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TITLE	<b>SSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	4: Infrastructure Sites
SUBJECT	1: Little Chicago Infrastructure Site

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## INTRODUCTION

This section supports an application for the development of a temporary infrastructure site near Little Chicago. It contains:

- an overview map with the site location ([Figure 4-1](#))
- an estimate of the personnel requirements
- a summary of the operations
- a description of potential environmental and resource effects
- construction equipment estimates

The location of the Little Chicago infrastructure site is shown in the site-specific map and photograph provided in [Figure 4-2](#) and [Figure 4-3](#).

There are two infrastructure sites in the Little Chicago area, one near the Mackenzie River called the Little Chicago infrastructure site and a second within the footprint of the Little Chicago compressor station site called the infrastructure site at the Little Chicago facility.

## PERSONNEL (PART 3)

The construction of the infrastructure site at Little Chicago will require clearing, grading, camp construction and mechanical crews. These crews, of up to 60 people, will be obtained from the main pipeline clearing and grading crews or will be established specifically for infrastructure development. They will initially reside at a barge-based pioneer camp. The Little Chicago camp pad will be completed during the fall of 2006 and a 300-person construction camp will be installed in the winter of 2006-2007.

Initial crews will move from the barge-based pioneer camp to the 300-person camp at the Little Chicago site as soon as it is commissioned in the winter of 2006-2007. This camp will require a support staff of about 30 people. These people are included in the 300-person total.

In the summer of 2007, the 300-person construction camp will be expanded to a capacity of about 1,350 personnel. This camp will require a camp support staff of about 120 people. These people are included in the 1,350-person total.

Construction personnel will occupy the expanded camp over three winter construction seasons (2007-2008 for right-of-way clearing, 2008-2009 for pipeline construction and 2009-2010 for commissioning and reclamation). Personnel will begin arriving in November. Numbers will peak in mid-winter and taper off toward spring. A minimal camp support staff will remain on the site between construction seasons.

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

The land use activities and operations associated with this site include:

- developing and operating:
  - a fuel storage site to support construction activities
  - an administration office
  - a stockpile site for storage of material, equipment, and pipe, and for construction equipment maintenance
  - a redeveloped seasonal barge landing
  - sequentially, a barge-based mobile camp from which personnel will move to a 300-person camp expanding to a 1,350-person camp for worker accommodation during construction activities
  - a helipad within the site boundary
- developing a new 1.2 km all-weather road from the Little Chicago barge landing to the Little Chicago infrastructure site, and a 8.6 km winter road from the site to the right-of-way

### **Preconstruction Activities**

Before site development begins:

- a preconstruction survey will be conducted to finalize the location and site-specific layout
- geotechnical evaluations will be conducted, as required, to support engineering of the infrastructure site components

Figure 4.1 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

Initial development activities will commence in 2006 and will include clearing and construction of the pad that will support the proposed infrastructure site. The pad material might be obtained from nearby borrow sites on both Sahtu private and Crown land. The borrow sites on Crown land will be included in the land use permit application for Crown lands within the Sahtu Settlement Area (SSA). Detailed discussion of development of borrow sites on private lands is included in [Section 5](#).

The temporary infrastructure site will be developed on the east side of the Mackenzie River. By placing all the related facilities together, operational efficiencies are realized and the overall footprint of construction activities is reduced.

These facilities include:

- a module, pipe, material and equipment stockpile
- a fuel storage depot
- a camp
- an administration office
- a helipad

An artist's impression of a 1,350-person camp layout is shown in [Figure 3-7](#).

## Infrastructure Site Access

Access to the Little Chicago infrastructure site will be from the barge landing along access road KG-BL-A-204.5.

Access from the infrastructure site to the pipeline right-of-way will be along winter access road KG-C-W-204.5 (see [Figure 4-2](#) and [Table 4-1](#)).

**Table 4-1: Little Chicago Infrastructure Site Access**

Access Road Name	Kilometre Post (KP)	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
KG-C-W-204.5	204.5		8.6		8.6
KG-BL-A-204.5	204.5		1.2		1.2
Total length of infrastructure access on SSA private lands:			9.8		

### **Fuel Storage Depot**

The fuel storage depot will require the installation of pads of a sufficient depth to permit truck movement around the site and to safely support refuelling activities. The pads will be sufficient to stabilize the traffic areas of the site, to provide a suitable driving surface and to support the fuel tanks. The fuel depot will be located within the overall infrastructure site footprint. Additional information on typical fuel storage depots is provided in [Section 3](#).

Storage tanks will be used to supply the site requirements for electric power generation and pipeline and facility construction equipment. Tank storage for about 15 million L will be required at the Little Chicago site. These tanks are planned to contain diesel fuel.

The fuel storage depot at the Little Chicago site will be monitored by computerized systems and site security patrol. It will be equipped with management control systems for access, and authorization controls for fuel handling. An emergency shutdown system will also be provided.

### **Stockpile Site**

The stockpile at the Little Chicago site will require the installation of pads to permit truck movement around the site and to safely support unloading and storing large loads of pipe, equipment, modules and materials. The pad will be of sufficient depth to stabilize the storage areas of the stockpile site and provide a suitable driving surface for heavy truck traffic. Pad material requirements, the stockpile layout, and size will be finalized after the preconstruction survey. Typical stockpile sites are discussed in [Section 3](#).

### **Camp Site**

Development of the temporary self-contained camp will require the installation of pads of sufficient depth to permit the transport and erection of about 300 modular camp structures. Pad material requirements, camp site layout and size will be finalized after the preconstruction survey. Typical camp layout and services are described in [Section 3](#).

Start-up of camp activities will involve the mobilization of supplies and materials.

Water for the camp will likely be obtained from the Mackenzie River. The water will be transported by truck from the source to the camp site for use as camp and fire suppression water.

### **Barge Landing Site**

The existing seasonal barge landing site is situated about 300 m southwest of the Little Chicago infrastructure site on the east side of the Mackenzie River. The

barge landing site will be redeveloped primarily on the beach area of the Mackenzie River (see [Figure 4-3](#)). The developed area will be used for unloading material and equipment from the barges onto trucks for subsequent transport to the stockpile site.

The use of the existing barge landing:

- reduces the impacts on commercial river traffic
- is close to existing infrastructure to reduce physical impacts

In-stream activities will be restricted to the excavating required to prepare a smooth flat base for beaching a 600 Series spud barge. Work on the river bank will involve installing temporary mooring points, consisting of anchor blocks or screw-in anchors, and constructing the barge access ramp adjacent to the spud barge for transferring material and equipment to trucks. No pier piles are required at this site. The material excavated from the river edge will either be used, if suitable, as fill to create the barge access ramp, or to level and fill low-lying areas at the barge landing site. The barge access ramps will be constructed by building up granular materials to the level of the spud barge's deck. Fill material will be obtained from local granular sites and granular resource suppliers. The need for rig mats or geotextiles to stabilize the fill material and improve the weight-bearing capacity of the ramps will be determined in the field during construction.

The multi-year use of the barge landing site might require the barge ramp to be replaced each season because of the wash-out effects caused by the spring ice flows on the Mackenzie River. This might require maintaining a small stockpile (about 1,000 m<sup>3</sup>) of till and granular resources for annually reconstructing the barge landing site. The need for and size of this stockpile will be determined at the site after the quality of the excavated material and local beach material has been assessed.

## **Operations Activities**

The site will act as a staging area for the construction activities for a section of the project and, possibly, the Little Chicago facility.

### **Fuel Depot Operations**

Fuel will be delivered by barge to the Little Chicago barge landing. Fuel storage tanks will be filled using fuel trucks shuttling between the barge landing and the tanks. If the fuel storage site is close enough, a temporary surface pipeline might be installed to connect the barge landing area to the fuel storage site so that fuel can be pumped directly into fuel storage tanks.

Required fuel will be delivered from the depot to the construction sites. This will require daily truck traffic through the fuel depot during construction operations.

## **Stockpile Operations**

The stockpile will be used to store material required for construction of the pipeline and possibly, the Little Chicago facility. The all-weather access road (KG-BL-A-204.5) will be used for transporting equipment and material from the barge landing site to the Little Chicago stockpile site. This activity will primarily take place in the summer during the open-water barging season.

During the barge-unloading period (about seven weeks each year), trucks will operate continuously until all the required material has been stockpiled. A preliminary estimate of materials to be stockpiled at the infrastructure site includes about 65,400 tonnes of pipe and 7,540 tonnes of camp modules and supplies. A list of equipment that might be stored at the site is included in [Section 6](#) and [Section 7](#) of this application.

During construction, the material required for constructing the project will be hauled from the stockpile site and set in place at the infrastructure site. When construction is underway, truck activity will occur along the proposed all-weather and winter access roads.

## **Camp Site Operations**

The camp will be used to feed and house construction personnel. The largest element of the operations will be catering and housekeeping for the camp residents. Other activities will include the maintenance operations of the camp and restocking of fuel and supplies by truck.

Daily transport of personnel will be required during construction activities along the pipeline right-of-way, and to and from the Little Chicago infrastructure site. This will be accomplished with buses and light trucks. Food and other supplies will be flown into the Little Chicago facility airstrip and subsequently trucked to the Little Chicago infrastructure site. Daily water truck cycles will bring the necessary volume of water (about 227 L per person daily or 300 m<sup>3</sup> daily at full occupancy) to the camp.

The camp will have attendants and facilities to handle medical problems as they arise. All project camps will have a zero tolerance policy for alcohol and illegal drugs.

## **Barge Site Operations**

The 600 Series spud barge will be used for unloading cargo barges of pipeline materials, pipeline construction equipment and construction consumables for the construction activities. The spud barge will be berthed at the barge landing site for about three weeks each season, to unload that season's materials.

About six 1500 Series cargo barges could be moored simultaneously near the barge landing site while waiting to be unloaded. They will be moored where they will not interfere with other river traffic or result in potential safety concerns. The immediate shore area will not need to be disturbed for mooring, as the cargo barges will be moored in the Mackenzie River. The mooring distance from the shore will depend on the water depth and the draft of the barges. Tie lines to temporary mooring points on shore, such as mooring screw anchors or anchor blocks, will be required to secure the barges to the shore while they wait to be unloaded. The temporary mooring points will be re-established each operation season, if they are destroyed or removed by ice activity.

## **SUMMARY OF POTENTIAL ENVIRONMENTAL AND RESOURCES EFFECTS (PART 6)**

### **ENVIRONMENT**

The following topics provide specific biophysical and human environment setting, effects and mitigation information for Little Chicago infrastructure site. This information includes data collected during the 2004 field studies.

#### **Biophysical Environment**

##### **Air Quality Setting**

The air quality setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

##### **Air Quality Potential Effects and Mitigation**

Potential effects on air quality associated with the development of the infrastructure site, such as dust, vehicle and equipment emissions, are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

This infrastructure site might be a potential source of air emissions from space heating and from the incinerators used to manage certain types of combustible non-hazardous wastes. Air effects from these sources will be limited to the immediate vicinity of the site.

##### **Noise and Light Setting**

The noise setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

The site is currently undeveloped and therefore, no manmade sources of light occur.

## **Noise and Light Potential Effects and Mitigation**

Potential effects on noise levels associated with the development of the infrastructure site are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

Industrial lighting can cause increases in ambient light. Sources of light include vehicles, flares and lighting around the site.

Lighting will be used during non-daylight hours, which, during the winter months, might mean periods where lighting is required on a 24 hour basis. Conversely, during the late spring and through summer months, lighting will not be required at all because of the extended daylight hours.

The potential visual effect of lighting can be partially reduced by proper placement and use of lighting only in areas where it is required.

## **Soils, Landforms and Permafrost Setting**

The infrastructure site components are located on an undulating glaciolacustrine plain adjacent to the Mackenzie River. The plain contains thermokarst lakes and is locally overlain by organic deposits. Continuous permafrost is expected within the organic layer over glaciolacustrine deposits and ice contents range from 1,000 to 2,000%, by weight in the organics and 50 to 70%, by weight in the glaciolacustrine. Colluvial deposits are found on slopes along the edge of the Mackenzie River and recent fluvial sediments are found on floodplains at the base of the slope. Fluvial deposits and colluvial slopes are also found along incised watercourse valleys to the north and south of the infrastructure sites. Colluvial slopes might be underlain by permafrost (70 to 80% of slopes). Permafrost is expected to be absent from south facing slopes. Ice contents in colluvium deposits might range from 30 to 50%, by weight. Fluvial deposits might be free of permafrost if drainage is well to moderate. Fluvial deposits with poor to very poor drainage might be underlain by permafrost in 80 to 90% of the area and ice contents might range from 20 to 90%, by weight. The area surrounding the sites is characterized by soils of the Cryosolic Order.

A soil test pit was excavated in the gently sloping glaciolacustrine plain at the western edge of the Little Chicago infrastructure site. An Orthic Eutric Turbic Cryosol was developed over moderately well drained parent materials. The permafrost table was encountered at a depth of 75 cm in July 2004.

The infrastructure site is connected to the pipeline right-of-way by an access road that will cross the undulating glaciolacustrine plain that contains thermokarst lakes. Lowland depressions in the plain have commonly developed overlying units of organic fen. Continuous permafrost is expected within the glaciolacustrine and organic over glaciolacustrine deposits and ice contents range

from 1,000 to 2,000%, by weight in the organics and 50 to 70%, by weight in the glaciolacustrine. Near the Mackenzie River the access road is parallel to moderate colluvial slopes of an adjacent watercourse valley. Colluvial slopes might be underlain by permafrost (70 to 80% of area). Permafrost is expected to be absent from south facing slopes. Ice contents in colluvium deposits might range from 30 to 50%, by weight. The access road will descend moderate slopes from the campsite to reach the barge site at the edge of the Mackenzie River.

### **Soils, Landforms and Permafrost Potential Effects and Mitigation**

Pond formation and altered drainage are possible at these infrastructure sites as much of the area is underlain by glaciolacustrine sediments. Erosion of colluvial slopes adjacent to infrastructure sites might also take place if water from the sites is allowed to drain downslope. Access roads crossing colluvial slopes are also subject to erosion. Construction of infrastructure site pad might result in soil loss.

General mitigation strategies to offset potential effects are outlined in [Section 8](#).

### **Vegetation Setting**

The vegetation at the Little Chicago infrastructure site is a mosaic of regenerating black spruce – Labrador tea/mountain cranberry and regenerating upland white spruce – Alaska birch vegetation types. The regenerating black spruce type is dominated by green alder, blue-green willow and prickly rose in the shrub layer, and mountain cranberry, northern Labrador tea, fireweed and bog bilberry in the ground cover. The regenerating white spruce type is dominated by Labrador tea, black spruce, green alder, willow species and shrubby cinquefoil in the shrub layer, and cloudberry, red bearberry, mountain cranberry and horsetail in the ground cover. A rare plant, red goosefoot (*Chenopodium rubrum*) was noted during a rare plant survey conducted on a mud flat near a small lake to the north of this proposed site. There is another small lake immediately north of the proposed site. Lakeshores are classified as uncommon plant communities in the area. The proposed airstrips dominated by forbs and small shrubs. Shrubs include balsam poplar, soapberry, white spruce and willow. Forbs include yarrow, Herriot's sagewort, common bearberry, common dandelion, wild blue flax and grasses. This majority of this site has been previously cleared. Two rare plant surveys and a vegetation survey were done near the south end of the proposed infrastructure site and no rare plants were observed.

Access roads between components and the pipeline right-of-way will cross the same non-burned and regenerating black spruce and white spruce forested areas as described above. The access road near the infrastructure site complex will also cross the same wetland habitats as described above. All of the vegetation communities in the area are locally and regionally common, except the lakeshore community as mentioned above.

## **Vegetation Potential Effects and Mitigation**

Development of these infrastructure site components will affect vegetation through clearing and mechanical damage to trees, shrubs, forbs and non-vascular species, the permanent loss of vegetation and underlying substrates through infrastructure site expansion and potential changes in site drainage and along the access roads. Some areas, such as the sites for the proposed infrastructure site and barge landing, have been previously cleared, meaning less clearing is required at this site than would have been necessary at another location.

The majority of effects on vegetation will occur because of project activities arising from site construction and operations. These effects might include the potential influence of dust deposition on the health and growth of nearby vegetation, as well as the potential accidental introduction of non-native plant species. Effects on vegetation due to the infrastructure site components will persist into the far future (effect extends beyond 30 years past decommissioning and abandonment) given the slow rate of vegetation growth in the North. When the infrastructure site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the infrastructure site and along the access road might develop into a different vegetation community than what was there before development.

Implementation of primary mitigation measures, as described in [Section 8](#), will help reduce the magnitude of effects on vegetation at this site and its access road.

## **Wildlife Setting**

The Little Chicago infrastructure site area is characterized by post-fire regenerating vegetation communities. Wildlife habitat at the site is comprised of mature white spruce scattered among thick shrubs, such as alder, willow, buffaloberry, and sapling white spruce, as well as some patches of mature spruce and birch. A small pond with sedge border is located adjacent to the site. An important feature of the campsite is the abundance of browse forage for moose and snowshoe hare, the main prey of lynx.

Access roads will route from the pipeline right-of-way to the campsite, and then from the campsite to the barge landing site. The access roads pass through a variety of habitat types between the pipeline right-of-way and the infrastructure sites, including mixedwood, shrubs, such as willow, alder, and regenerating black spruce burn.

Key wildlife species detected at or near the site included caribou along the Mackenzie River shoreline and forest, and moose in the forest. Key species are species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. Other wildlife observed at or near these sites during surveys included snowshoe hare, red squirrel, fox, arctic ground squirrel,

black bear and American robin. Key wildlife species recorded at the campsite was limited to moose. Additional wildlife recorded at or near the campsite included wolf, black bear, snowshoe hare and sandhill crane.

An assessment of key habitat features, such as percent cover of forage species, indicated that the undisturbed segments of the forest of the airstrip site is considered to provide high quality foraging habitat for marten and lynx, and fall foraging habitat for grizzly bear, and nesting habitat for boreal chickadee (see Table 4-2). The site is also considered to provide moderate quality foraging habitat for woodland caribou and moose, and spring foraging and denning habitat for grizzly bear. However, traditional knowledge indicates grizzly bear are unlikely to occur in the area. Although the site contains some forage for beaver, this species is unlikely to inhabit the banks of the Mackenzie River at this location because of unsuitable habitat.

**Table 4-2: Habitat Quality for Key Wildlife Species at the Little Chicago Infrastructure Site**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
			Access Road
Mammals	Woodland caribou	Winter foraging	Low
	Moose	Winter foraging	High to moderate
	Grizzly bear	Fall foraging	Low
		Spring foraging	Low
		Denning	Low
	Marten	Foraging	Moderate
	Lynx	Foraging	Moderate
	Beaver	Cover	Low
Foraging		Low	
Birds	Scaup	Nesting	Moderate to high
	Peregrine falcon	Nesting	Low
	Arctic tern	Nesting	Low
	Lesser yellowlegs	Nesting	Moderate to high
	Boreal chickadee	Nesting	High
NOTE: <sup>a</sup> Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements, such as shrub availability for moose.			

The site is considered to provide high quality foraging habitat for moose and beaver. However, the wetland adjacent to the site might be too shallow to provide year-round habitat for beaver. The site is also considered to provide high quality

nesting habitat for lesser yellowlegs and boreal chickadee, and moderate quality foraging habitat for marten and lynx.

The access roads associated with these sites are considered to provide high to moderate quality foraging habitat for moose, and high to moderate nesting habitat for boreal chickadee, lesser yellowlegs, and scaup. As well, they provide moderate quality foraging habitat for marten and lynx.

Overall habitat quality at the infrastructure site and access roads was considered to be moderate to high for birds and mammals, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence. The habitat types at these sites are common in the region, and much of the area, was previously disturbed. The barge landing site was rated as low quality habitat for mammals and birds.

Based on habitat availability a variety of species might inhabit the infrastructure site. These include several species that have special status designation at the national and territorial levels, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Department of Resources, Wildlife and Economic Development (RWED, now ENR), respectively. Special status species that were observed, or might occur based on habitat availability, are summarized in [Table 4-3](#).

**Table 4-3: Special Status Species That Might Occur at the Little Chicago Infrastructure Site**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Woodland caribou	Sensitive	Threatened	Schedule 1 – threatened	-
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern <sup>f</sup>	Lower risk – least concern
Wolverine	-	Special concern	Schedule 3 – special concern <sup>f</sup>	Vulnerable
Northern flying squirrel	Sensitive	-	-	-
River otter	Sensitive	-	-	-
Rock ptarmigan	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Lesser yellowlegs	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Northern flicker	Sensitive	-	-	-

**Table 4-3: Special Status Species That Might Occur at the Little Chicago Infrastructure Site (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
American tree sparrow	Sensitive	-	-	-
Harris's sparrow	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
NOTES:				
<sup>a</sup> A hyphen indicates no status has been assigned for that species.				
<sup>b</sup> RWED – Resources, Wildlife and Economic Development (known as ENR since April 1, 2005)				
<sup>c</sup> COSEWIC – Committee on the Status of Endangered Wildlife in Canada				
<sup>d</sup> SARA – <i>Species at Risk Act</i>				
<sup>e</sup> IUCN – The World Conservation Union				
<sup>f</sup> SARA status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation and final Ministerial approval.				
SOURCE: Environment Canada 2004				

### Wildlife Potential Effects and Mitigation

The access roads, and the undisturbed areas of the proposed infrastructure site are composed of moderate to high quality habitat for wildlife. The barge landing is composed of low quality habitat. Habitat types at these sites are common in the region, and thus are not a limiting resource to wildlife. The undisturbed forest adjacent to the proposed infrastructure site provides high quality foraging habitat for marten and lynx, high quality fall foraging habitat for grizzly bear, and high quality nesting habitat for boreal chickadee. Denning habitat for carnivores might be present in the vicinity of the proposed infrastructure site. The campsite provides high quality foraging habitat for moose and beaver, and high quality nesting habitat for lesser yellowlegs and boreal chickadee. The access roads provide moderately high quality foraging habitat for moose, and moderately high quality nesting habitat for lesser yellowlegs and boreal chickadee.

General potential effects resulting from development and operation of the infrastructure site and access road on wildlife include direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small footprint of disturbances relative to regional habitat availability suggests that the magnitude of project effects on birds and most mammals, including those with special status designation, will be low. However, specific issues of concern at the infrastructure sites and along the access road include:

- attraction of bears to the infrastructure sites and potential mortality of problem bears
- disturbance of grizzly bear from high quality fall forage

- disturbance of nest sites and potential den sites
- disturbance of moose at the campsite and along the access road during winter
- increased hunting/poaching of moose, woodland caribou and trapping of marten and lynx resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during site and access road development and operations. Specifically, the following mitigation measures are considered important for this site:

- use the waste management plan described in [Section 11](#)
- avoid known nesting and denning sites (as determined during pre-construction surveys) to the extent practical
- reduce project activities during the nesting period to the extent practical
- prohibit the recreational use of project roads and rights-of-way by project staff while on the job site
- establish and enforce regulations to prevent wildlife harassment

### **Hydrology Setting**

The site is located near the banks of the Mackenzie River. The area encompassing this infrastructure site that contributes runoff to the Mackenzie River is about 1.6 km<sup>2</sup>.

### **Hydrology Potential Effects and Mitigation**

Effects of any potential increase in mean annual runoff flow due to the higher runoff coefficient of the disturbed area and in mean sediment concentration on the Mackenzie River are expected to be limited because of the relatively high flows in the river and the high background concentrations of sediment and high dilution capacity of the river.

### **Groundwater Setting**

Surface materials at this infrastructure site are expected to include silt and peat cover. The upland areas are well drained with mostly overland flow expected towards nearby surface waterbodies, in particular the Mackenzie River. No groundwater features were evident from an aerial inspection of the site completed in 2004.

### **Groundwater Potential Effects and Mitigation**

General mitigation measures, such as the installation of ditches or culverts to restore surface water drainage patterns, will be used, as required.

Groundwater effects and mitigation information for this infrastructure site are expected to be similar to regional SSA data described in [Section 8](#).

### **Water Quality Setting**

Water quality data for this site is expected to be similar to regional data described in [Section 8](#).

### **Water Quality Potential Effects and Mitigation**

Developing this infrastructure site might affect water quality through the release of treated domestic wastewater from the campsite, leaks and spills, sediment releases from disturbed land, and changes in surface water flow and level from changes associated with surface runoff or water withdrawals.

Effects of small-scale leaks will be reduced through management practices, contingency plans, mitigation and emergency response plans.

The effects on mean annual flow and mean annual sediment concentrations in the Mackenzie River are predicted to be limited. Consequently, non-measurable effects on water quality parameters associated with sediment inputs, that is, nutrients and metals, are expected.

### **Fish and Fish Habitat Setting**

No waterbodies have been identified that are likely to be affected by the infrastructure site.

Only northern pike juveniles and lake chub were captured during studies conducted in 2003. However, the Mackenzie River is known to support 19 fish species in this region of the Mackenzie River. Longnose sucker, inconnu, lake whitefish, Arctic cisco, northern pike, broad whitefish, chum salmon and Arctic lamprey, and six small-bodied forage and minnow species, were reported in previous studies conducted at a site near Grandview, about 40 km upstream of the infrastructure site.

The Mackenzie River also serves as a corridor for movement of diadromous fish species between the Beaufort Sea and upstream areas of the Mackenzie River. Arctic cisco migrants were collected in mid-summer, moving to upstream spawning areas and chum salmon were present in the fall and continued to be captured by subsistence fishermen until end of October.

The habitat in the Mackenzie River consisted entirely of deep runs. Several large islands were present on the west side of the channel across from the proposed barge landing site. Wetted channel widths ranged from 1,654 to 1,678 m, with a mean width of 1,670 m. Mean water depths were 4.4 to 8.1 m, with a maximum depth of 14.7 m. Channel bed material was sand, gravel and cobble. Overhead cover was provided by water depth, turbulence and occasional woody debris. The river banks were primarily composed of sand and gravel. Riparian vegetation along both banks consisted of shrubs, with some coniferous forest, grasses and forbs.

The cover provided by depth, and seasonally by high turbidity, makes the east bank run habitats suitable for rearing, and adult feeding and holding by species such as northern pike, longnose sucker, whitefish species and inconnu (see [Table 4-4](#)). Shallow flats along the shore margins provide suitable rearing habitat for species such as inconnu, longnose sucker, other whitefish species, and small minnow species during the summer. Use of the Mackenzie River as for spawning is unlikely. Side channels where woody debris is present might be used by northern pike for spawning but spring spawning species likely spawn in small tributaries such as the unnamed watercourse immediately upstream of the barge landing site. River depth is sufficient to allow overwintering in parts of the channel near the barge site.

**Table 4-4: Potential Habitat Use of the Mackenzie River at the Little Chicago Barge Landing Site**

Species <sup>a</sup>	Overwintering	Spawning and Incubating	Rearing	Adult Feeding and Holding
Arctic grayling	Yes	No	No	No
Northern pike	Yes	Yes	Yes	Yes
Longnose sucker	Yes	No	Yes	Yes
Whitefish species	Yes	Yes	Yes	Yes
Burbot	Yes	Yes	Yes	Yes
NOTE: <sup>a</sup> Of the species and species groups listed, none have been confirmed near the barge landing site during the present study.				

### **Fish and Fish Habitat Potential Effects and Mitigation**

Developing the infrastructure site components might affect fish and fish habitat through the improvements and the introduction of sediment carried by surface runoff from the site. Maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will prevent sediment from the infrastructure site reaching surface waters.

## **Human Environment**

This topic contains a description of the protected areas and heritage resource setting and potential effects and mitigation specific to the Little Chicago infrastructure site. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

This site is located within the proposed Mackenzie River Special Management Area. This area is described in the SPDLUP as a very important regional and territorial travel and transportation corridor, heritage place and traditional use location.

### **Protected Areas Potential Effects and Mitigation**

The development of this site in the proposed Mackenzie River Special Management Area will result in a decrease in the land base available for other land uses within this area. The presence of development within this area will be a permanent change to the landscape.

### **Heritage Resources Setting**

The site was inspected as part of the 2003 and 2004 field programs. The location was considered to have high potential for the discovery of heritage resources. Heritage resource sites have been previously recorded within a 2 km range of the development area, indicating prior use of this region. Recent cultural features were noted adjacent to the proposed development, indicating a continued cultural use of the area; however, no new archaeological sites were recorded as a result of the surface reconnaissance.

The nature of the heritage resource potential and results of the investigations at this location were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2003-933. Results of the 2004 field reconnaissance will be provided to the Prince of Wales Northern Heritage Centre in a report under permit 2004-956.

### **Heritage Resources Potential Effects and Mitigation**

Before the development of this site, a Heritage Resource Impact Assessment will be conducted and provided to the Prince of Wales Northern Heritage Centre. If it is determined that the development will affect any heritage resources, mitigation plans will be prepared. Regulations in the Northwest Territories prevent the publication or distribution of this information to the public. This information can only be obtained, with explicit approval, from the Prince of Wales Northern Heritage Centre.

## PUBLIC INVOLVEMENT

Several Fort Good Hope residents expressed concerns about the sensitive nature of the Little Chicago area. They were concerned that the area near Little Chicago is a historical site, on a bird migratory route and in a fishing and hunting area. