
TITLE	Application for a Type A Land Use Permit in the DCR
SECTION	3: Overview of Activities in the DCR
SUBJECT	1: Regional Overview

PURPOSE

This section describes the proposed activities and pipeline components associated with the Mackenzie Gas Project in the Dehcho Region. It applies to both the construction and operations phases, and contains typical drawings, artists' impressions, and photographs.

An introduction to the biophysical and human environment setting is also included in this section, as is a discussion of primary mitigation strategies to reduce potential effects or development concerns that might be associated with the project.

SUMMARY OF REGIONAL ACTIVITIES

A one-kilometre wide corridor has been identified for the gas pipeline through the DCR. Within this corridor, a proposed pipeline route has been identified that extends about 532.3 km from the SSA to Alberta. This includes about 10.4 km of Sahtu private settlement land within the northernmost portion of the DCR.

Development Activities

As shown in [Figure 3-1](#), the proposed development in the DCR will involve constructing and operating:

- about 521.9 km of gas pipeline in a 40-m wide right-of-way
- gas compressor stations near Blackwater River and Trail River
- a gas heater station near Trout River
- pipeline appurtenances such as valves and cathodic protection facilities within the three facility sites and at five sites along the pipeline right-of-way

New long-term land access arrangements, amounting to about 2,110.7 ha, will be required for the gas pipeline right-of-way and the compressor and heater station sites in the DCR. An estimated 86.8 ha of additional temporary workspace will also be needed for construction purposes, not including timber storage and pipeline shoofly areas. The workspace for these requirements will be determined as engineering and construction planning progresses.

To support the proposed pipeline construction and operations activities in the DCR, various new infrastructure developments will be needed, including:

- construction camps, stockpiles, and fuel storage at the Blackwater River, Trail River, and Trout River facility sites and at Ochre River, Camsell Bend (ferry crossing), McGill Station, and Trout Lake (near K'eotsee)
- a construction camp within the municipal boundaries of Hay River
- stockpiles and fuel storage near River Between Two Mountains and at Fort Simpson and the Liard River ferry crossing
- 76 access roads totalling 257.1 km
- temporary spud barge landings at the existing Blackwater River, Ochre River, and River Between Two Mountains sites, and at the Camsell Bend and Liard River ferry crossing sites
- an airstrip at the Blackwater River and Trail River compressor stations
- helipads at the Blackwater River, Trail River, and Trout River facility sites

Borrow Sites

To support construction activities in the DCR, a total requirement of about 945,000 m³ of borrow materials has been estimated. Forty-two borrow sites have been identified for potential development. Together, these sites could provide about 2.6 million m³ of borrow material.

Existing Infrastructure

In addition to the proposed development activities, existing services and transportation infrastructure will be used where practical and with permission, where required. In the DCR, examples include:

- the Mackenzie Highway
- GNWT winter roads including from the Mackenzie Highway south to Trout Lake and from Wrigley north to Fort Good Hope
- commercial airstrips and airports at Wrigley, Fort Simpson, and Hay River
- barge landings at Fort Simpson and Hay River, and at the Camsell Bend and Liard River ferry crossings
- bulk fuel storage at Hay River

Water Requirements and Sources

An estimated 1.54 million cubic metres of water will be needed in the DCR for construction purposes (see [Table 3-1](#)). These requirements are addressed in the Type A water licence application submitted to the Board.

The water will be used to build and maintain access roads and a right-of-way travel lane, for pipeline installation and pressure testing purposes, and for domestic use at the camps. Water will normally be transported by truck to sites from nearby lakes, rivers, and in certain cases, municipal systems.

Table 3-1: Water Requirements in the DCR

Purpose	Annual Quantity (m ³)	Total Quantity (m ³)
Winter Access Roads	69,600	208,00
Pipeline Right-of-Way	354,000	1,062,000
Camp Water	123,450	246,900
Horizontal Directional Drilling (HDD)	-	15,700
Pipeline Pressure Testing	-	4,500
Total	547,050	1,537,900

About 44 potential water sources are being considered in the DCR (see [Figure 3-2](#)). Their location by area, is provided on [Table 3-2](#). Some can be accessed from several points on the pipeline right-of-way. The largest potential sources include the Mackenzie, Blackwater, Willowlake, Liard and Trout rivers.

Table 3-2: Location of Potential Water Sources in the DCR

Location	Approximate Kilometre Post (KP)		Number of Sources
	From	To	
SSA and DCR boundary area	686.3	771.1	13
Whitesand Creek and Ochre River	771.1	785.4	1
Wrigley Bypass	785.4	802.1	4
River Between Two Mountains	802.1	851.3	5
Willowlake River	851.3	870.2	1
Ebbutt Hills	870.2	986.5	11
Fort Simpson	986.5	1028.7	3
South Deh Cho	1028.7	1055.7	2

Table 3-2: Location of Potential Water Sources in the DCR (cont'd)

Location	Approximate Kilometre Post (KP)		Number of Sources
	From	To	
Highway Crossing Area	1055.7	1091.6	2
Trout River	1091.6	1220.1	2
Total			44

Water Use and Deposits

Water will be obtained from the Mackenzie River and other potential water sources in the DCR for building winter access roads and the pipeline travel lane.

