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TITLE	<b>Application for Land Use Permits for Land within the Municipal Boundaries of Norman Wells, Fort Good Hope and Tulita</b>
SECTION	6: Pipeline Segments
SUBJECT	1: Summary

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## INTRODUCTION

This section supports an application for the land use activities and operations associated with the two pipeline segments on land within the Norman Wells municipal boundary (see [Figure 6-1](#)). It includes:

- an estimate of personnel requirements
- a summary of the operations
- a description of potential environmental and resource effects
- construction equipment estimates
- information about the two pipeline segments, including:
  - pipeline rights-of-way
  - watercourse crossings
  - access roads
  - appurtenances

The pipeline segments in this section are numbered from north to south. The pipeline segments adjacent to the two pipeline segments in this section are both located on private land outside the Norman Wells municipal boundary. The adjacent pipeline segments are the subject of the SSA private land use permit application.

Site-specific maps showing the location of individual pipeline segments are provided in the subjects included in this section.

## PERSONNEL (PART 3)

A pipeline construction spread (C2) will be built across a portion of Sahtu Settlement Area lands during the winters of 2007-2008 and 2008-2009, with cleanup and reclamation occurring in the following year. This spread will support the construction of about 14.9 km of the proposed pipelines on lands within the Norman Wells municipal boundary.

Beginning at the municipal boundary west of Norman Wells (KP-475.0), there will be about 1.4 km of an NPS 10 NGL pipeline in a 30 m wide right-of-way ending at the fenceline of the Enbridge interconnect facility (KP-476.4). On land within the Norman Wells municipal boundary, there will also be about 13.5 km of an NPS 30 gas pipeline in a 40 m wide right-of-way from the western to the eastern municipal boundary (KP-488.5). The construction spread configuration for the entire pipeline is shown in the foldout maps in [Appendix C](#).

The construction crew for these pipeline segments will operate out of the Norman Wells infrastructure site. The personnel in this spread will consist of up to 1,350 people to manage, support and execute all elements of the construction process.

## **SUMMARY OF OPERATIONS (PART 5)**

The land use activities and operations described in this section include:

- developing and maintaining about 14.9 km of pipeline right-of-way that will contain:
  - 13.5 km of 40 m wide pipeline right-of-way for the NPS 30 gas pipeline
  - 1.4 km of 30 m wide pipeline right-of-way for the NPS 10 NGL pipeline
  - pipeline appurtenances such as valves, cathodic protection devices, signs and markers
  - watercourse crossings, where required, along the pipeline right-of-way
- developing and maintaining one access road with a total length of about 1.0 km (for cross-sections, see [Section 3](#)) connecting the pipeline right-of-way, existing transportation routes, water sources, infrastructure sites and roads near watercourse crossings
- using additional temporary workspace in support of construction activities

[Figure 6-1](#) is an overview map of the pipeline segments. The following subjects describe the proposed alignment of these pipeline segments:

- [Subject 6.2 Pipeline Segment M1-NW-Gas](#)
- [Subject 6.3 Pipeline Segment M2-NW-NGL](#)

### **Preconstruction Activities**

Before construction activities begin on the right-of-way:

- a preconstruction survey will be conducted to finalize the alignment
- detailed planning will be conducted to locate temporary construction access from the pipeline right-of-way to existing transportation routes, water sources, borrow sites and near watercourse crossings
- geotechnical evaluations will be conducted, as required

Figure 6.1 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.

## Development Activities

### Pipeline Right-of-Way

The segments of the pipelines on land within the Norman Wells municipal boundary are described in [Table 6-1](#).

**Table 6-1: Pipeline Segments on Land within the Norman Wells Municipal Boundary**

Segment	Starting Kilometre Post (KP)	Ending Kilometre Post (KP)	Length (km)
M1-NW-Gas	475.0	488.5	13.5
M2-NW-NGL	475.0	476.4	1.4

The pipeline segments adjacent to these pipeline segments are both located on private land outside the Norman Wells municipal boundary. These right-of-way segments are the subject of the SSA private land use permit application.

The right-of-way width provides for most pipeline construction activities, including storage of snow, spoil and slash, workspace for trenching, welding and stringing activities, and a travel lane for moving personnel and equipment. [Section 3](#) contains typical schematics of pipeline right-of-way configurations.

Temporary workspace will be required in certain areas, such as watercourse crossings, pipeline appurtenances, cross slopes, and truck turnarounds, during the construction period as shown in [Section 3](#). The temporary workspace requirement for cross slopes watercourse crossings and pipeline appurtenances is listed in the pipeline subjects that follow. Temporary workspace requirements for pipeline construction activities are shown in [Table 6-2](#).

**Table 6-2: Estimated Temporary Workspace Requirements**

Use of Temporary Workspace	Description of Use	Site Size	Number of Locations	Total Area (ha)
Cross slopes	Area required for working on right-of-way where cross slopes are excessive	8 m x length of cross slope	12	1.6
Road crossings	Extra space required when crossing a roadway	5,000 m <sup>2</sup>	1	0.5

**Table 6-2: Estimated Temporary Workspace Requirements (cont'd)**

Use of Temporary Workspace	Description of Use	Site Size	Number of Locations	Total Area (ha)
Laydown areas	Extra space required at the beginning and end of each construction spread	200 m x 160 m	1	3.2
Watercourse crossings	Area required for crossing activities and to lay down pipe	6,000 m <sup>2</sup>	4	2.4
Total:				7.7

This space is necessary for construction activities and is incremental to the right-of-way itself. The need, exact location and size of any additional temporary workspaces will be determined in the field and will be based on, among other things, geographic conditions encountered during construction (see [Section 3](#)).

