eliminate all population movement to Inuvik. If the predicted in-migration level is achieved, and if all of these persons were to be housed in permanent accommodations, as many as 160 additional housing units would be

required. This is well within the range of demand projected in the Ellis Consulting study, and therefore it is expected that the Inuvik housing and accommodation market will make a substantial capacity adjustment in anticipation of this demand.

As shown in Table 4-15, the resulting project effects on temporary and permanent housing in the GSA Aboriginal communities are expected to be low magnitude. However, in Inuvik, these effects are expected to be high magnitude. The duration of these effects will be primarily during construction.

**Table 4-15: Housing – Construction Effect Attributes for the Gwich'in Settlement Area**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
GSA Aboriginal communities	Adverse	Low	Regional	Short term	No
Inuvik	Adverse	High	Local	Short term	No

**4.3.6.4 Operations Effects**

Most employment opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. However, ongoing project operations and maintenance will create direct, indirect and induced job opportunities for northern residents. Although some rotational operations workers might be housed in camp facilities that will be remote from communities, some might be housed in Inuvik. At the start of project operations, it is probable that southerners will fill most of the operations and maintenance positions. However, as northern trainees become qualified, it is expected that northern residents will fill most of these jobs.

As shown in Section 3.3, Demography, the population effects on Inuvik are expected to decline from the peak construction levels to a longer-term stabilized increase of about 200 persons higher than pre-project levels. As a result, there could be an incremental demand for about 70 residences in Inuvik by 2020. The capacity of the local housing sector should easily meet this need over that time. In fact, this ongoing demand could lessen any decline in the market related to the drop-off from construction demand effects. The resulting long-term tax base would also be a positive effect. No effects are expected in any other GSA community.

Mitigation could include worker use of camp accommodations until the required housing is in place, and the housing demand and supply are in balance. As Table 4-16 shows, residual effects are expected to be positive, but low magnitude.

Table 4-16: Housing – Operations Effect Attributes for the Gwich'in Settlement Area

Region	Effect Attribute			Significant	
	Direction	Magnitude	Geographic Extent		
Inuvik	Positive	Low	Local	Long term	No

#### 4.3.7 Housing – Sahtu Settlement Area

In this section, the focus is on examination of project effects on housing in the SSA, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A general discussion of project effects on housing relevant to the SSA is found in Section 4.3.3, Assessment and Management of Project-Specific Effects, and Section 3.3.7, Demography – SSA, there is an assessment of the migration influences that could affect housing availability in the SSA.

The projected needs for additional dwellings for Norman Wells are described previously in Section 4.3.2, Existing Baseline Conditions. Given these influences, Ellis Consulting (2002c) projects the need for a cumulative total of five additional dwellings in Norman Wells by the end of 2006, and of seven additional dwellings by the end of 2009.

Temporary accommodations exist in Norman Wells, but they fill up during the winter months. Housing in Norman Wells is in short supply, but in 2000, only 11% of the housing was in need of major repair (see Table 4-12, shown previously). In Fort Good Hope, housing is limited and about one third needed major repairs in 2000. Any sizeable number of in-migrants, even those moving in with relatives for the short term, could have adverse effects on housing in either community. These effects will be greater in Norman Wells, where most of the non-Aboriginal and some SSA migrants likely will be attracted.

It is expected that as many as 100 persons could migrate to Norman Wells during peak construction activity. However, an expansion of both permanent housing units and temporary accommodation is also expected to occur by that time.

##### 4.3.7.2 Mitigation Measures

The mitigation measures described in Section 4.3.4, Mitigation Measures, all apply to the SSA.

**4.3.7.3 Residual Effects**

Most project activity and associated excitement in the SSA will be near Norman Wells and, to a lesser extent, Fort Good Hope. It will not be possible to eliminate all population movement, and project effects on temporary and permanent housing in these communities could be adverse.

If the predicted in-migration level is achieved and if all of these persons were to be housed in permanent accommodation, as many as 40 additional housing units would be required in Norman Wells. This is outside the range of demand projected in the Ellis Consulting study, and therefore the Norman Wells housing and accommodation market will need to make a substantial capacity adjustment in anticipation of this short-term peak in demand. It is also likely that much of this demand would be met through use of temporary accommodation, as it is unlikely the long-term demand would justify investment in permanent housing.

Table 4-17 shows that these effects are expected to be high magnitude in Norman Wells. The duration of effects will be limited to construction

**Table 4-17: Housing – Construction Effect Attributes for the Sahtu Settlement Area**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
SSA total	Adverse	Low	Local	Short term	No
SSA Aboriginal communities	Adverse	Low	Local	Short term	No
Norman Wells	Adverse	High	Local	Short term	No
Fort Good Hope	Adverse	Low	Local	Short term	No

**4.3.7.4 Operations Effects**

Most employment opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. However, ongoing project operations and maintenance will create direct, indirect and induced job opportunities for northern residents. Although some rotational operations workers might be housed in camp facilities, some might be housed in Norman Wells. At the start of project operations, it is probable that southerners will fill most of the operations and maintenance positions. However, as northern trainees become qualified, it is expected that northern residents will fill most of these jobs.

As shown in Section 3.3, Demography, the population effects on Norman Wells are expected to decline from the peak construction levels to a longer-term stabilized increase of about 40 persons higher than pre-project levels. As a result, there could be an incremental demand for about 16 residences in Norman Wells

by 2020. The local housing sector should be able to meet this need over that time. In fact, this ongoing demand could lessen any decline in the market related to the drop-off from construction demand effects. The resulting long-term tax base would also be a positive effect. No effects are expected in any other SSA community.

Mitigation could include worker use of camp accommodations until the required housing is in place, and the housing demand and supply are in balance, and the project could provide housing incentives or subsidies that would encourage expanded supply. As Table 4-18 shows, the residual effects are expected to be positive, but low magnitude.

