

TITLE	GSA Private Lands Application for a Type A Land Use Permit
SECTION	3: Overview of Activities in the GSA
SUBJECT	5: Project Activities – Borrow Sites

SCOPE

Natural materials needed to construct the project will be obtained from new and existing borrow sites, commonly known as sand or gravel pits and rock quarries. These sources will be accessed along the proposed pipeline corridor.

About five million cubic metres of borrow materials will be required for the project, including the pipeline right-of-way, access roads and facility sites. Of this project total, an estimated 720,000 m³ of borrow material will be needed for developments in the GSA.

About 127 potential borrow sites have been identified for the project. This includes 15 potential sites in the GSA. Nine are on Gwich'in private lands (see [Table 3-5](#)). An estimated 938,000 m³ of borrow material could be obtained from the 15 sites.

Table 3-5: Summary of Potential Borrow Sites in the GSA

Borrow Source	Potential Borrow Material	Existing	Land Ownership ^a	Expected Year(s) In Use	Land Use Designation (Gwich'in land use plan)
2.051PA	Sandstone and limestone	Yes	Private	2006-09	General Use
2.061P	Sand and gravel with some silt	Yes	Crown	2006-09	Transportation
2.064BP	Limestone	No	Crown	2007-08	General Use
4.020P	Sand and gravel	No	Private	2007-08	Lakes Around Travaillant Lake
4.023P	Sand and gravel	No	Private	2007-08	Lakes Around Travaillant Lake
4.026P	Sandy gravel	No	Private	2007-08	Lakes Around Travaillant Lake
4.038APA	Sand and gravel	No	Private	2007-08	Lakes Around Travaillant Lake
4.038APB	Sand and gravel	No	Private	2007-08	Lakes Around Travaillant Lake

Table 3-5: Summary of Potential Borrow Sites in the GSA (cont'd)

Borrow Source	Potential Borrow Material	Existing	Land Ownership^a	Expected Year(s) In Use	Land Use Designation (Gwich'in land use plan)
4.039P	Sand and gravel	No	Private	2007-08	Lakes Around Travaillant Lake
4.059AP	Sand and gravel	No	Private	2007-08	Lakes Around Travaillant Lake, Travaillant Lake, Mackenzie/Tree River
4.100P	Shale	No	Private	2007-08	Lakes Around Travaillant Lake
4.103PB	Gravelly sand and silty sand	No	Crown	2007-08	Lakes Around Travaillant Lake
5.013P	Gravelly sand	No	Crown	2007-08	Lakes Around Travaillant Lake
5.020P	Mostly gravel and sand with some silt	No	Crown	2007-09	General Use
20.073P	Limestone	Yes	Crown	2007-09	Transportation
NOTE: ^a Borrow sites on private land are highlighted in bold lettering.					

Borrow Site Development

A typical borrow site development is depicted in [Figure 3-9](#).

The development schedule for borrow sites will be determined by project needs during construction and, potentially, during operations. The sites will be developed for the components they will supply and will be reclaimed, as required.

The schedule at each site will be influenced by the ice content of the borrow material. Sites with a high ice content might be excavated at least one year in advance, with the borrow material likely to be excavated and stockpiled. The piles of high ice content material might be allowed to melt and drain over the summer for use the following winter. Other activities that might be required at various borrow sites during the summer include stripping overburden, excavating borrow material and stockpiling.

Most borrow sites will have material that will meet the applicable specifications for road and pad construction. However, where the material does not meet specifications for pipeline backfill, it will be crushed or screened during site excavation. Materials might be screened to separate borrow material for different uses. Large material might be crushed to make it suitable for use on the project.

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.

TITLE	GSA Private Lands Application for a Type A Land Use Permit
SECTION	3: Overview of Activities in the GSA
SUBJECT	6: Project Activities – Pipeline

PROJECT COMPONENTS

Gathering, Gas and NGL Pipelines

The proposed pipeline route through the GSA extends from the ISR to the SSA boundary, a distance of 187.2 km. Of this total, about 110 km crosses Gwich'in private land in two segments. The remaining 76.4 km is situated on Crown land. The proposed pipeline segments are shown in [Table 3-6](#) and [Figure 3-10](#).