No additives or treatment to the water will be required for building the access roads and the travel lane. The water will be trucked to the sites and used to help freeze and form the travel surface. In spring, the ice and snow will melt and flow into the natural drainage system. Any fuel spills will be handled in accordance with the project spill contingency plan (SCP). The collected materials will be managed in accordance with the applicable regulatory requirements described in [Section 11](#).

Water will be required for domestic purposes at the Blackwater River, Trail River, Trout River, Ochre River, Camsell Bend, Hay River, McGill Station and Trout Lake camps. The water will be obtained from nearby sources and from Hay River, subject to any necessary agreements with the town.

Domestic wastewater from the camps will be treated to meet the appropriate regulatory standards. Camp sewage will either be treated onsite or transported to an approved off-site location, in compliance with the applicable environmental and health standards. Off-site transport and disposal of sewage will occur primarily when smaller staffing requirements exist, such as during the operations phase.

Water for pressure testing the pipelines is expected to be obtained from nearby sources. This water will be mixed with methanol. After the tests are completed, the methanol will be separated from the water or the mixture will be salvaged or disposed of in an environmentally appropriate manner. A number of alternatives are being investigated for disposal, including recycling, flaring or evaporation.

Figure 3.1 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.

Figure 3.2 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.

TITLE	Application for a Type A Land Use Permit in the DCR
SECTION	3: Overview of Activities in the DCR
SUBJECT	2: Project Setting

SETTING FOR PROJECT ACTIVITIES IN THE DCR

This subject provides a summary of the regional biophysical and human environment setting for the project activities that will occur in the DCR. Detailed regional information is provided in [Section 8](#).

BIOPHYSICAL SETTING

The biophysical information in this topic incorporates information from desktop studies and reconnaissance-level field investigations in 2002, 2003, and 2004. The desktop studies included a review and analysis of available literature, government data, aerial photos, and satellite imagery. The reconnaissance surveys were conducted along the pipeline route, at proposed facility sites, and at various infrastructure sites. Detailed fisheries and wildlife studies, as well as air quality monitoring and sound level surveys, were also undertaken at certain locations (see [Section 8](#) for regional data and [sections 4, 5, 6](#) and [7](#) for site-specific information).

Climate

The pipeline corridor through the DCR, including the Blackwater River and Trail River compressor stations and the Trout River heater station, is located within a 300 by 500 km area designated as the northern air shed.

The average annual temperature is -3.7°C in Fort Simpson, with temperature extremes ranging from -53.5°C in the winter to 35.4°C in summer. Normal annual precipitation is about 360.5 mm in Fort Simpson.

Noise

The acoustic environment around the proposed development in the DCR is dominated by the sounds of nature. Existing sound levels are expected to be in the range of 20 to 40 dBA, although sites near the Mackenzie Highway and GNWT winter roads will have higher ambient levels due to vehicle traffic.

Soils, Landforms and Permafrost

The area covered by this application is within the South Taiga Plains ecological zone. Most of the surficial material in the DCR was deposited during continental glaciation. Glacial or post-glacial processes created many of the landforms.

Organic deposits form the most extensive surficial unit in the development area and cover about 50% of the development area. Moraine and glaciolacustrine deposits account for about 25 to 30%, with glaciofluvial, aeolian, colluvial, fluvial and other deposits making up the balance. Abundant fens and bogs occupy depressions and low-lying areas.

The DCR is situated primarily in a zone of sporadic discontinuous permafrost. Extensive discontinuous permafrost is found in the northernmost 40 km. Areas of intermediate discontinuous permafrost and isolated patches of continuous permafrost are located elsewhere in the region. The permafrost layer is typically up to 10 m thick.

Vegetation

The South Taiga Plains ecological zone extends throughout the DCR. In the uplands, there are closed forests of aspen, white spruce, Alaska birch, and jack pine. In the level, poorly-drained terrain, there are extensive forests of open to scattered black spruce and tamarack. Broad areas have been burned near the Great Bear River, Willowlake River and K'eotsee (Trainor Lake).

Seventeen major vegetation types have been identified within the South Taiga Plains. The most common are black spruce-Labrador tea/mountain cranberry and upland white spruce-trembling aspen-jack pine. Uncommon vegetation communities include patterned fens, stands of closed canopy mature tree communities that occur on fluvial, eroded, and saturated areas and on eskers, kames and other less common terrain features.

There are six vegetation types of concern in the South Taiga Plains:

- riparian willow
- riparian willow-red osier dogwood
- black spruce/cloudberry-lichen bog
- leatherleaf/bog rosemary-peat moss
- graminoid fens, including patterned fens
- white spruce/stair-step moss

There are also four vegetation communities of concern - tall forest stands and vegetation growing on rock outcrops, near human communities, and around alkaline lakes.

Sixteen rare plant species have been identified in field reconnaissance in the DCR study area. One is a nationally rare species, the dwarf clubbrush (*Solidago graminifolia*).

Wildlife

The DCR is home to about 44 species of terrestrial mammals, including ungulates, large carnivores, furbearers, and small mammals. Characteristic species include moose, woodland caribou, black bear, wolverine, marten, fisher, beaver and muskrat. Grizzly bears occur at low densities and are widely dispersed. Bison might also roam through the region, especially south of the Mackenzie River.

Some special status species occur in the DCR. Examples are the woodland caribou (boreal population), grizzly bear (northwestern population), wolverine, northern flying squirrel and river otter.