**Table 4-18: Housing – Operations Effect Attributes for the Sahtu Settlement Area**

Region	Effect Attribute			Significant	
	Direction	Magnitude	Geographic Extent		
SSA Aboriginal communities	Neutral	No effect	Regional	Long term	No
Norman Wells	Positive	Low	Local	Long term	No

#### **4.3.8 Housing – Deh Cho Region**

In this section, the focus is on examination of project effects on housing in the DCR, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A general discussion of project effects on housing relevant to the DCR is found in Section 4.3.3, Assessment and Management of Project-Specific Effects. A description of the influences that will likely affect migration in the DCR is found in Section 3.3.8, Demography – DCR.

Housing in Fort Simpson is adequate and, in 2000, 20% of the housing was in need of major repair (see Table 4-12, shown previously). It is expected that as many as 140 persons could migrate to Fort Simpson during peak construction activity. However, an expansion of both permanent housing units and temporary accommodation is also expected to occur by that time. The expected numbers of Aboriginal and non-Aboriginal in-migrants will have little effect on housing in any other DCR community.

##### **4.3.8.2 Mitigation Measures**

The mitigation measures described in Section 4.3.4, Mitigation Measures, all apply to the DCR.

**4.3.8.3 Residual Effects**

The activity and associated excitement stimulated by the project in the DCR will be focused in Fort Simpson, and it might not be possible to eliminate all population movement to this community.

If the predicted in-migration level is achieved and if all of these persons were to be housed in permanent accommodation, as many as 50 additional housing units would be required in Fort Simpson. The Fort Simpson housing and accommodation market will need to make a capacity adjustment in anticipation of this short-term demand. It is also possible that much of this demand could be met through use of temporary accommodation.

As a result, project effects on housing in Fort Simpson are expected to be moderate magnitude (see Table 4-19), but will be limited to construction. No effects on housing are expected in the other DCR communities.

**Table 4-19: Housing – Construction Effect Attributes for the Deh Cho Region**

Region	Effect Attribute			Significant
	Direction	Magnitude	Geographic Extent	
Fort Simpson	Adverse	Moderate	Local	No
Other DCR communities	Adverse	Low	Regional	No

**4.3.8.4 Operations Effects**

Most employment opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. No direct operations or training positions will be based in the DCR. However, there will be contract maintenance opportunities in the DCR, most likely in Fort Simpson.

As shown in Section 3.3, Demography, the population effects on Fort Simpson are expected to decline from the peak construction levels to a longer-term stabilized increase of about 10 persons higher than pre-project levels. As a result, there could be an incremental demand for about four residences by 2020. There should be no need for mitigation and no residual effects during operations as the existing housing supply, i.e., rentals and privately owned dwellings, appears to have the capacity to meet an incremental demand for housing in Fort Simpson. In fact, this ongoing demand could lessen any decline in the market related to the drop-off from construction demand effects. The resulting long-term tax base would also be a positive effect. No effects are expected in any other DCR community.

As Table 4-20 shows, the residual effects are expected to be positive, but low magnitude.

**Table 4-20: Housing – Operations Effect Attributes for the Deh Cho Region**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Fort Simpson	Positive	Low	Local	Long term	No

### 4.3.9 Housing – Industrial and Commercial Centres in the Northwest Territories

In this section, the focus is on examination of project effects on housing in the ICCs in the Northwest Territories, but the previous discussions on effect pathways, data, assessment of effects and mitigation measures are also relevant.

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

A general discussion of project effects on housing relevant to Yellowknife and Hay River is in Section 4.3.3, Assessment and Management of Project-Specific Effects. Description of the influences that will likely affect migration in the ICCs is in Section 3.3.9, Demography – ICCs in the Northwest Territories.

The projected need for additional dwellings for Hay River and Yellowknife was previously discussed in Section 4.3.2, Existing Baseline Conditions, under Housing. Given these influences, Ellis Consulting (2002a) projects the need for a cumulative total of 114 additional dwellings in Hay River by the end of 2006 and 166 additional dwellings by the end of 2009. In Yellowknife, the projected need is for a cumulative total of 481 additional dwellings by the end of 2006 and 871 by the end of 2009.

Housing in Yellowknife is limited and, in 2000, 10% was in need of major repairs (see Table 4-12, shown previously). However, the housing supply was expanded between 2002 and 2003 with the addition of a new high-rise apartment block and new townhouse condominium development. In Hay River, housing is adequate, but 21% needed major repairs. Any large influx of in-migrants, even those moving in with relatives for the short term, could have adverse effects on housing in either community. Also, other projects have shown that when a demand for housing occurs, prices increase, thereby negatively affecting those on fixed income, many of whom are single mothers or widows.

It is expected that as many as 125 persons could migrate to Hay River during peak construction activity. However, an expansion of both permanent housing units and temporary accommodation is also expected to occur by that time. No reasonable quantitative prediction can be made of the population effect on Yellowknife, but it should not be noticeable against the background of other growth.

**4.3.9.2 Mitigation Measures**

The mitigation measures described in Section 4.3.4, Mitigation Measures, all apply to the ICCs.

**4.3.9.3 Residual Effects**

Most of the project-induced activity at the southern end of the pipeline will be centred in Hay River. If the predicted in-migration level is achieved and if all of these persons were to be housed in permanent accommodation, as many as 45 additional housing units would be required in Hay River. The Hay River housing and accommodation market will need to make a capacity adjustment in anticipation of this short-term demand. It is possible that much of this demand could be met through temporary accommodation.

The effects on accommodations in Yellowknife and Hay River are shown in Table 4-21. In Yellowknife, effects are expected to be of low magnitude. These effects will be related to indirect and induced economic and governance activities. Given the current adequacy of housing in Hay River, and despite the repair needs, only a moderate effect is expected there from the project. The duration of these effects will be limited to construction.

**Table 4-21: Housing – Construction Effect Attributes for Industrial and Commercial Centres in the Northwest Territories**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Yellowknife	Adverse	Low	Local	Short term	No
Hay River	Adverse	Moderate	Local	Short term	No

**4.3.9.4 Operations Effects**

Most employment opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. There will be no direct operations or contract maintenance positions located in the ICCs.

