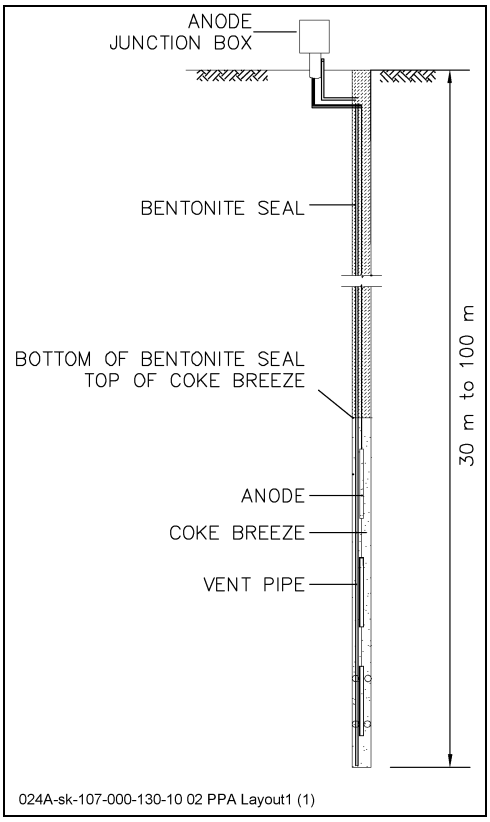

Figure 3-17: Typical Deep Anode Groundbed

Deep anode groundbeds will be installed at the Storm Hills lateral pig receiver and the gas and NGL pipeline pig launchers, both of which will be located within the Inuvik area facility footprint. There will also be groundbeds at the Fish Trap Lake and Thunder River block valve sites near kilometre posts 69.7 and 156.5.

A rock drill will typically be used to drill deep anode groundbeds in frozen and rocky terrain (see Figure 3-18).

The anodes will be powered by rectifiers or TEG. Rectifiers will be used where alternating current (AC) power is available at the facility sites. TEGs will be used at locations without a continuous supply of AC power.

Test stations consisting of junction boxes and test lead posts will be installed at about 3.0 km intervals along the pipeline right-of-way. The effectiveness of the cathodic protection system will be evaluated by taking measurements at the test stations of electrical potential of the pipeline with respect to the ground.

Signs and Markers

Appropriate signs will be specified and designed to warn the public, GWNT Department of Transportation and any third-party utility companies of the

Figure 3-18: Example of a Deep Well Anode Drill

presence of the pipelines. These bilingual warning signs, in English and the regional Aboriginal language, will consist of the following:

- road crossing warning signs, which will be installed where the crossing pipeline enters and exits the road right-of-way and will be visible from the travelled surface of the road

- pipeline crossing warning signs, which will be installed adjacent to the intersection of crossing pipelines

- watercourse crossing signs, which, except for vegetated crossings, will be installed just back from the top of the bank on either side of the watercourse crossing, and if practical, will be visible from the centre of the channel

- signs which will be posted directly above the pipeline on any fence lines that are crossed, and placed on the support post of the aerial markers

- signs which will be placed on all posts installed to support cathodic protection test lead junction boxes

Aerial markers will be installed at about 5.0 km intervals along the pipeline, and will provide reference locations along the pipeline that will be visible from the air.

PIPELINE CONSTRUCTION

Construction Plan

A preliminary multi-year construction plan has been developed for the project. In developing this plan, the following were considered:

- safety and emergency response
- concerns of local residents
- environmental protection
- regulatory requirements
- permafrost conditions
- seasonal constraints
- reduced daylight during the winter
- severe weather conditions
- coordination between the gas and NGL pipeline construction
- construction logistics
- infrastructure requirements
- specialized construction equipment
- select fill requirements

Public concerns considered in the construction planning process are described in Section 10.

Construction Spreads

The preliminary construction plan assumes that pipeline construction will be segmented into five construction spreads for each year of construction. Two spreads are planned for the GSA.

One of the construction spreads in the GSA includes the Storm Hills lateral and 95 km of dual pipelines from the Inuvik area facility to Crossing Creek Lake (E2). It is scheduled for the second pipeline construction season.

The other construction spread in the GSA (D1) extends from Crossing Creek Lake to Little Chicago in the SSA, a distance of about 106 km. It will be constructed in the first pipeline construction season (see Section 1 and the foldout maps in Appendix C – Foldout Maps).