Important habitats for many terrestrial mammal species have been identified throughout the DCR. These are located primarily within the lakes and tributaries of the Mackenzie River. Riparian zones are important movement corridors for a number of wildlife species. Forest and shrub communities along these narrow riparian habitat bands provide food, protective cover and thermal cover during the winter months.

Approximately 176 bird species occur in the DCR, of which about 145 species occur as breeders and the remainder (mostly shorebirds, waterbirds, and several raptors) as migrants. Species that migrate through the region include snow geese and tundra swans. Breeding species include several species of waterfowl, raptors, shorebirds and passerines. Only 23 species occur as year-round residents. Thirty-four special status species have been identified, including peregrine falcon, short-eared owl, golden eagle, and boreal chickadee.

The wetlands, lakes and watercourses in the DCR provide important nesting and migrating habitats for waterfowl and shorebirds. The Mackenzie River supports migrating waterfowl in the spring. Upland habitats support hawks, owls, upland game birds, woodpeckers and various passerines. Other important nesting habitat includes bogs and fens as well as wetlands, lakes, sandbars, watercourses and other permanent waterbodies.

Only two species of amphibians, the boreal chorus frog and wood frog, are known to occur in the study area. The boreal chorus frog is considered "sensitive" by ENR.

Hydrology

The Mackenzie River basin contains the longest drainage system in Canada, the second largest in North America, and the sixth largest in the world. The two largest tributaries to the Mackenzie River, in terms of drainage basin area, are the Liard River (about 277,000 km²) in the DCR and the Great Bear River (about 155,000 km²) in the SSA.

The proposed pipeline crosses seven large watercourses (drainage basins >1,000 km²) in the DCR. These are the Blackwater River (10,400 km²), Ochre River (1,160 km²), River Between Two Mountains (4,520 km²), Willowlake River (19,900 km²), Mackenzie River (992,000 km²), Jean Marie Creek (1,570 km²), and Trout River (6,372 km²).

The development area in the DCR is, for the most part, poorly drained with flat gradients and watercourses that are continually affected by beaver activity. Thaw proceeds slowly in the spring and summer, as vegetation and muskeg provide good insulation. Organic material holds considerable volumes of water at or near the surface, which are released slowly through the summer.

About 60% of the watercourses in the DCR are vegetated channels with poorly defined flow paths or with drainage dispersed through shrubs and trees. Another 18% are small watercourses that have discernable banks and substrate, but are likely to freeze to the bottom during winter and do not provide fish with overwintering habitat.

Groundwater

Groundwater in the DCR is linked to surface flow that, in turn, responds to short- and long-term variations in precipitation or snowmelt.

Watercourses between the boundary with the SSA and the Willowlake River originate in the Franklin Mountains, immediately east of the pipeline corridor. Karst features are common and perennial springs related to karstification occur upstream of, and along, this part of the corridor.

In the White Sand Creek area, and between the Ochre River and Smith Creek, the pipeline is parallel to, and immediately west of, the McDonnell Range of the Franklin Mountains. Water percolates downward and moves through the rocks until it discharges from springs at the base of the mountains. These springs are mainly perennial so sheets of ice on the ground surface, known as icings, might extend substantial distances along the watercourses.

Icings occur on the proposed pipeline crossings between Smith Creek and River Between Two Mountains, even though the corridor in this area is about five kilometres west of the base of the Franklin Mountains.

South of Smith Creek, the corridor veers away from the Franklin Mountains. Icings were observed along this stretch of the pipeline, although only one spring was identified in the reconnaissance.

Karst features and springs are not common in the southern part of the DCR, except possibly between Jean Marie Creek and Trout River. This area is located in the region of sporadic discontinuous permafrost.

Water Quality

Waters in the Mackenzie River basin flow through varied lithology and receive drainage waters from several subdrainage basins.

Waterbodies are well oxygenated during summer, fall and winter, with dissolved oxygen concentrations mostly above the minimum aquatic life guidelines. Turbidity levels are mostly low during winter, summer and fall, with occasional moderate and high values in some watercourses. Water is moderately coloured in summer and fall, and values are above the drinking water guideline. Total dissolved solids (TDS) and conductance levels are variable and range from low to very high.

Due to variations in geological terrain, nutrient levels are variable. Most metals are present at levels below aquatic life and drinking water guidelines.

Fish and Fish Habitat

The Mackenzie River and its tributaries throughout the DCR support both diadromous and resident fish species. None of these species are listed as endangered, threatened, or of special concern.

About 30 species of fish are potentially present in DCR watercourses. Of these species, 13 spawn in the fall or winter. These include the salmonid species, except arctic grayling. Fall spawning generally occurs in larger watercourses with perennial flow. Spring spawning is typically in smaller tributaries and can occur in intermittent or ephemeral drainages.

HUMAN ENVIRONMENT SETTING

This topic discusses various aspects of the human environment in the DCR, including traditional culture, heritage resources and protected areas, logistics, employment, the economy, infrastructure, and community services. It includes feedback from the public involvement program, interviews and a review and analysis of available literature and government data. A detailed discussion is provided in [Section 8](#).

People and the Economy

The DCR includes the village of Fort Simpson, a moderately sized administrative center, and several smaller communities, including Fort Providence, Fort Liard, Wrigley, Nahanni Butte, Trout Lake Jean Marie River, Kakisa, Hay River Reserve and West Point Reserve. All of these communities have mostly Aboriginal populations. Hay River is located within the South Slave administrative boundary.