As shown in Section 3.3, Demography, the population effects on the ICCs are expected to result in a longer-term stabilized increase of about 165 persons higher than pre-project levels. As a result, there could be an incremental demand for about 60 residences by 2020. There should be no need for mitigation and no residual effects during operations as the existing housing supply, i.e., rentals and privately owned dwellings, appears to have the capacity to meet an incremental demand for housing in the ICCs. These effects could be seen as both positive and adverse in direction. As Table 4-22 shows, only neutral but low-magnitude residual operations effects are expected on housing in the ICCs.

**Table 4-22: Housing – Operations Effect Attributes for Industrial and Commercial Centres in the Northwest Territories**

Region	Effect Attribute			Significant	
	Direction	Magnitude	Geographic Extent		
Yellowknife	Positive and adverse	Low	Local	Long term	No
Hay River	Positive and adverse	Low	Local	Long term	No

**4.3.10 Housing – Dene Tha’ First Nation in Northwestern Alberta**

Project effects on housing in the DTFN communities are forecast to be negligible because it is expected that the project will create no additional demand for housing in any of the three DTFN communities.

**4.3.11 Housing – Industrial and Commercial Centres in Northwestern Alberta**

In common with other resource development towns, housing is expensive and there is a zero vacancy rate in High Level. In February 2004, housing availability was very limited and there was continuing high demand. Because of high construction costs, affordable housing is a continuing issue of such significance that the town hospitality industry is having difficulty employing food service and housekeeping workers. However, there is relatively little new construction, with only about 12 building permits issued annually.

Generally, housing in Rainbow Lake and Zama City is adequate, but with little surplus. In Rainbow Lake there is an attractive section of new houses, and many mobile homes. Because Zama City is essentially an oil patch frontier community, there are relatively more mobile homes and little in the way of new housing.

**4.3.11.1 Assessment and Management of Project-Specific Effects – Construction**

Project effects on housing in northwestern Alberta will be restricted to High Level. There will be no effects in Rainbow Lake or Zama City. During the pre-construction and construction years, High Level will experience a substantial increase in truck traffic, and likely some increase in passenger vehicles. Therefore, project effects will be experienced by the temporary accommodation and hospitality industry. However, a large new hotel, The Mirage, is under construction, and the Super 8 Motel is considering a significant expansion.

During the construction years, there will be increased demand for accommodations for hospitality industry workers, and shortages exist already.

**4.3.11.2 Mitigation Measures**

Any mitigation of the present very limited housing situation in High Level is unlikely because it is structural in nature: high construction costs coupled with high demand by people who can afford only low rental prices. No significant increase in low-cost housing is expected.

**4.3.11.3 Residual Effects**

Affordable housing will continue to be a problem in High Level because of high demand by low-income earners and the obstacles to satisfying this demand when construction costs are high. However, this will be rectified by the market as a growing scarcity of hospitality workers drives up their wages. Some will thus be able to afford higher rents, and new accommodations will be constructed. Therefore, market adjustment to the scarcity might be expected and the residual effects, although adverse, are expected to be low magnitude (see Table 4-23).

**Table 4-23: Housing – Project Effect Attributes for the Industrial and Commercial Centres in Northwestern Alberta**

Region	Effect Attribute			Significant
	Direction	Magnitude	Geographic Extent	
High Level	Adverse	Low	Local	No
Rainbow Lake, Zama City	No effect	No effect	Local	No

**4.3.11.4 Operations Effects**

Traffic levels through High Level will subside with completion of construction and with it any expected elevated demand for housing. No residual effects are expected in the northwestern Alberta ICCs during operations.

**4.4 Recreation Resources**

How will the project affect recreation resources?

The focus in this section is on the potential ways in which availability of recreation resources in the study area communities might be changed by:

- in-migrant southern workers
- project effects on the lives of northern residents
- the capacities and conditions of nontraditional recreation resources