### Access Roads

One winter access road will be required on land within the Norman Wells municipal boundary. This road will provide access to the Mackenzie River, the pipeline right-of-way, existing transportation routes and water sources (see [Table 6-3](#)). The alignment of this road will be finalized as engineering design progresses.

**Table 6-3: Access Roads for Water Sources and Pipeline Construction**

Segment	Number of Access Roads	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
M1-NW-Gas	1	1.0	-	-	1.0
M2-NW-NGL	0	0.0	-	-	0.0
Total	1	1.0	0.0	0.0	1.0

### Watercourse Crossings

#### *Access Roads and Right-of-Way Travel Lanes*

Watercourses and ravines encountered during the construction of access roads and right-of-way travel lanes, both between sites and at crossing locations, will be crossed using one of six main techniques – permanent bridges, temporary bridges, culvert crossings, timber fill crossings, ice bridges and snow fill crossings.

Descriptions of each crossing type are provided in [Section 3](#).

Crossing locations are listed in [Subject 6.2 \(M1-NW-Gas\)](#) and [Subject 6.3 \(M2-NW-NGL\)](#).

### ***Pipelines***

Watercourses encountered along the right-of-way might be crossed using one of three main techniques – trenchless horizontal directional drilling, isolated crossings or open cut crossings. Descriptions of these techniques are contained in [Section 3](#). No trenchless or aerial crossings are presently planned for watercourse crossings on land within the Norman Wells municipal boundary.

A summary of the crossings for each pipeline segment is shown in [Table 6-4](#).

**Table 6-4: Watercourse Crossings Along the Pipeline Right-of-Way**

<b>Segment</b>	<b>Horizontal Directional Drill</b>	<b>Isolated</b>	<b>Large Open Cut<sup>a</sup></b>	<b>Open Cut<sup>b</sup></b>	<b>Number of Crossings</b>
M1-NW-Gas	-	1	3	-	4
M2-NW-NGL	-	0	0	-	0
Total	0	1	3	0	4

NOTES:  
<sup>a</sup>These crossings require temporary workspace and are trenched to a depth of about 1.2 m versus the standard depth of 0.9 m.  
<sup>b</sup>These crossings are trenched to the standard depth of 0.9 m.

### **Pipeline Appurtenances**

Various appurtenances will be installed on the right-of-way for pipeline operations and maintenance. These include cathodic protection devices, block valves, pigging facilities, signs and markers (see [Section 3](#)).

A summary of the pipeline appurtenances is provided in [Table 6-5](#). These appurtenances will be located in shared sites to reduce disturbance and to facilitate operations and maintenance activities. For appurtenance locations, see [Section 3](#) and the individual pipeline segment descriptions in this section.

**Table 6-5: Pipeline Appurtenances Summary**

<b>Segment</b>	<b>Block Valve Sites</b>	<b>Gas Block Valve Sites</b>	<b>NGL Block Valve Sites</b>	<b>Cathodic Protection Sites</b>
M1-NW-Gas	-	1	-	1
M2-NW-NGL	-	-	1	-

## SUMMARY OF POTENTIAL ENVIRONMENTAL AND RESOURCE EFFECTS (PART 6)

Individual pipeline segments on land within the Norman Wells municipal boundary might cover different ecological regions with significant variations in the terrestrial environment including vegetation types, soils and landforms, and wildlife habitat. This makes the prediction of specific effects and mitigation on a segment-specific basis difficult to quantify at this stage of the project. Therefore, information addressing potential environmental and resource effects is presented for the region in [Section 8](#).

### EQUIPMENT (PART 10)

[Table 6-6](#) shows an estimate of the equipment that might be required for a typical pipeline construction spread. An exact list and numbers will not be known until immediately before construction.

**Table 6-6: Estimate of Typical Pipeline Construction Equipment**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Trucks – 32	Tandem tractor	Hauling
Trucks – 7	Tandem crane	Lifting
Trucks – 164	4x4 pick-up and crew cab	Personnel transport
Trucks – 110	Mechanic rig	Field mechanic
Ambulances – 14	4x4	First aid, med-evac
Trucks – 7	Tandem fuel	Equipment fuelling
Trucks – 7	Tandem service	Equipment servicing
Trucks – 37	1 and 3 ton flat bed	Hauling
Trucks – 2	10 ton truck	Loading and hauling
Trucks – 8	Tandem water	Water hauling
Trailers – 10	Low-boy	Hauling
Jeeps – 3	4x4	Personnel transport
Trailers – 19	Pole, tri-axle	Hauling
Trailers – 32	High-boy	Hauling
Trailers – 23	Warehouse van	Parts and supplies
Trailers – 11	Office skid	Administration
Buses – 55	36, 24, 12 passenger 4x2	Personnel transport
Athey tracks – 13	As required	Hauling