The 2003 estimated population of the DCR communities was 3,428, including a total of 1,237 in Fort Simpson. Census data for 1991 and 2001 showed most communities had slight increases in population, with Fort Providence, Nahanni Butte and Hay River Reserve experiencing higher increases than the other communities.

Employment rates in the DCR communities generally increased from 1991 to 2001, while unemployment rates decreased. In 2001, average employment income was about \$31,444 in Fort Simpson, \$21,977 in Fort Providence, and \$27,458 in Fort Liard.

Community Services

Community wellness, measured in terms of the physical, emotional, social and economic well being of individuals and families in the DCR communities, is challenged by a number of issues. These longstanding issues include alcohol abuse and related violence and illness, smoking, sexually transmitted infections (STIs) and suicides. This places additional burdens on health care, public safety and protection services in the communities.

The Dehcho communities are served by the Deh Cho Health and Social Services Authority (DCHSSA), headquartered out of Fort Simpson. The DCHSSA runs health and social service centers in Fort Simpson, Fort Liard and Fort Providence. Wrigley has a health center, with social services provided by Fort Simpson. Nahanni Butte, Trout Lake and Jean Marie River have health stations, and associated social services are provided by Fort Simpson. The health care needs of Hay River Reserve and West Point Reserve residents are met by Hay River health care facilities. Kakisa depends on the Fort Providence health and social services.

Hospital services in the DCR are available in Yellowknife. Air ambulances are stationed in Yellowknife to ensure speedy response to medical emergencies in the other communities. Services that are not available from the DCHSSA might be sought in Yellowknife or outside the Northwest Territories, upon referral of DCHSSA staff.

There are RCMP detachments in Fort Simpson, Hay River and Fort Liard. The Fort Simpson RCMP detachment consists of three officers. The Hay River detachment has nine officers.

By 2004, all of the Dehcho communities had kindergarten to grade 12 schools, except Wrigley, Kakisa, and Nahanni Butte, which offer kindergarten to Grade 10. All of the schools had substantial excess capacity.

The proportion of the adult population with high school diplomas decreased slightly to 46 from 47.9% between 1994 and 2001. The graduation rate increased in Fort Simpson, Wrigley and Jean Marie River, decreased in Fort Providence and was unchanged in Fort Liard.

Physical Infrastructure

Dehcho communities in the northern and western parts of the DCR use Fort Simpson as a transportation hub. Hay River serves as the hub for communities in the southern and eastern parts of the DCR. Fort Simpson and Hay River have scheduled air service. None of the smaller Dehcho communities is linked to Fort Simpson or Hay River by scheduled air service. When necessary, these communities depend on periodic air charters.

Most of the DCR communities (Fort Simpson, Fort Providence, Fort Liard, Wrigley, Jean Marie River, Kakisa and Hay River Reserve) have at least seasonally restricted access to an all-weather highway. Nahanni Butte and Trout Lake are the most isolated, with only rough ice road connections to a highway and no driveable summer connections.

The highway connections for all the Dehcho communities, except Trout Lake, facilitate truck-based re-supply. Fort Simpson, Fort Liard and Fort Providence have bus service, although the Fort Providence service is, for now, seasonally restricted. The DCR bridge project will replace a seasonal ferry with a permanent bridge over the Mackenzie River to Fort Providence.

Hay River is the only community in the southern NWT with a railroad connection. Barging service is available to both Fort Simpson and Fort Providence, but these communities do not depend on marine re-supply as they receive their deliveries by truck. Jean Marie River, Wrigley and Fort Liard also have barging service available, as does Nahanni Butte by special charter.

Water, mostly trucked, and liquid and solid waste disposal services are available in all of the Dehcho communities except Trout Lake. Trout Lake has outdoor pits or privies and residents burn much of their solid waste before disposal.

Diesel-fuelled generators supply power in all communities except Jean Marie River and the Hay River Reserve, which are connected to the NWT Power Corporation grid. The main heating fuel is P-50 fuel oil, with wood as a supplement in many communities.

Traditional Culture

Traditional culture includes the knowledge, skill and disciplines required to harvest and survive on the land. Traditional or country foods, the traditional economy, and Aboriginal language use and retention, are important aspects. Within the DCR, survey findings indicate:

- about 41% of the adult population hunted or fished in 2002
- country food represented at least half of the food consumed in 2002 by 61% of DCR households

- trapping has been declining in DCR Aboriginal communities since the late 1980s
- fluency in Aboriginal languages declined between 1989 and 1999, with about 65% of Aboriginal adults in the DCR speaking Aboriginal languages in 1999

Non-Traditional Land and Resource Use

Non-traditional land and resource use within the DCR includes extracting borrow material, small-scale commercial fuel wood harvesting, a saw mill and a log home operation, oil and gas activities, non-traditional resource harvesting, and tourism and recreation.

Mineral showings for copper, iron and zinc have been identified north of Wrigley. A gold deposit (placer) has been reported near the River Between Two Mountains and a zinc deposit has been identified in the Ebbutt Hills area. There are also several mineral claims south of Fort Simpson in the pipeline corridor, although there are no known mineral deposits in this area.