4.4.1 Effect Pathways

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

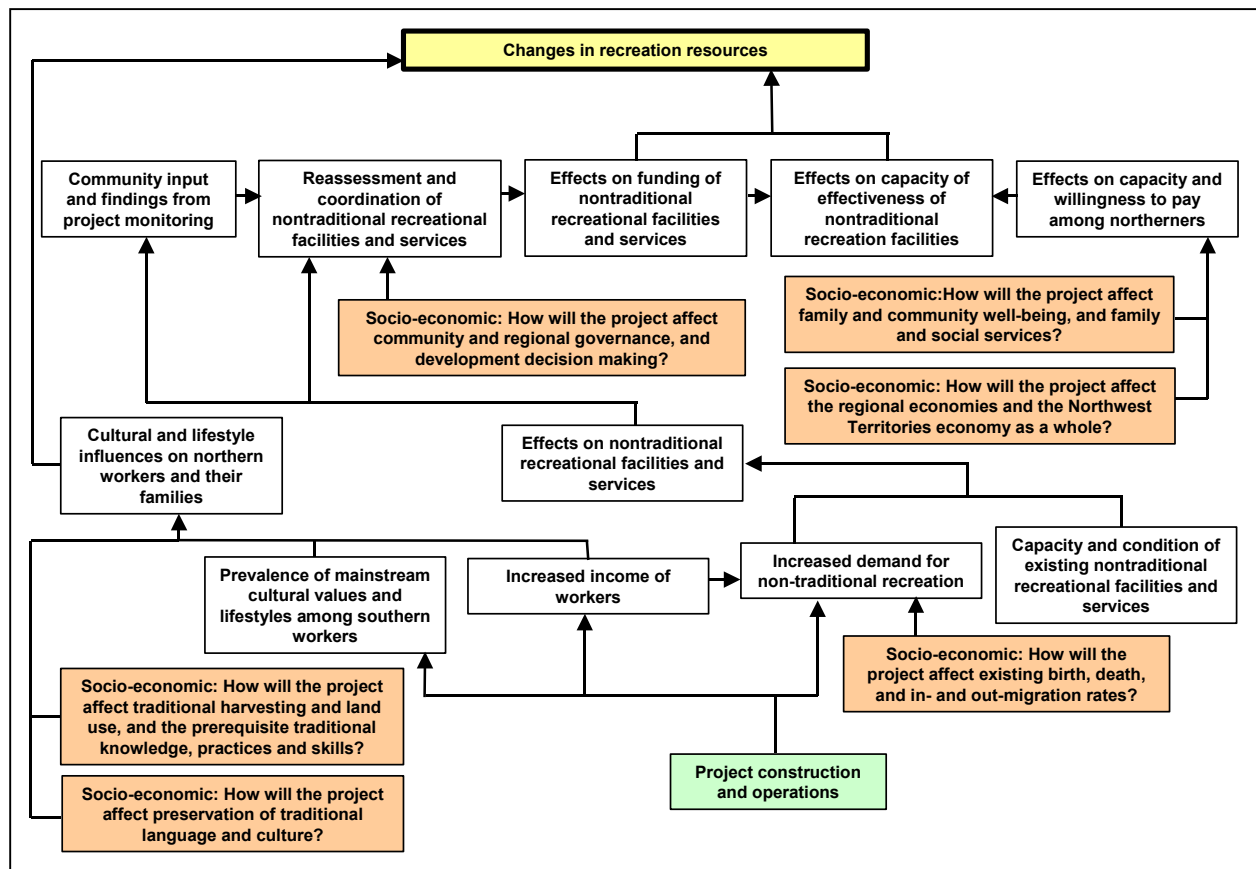


Figure 4-5: Project Effects on Recreation Resources

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.

In the final analysis, 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 diagrammed previously. 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 7, Nontraditional Land and Resource Use.

#### **4.4.2 Existing Baseline Conditions**

Table 4-24 shows information on recreational facilities in selected communities. Information on these facilities in all study area communities is found in Volume 4, Socio-Economic Baseline. Also relevant is the discussion in Section 3.3, Demography on project-related in-migration, and information in Volume 4, Socio-Economic Baseline on the reduced involvement of Aboriginal people in some aspects of their traditional culture.

The study area communities, whether large or small, are as well furnished with recreation facilities as most southern communities of comparable size.

Table 4-24: Community Recreation Facilities (2002)

Community	Recreation Facilities
Inuvik	Seasonal pool, arena, curling rink, track, mini-golf, school gyms, parks and playgrounds, tennis courts, softball fields, ski trails, beach area, library
Norman Wells	Community hall, arena, curling rink, tennis and handball court, seasonal pool, school gym, fitness centre, ski trails, softball field, library, museum
Fort Simpson	Arena, curling rink and gym complex, community hall, softball field, track, tennis court, golf course, boat launch, public dock, parks and playgrounds, seasonal pool, campground, school gym, library
Yellowknife	Two arenas, curling rink, indoor swimming pool, golf course, bowling alley, pool halls, fitness centres, racquet club, school gyms, baseball fields, campground, beach areas, ski and walking trails, parks and playgrounds, tennis courts, halls, movie theatre, museum, auditorium
Hay River	Arena, curling rink and hall complex, ski and golf facility, track, indoor swimming pool, softball fields, playgrounds, swimming and boating area, school gyms, library
SOURCES: GNWT RWED (2002), local recreation directors (2003, personal communication)	

Although none of these trends can be quantified, the project will create increased demands on recreation resources by:

- attracting in-migrants to the Northwest Territories, although most project construction workers will be accommodated in camps
- providing northern residents in general with the increased incomes that enable them to spend more on recreation
- increasing the effective interest of some Aboriginal people in recreation resources or events

No relevant statistical data is currently available on the recreation capacities of most project-affected communities, i.e., information on the maximum numbers of patrons that recreation facilities can accommodate and unused capacities. This deficiency has been overcome, in part, through interviews with recreation directors in several study area communities.

It is assumed that during construction there might be a temporary increase in demand for recreation facilities in regional centres, and that this demand will largely disappear with completion of this phase.

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

Generally, the recreation resources in most communities in the study area would be judged suitable in southern communities of comparable size, although there are exceptions. The larger communities are well equipped, or funding has been arranged to construct new or expand existing facilities. The facilities of even the small communities are adequate in size, and in some, they reflect local initiative and hard work – in building a golf course, for example.

The adequacy of the facilities in all the study area communities during construction will depend on how much increase there is in the local population and in recreation demand at that time. The discussion of population increase in the overview (see Section 3.3, Demography) and subsequent region-specific discussions is relevant here as well.

#### **4.4.4 Mitigation Measures**

Mitigation measures include:

- providing self-contained camps for all components of the project. The camps will be sized to accommodate the direct workforce and others indirectly involved in the project, such as project management, inspectors, environmental monitors, consultants and regulators.
- designating a recreation area in project camps that could include such things as satellite televisions, VCR and DVD players, computers, pool tables, exercise equipment, and games
- where required and in agreement with communities, the project might rent existing facilities. Subject to such agreements, it might be possible to use a local school gymnasium, outside regular school hours, for organized aerobic or fitness classes, and basketball or volleyball leagues. This could accommodate temporary growth in demand. The rental fee would have to be sufficient to cover any additional janitorial or security costs.

#### **4.4.5 Recreation Resources – Inuvialuit Settlement Region**

In this section, the focus is on examination of project effects on recreation resources in the ISR, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A brief discussion of the adequacy of recreation resources in the study area is found in Section 4.4.3, Assessment and Management of Project-Specific Effects. The influences likely to affect in-migration in the ISR are described in Section 3.3.5, Demography – ISR. In the ISR, Tuktoyaktuk and Aklavik are the only communities that might experience project-related in-migration that could affect existing recreation resources. Both communities have the usual complement of recreation resources, suitable to their sizes, which are commonly found in the Northwest Territories.

The following discussion of the adequacy of recreation resources during construction presumes that the mitigation measures described in Sections 3.3.4,

Mitigation Measures, under Demography, and 4.4.4, Mitigation Measures, will be implemented.