Construction Methods

Conventional winter pipeline and industrial facility construction methods and equipment will generally be used to build the proposed pipelines and associated

facilities. Conventional winter construction techniques include:

- winterizing construction equipment and fuel tanks
- welding, followed by trenching
- lowering and backfill of the pipelines
- providing protection and housing for the workforce, including camp facilities, lighting and weather protection

Right-of-Way and Temporary Workspace

Right-of-Way Configuration

The pipeline right-of-way will provide work, travel and spoil areas to support safe and efficient construction. The configuration of a typical single pipeline alignment in a 40-m wide right-of-way is shown in Figure 3-19. Figure 3-20 shows a typical dual pipeline alignment in a 50-m wide right-of-way.

A trencher travel lane will be located between the ditch spoil pile and the edge of the right-of-way. The lane will be between 3.5 and 5.0 m wide and will be used to move lighting plants and ditching equipment.

A travel lane and work area will also be located within the right-of-way. Its surface will be prepared to safely accommodate the movement of construction equipment, including buses and pipe-stringing trucks. Over sensitive terrain and where practical, snow and ice pads will be constructed on the travel lane to facilitate the movement of construction equipment. An example of a busy right-of-way during construction is provided in Figure 3-21.

Right-of-way preparation techniques suitable for several combinations of slope and soil conditions have been developed. These techniques are designed to reduce potential erosion or instability related to permafrost and disturbance of surface organic cover.

Steep longitudinal and sidehill slopes will be graded during construction to provide safe working conditions and for performance of the work (see Figure 3-22). Grading will depend on various factors such as slope angles, soil types and ice content. Work pads might be prepared where unstable ice-rich soils make grading impractical.

Mitigation measures will be implemented both during and after construction to limit potential thaw settlement in permafrost areas. These measures might include the following but not are limited to revegetation, drainage control structures, surface insulation methods such as wood chips where available, and reclamation of graded slopes.

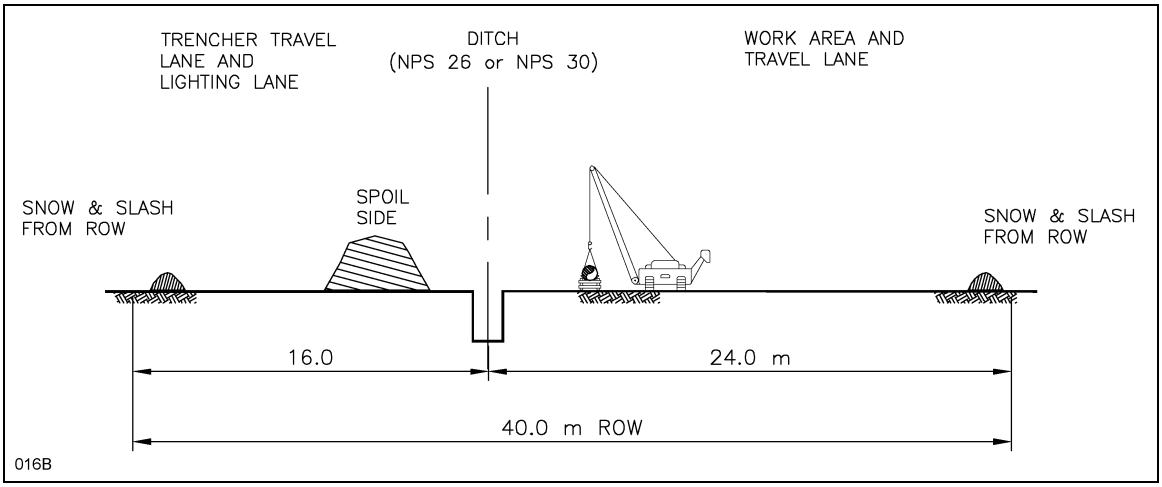

Figure 3-19: Typical Right-of-Way Configuration for Single Pipe (40 m)

Temporary Workspace

Temporary workspace during construction will be required at a number of locations for the following uses:

- shooflies on the pipeline right-of-way
- watercourse crossings with defined banks
- turnaround areas or pushouts
- road, highway and pipeline crossings
- equipment storage areas
- deep grade or large slope sites
- sidebends
- sharp direction change areas
- valve sites
- pig launcher and receiver sites
- timber storage sites

The temporary workspace requirements for the pipelines through the GSA are estimated at 38.8 ha on private lands and 22.1 ha on Crown lands. This space is necessary for construction activities and is incremental to the right-of-way itself. Areas required for timber storage and shooflies on the pipeline right-of-way are excluded from these estimates and will be identified as construction planning and engineering progresses.