The first Crown land segment C1, which is a short 100 m segment from the ISR boundary to the inlet of the Inuvik area facility, is part of the gathering pipeline. The other segments are all for the NGL and gas pipelines.

The distances in [Table 3-6](#) show the southernmost section of the gathering pipelines, designated as KP-S (Storm Hills lateral), and the KP markings for the gas pipeline, which start at the Inuvik area facility and end at the NGTL interconnection in Alberta.

Table 3-6: Pipeline Segments in the GSA

Pipeline Segment ^a	Area(s)	Length (km)	Start	Finish	Land Use Designation (Gwich'in land use plan)
Crown Land – C1	Inuvik	0.1	S-051.6	S-051.7	Campbell Creek
Crown Land – C2	Inuvik	11.8	0.0	011.8	Campbell Creek
Private Land – P1	Inuvik	3.4	011.8	015.2	Campbell Creek
Crown Land – C3	Inuvik, Caribou Lakes	32.9	15.2	048.1	Campbell Creek, General Use
Private Land – P2	Caribou Lakes, Fish Trap Lake, Travaillant River, Thunder River	106.6	48.1	154.7	Lakes Around Travaillant Lake, Travaillant Lake, Mackenzie/Tree River
Crown Land – C4	Thunder River	31.6	154.7	186.3	Lakes Around Travaillant Lake, General Use

NOTE:

^aPipeline segments on private land are highlighted in bold lettering.

The 40 m wide right-of-way for the Storm Hills lateral, leading into the Inuvik area facility, is situated in the Campbell Creek Special Management Zone.

The 50 m wide right-of-way for the gas and NGL pipelines crosses through the Campbell Creek and Lakes Around Travaillant Lake special management zones, the Travaillant Lake, Mackenzie/Tree River Conservation Zone, and general use zones in the Caribou Lakes and Thunder River areas.

The gas and NGL pipelines will be buried and generally installed in separate ditches, about 13 m apart. If necessary, they might be placed in a common trench where there are ice-rich or steep slopes and at larger watercourse crossings.

Pipeline Facility

For the GSA, there is only one facility proposed, the Inuvik area facility. This facility is required to process dehydrated sweet natural gas and NGLs received from the gathering pipelines. It is described in detail in [Section 7](#).

The Inuvik area facility will be located about 20 km northeast of Inuvik in the Campbell Creek Special Management Zone, at the terminus of the gathering pipeline and the start of the gas and NGL pipelines.

The Inuvik area facility will occupy about 48 ha, of which about 26 ha will be fenced. Site preparation is expected to start in 2006. Access will be by helicopter initially, followed by the proposed all weather road extending about 16.3 km north from the Dempster Highway.

The facility will include maintenance, administration and control room facilities. It will be staffed 24 hours per day with operations personnel.

Pipeline Appurtenances

Block Valves

Block valves will be installed along the gathering pipelines, gas and NGL pipelines at about the same time as the pipelines are installed. Block valves allow pipeline segments to be isolated for operations and maintenance.

In the GSA, block valve assemblies will be installed for the Storm Hills lateral, gas and NGL pipelines within the footprint of the Inuvik area facility and along the pipeline right-of-way at intermediate locations where compressor and pump stations might be required in the future. The NGL pipeline will have additional block valves installed on each side of large watercourse crossings and in certain instances, on one side only (see [Table 3-7](#) for the proposed locations).

The intermediate gas and NGL valve sites near Fish Trap Lake and Thunder River are located within the Lakes Around Travaillant Lake Special Management Zone (the special management zone), near KP-69.7 and KP-156.5. An NGL valve site is situated in the Travaillant Lake, Mackenzie/Tree River Conservation Zone, near KP-108.7.

Figure 3.10 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.

Intermediate block valves will be mostly below ground in the GSA. However, these valves will have extensions about 1.2 m above ground to allow valve actuators to be installed.

Risers with valves will also be installed. These will be used to depressurize the pipeline to permit pipeline maintenance (see [Figure 3-11](#)). NGLs, if removed, will be stored in mobile storage tanks or re-injected into the downstream pipeline sections.

The block valve assemblies will include blowdown or drain valves and bypass valves to depressurize the pipeline for maintenance. The design of the gas pipeline block valve assemblies will include side valves that will permit future station piping to be connected without taking the pipeline out of service. Manual blowdown or drain valves will be used to vent sweet natural gas and remove fluid from the pipelines.