**Table 6-6: Estimate of Typical Pipeline Construction Equipment (cont'd)**

<b>Type and Approximate Number per Site</b>	<b>Size, Model or Equivalent</b>	<b>Proposed Use</b>
Sidebooms – 63	Standard medium to large sized sidebooms	Pipe work
Sidebooms – 18	Auto-weld	Carry welding shelters
Bulldozers – 64	Medium and large sized bulldozers (310-400 HP)	Earth moving
Tractors – 5	Medium sized tractor	Pipe crews, early work
Mechanical welding equipment – 1	As required	Weld pipe
Quad welders – 8	As required	Weld pipe
Mechanical welding shelters – 18	As required	Shelter welders
Welding sleds – 8	As required	Transport welders
Ditchers – 3	Bucket	Trenching
Ditchers – 4	Chain	Trenching
Clamshell mechanical ditchers – 4	Medium sized excavator	Excavation
Tracked mechanical ditchers – 45	Large sized excavator	Excavation
Dump trucks – 48	Articulated	Hauling earth
Snowmobiles – 13	As required	Transport
Nodwells – 4	As required	Hauling
Graders – 6	Large sized grader (4.3 m blade)	Road grading
Loaders – 8	Large sized loader (3.0 m <sup>3</sup> bucket loader)	Loading granular dump trucks
Cranes – 5	100 tonne tracked	Lifting and loading
Bending machines (comes with dies and mandrels) – 2	As required	Pipe bending
Internal clamps – 4	As required	Pipe work
Skid sleds – 64	As required	Pipe work
External clamps – 10 to 20	As required	Pipe work
Bevelling machines – 5 to 10	As required	Pipe work
Sand blasting units – 13	As required	Cleaning pipe
Lower-in belts – 10	As required	Pipe work
Pumps – 72	Assorted sizes	Ditch dewatering and testing
Testing trailers – 2	As required	Monitoring and pressure testing

**Table 6-6: Estimate of Typical Pipeline Construction Equipment (cont'd)**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Compressors – 21	150 through 1,600 cfm	Pipe work, dewatering and testing
Generators – 4	Assorted sizes	Power for hand tools and pumps
Radios – 54	Base (4) and mobile (50)	Communications
Propane tanks – 5	1,890 L	Propane storage
Holiday detectors – 15	As required	Testing pipe coating
Light towers – 92	Assorted sizes	Work area lighting
Pipe cradles – 13	Assorted sizes	Pipe work
Hydraulic rock drills – 5	Assorted sizes	Drilling rock
Trench boxes – 8	Assorted sizes	Store safety equipment
Skid stackers – 4	As required	Collecting and bundling skids
Fuel tanks – 15	Assorted sizes	Fuel storage

**PERIOD OF OPERATION (PART 14)**

The right-of-way and pipeline through land within the Norman Wells municipal boundary are scheduled for development during the winters of 2007-2008 and 2008-2009 (see [Section 3](#)), with cleanup and reclamation occurring in the following year.

**LOCATION OF ACTIVITIES BY MAP COORDINATES (PART 16)**

Map coordinates of pipeline segments are listed in [Table 6-7](#).

Kilometre post markers are approximate and shown for relative placement purposes only. Final KP markers will depend on the final pipeline route.

**Table 6-7: Map Coordinates of Pipeline Segments**

Segment	Kilometre Post (KP)	Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
M1-NW-Gas Begin	475.0	65.2950	-126.9131	597310	7242938	9
M1-NW-Gas End	488.5	65.2586	-126.6505	609706	7239318	9
M2-NW-NGL Begin	475.0	65.2932	-126.9142	597265	7242736	9
M2-NW-NGL End	476.4	65.2883	-126.8877	598520	7242238	9

## FEES (PART 18)

The total land area required for activities contained in this section is 67.9 ha, comprised of 58.2 ha for pipeline right-of-way, 7.7 ha for temporary workspace and 2.0 ha for access.

The land requirements are shown in [Appendix A](#).

## PUBLIC INVOLVEMENT

Local community representatives provided input during the 2002 helicopter reconnaissance along the K'ahsho Got'ine District and Tulita District pipeline system sections. They assisted in defining the route through the Little Chicago area, the Fort Good Hope area including the Hare Indian (Rabbit-skin) River crossing and south to Gibson's Gap, the routing near Bear Rock and the Great Bear River crossing, and the project routing south of Tulita District to the Deh Cho Region.

In early 2003, several Fort Good Hope residents expressed concern about avoiding and respecting the gravesites located in the Little Chicago area. During further public involvement activities, Fort Good Hope residents also expressed general concerns related to the pipeline route, which included:

- avoiding burial sites and traditional trails
- considering sensitive areas, trapping areas (marten), harvesting areas (moose and caribou), migratory birds, ground dwelling animals and protected areas
- respecting the small lakes (fish, beaver) with setbacks
- ensuring the local community has provided input and acceptance to the proposed selected pipeline route
- ensuring that TK data has been considered during the detailed route planning phase of the project.

The community of Tulita expressed concern with the proximity of the preliminary pipeline route (adjacent to the Enbridge pipeline river crossing) to Tulita's water intake system. After further evaluation, an alternative route was selected about 6 km upstream of the Enbridge pipeline river crossing. The community of Tulita confirmed their acceptance of this proposed pipeline route.

During the MVEIRB Environmental Assessment of the proposed Geotechnical Investigation Program in the Deh Cho Region, the communities of Fort Simpson and Wrigley expressed concern over developments in the Blackwater River area. According to these communities, this area is an extremely significant cultural meeting place and has many spiritual sites (e.g., sacred rock and people turn to

stone), and important harvest area including moose pastures and caribou migration zone. It is also situated in a managed candidate projected area.

Public involvement activities are documented in [Section 10](#) of this application.