#### 4.4.5.2 Mitigation Measures

The mitigation measures described in Section 4.4.4, Mitigation Measures, all apply to the ISR.

#### 4.4.5.3 Residual Effects

The project-induced increase in the Tuktoyaktuk population is expected to be small and the mitigation measures will likely be reasonably effective. Thus, as Table 4-25 indicates, project effects on recreation resources in Tuktoyaktuk and Aklavik are expected to be low magnitude. These effects will last only for the duration of construction. There will be no noticeable effect in other ISR communities.

**Table 4-25: Recreation Resources – Project Effect Attributes for the Inuvialuit Settlement Region**

Region	Effect Attribute			Significant
	Direction	Magnitude	Geographic Extent	
ISR	Neutral	No effect	Regional	No
Tuktoyaktuk	Adverse	Low	Local	No
Aklavik	Adverse	Low	Local	No

#### 4.4.5.4 Operations Effects

Most employment opportunities generated by the project will end once construction, associated cleanup and site restoration activities are complete. However, there will be continued well-drilling activities, and also some operations and maintenance jobs created in the BDR. Southerners and some residents of the ISR will fill these jobs, but no in-migration is expected in ISR communities. Project effects will be restricted to construction. There will be no need for mitigation and no residual effects during operations.

#### 4.4.6 Recreation Resources – Gwich'in Settlement Area

In this section, the focus is on examination of project effects on recreation resources in the GSA, and Inuvik in particular, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A brief discussion of the adequacy of recreation resources in the study area is found in Section 4.4.3, Assessment and Management of Project-Specific Effects. The influences likely to affect in-migration in the GSA are described in

Section 3.3.6, Demography – GSA. Based on current expectations concerning project-induced in-migration, effects on recreation resources in the GSA might be seen in Inuvik. However, expanded recreation facilities are now being built in Inuvik, i.e., the new Family Recreation Centre, attached to the existing Midnight Sun Recreation Complex. The final combined facility will provide:

- a hockey arena
- a curling rink
- an indoor swimming pool
- two squash courts
- a fitness and aerobics room
- dressing rooms
- a conference centre
- a snack bar
- a sitting area

These facilities will considerably increase the recreation resources of that community. With the mitigation measures in place to reduce pipeline population effects, described in Section 3.3, Demography, Inuvik recreation facilities should be adequate. In fact, the potential increased utilization could create opportunities for increased user fees and enhanced community adjustment between new and existing residents.

Little, if any, increase in recreation demands is expected in any other Gwich'in community.

#### **4.4.6.2 Mitigation Measures**

The mitigation measures described in Section 4.4.4, Mitigation Measures, all apply to the GSA.

#### **4.4.6.3 Residual Effects**

It is expected that as many as 450 persons could migrate to Inuvik during peak construction activity. Information on expansion of the Inuvik recreation facilities is described previously. It is not possible to accurately anticipate the likely size of project-induced increased demands on recreation resources in Inuvik, but some adverse increase in demand is projected. However, as Table 4-26 shows, project effects in Inuvik are expected to be low magnitude. Effects, if any, on other GSA communities should be negligible.

**Table 4-26: Recreation Resources – Construction Effect Attributes for the Gwich'in Settlement Area**

Region	Effect Attributes				Significant
	Direction	Magnitude	Geographic Extent	Duration	
GSA	Neutral	No effect	Regional	Short term	No
Inuvik	Positive and adverse	Low	Local	Short term	No

#### 4.4.6.4 Operations Effects

As shown in Section 3.3, Demography, the population effects on Inuvik are expected to decline from the peak construction levels to a longer-term stabilized increase of about 200 persons higher than pre-project levels. As a result, there could be an incremental demand for recreation resources in Inuvik by 2020. The capacity of the local recreation sector should easily meet this need over that time.

The incremental demand on recreation facilities is expected to be positive, and should be well within the capacity of the expanded facilities (see Table 4-27). As a result, there will be no need for mitigation and no residual effects during operations.

**Table 4-27: Recreation Resources – Operations Effect Attributes for the Gwich'in Settlement Area**

Region	Effect Attributes				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Inuvik	Positive and adverse	Low	Local	Long term	No

#### 4.4.7 Recreation Resources – Sahtu Settlement Area

In this section, the focus is on examination of project effects on recreation resources in the SSA, and Norman Wells in particular, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A brief discussion of the adequacy of recreation resources in the study area is found in Section 4.4.3, Assessment and Management of Project-Specific Effects. The influences likely to affect in-migration in the SSA are described in Section 3.3.7, Demography – SSA.

Information supplied by the recreation director in Norman Wells established the following:

- the facilities and programs now provided in Norman Wells are comparable to those found in most southern communities of similar size
- recreation demands in Norman Wells do not challenge current facilities and programs
- the present facilities could cope with the demands associated with a modest, project-induced increase in the population of Norman Wells. However, some increase in the number of programs offered, and a resulting increase in staffing, might be necessary (Hannon 2003, personal communication).

The recreation coordinator in Fort Good Hope described nontraditional recreation resources in Fort Good Hope as essentially adequate, given the size of the community (McNeely 2003, personal communication). These facilities include:

- a gymnasium
- a youth centre
- a baseball diamond
- an informal soccer field
- two playgrounds which need upgrading
- swimming in a nearby safe backwater of the Rabbitskin River
- natural winter ice hockey and curling sheets
- volleyball and indoor soccer in the school gymnasium

A fitness centre is needed. In terms of surplus capacity, about half the time the facilities are used to capacity, but at other times there is unused capacity.

The following discussion of possible effects on recreation resources in the SSA assumes that the common-practice measures to reduce population effects, as described in Section 3.3.4, Mitigation Measures, under Demography, will be in place. Any incremental demand on recreation resources in the SSA will most likely be in Norman Wells, given current assessments of available resources and the communities most likely to experience population increases.

#### **4.4.7.2 Mitigation Measures**

The mitigation measures described in Section 4.4.4, Mitigation Measures, all apply to the SSA.