The need, exact location, and size of additional temporary workspaces will be determined in the field during surveying, clearing and construction.

Typical workspace requirements are depicted in Figure 3-23, Figure 3-24, and Figure 3-25 for a watercourse crossing, pushout area and sidebends.

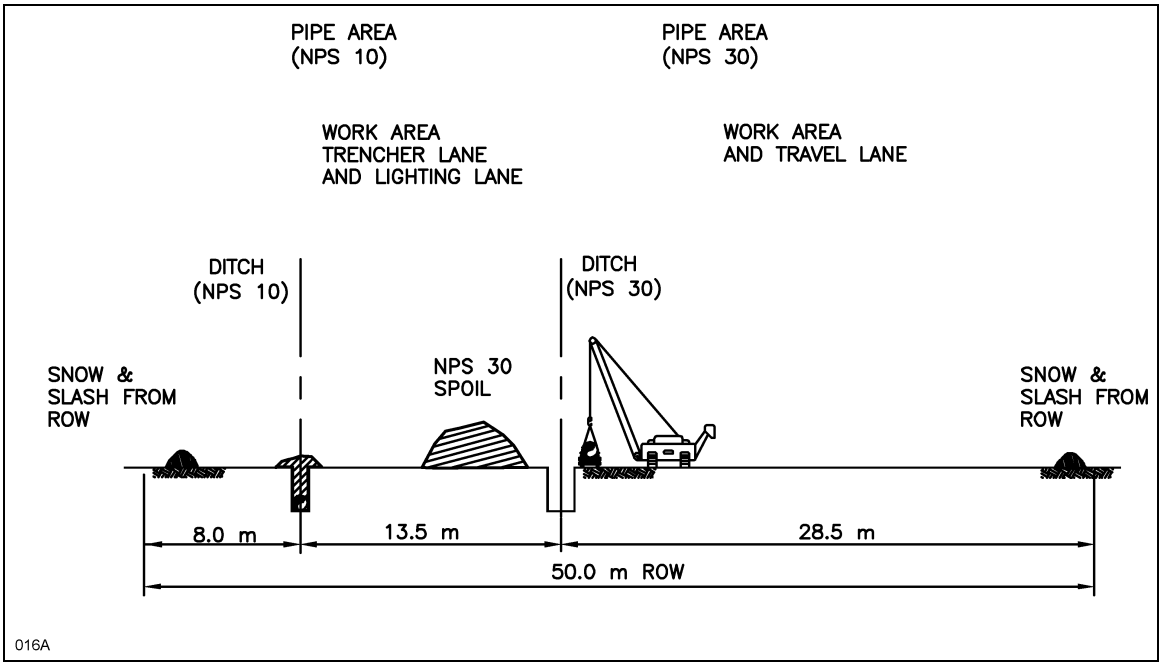

Figure 3-20: Typical Right-of-Way Configuration for Dual Pipelines (50 m)

Clearing and Subsurface Investigations

The right-of-way and temporary workspace will be cleared for pipeline construction when ground conditions allow. The full width of the right-of-way might not be cleared in some areas, such as the approaches to watercourse crossings with steep south-facing slopes. In the GSA, pipeline right-of-way clearing is expected to start in 2006 and end in 2009.

Before the start of right-of-way construction activities, the pipeline centreline will be located and staked within the identified route corridor and will require clearing a line-of-sight for surveying, using hand tools where necessary, in forested or bush areas.

Clearing and subsurface investigation activities include:

- surveying and marking the right-of-way and temporary workspace
- fencing or flagging areas to be avoided, such as environmentally sensitive sites
- clearing trees and shrubs from the right-of-way
- investigating subsurface conditions within the right-of-way

Figure 3-21: Example of a Right-of-Way During Construction

Trees and brush will be cut off at ground level. Non-merchantable timber and brush will be windrowed on the edge of the right-of-way. Timber will be stockpiled for project use in storage areas adjacent to the right-of-way. It might be used as a source of wood chips to insulate slopes along the right-of-way, for log corduroy, or to aid in bridge construction (see Figure 3-26). If requested, timber might also be stockpiled for community use, where practical.

Surface Preparation

The right-of-way surface will be leveled or graded to facilitate moving vehicles and equipment. Larger diameter pipe, such as the NPS 30 gas pipeline, typically requires larger construction equipment. This generally increases the extent of levelling that is required. Certain design locations such as side slopes, river crossings and steep gullies, typically require grading.