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TITLE	<b>Application for Land Use Permits for Land within the Municipal Boundaries of Norman Wells, Fort Good Hope and Tulita</b>
SECTION	6: Pipeline Segments
SUBJECT	2: Pipeline Segment M1-NW-Gas

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## DESCRIPTION

The first segment of pipeline right-of-way on land within the Norman Wells municipal boundary starts at KP-475.0, the western municipal boundary. This segment is about 13.5 km long and ends at KP-488.5, north of Hanna Lake (see [Figure 6-2](#) for KP-473 to KP-481 and [Figure 6-3](#) for KP-481 to KP-489). [Table 6-8](#) lists map coordinates of this pipeline segment.

**Table 6-8: Pipeline Segment M1-NW-Gas (Map Coordinates)**

Segment	Kilometre Post (KP)	Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
M1-NW-Gas Begin	475.0	65.2950	-126.9131	597310	7242938	9
M1-NW-Gas End	488.5	65.2586	-126.6505	609706	7239318	9

Four watercourse crossings occur in this pipeline segment. Some watercourses will have detailed crossing plans. This segment also contains a valve and a cathodic protection facility.

## PIPELINE RIGHT-OF-WAY

The crew involved in construction of the spread (C2) in which this segment is located, will be working between Norman Wells and Little Smith Creek. Construction of this segment is currently planned for the winters of 2007-2008 and 2008-2009, with cleanup and reclamation occurring in the following year.

The right-of-way will be 40 m wide. In some areas, construction activities will require temporary workspace during the construction period (see [Summary of Operations](#) in [Subject 6.1](#) and [Section 3](#)).

## ACCESS

About 1.0 km of access road will be required on this segment. [Table 6-9](#) contains access road details. [Figure 6-2](#) shows the alignment of this road.

**Table 6-9: Access Roads within Pipeline Segment M1-NW-Gas**

Access Road Name	Kilometre Post (KP)	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
TD-WS-W-MR-476.3	476.3	1.0			1.0
Length of access roads in this segment of municipal lands:					1.0

Currently, the defined temporary access to the right-of-way uses an existing all-weather road from the Esso Dock Barge Landing (TD-BL-A-476.3), existing municipal roads and winter access (TD-WS-W-MR-476.3).

Appropriate portable bridges and snow/ice bridges will be built along the right-of-way travel lane and winter access roads to accommodate the construction traffic. [Section 3](#) contains descriptions of bridges that might be installed.

## WATERCOURSE CROSSINGS

Temporary workspace is required for crossing activities and to lay down pipe before trenching. About 2.4 ha of temporary workspace will be required.

There are four watercourse crossings along the right-of-way in this segment of municipal land. These crossings will be completed by one of two different watercourse crossing methods - open cut or isolated. Designs for these crossings will be done as part of the detailed pipeline design before construction begins.

[Table 6-10](#) identifies the watercourse crossings in this segment.

**Table 6-10: Watercourse Crossings within Pipeline Segment M1-NW-Gas**

Crossing Class	Crossing ID	Crossing Name	Kilometre Post (KP)	Proposed Crossing Methodology	Proposed Temporary Workspace (ha)
Active I	RPR-301-A	Bosworth Creek	476.4	Isolated	0.6
Vegetated	RPR-302	Unnamed	485.1	Open cut	0.6
Vegetated	RPR-303	Unnamed	486.3	Open cut	0.6
Vegetated	RPR-304	Joe Creek	488.1	Open cut	0.6

## OTHER CROSSINGS

There are two road crossings along the right-of-way within this segment of land within the Norman Wells municipal boundary. Temporary workspace requirements for crossing activities are shown in [Table 6-2](#). A listing of the third-party crossings within this segment are presented in [Table 6-11](#).

**Table 6-11: Third-Party Crossings within Pipeline Segment M1-NW-Gas**

Crossing Type	Kilometre Post (KP)	Region	Land Owner	Latitude (DD)	Longitude (DD)	Easting (m)	Northing (m)	UTM Zone
Municipal Road	482.7	SSA	NW-Municipal	65.2821	-126.7615	604430	7241750	9
Municipal Road	484.8	SSA	NW-Municipal	65.2738	-126.7222	606290	7240892	9

## APPURTENANCES

Along the right-of-way within the SSA and Norman Wells, there are gas and NGL valve sites and a cathodic protection site. All of these sites will be accessed through the pipeline right-of-way.

[Table 6-12](#) shows the appurtenances and temporary workspace in this pipeline segment (see also [Figure 6-2](#)).

### Gas Valve Sites

One gas valve site occurs within this segment of the pipeline. It is located at the proposed Norman Wells compressor station site at KP-475.5 and will not require any additional permanent lands (see [Table 6-12](#) and [Figure 6-2](#)).

### NGL Block Valve Sites

There are no NGL block valve sites associated with this pipeline segment.

### Cathodic Protection Sites

There is one cathodic protection site within this pipeline segment. The site is located at KP-475.5 and is labelled CP-10. It is located within the Norman Wells facility site (see [Figure 6-2](#)) and will not require any additional permanent lands.

**Table 6-12: Appurtenances within Pipeline Segment M1-NW-Gas**

Appurtenance/ Facility ID	Name and Location	Kilometre Post (KP)	Temporary Workspace (ha)
GAS BV-007	Norman Wells compressor station (automated gas block valve No. 7)	475.5	Not required
CP-10	Cathodic protection site No. 10 (within facility footprint)	475.5	Not required

## PUBLIC INVOLVEMENT

Concerns regarding the pipeline route through the SSA have been summarized in [Subject 6.1](#) of this application. Public involvement activities are documented in [Section 10](#) of this application.

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Figure 6.3 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.