Existing petroleum industry activity in the DCR includes the Enbridge Norman Wells pipeline, Fort Liard and Cameron Hills areas.

Sport hunting and game bird hunting are permitted for specific species. No commercial or domestic fishing licences have been issued in the DCR near the proposed development activities. Sport fishing is licensed by ENR.

Several tourism-based businesses operate in the area that might be traversed by the pipeline corridor and recreationalists frequently use all-weather and winter road corridors for touring by snowmobiles and all-terrain vehicles.

Protected Areas

The gas pipeline and related infrastructure are located within three candidate areas for protected area status under the Northwest Territories Protected Areas Strategy (NWT-PAS). These candidates are Edézhíe, Pehdzéh Ki Deh, and Samba K'e, which are shown in [Figure 3-10](#).

The Edézhíe area includes the Horn Plateau and extends west to the Mackenzie River along the Willowlake River Valley. It also includes the Enbridge Norman Wells pipeline right-of-way and the Mackenzie Highway. The ecological, cultural and economic values of the area are currently being assessed under the NWT-PAS process, and a final protected area proposal is being developed. Edézhíe has interim protection from new surface and subsurface interests under P.C. 2002-1805, but provides for a gas pipeline corridor along the western edge of the area.

The Pehdzéh Ki Deh has been identified for its cultural significance and traditional use. A protected area proposal is being developed under the NWT-PAS

process and community support, as well as a sponsoring agency, is being sought. There are no limitations on new subsurface or surface interests as a result of the NWT-PAS, although there is local and regional support for this protected area initiative.

The Smbaa K'e area has been identified by the Trout Lake community for consideration under the NWT-PAS, although it does not currently fit into any single step of the PAS process. Most of the area is already protected, on an interim basis, by P.C. 2003-1230. There are provisions in this order for a gas pipeline and related infrastructure.

In addition to the NWT-PAS process, Edézhíe, Pehdzéh Ki Deh, and Smbaa K'e have been proposed as conservation zones in the June 2005 version of the Dehcho June 2005 draft land use plan. This draft proposes four types of land use zones for the DCR – conservation, special management, general use, and a special infrastructure corridor for the gas pipeline and related infrastructure.

Development activities in the DCR will be required in five of the proposed conservation zones, as well as in four special management zones and the special infrastructure corridor.

The five proposed conservation zones are:

- Pehdzéh Ki Deh
- JMR Five Lakes
- Sibbeston Plains
- Edézhíe
- Smbaa K'e/Redknife River

The four proposed special management zones are:

- Jean Marie
- Cameron Hills, Blackstone River, Arrowhead River
- Trout River
- Fort Simpson

As the June 2005 draft land use plan is still in the preparation and comment phase, revisions and modifications might be required before, and after, the land use plan is approved.

Heritage Resources

About 24 previously unrecorded heritage sites were identified in, or relatively close to, proposed project development locations during the field reconnaissance programs in 2002 and 2003. These results have been provided to the Prince of Wales Northern Heritage Centre.

The finds included prehistoric archaeological, historic archaeological, and a wide array of cultural sites, including recent campsites, trails, cabins, and traps.

Most of the sites surveyed were at potential river crossings, borrow sources, infrastructure sites and access roads near known heritage resource sites, or in areas where project-related ground disturbance might be significant.

TITLE	Application for a Type A Land Use Permit in the DCR
SECTION	3: Overview of Activities in the DCR
SUBJECT	3: Project Schedule

SCHEDULE OF PROJECT ACTIVITIES

A preliminary multi-year construction plan has been developed for the project.

The construction schedule incorporates the timing of regulatory approvals described in the *Cooperation Plan for the Environmental Impact Assessment and Regulatory Review of a Northern Gas Pipeline Project through the Northwest Territories* developed by the Northern Pipeline Environmental Assessment and Regulatory Chairs' Committee.

The preliminary plan assumes three years of construction for the pipelines and associated facilities, followed by construction clean-up, demobilization and reclamation (see [Table 3-3](#)).

The first year involves preparatory activities starting in the summer of 2006. These activities include building the infrastructure needed for construction and clearing the right-of-way and facility sites.

The second and third years involve completing preparatory activities and constructing the pipelines and associated facilities.

Camp and equipment demobilization, construction cleanup and site reclamation will start in the third year and will be substantially complete in the fourth year.

Most pipeline installation activities will be completed during the winter. Some activities, such as watercourse crossings and borrow site developments, might occur in the summer, where access to the work site is practical. Summer activities are critical to the schedule, as these will allow development of infrastructure needed to support winter construction.

Construction plans include the receipt of regulatory approvals, permits, and authorizations in time to begin infrastructure construction in the second half of 2006.

Table 3-3: Pipeline and Facilities Construction Schedule for the DCR

Season	Activity
Summer 2006	<ul style="list-style-type: none"> • Mobilize equipment, small camps, and fuel for pipeline right-of-way clearing. • Mobilize equipment, small camps, and fuel and begin construction at the Blackwater River compressor station, Ochre River, River Between Two Mountains, Camsell Bend, Liard River and McGill Station. • Construct barge landing sites at the Blackwater River compressor station, Ochre River, Camsell Bend sites and River Between Two Mountains. • Begin to develop and operate borrow sites that are accessible in the summer. • Erect fuel facilities at Blackwater River compressor station, Ochre River, Camsell Bend, and McGill Station sites. • Mobilize and erect 60- to 120-person temporary camps at the Ochre River, Camsell Bend, Liard River, McGill Station and Blackwater River compressor station sites.
Winter 2006–2007	<ul style="list-style-type: none"> • Construct winter roads for the Ochre River, Trail River, Trout River, Trout Lake, and Liard River sites. • Mobilize mobile camps and begin surveying, clearing and soils investigation along the pipeline right-of-way (spreads B1, A1). • Mobilize equipment, small camps, and fuel and begin construction at the Trail River, Trout River and Trout Lake sites. • Construct winter roads to, and pads at, HDD sites at Willowlake River, Blackwater River, Ochre River, and the Mackenzie River. • Mobilize and erect a 120-person camp at the Trout Lake and Trail River sites and a 40-person camp at the Trout River heater station site.
Summer 2007	<ul style="list-style-type: none"> • Mobilize and erect the pipeline construction camps at the Ochre River, McGill Station, and Camsell Bend sites. • Mobilize piling and equipment to the Blackwater River compressor station and begin installing the station piling. • Move-in pipe, equipment, and fuel to support main pipeline construction. • Mobilize and erect a 300-person camp at Hay River.
Winter 2007–2008 First pipe-laying season	<ul style="list-style-type: none"> • Construct winter roads and mobilize HDD equipment, fuel and supplies to the Willowlake River, Blackwater River, Ochre River, and the Mackenzie River HDD sites and install the crossings. • Mobilize and erect a pipeline camp at the Trout Lake site. • Construct winter roads for the Ochre River, Camsell Bend, Liard River, McGill Station, Trout River and Trout Lake sites. • Mobilize mobile camps and begin surveying, clearing and soils investigation along the pipeline right-of-way (spreads A2, B2). • Mobilize piling and equipment to the Trout River heater station sites and begin installing the station piling. • Begin pipeline construction spreads A1, and B1. • Begin pipeline right-of-way reclamation.

Table 3-3: Pipeline and Facilities Construction Schedule for the DCR (cont'd)

Season	Activity
Summer 2008	<ul style="list-style-type: none"> • Move-in pipe, equipment, and fuel to support main pipeline construction. • Mobilize equipment, modules and components, and begin construction at the Blackwater River compressor station. • Begin post-construction monitoring and associated remediation.
Winter 2008–2009	<ul style="list-style-type: none"> • Construct winter roads and construct pipeline spreads (A2, B2). • Mobilize equipment, modules, and components for the Trout River heater station and Trail River compressor station and begin constructing the stations.
Summer 2009	<ul style="list-style-type: none"> • Begin commissioning the Trout River heater station and the Blackwater River and Trail River compressor stations. • Begin infrastructure and borrow site reclamation. • Begin demobilizing construction equipment and camps.
Winter 2009–2010	<ul style="list-style-type: none"> • Complete commissioning and start-up activities. • Start up and begin operating facilities and pipelines.
Summer 2010	<ul style="list-style-type: none"> • Complete pipeline right-of-way reclamation and reclamation of infrastructure sites not required for operations. • Complete demobilization. • Continue post-construction monitoring and associated remediation.

INFRASTRUCTURE

Barge Landing Sites

Existing barge infrastructure will be the main mode for transporting materials and supplies, facility modules, camps, pipe, valves, construction equipment and fuel for construction activities north of Fort Simpson.

Materials and equipment delivered by vehicle or rail to Hay River, and by vehicle to Fort Simpson, where they will be transferred to barges for transport downstream. The barges will be moved by tugs. A single tug will be capable of pushing or pulling up to six fully laden barges. The towed barges will be moored to buoys at the barge landings. Tugs will pull each barge to the near shore landing area for unloading.

Most of the barge landings required by the project will be temporary summer sites, requiring one or more spud barges. Temporary spud barge landings, consisting of one or more 600 series barges, will be grounded and anchored into the river bank and used as a temporary dock, crane platform and access ramp (see [Figure 3-3](#)). Larger 1000 or 1500 series barges will be used to transport materials to the spud barges. The landings will be secured to shoreline mooring points, as shown in [Figure 3-4](#).

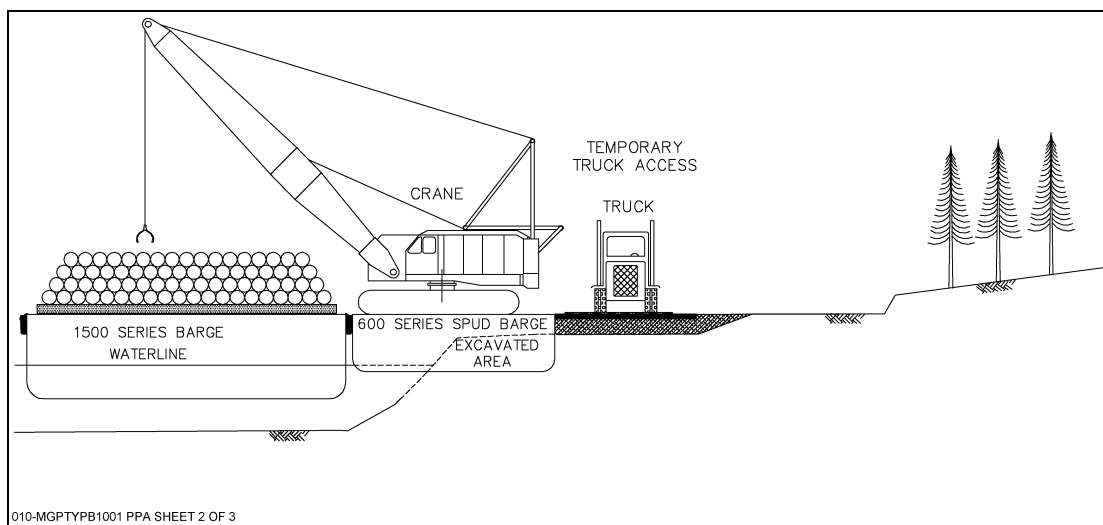


Figure 3-3: Typical Pipe Unloading from 600 Series Barge

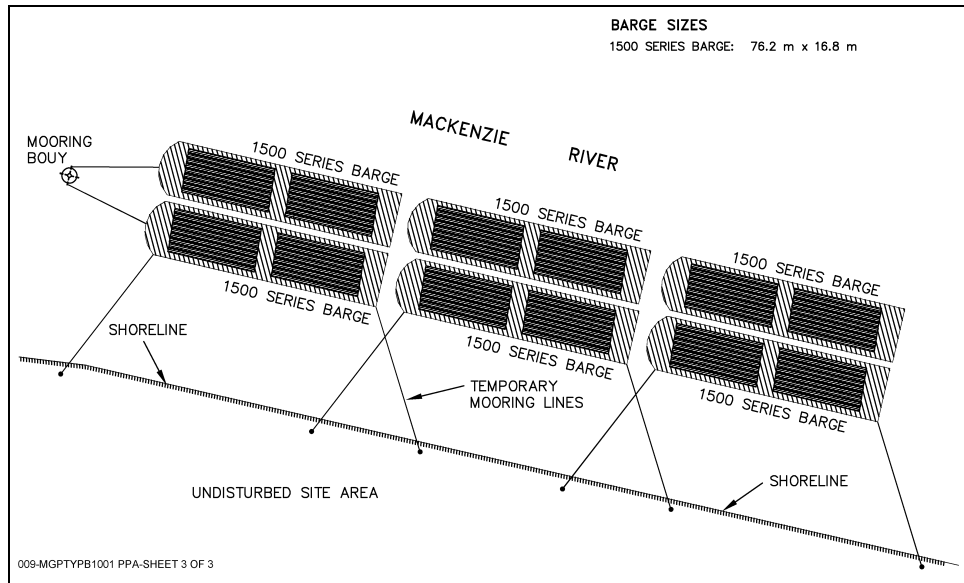


Figure 3-4: 1500 Series Typical Barge Mooring

The spud barges will be moved onto the riverbank at the end of each barging season to prevent them from being lost or damaged during spring breakup. The landings will be secured to shoreline mooring points.

Some sites will be abandoned and reclaimed after construction is complete. Others will be required for the operations phase, such as the proposed Blackwater River barge landing.

Within the DCR, new temporary spud barge landings will be required at two existing but currently unused sites (Blackwater River and Ochre River), at River Between Two Mountains, and at the Camsell Bend and Liard River ferry crossings. The two ferry crossings and one River Between Two Mountains site are currently in use and will require modifications to allow for the addition of the new temporary spud barge landing sites.

The existing Fort Simpson barge landing might also require upgrades to accommodate the high volume of barge traffic and the weight of equipment, materials and supplies required for project construction. Upgrades to the Hay River barge landing are not anticipated.

About 0.6 ha of additional near shore area will be required for anchoring, loading and unloading the barges. An artist's impression of a typical landing is shown in [Figure 3-5](#).

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Pipeline and Facility Construction Camps

New temporary camps, both stationary and mobile, will be needed in the DCR to house the workers required to build the proposed facilities and infrastructure, and construct the pipelines for the project.

Stationary Camps

Eight stationary camps are proposed for the DCR, ranging in capacity from 40 to 950 people. Their purpose, location, and estimated size are provided in [Table 3-4](#) and the site-specific maps in [Section 4](#) of this application.

Table 3-4: Location and Estimated Size of Stationary Camps in the DCR

Site Name	Capacity (Persons)	Purpose	Footprint (ha)	Status Under Interim Withdrawal Orders
Blackwater River compressor station	120	Pipeline facilities	1.1	No withdrawal
Ochre River infrastructure site	950	Pipeline	5.3	No withdrawal
Camsell Bend infrastructure site	950	Pipeline	5.3	Surface and subsurface
Trail River compressor station	120	Pipeline facilities	1.1	No withdrawal
McGill Station infrastructure site	950	Pipeline	5.3	Subsurface
Trout River heater station	40	Pipeline facilities	0.4	No withdrawal
Trout Lake (near K'eotsee)	900	Pipeline	5.3	Surface and subsurface
Hay River infrastructure site	300	Pipeline and pipeline facilities	3.3	No withdrawal
Total			27.1	

The camps will typically consist of modular units arranged in conventional construction field camp configurations and will have footprints ranging from about 0.4 to 5.3 ha in the DCR. They will include sleeper, lavatory, shower, kitchen and dining units, recreational facilities, first aid stations, generator sets and water treatment units. They might also have offices, maintenance shops and bulk storage trailers. Artist's impressions of three sizes of stationary camps (120, 250, and 950 persons) are shown in [Figure 3-7](#), [Figure 3-8](#) and [Figure 3-9](#).