If the short-term increase in indirect and induced demand for housing is met by the private sector through temporary accommodation, the private sector should be encouraged to include provisions for recreational activities in these facilities.

#### 4.4.7.3 Residual Effects

It is expected that as many as 100 persons could migrate to Norman Wells during peak construction activity. It is not possible to accurately project the likely size of project-induced increased demands on recreation resources in Norman Wells, but taking into account mitigation measures, it is expected that the incremental demand on recreation facilities and resources will be manageable. Table 4-28 shows that project effects on recreation resources in Norman Wells are expected to be moderate magnitude. These effects will last only during construction.

**Table 4-28: Recreation Resources – Construction Effect Attributes for the Sahtu Settlement Area**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
SSA	Adverse	Low	Regional	Short term	No
Norman Wells	Adverse	Moderate	Local	Short term	No

#### 4.4.7.4 Operations Effects

As shown in Section 3.3, Demography, the population effects on Norman Wells are expected to decline from the peak construction levels to a longer-term stabilized increase of about 40 persons higher than pre-project levels. As a result, there could be a marginally incremental demand for recreation resources by 2020. The capacity of the local recreation sector should easily meet this need over that time.

Assuming this is the case, the effect of these people on recreation facilities and resources in Norman Wells are expected to be both adverse and positive but low magnitude (see Table 4-29). As a result, there will be no need for mitigation during operations.

**Table 4-29: Recreation Resources – Operations Effect Attributes for the Sahtu Settlement Area**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Norman Wells	Positive and adverse	Low	Local	Long term	No

#### 4.4.8 Recreation Resources – Deh Cho Region

In this section, the focus is on examination of project effects on recreation resources in the DCR, and Fort Simpson in particular, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A brief discussion of the adequacy of recreation resources in the study area is found in Section 4.4.3, Assessment and Management of Project-Specific Effects, under Recreation Resources. The influences likely to affect in-migration in the DCR are described in Section 3.3.8, Demography – DCR.

Fort Simpson is the DCR community most likely to experience project-induced increased demands on recreation facilities. Information supplied by the recreation director in Fort Simpson made it clear that many of the facilities in Fort Simpson are small and seasonal, and are normally used to capacity (Donahue 2003, personal communication). The ice arena and two curling sheets have natural ice and are used frequently. The swimming pool is small and only three feet deep, but is still used to near capacity. Typically, the fitness centre is now used to full capacity. Only the gymnasium and two baseball diamonds are available for additional usage.

Although soccer is popular in the area, there is no dedicated soccer field in the community, nor is there a running track. Proposals for track and soccer field facilities are currently being developed. In sum, many recreation facilities in Fort Simpson are currently operating at or near capacity.

At the first Deh Cho regional technical workshop in October 2003, community representatives indicated that some Deh Cho communities will share whatever recreation facilities they have with outsiders, and other communities will not. At the second Deh Cho regional technical workshop in May 2004, community participants recommended that construction camps should have their own recreation facilities. If communities are to provide recreational support to construction personnel, they will need help in developing and maintaining the additional programs and facilities.

#### **4.4.8.2 Mitigation Measures**

The mitigation measures described in Section 4.4.4, Mitigation Measures, all apply to the DCR.

If the short-term increase in indirect and induced demand for housing is met by the private sector through temporary accommodation, the private sector should be encouraged to include provisions for recreational activities in these facilities.

#### **4.4.8.3 Residual Effects**

It is expected that as many as 140 persons could migrate to Fort Simpson during peak construction activity. As it is not possible to accurately forecast the likely size of project-induced increased demands on recreation resources in Fort Simpson, conservative analysis requires that an adverse increase must be expected. As Table 4-30 shows, project effects on recreation resources in this

community are expected to be high magnitude for Fort Simpson. No effects are expected in any other DCR communities. These effects will last only during construction.

**Table 4-30: Recreation Resources – Project Effect Attributes in the Deh Cho Region**

Region	Effect Attribute			Significant	
	Direction	Magnitude	Geographic Extent		
DCR	Neutral	No effect	Regional	Short term	No
Fort Simpson	Adverse	High	Local	Short term	No

#### 4.4.8.4 Operations Effects

As shown in Section 3.3, Demography, the population effects on Fort Simpson are expected to decline from the peak construction levels to a longer-term stabilized increase of about 10 persons higher than pre-project levels. As a result, there could be a very small incremental demand for recreation resources by 2020. The capacity of the local recreation sector should easily meet this need over that time.

Assuming this is the case, it is expected that there will be no effect on recreation facilities and resources in Fort Simpson. Thus, there will be no need for mitigation and no residual effects during operations.

#### 4.4.9 Recreation Resources – Industrial and Commercial Centres in the Northwest Territories

In this section, the focus is on examination of project effects on recreation resources in the ICCs in the Northwest Territories, but the previous discussions on effect pathways, data, assessment of effects and mitigation are also relevant.

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

A brief discussion of the adequacy of recreation resources in the study area is found in Section 4.4.3, Assessment and Management of Project-Specific Effects. The influences likely to affect in-migration in Yellowknife and Hay River are described in Section 3.3.9, Demography – ICCs in the Northwest Territories.

The recreation facilities and programs now found in Yellowknife are relatively abundant, including those provided by the city and those for profit. In Hay River, construction will begin in June 2004 to expand facilities in the Hay River B.G. Sivertz Sports Centre. This will include increasing the current 75-person capacity swimming pool to accommodate over 250 people, and expanding the fitness centre facilities to accommodate four times the current 15-person capacity. At the same time, a new squash court will be built (Hay River recreation director 2003, personal communication).

Therefore, project effects on recreation resources use in the ICCs will depend on the provision of recreation facilities and equipment in the construction camp near Hay River, and the effectiveness of measures to discourage speculative in-migration. The facilities available in Yellowknife are expected to be adequate.

**4.4.9.2 Mitigation Measures**

The mitigation measures described in Section 4.4.4, Mitigation Measures, all apply to the ICCs.

**4.4.9.3 Residual Effects**

It is expected that as many as 125 persons could migrate to Hay River during peak construction activity. As it is not possible to accurately anticipate the likely size of project-induced increased demands on recreation resources in Hay River, conservative analysis requires that some increase must be expected. However, the potential increased utilization could create opportunities for increased user fees and enhanced community adjustment between new and existing residents.

As Table 4-31 shows, project effects on recreation resources are expected to be both adverse and positive, but low magnitude. These effects will last only during construction.

**Table 4-31: Recreation Resources – Project Effect Attributes for the Industrial and Commercial Centres in the Northwest Territories**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Hay River	Positive and adverse	Low	Local	Short term	No

**4.4.9.4 Operations Effects**

Most employment opportunities generated by the project will end once construction, associated cleanup and site restoration is complete. Any project operations and maintenance work will be based in Inuvik and the Mackenzie Valley. Project effects will be restricted to construction. As a result, there will be no need for mitigation and no residual effects during operations.

**4.4.10 Recreation Resources – Dene Tha’ First Nation in Northwestern Alberta**

The effects of the NGTL portion of this project on recreation facilities in the DTFN communities are expected to be negligible because the project is not expected to create any additional demand for recreation resources in any of the three DTFN communities.

#### 4.4.11 Recreation Resources – Industrial and Commercial Centres in Northwestern Alberta

As detailed in Section 3.3.11, Demography – ICCs in Northwestern Alberta, construction is expected to have no effect on population movement in Rainbow Lake and Zama City. The effects of the NGTL portion of the project in High Level will be restricted to some increase in the need for hospitality industry workers, an increase which must likely come from outside the community, as described in Sections 3.3.11, Demography – Dene Tha' First Nation in Northwestern Alberta, and 4.3.11, Housing – ICCs in Northwestern Alberta.

The recreational needs of drivers who stop over in High Level will doubtless be met by the hotels, motels, restaurants, bars and televisions in rental rooms. The number of additional hospitality workers in the community will be such a small addition to the High Level population as to have no effect on available recreation resources. Accordingly, there is no need for any further analysis.

#### 4.5 Governance

##### *How will the project affect community and regional governance, and development decision making?*

Governance is a broad term encompassing both the authority to make decisions and the ability to access and manage the funds that, alone, would make some decisions consequential. The fiscal authority of the Aboriginal governing bodies is constrained by intergovernmental funding arrangements and limited access to other revenue sources. Any increase in funding received from nongovernmental sources will increase the relative autonomy of the Aboriginal governing bodies.

##### 4.5.1 Effect Pathways

Figure 4-6 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

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

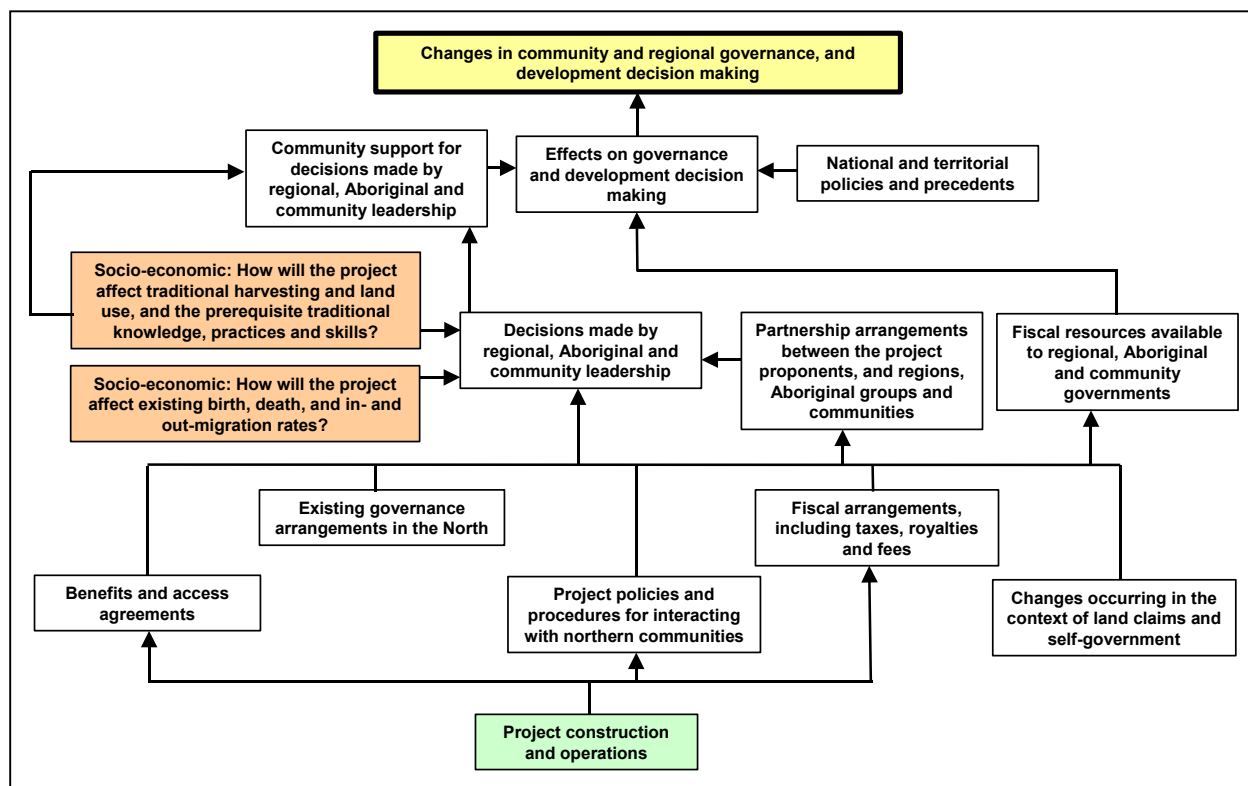


Figure 4-6: Project Effects on Community and Regional Governance, and Development Decision Making

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 a 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 region.

Throughout the community participation process for this 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 NGO workshops in December 2003 and March 2004, the ISR–GSA 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.

#### **4.5.2 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
- how project effects will interact with the legacies of earlier development proposals

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 this EIS focuses on the post-decision governance implications of the project.

### **4.5.3 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 Inuvialuit and the Gwich'in are exceptional in jointly negotiating with the GNWT an innovative but complex system of regional government for the BDR.

There are ongoing self-government negotiations between the GNWT, Government of Canada and Sahtu people. 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 Volume 4, Socio-Economic Baseline.

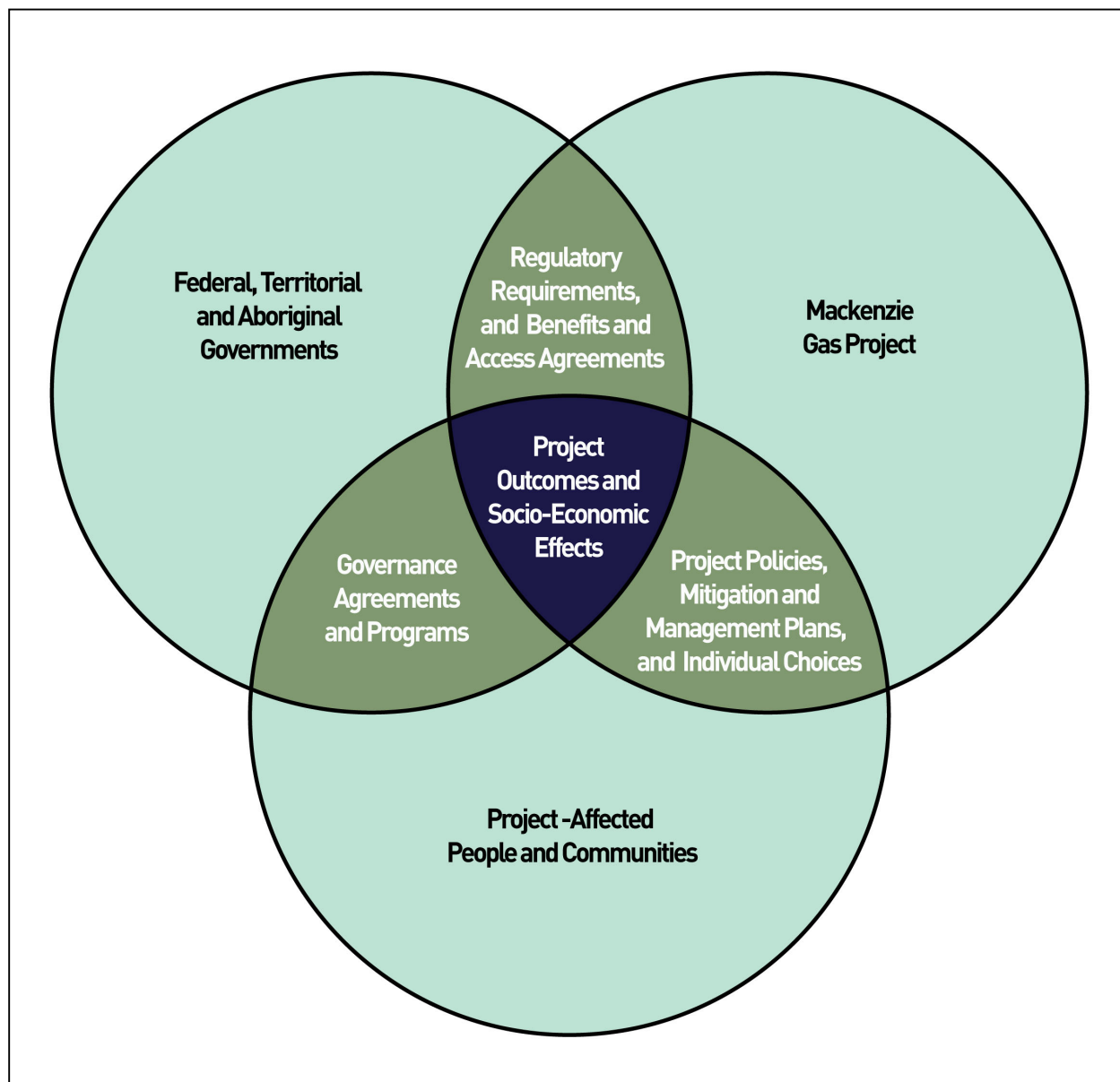
#### **4.5.4 Assessment and Management of Project-Specific Effects**

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 4-7 illustrates that all parties must cooperate to achieve the common objective of optimizing project effects on people.



**Figure 4-7: 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.

The size of these various project payments could be far in excess of the costs of sustaining adequate levels of infrastructure and services to meet project demands. Before implementation of a final devolution agreement, the largest part of these 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 the bulk of project royalty fee and tax revenue only during operations.

There is an inevitable disconnect; 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 3, The Economy and in various other sector-specific sections dealing with public service delivery, e.g., health care and social services delivery.

#### **4.5.5 Governance in Northwestern Alberta**

The DTFN is not currently involved in individual devolution or self-government negotiations with the federal government. However, there is an *aggregated* negotiation occurring between 22 of the 23 Treaty 8 First Nations in Alberta and INAC for a comprehensive self-government agreement-in-principle. These negotiations are at the initial stages (Chipeniuk 2004, personal communication). It is unlikely that the pipeline route will cross DTFN reserve lands or result in significant new demands for public expenditures in northwestern Alberta.

Therefore, the project will have no more than negligible effects on DTFN or other local Alberta community or regional governance.

**4.5.6 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 4-32 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 4-32: Governance – Project Effect Attributes for the Study Area Communities**

Region	Phase	Effect Attribute				Significant
		Direction	Magnitude	Geographic Extent	Duration	
NWT study area	Construction	Adverse	Moderate	Regional and beyond regional	Short term	No
Northwestern Alberta	Construction	Neutral	No effect	Regional	Short term	No
NWT study area	Operations	Positive	Low	Regional and beyond regional	Long term	No