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TITLE	<b>Application for Land Use Permits for Land within the Municipal Boundaries of Norman Wells, Fort Good Hope and Tulita</b>
SECTION	6: Pipeline Segments
SUBJECT	3: Pipeline Segment M2-NW-NGL

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## DESCRIPTION

The second segment of pipeline right-of-way on Norman Wells municipal lands also starts at KP-475.0, the western municipal boundary. This segment is about 1.4 km long and ends at KP-476.4, the Enbridge interconnect facility (see [Figure 6-4](#) for KP-473 to KP-480). [Table 6-13](#) lists map coordinates of this pipeline segment.

**Table 6-13: Pipeline Segment M2-NW-NGL (Map Coordinates)**

Segment	Kilometre Post (KP)	Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
M2-NW-NGL Begin	475.0	65.2932	-126.9142	597265	7242736	9
M2-NW-NGL End	476.4	65.2883	-126.8877	598520	7242238	9

There are no watercourse crossings in this segment of the right-of-way. This segment contains a valve site within the Enbridge interconnect facility.

## PIPELINE RIGHT-OF-WAY

The crew involved in construction of the spread (C2) in which this segment is located, will be working between Norman Wells and Little Smith Creek. Construction of this segment is currently planned for the winters of 2007-2008 and 2008-2009, with cleanup and reclamation occurring in the following year.

The right-of-way will be 30 m wide. In some areas, construction activities might require temporary workspace during the construction period (see [Summary of Operations](#) in [Subject 6.1](#) and [Section 3](#)).

## ACCESS

There are no access roads required for this segment of the pipeline.

Access to this segment is along the pipeline right-of-way and existing municipal roads.

Appropriate portable bridges and snow/ice bridges will be built along the right-of-way travel lane and winter access roads to accommodate the construction traffic. [Section 3](#) contains descriptions of bridges that might be installed.

## WATERCOURSE CROSSINGS

There are no watercourse crossings along the right-of-way in this pipeline segment.

## OTHER CROSSINGS

There are no third-party pipeline or road crossings along the right-of-way in this pipeline segment.

## APPURTENANCES

Along the right-of-way within the SSA and Norman Wells, there are gas and NGL valve sites and a cathodic protection site. All of these sites will be accessed through the pipeline right-of-way.

[Table 6-14](#) shows the appurtenances and temporary workspace in this segment of land within the Norman Wells municipal boundary (see also [Figure 6-4](#)).

### Gas Valve Sites

There are no gas block valve sites associated with this pipeline segment.

### NGL Block Valve Sites

One NGL valve site occurs within this segment of the pipeline. It is located at KP-476.4 at the Enbridge interconnect facility and will not require any additional permanent lands (see [Table 6-14](#) and [Figure 6-4](#)).

### Cathodic Protection Sites

There are no cathodic protection sites associated with this pipeline segment.

**Table 6-14: Appurtenance within Pipeline Segment M2-NW-NGL**

Appurtenance/ Facility ID	Name and Location	Kilometre Post (KP)	Temporary Workspace (ha)
NGL BV-028	Automated NGL block valve No. 28 (within Norman Wells Enbridge interconnect facility)	476.4	-

## PUBLIC INVOLVEMENT

Concerns regarding the pipeline route through the SSA have been summarized in Subject 6.1 of this application. Public involvement activities are documented in [Section 10](#) of this application.

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TITLE	<b>Application for Land Use Permits for Land within the Municipal Boundaries of Norman Wells, Fort Good Hope and Tulita</b>
SECTION	6: Pipeline Segments
SUBJECT	4: Pipeline Segment M1-FGH

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## INTRODUCTION

This section supports an application for the land use activities and operations associated with the pipeline segment on land within the Fort Good Hope municipal boundary (see [Figure 6-1](#)). It includes:

- an estimate of personnel requirements
- a summary of the operations
- a description of potential environmental and resource effects
- construction equipment estimates
- information about the pipeline segment, including:
  - pipeline right-of-way
  - watercourse crossings
  - access roads
  - appurtenances

The pipeline segment in this section is adjacent to Crown land to the north and private land to the south. Those segments of the pipeline are the subject of the Crown land use permit application and SSA private land use permit application.

Several watercourse crossings occur in this pipeline segment. Some watercourses will have detailed crossing plans. This segment also contains valve sites.

Site-specific maps showing the location of the pipeline segment are provided in this section.

## PERSONNEL (PART 3)

A section of pipeline construction spread (C1) will cross municipal lands in Fort Good Hope during the winters of 2006-2007 through 2007-2008, with cleanup and reclamation to occur in the following year. This spread will support the construction of about 9.6 km of pipeline on land within the Fort Good Hope municipal boundary.

Beginning at the Hare Indian (Rabbit-skin) River (KP-330.2), there will be an NPS 30 gas pipeline and an NPS 10 NGL pipeline within the same 50 m right-of-way. This segment runs south to KP-339.8, east of the Fort Good Hope airport. The construction spread configuration for the pipeline is shown in the maps in [Appendix C](#).

The construction crew will operate out of the Fort Good Hope infrastructure site on Crown land. The personnel in this spread will consist of up to 1,350 people to manage, support and execute all elements of the construction process.

### **SUMMARY OF OPERATIONS (PART 5)**

The land use activities and operations described in this section include:

- developing and maintaining about 9.6 km of 50 m wide pipeline right-of-way that will contain:
  - about 9.6 km of NPS 30 gas pipeline
  - about 9.6 km of NPS 10 NGL pipeline
  - pipeline appurtenances such as valves, cathodic protection devices, signs and markers
  - watercourse crossings, where required, along the pipeline right-of-way
- developing and maintaining three winter access roads with a total length of 3.5 km (for cross-sections, see [Section 3](#)) connecting the pipeline right-of-way, existing transportation routes, water sources, infrastructure sites and roads near watercourse crossings
- using additional temporary workspace in support of construction activities

[Figure 6-5](#) is an overview map of the pipeline segment. It describes the proposed alignment of this pipeline segment.

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### Preconstruction Activities

Before construction activities begin on the right-of-way:

- a preconstruction survey will be conducted to finalize the alignment
- detailed planning will be conducted to locate temporary construction access from the pipeline right-of-way to existing transportation routes, water sources, borrow sites and near watercourse crossings
- geotechnical evaluations will be conducted, as required

### Development Activities

#### Pipeline Right-of-Way

The crew involved in construction of the spread (C1) of the pipeline, in which this segment is located, will be working between Fort Good Hope and Norman Wells. Construction of this segment is currently planned for the winter of 2006-2007 through 2007-2008, with clean up and reclamation occurring in the following year.

The right-of-way will be 50 m wide. The right-of-way width provides for most pipeline construction activities, including storage of snow, spoil and slash, workspace for trenching, welding and stringing activities, and a travel lane for moving personnel and equipment. [Section 3](#) contains typical schematics of the pipeline right-of-way configurations.

Temporary workspace will be required in certain areas, such as watercourse crossings, pipeline appurtenances, cross slopes and truck turnarounds during the construction period, as shown in [Summary of Operations](#) and [Section 3](#).

Temporary workspace requirements for cross slopes, watercourse crossings and pipeline appurtenances is shown in [Table 6-15](#).

**Table 6-15: Estimated Temporary Workspace Requirements**

Use of Temporary Workspace	Description of Use	Site Size	Number of Locations	Total Area (ha)
Cross slopes	Area required for working on right-of-way where cross slopes are excessive	8 m x length of cross slope	8	1.0

**Table 6-15: Estimated Temporary Workspace Requirements (cont'd)**

Use of Temporary Workspace	Description of Use	Site Size	Number of Locations	Total Area (ha)
Watercourse crossings	Area required for crossing activities and to lay down pipe	6,000 m <sup>2</sup>	1.5	2.0
Block valves/ CP sites	Extra space required for construction of a valve/CP site on the right-of-way	4,500 m <sup>2</sup>	2	0.9
Total:				3.9

This space is necessary for construction activities and is incremental to the right-of-way itself. The need, exact location and size of any additional temporary workspaces will be determined in the field and will be based on, among other things, geographic conditions encountered during construction (see [Section 3](#)).

### Access Roads

Three temporary access roads will be required on land within the Fort Good Hope municipal boundary. These roads will provide access to the pipeline right-of-way, existing transportation routes, water sources, and watercourse crossings (see [Table 6-16](#)). The alignment of these roads will be finalized as engineering design progresses.

**Table 6-16: Access Roads for Water Sources and Pipeline Construction**

Access Road Name	Kilometre Post (KP)	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
KG-PL-W-328.1	328.1	2.7	3.3	-	6.0
KG-WS-W-140	332.9	0.6	-	-	0.6
KG-WS-W-141	338.0	0.2	-	-	0.2
Length of access roads in Fort Good Hope municipal lands:		3.5			

Currently, the defined temporary access to the right-of-way is winter access road KG-C-W-341.9 starting at the Fort Good Hope infrastructure site. This access road is the subject of SSA land use permit applications.

Appropriate portable bridges and snow/ice bridges will be built along the right-of-way travel lane and winter access roads to accommodate the construction traffic. [Section 3](#) contains descriptions of bridges that might be installed.

## Watercourse Crossings

### *Access Roads and Right-of-Way Travel Lanes*

Watercourses and ravines encountered during the construction of access roads and right-of-way travel lanes, both between sites and at crossing locations, will be crossed using one of six main techniques – permanent bridges, temporary bridges, culvert crossings, timber fill crossings, ice bridges and snow fill crossings.

Descriptions of each crossing type are provided in [Section 3](#).

There are six watercourse crossings along the right-of-way in this segment on land within the Fort Good Hope municipal boundary. These crossings will be completed by one of two different watercourse crossing methods – open cut or horizontal directional drill. Designs for the crossings will be done as part of the detailed pipeline design before construction begins. Descriptions of these techniques are contained in [Section 3](#). No isolated or aerial crossings are presently planned for lands within the Fort Good Hope municipal boundary.

Temporary workspace for larger crossings will be required for crossing activities and to lay down pipe before trenching. About 2.0 ha of temporary workspace will be required. [Table 6-17](#) identifies the watercourse crossings in this pipeline segment.

**Table 6-17: Watercourse Crossings Along the Pipeline Right-of-Way**

Crossing Class	Crossing ID	Crossing Name	Kilometre Post (KP)	Proposed Crossing Methodology	Proposed Temporary Workspace (ha)
Large	RPR-249 <sup>a</sup>	Hare Indian (Rabbitskin) River	330.2	Trenchless	1.4
Vegetated	RPR-250	Unnamed	331.0	Open Cut	-
Vegetated	RPR-251	Unnamed	332.7	Open Cut	-
Vegetated	RPR-252	Unnamed	334.5	Open Cut	-
Active I	RPR-253	Jackfish Creek	336.0	Open Cut	0.6
Vegetated	RPR-253.1	Unnamed	338.0	Open Cut	-

NOTE:  
<sup>a</sup>This crossing of the Hare Indian (Rabbitskin) River traverses the boundary between Sahtu private lands and the municipal lands of Fort Good Hope and is discussed in both land use permit applications.

### Other Crossings

There are no third party pipeline or road crossings along the right-of-way in this segment of lands within the Fort Good Hope municipal boundary.

## Pipeline Appurtenances

Various appurtenances will be installed on the pipeline right-of-way for operations and maintenance. These include cathodic protection devices, block valves, signs and markers (see [Section 3](#)).

Along the right-of-way within Fort Good Hope, there are two NGL valve sites. These sites will be accessed through the pipeline right-of-way. Temporary workspace is required for valve locations along the right-of-way.

[Table 6-4](#) shows the appurtenance and the temporary workspace in this segment of municipal lands (see also [Figure 6-2](#) and [Figure 6-3](#)).

## Gas Block Valves

There are no gas block valve sites associated with this pipeline segment.

## NGL Block Valves

Block valve site NGL BV-016 is located at KP-330.8 and block valve site NGL BV-017 is located at KP-338.9. These NGL block valve sites will not require any additional permanent lands.

## Cathodic Protection Sites

There are no cathodic protection sites associated with this pipeline segment.

**Table 6-18: Pipeline Appurtenances for Lands within the Fort Good Hope Municipal Boundary**

Appurtenance/ Facility ID	Name and Location	Kilometre Post (KP)	Temporary Workspace (ha)
NGL BV-016/ NGL CV-007	NGL block valve No. 16 and NGL check valve No. 7 (manual)	330.8	0.45
NGL BV-017/ NGL CV-008	NGL block valve No. 17 and NGL check valve No. 8 (manual)	338.9	0.45

## SUMMARY OF POTENTIAL ENVIRONMENTAL AND RESOURCE EFFECTS (PART 6)

Individual pipeline segments on land within the Fort Good Hope municipal boundary might cover different ecological regions with significant variations in the terrestrial environment, including vegetation types, soils and landforms, and wildlife habitat. This makes the prediction of specific effects and mitigation on a segment-specific basis difficult to quantify at this stage of the project. Therefore,

information addressing potential environmental and resource effects is presented for the region in [Section 8](#).

## PUBLIC INVOLVEMENT

Concerns regarding the pipeline route through the SSA have been summarized in Subject 6.1 of this application. Public involvement activities are documented in [Section 10](#) of this application.

## EQUIPMENT (PART 10)

[Table 6-19](#) shows an estimate of the equipment that might be required for a typical pipeline construction spread. An exact list and numbers will not be known until immediately before construction.

**Table 6-19: Estimate of Typical Pipeline Construction Equipment**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Trucks – 32	Tandem tractor	Hauling
Trucks – 7	Tandem crane	Lifting
Trucks – 164	4x4 pick-up and crew cab	Personnel transport
Trucks – 110	Mechanic rig	Field mechanic
Ambulances – 14	4x4	First aid, med-evac
Trucks – 7	Tandem fuel	Equipment fuelling
Trucks – 7	Tandem service	Equipment servicing
Trucks – 37	1 and 3 ton flat bed	Hauling
Trucks – 2	10 ton truck	Loading and hauling
Trucks – 8	Tandem water	Water hauling
Trailers – 10	Low-boy	Hauling
Jeeps – 3	4x4	Personnel transport
Trailers – 19	Pole, tri-axle	Hauling
Trailers – 32	High-boy	Hauling
Trailers – 23	Warehouse van	Parts and supplies
Trailers – 11	Office skid	Administration
Buses – 55	36, 24, 12 passenger 4x2	Personnel transport
Athey tracks – 13	As required	Hauling
Sidebooms – 63	Standard medium to large sized sidebooms	Pipe work

**Table 6-19: Estimate of Typical Pipeline Construction Equipment (cont'd)**

<b>Type and Approximate Number per Site</b>	<b>Size, Model or Equivalent</b>	<b>Proposed Use</b>
Sidebooms – 18	Auto-weld	Carry welding shelters
Bulldozers – 64	Medium and large sized bulldozers (310-400 HP)	Earth moving
Tractors – 5	Medium sized tractor	Pipe crews, early work
Mechanical welding equipment – 1	As required	Weld pipe
Quad welders – 8	As required	Weld pipe
Mechanical welding shelters – 18	As required	Shelter welders
Welding sleds – 8	As required	Transport welders
Ditchers – 3	Bucket	Trenching
Ditchers – 4	Chain	Trenching
Clamshell mechanical ditchers – 4	Medium sized excavator	Excavation
Tracked mechanical ditchers – 45	Large sized excavator	Excavation
Dump trucks – 48	Articulated	Hauling earth
Snowmobiles – 13	As required	Transport
Nodwells – 4	As required	Hauling
Graders – 6	Large sized grader (4.3 m blade)	Road grading
Loaders – 8	Large sized loader (3.0 m <sup>3</sup> bucket loader)	Loading granular dump trucks
Cranes – 5	100 tonne tracked	Lifting and loading
Bending machines (comes with dies and mandrels) – 2	As required	Pipe bending
Internal clamps – 4	As required	Pipe work
Skid sleds – 64	As required	Pipe work
External clamps – 10 to 20	As required	Pipe work
Bevelling machines – 5 to 10	As required	Pipe work
Sand blasting units – 13	As required	Cleaning pipe
Lower-in belts – 10	As required	Pipe work
Pumps – 72	Assorted sizes	Ditch dewatering and testing
Testing trailers – 2	As required	Monitoring and pressure testing
Compressors – 21	150 through 1,600 cfm	Pipe work, dewatering and testing

**Table 6-19: Estimate of Typical Pipeline Construction Equipment (cont'd)**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Generators – 4	Assorted sizes	Power for hand tools and pumps
Radios – 54	Base (4) and mobile (50)	Communications
Propane tanks – 5	1,890 L	Propane storage
Holiday detectors – 15	As required	Testing pipe coating
Light towers – 92	Assorted sizes	Work area lighting
Pipe cradles – 13	Assorted sizes	Pipe work
Hydraulic rock drills – 5	Assorted sizes	Drilling rock
Trench boxes – 8	Assorted sizes	Store safety equipment
Skid stackers – 4	As required	Collecting and bundling skids
Fuel tanks – 15	Assorted sizes	Fuel storage

**PERIOD OF OPERATION (PART 14)**

The right-of-way and pipeline through lands within the Fort Good Hope municipal boundary are scheduled for development during the winters of 2006-2007 and 2007-2008 (see [Section 3](#)), with clean up and reclamation occurring in the following year.

**LOCATION OF ACTIVITIES BY MAP COORDINATES (PART 16)**

Map coordinates of this pipeline segment are listed in [Table 6-20](#).

Kilometre post markers are approximate and shown for relative placement purposes only. Final KP markers depend on the final pipeline route.

**Table 6-20: Map Coordinates of Pipeline Segments**

Segment	Kilometre Post (KP)	Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
M1-FGH Begin	330.2	66.3172	-128.5392	520652	7355341	9
M1-FGH End	339.8	66.2333	-128.5101	522030	7346005	9

**FEES (PART 18)**

The total land area required for the activities contained in this section is 58.9 ha.

The land requirements are shown in [Appendix A](#).

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TITLE	<b>Application for Land Use Permits for Land within the Municipal Boundaries of Norman Wells, Fort Good Hope and Tulita</b>
SECTION	6: Pipeline Segments
SUBJECT	5: Access Roads Located within the Hamlet of Tulita Municipal Boundary

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## INTRODUCTION

This section supports an application for land use activities and operations associated with access roads required to provide access to the pipeline right-of-way and existing transportation routes (see [Table 6-21](#)). It includes:

- an estimate of personnel requirements
- a summary of the operations
- information about the access roads

## PERSONNEL (PART 3)

Access road construction will occur on municipal lands in the Hamlet of Tulita during the winters of 2007-2008 and 2008-2009, with cleanup and reclamation to occur in the following year. These roads will support pipeline construction on nearby Crown and private land.

The construction crews will operate out of the Norman Wells infrastructure site. The personnel required for construction of the access roads will be taken from the 1,350 people available for pipeline construction spread (C2).

## SUMMARY OF OPERATION (PART 5)

Three temporary winter access roads are proposed on land within the Hamlet of Tulita municipal boundary. These roads will provide access to the pipeline right-of-way and existing transportation routes (see [Table 6-21](#)). The alignment of these roads will be finalized as engineering design progresses.

Existing roads, highways and previously disturbed areas will be used as much as practical, including the Wrigley to Fort Good Hope Winter Road and the GNWT DOT winter roads on the Mackenzie River. Where necessary, new roads will be built as described in [Section 3](#).

**Table 6-21: Access Roads within the Hamlet of Tulita Municipal Boundary**

Access Road Name	Kilometre Post (KP)	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
TD-PL-W-538.6	538.6	2.6	13.5	18.6	34.7
TD-PL-W-557	557.0	4.0	3.8		7.8
TD-PL-W-569.9	569.9	41.5		7.5	49.0
Total length of access within the municipal boundaries of the Hamlet of Tulita:					48.1

The design for the winter access roads will be site specific and will consider factors such as:

- geotechnical conditions and terrain features, including drainage patterns
- load weight and size
- community input
- existing cut lines and previously disturbed areas
- seasonal reinstatement of access roads
- water sources for winter access road construction

A road allowance about 20 m wide will be required in all cases. The travel surface will differ depending on the type and purpose of the road. Typical schematics of access roads are provided in [Section 3](#).

Winter road construction will start once a sufficient frozen ground depth, suitable for supporting heavy equipment, is achieved. Trees will be cut off at ground level and windrowed. Snow, brush and vegetative material will be compacted with light tracked equipment. Continued compaction will be achieved with snow and water by using progressively heavier equipment. Excess snow accumulations and loose surface material will be ploughed to the side of the travel surface.

By using equipment with a protected blade, or equivalent, the disturbance of the surface organic layer will be limited. The road will be built up to strength by continuing to add water and snow in areas of sensitive terrain, and where practical. A smooth, hardwearing road surface will be achieved by dragging and surface grading. Maintenance will be done on an ongoing basis using conventional construction equipment, snow and water. Where snow cover is limited, water will be added to the available snow to create the desired depth of ice. Roads constructed on lakes and rivers will require minimum watercourse ice depths of about 1.2 m.

The potential water use requirements for the winter access roads over land within the Hamlet of Tulita municipal boundary are estimated at about 1140 m<sup>3</sup> per construction season. No water use has been estimated for the access roads to be built on the Mackenzie River.

## **PUBLIC INVOLVEMENT**

Concerns regarding the pipeline route through the SSA have been summarized in Subject 6.1 of this application. Public involvement activities are documented in [Section 10](#) of this application.

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