The foundation design for the stationary camps will be based on a site-specific geotechnical assessment. The camp layout and footprint will be subject to site-specific influences such as terrain, environment and local communities. Site

security plans will be developed, as required, to address the health and safety of personnel, and the security of equipment and materials.

The camps will be designed to be self-sufficient in terms of power, water treatment, sewage and solid waste treatment and disposal, and communications capabilities. However, when they are located near a community, opportunities to purchase water, power or waste management services will be assessed. This assessment will include community input.

Water for the stationary camps in the DCR will be sourced from nearby lakes, rivers and municipal systems and transported by truck to the sites.

The expected sources and volumes of water required by the stationary camps during the three-year construction period are shown on [Table 3-5](#). These estimates are based on a consumption rate of 227 L per day of water per person at the infrastructure and facility camps.

Table 3-5: Camp Water Requirements in the DCR

Camp Location	Primary Source	Daily Volume (m ³)	Annual Volume (m ³)	Project Volume (m ³)
Blackwater River compressor station	Mackenzie River	10	3,550	7,100
Ochre River infrastructure site	Mackenzie River	76	27,700	55,400
Camsell Bend infrastructure site	Mackenzie River	76	27,700	55,400
Trail River compressor station	Nearby unnamed lake	10	3,550	7,100
McGill Station	Nearby wells and rivers	76	27,700	55,400
Trout River heater station	K'eotsee	2	900	1,800
Trout Lake (near K'eotsee)	K'eotsee	37	13,500	27,000
Hay River	Hay River	52	18,850	37,700
Total		339	123,450	246,900

Mobile Camps

About 20 mobile camps will be required for the project, some of which will be used in the DCR. Mobile camps are small, self-contained units that might be based on barges or land (see [Figure 3-6](#)).

Mobile camps will be moved frequently during construction and will typically be used for the crews developing new stationary camps, expanding existing camps, or installing storage facilities, barge landing sites, borrow sources and access roads. The land-based mobile camps will accommodate 35 to 70 people.

Site location, seasonal conditions, and travel distances will determine the water sources for the mobile camps. In most cases, the water will be obtained off site and delivered by truck.

The mobile camps will be self-sufficient in terms of power, water supply, water treatment, sewage and solid waste treatment and disposal, and communications capabilities. Possible exceptions are the camps near communities with municipal facilities.

As with stationary camps, site security plans for mobile camps will be developed as required, to address the health and safety of personnel, and the security of equipment and material.



Figure 3-6: Example of a Land-Based Mobile Camp

Pipe and Equipment Stockpile Sites

Ten new stockpile sites will be developed in the DCR to store pipe, materials and equipment after they have been delivered and before they are needed for construction on the project (see [Table 3-6](#) for the stockpile locations and items to be stored in the DCR). These sites might also be used to store construction equipment when it is not being used. They will be developed between 2006 and 2008.

Table 3-6: Construction Stockpile Locations and Materials in the DCR

Site Location	Storage Items
Blackwater River compressor station	Line pipe, material and equipment
Ochre River infrastructure site	Line pipe, material and equipment
River Between Two Mountains infrastructure site	Line pipe, material and equipment

Table 3-6: Construction Stockpile Locations and Materials in the DCR (cont'd)

Site Location	Storage Items
Camsell Bend ferry crossing	Line pipe, material and equipment
Trail River compressor station	Material and equipment
Liard River ferry crossing	Line pipe, material and equipment
McGill Station infrastructure site	Line pipe, material and equipment
Trout River heater station	Material and equipment
Trout Lake (near K'eotsee)	Line pipe, material and equipment
Hay River infrastructure site	Line pipe, material and equipment

Stockpile sites will typically be about seven hectares in area. The dimensions will depend on site location and the quantity and size of pipe and other materials to be stored. Some sites have existing roads. In most cases, a road will be constructed to connect the sites to the pipeline right-of-way or facility site.

Site preparation methods will depend on the conditions at each location. The sites will be developed to allow safe movement of trucks and equipment, and safe crane operations. The portions used for vehicle traffic will be gravelled.

Fuel Storage Sites

Fuel storage sites will be developed within the footprint of the Blackwater River, Ochre River, River Between Two Mountains, Camsell Bend, Trail River, Liard River, McGill Station, Trout River and Trout Lake sites. Use of existing bulk fuel storage facilities at Hay River is also planned.

The primary fuel for camp, construction equipment and light duty trucks will be diesel. The chartered air carriers will supply aviation fuel. The volumes of fuel to be stored will range from 100,000 L at the Trout River heater station to 6.8 million L at Camsell Bend and 6.9 million L at Ochre River.

The fuel storage sites will be set back at least 100 m from any body of water or will be protected from flooding, unless otherwise authorized. These sites might be up to several hectares in area, depending on the tank size, location and quantity of fuel to be stored. The fuel tanks will either be double-walled or single-walled with secondary containment systems.

Most fuel storage facilities will be located on compacted gravel foundations. The horizontal double-walled tanks will be placed on skids.

At mobile camps, in the first season of construction, fuel might be stored on board barge-based camps or on trucks for land-based mobile camps.

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Figure 3.9 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.