Figure 3-11: Example of Underground Block Valve and Riser Installation

[Figure 3-12](#) and [Figure 3-13](#) are drawings of typical intermediate block valve sites for the gas and NGL pipelines. Artist's impressions are provided in [Figure 3-14](#) and [Figure 3-15](#).

A main control centre (MCC) in Calgary will be used to remotely monitor, control and diagnose NGL and gas block valve functions for the pipelines. The intermediate valve sites will be equipped with thermo-electric generators (TEG), which will produce limited power. Lights will only be used when operations or maintenance staff are present.

Table 3-7: Intermediate Valve Sites on NGL and Gas Pipelines

Valve Type	Site Name	Kilometre Post (KP)	Land Ownership ^a	Land Use Designation (Gwich'in land use plan)
NGL pipeline check valve and manual block valve location	Unnamed creek	16.0	Crown	Campbell Creek
NGL pipeline check valve and manual block valve location	North Caribou Lake	32.0	Crown	General Use
Gas pipeline block valve location	Future Fish Trap Lake compressor station	69.7	Private	Lakes Around Travaillant Lake
NGL pipeline block valve location	Travaillant River – upstream	76.5	Private	Lakes Around Travaillant Lake
NGL pipeline check valve and manual block valve location	Travaillant River – downstream	79.3	Private	Lakes Around Travaillant Lake
NGL pipeline check valve and manual block valve location	Unnamed hills – upstream	108.7	Private	Travaillant Lake, Mackenzie/Tree River
NGL pipeline block valve location	Thunder River – upstream	152.9	Private	Lakes Around Travaillant Lake
NGL pipeline isolation valve upstream of future pump station location	Future Thunder River pump station – upstream	156.4	Crown	Lakes Around Travaillant Lake
Gas pipeline block valve location	Future Thunder River compressor station	156.5	Crown	Lakes Around Travaillant Lake
NGL pipeline isolation valve downstream of future pump station	Future Thunder River pump station – downstream	156.5	Crown	Lakes Around Travaillant Lake
NGL pipeline block valve location	Unnamed hills – upstream	176.7	Crown	General Use
NOTE:				
^a Valve sites on private land are highlighted in bold lettering.				

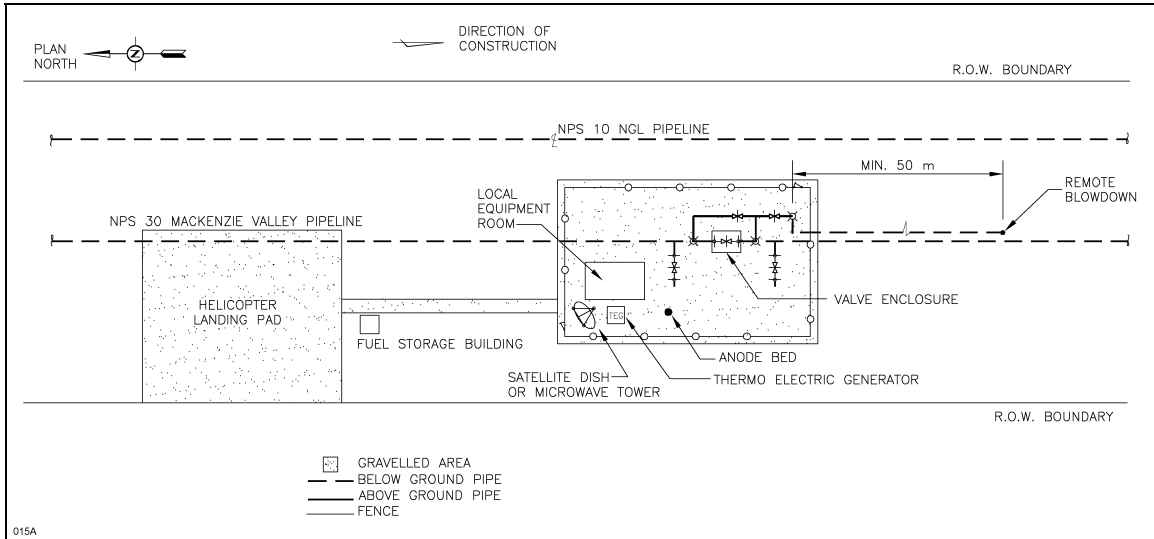


Figure 3-12: Typical Block Valve (Gas) – Dual Pipeline Site

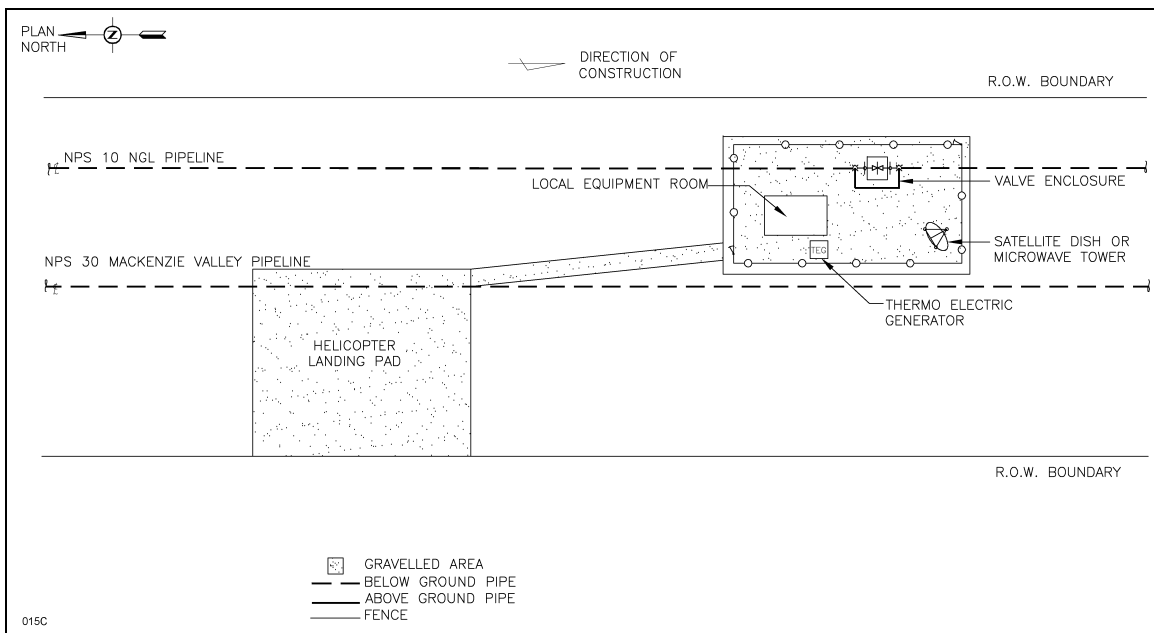


Figure 3-13: Typical Block Valve (NGL) – Dual Pipeline Site

Pigging Facilities

Pig launchers and receivers are facilities that enable pigs to be inserted into, or removed from, the pipeline (see the photograph provided in [Figure 3-16](#)). Pigs are devices placed into pipelines to clean the inside of the pipeline or to monitor its condition and position.

Cleaning pigs are usually made of hard rubber or foam and might be ball or bullet-type. Monitoring or smart pigs, equipped with inertial-guidance

Figure 3.14 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 3.15 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.

technologies, will be used to determine pipeline centreline coordinates. With regular runs of smart pigs, it can be determined if pipeline movement is occurring as a result of ground movement and the resultant strains. Other types of smart pigs, such as magnetic flux or ultrasonic pigs, will be used to determine if areas of the pipelines have experienced potentially problematic metal loss.

Pig launchers will be installed at the beginning of the gas and NGL pipelines at the Inuvik area facility. A pig receiver for the Storm Hills lateral will also be located within the site. There are no other pigging facilities proposed in the GSA.



Figure 3-16: Example of a Pig Launcher or Receiver

Cathodic Protection

The pipelines will be protected from external corrosion by a combination of an external coating and a cathodic protection system. This system will consist mainly of deep impressed current anode groundbeds that will be appropriately spaced to provide the pipeline with the requisite level of cathodic protection (see a schematic in [Figure 3-17](#)).

Shallow groundbeds might also be considered in areas of discontinuous permafrost, which occur in the southern part of the GSA. Where required, a galvanic system might be used to complement the impressed current system.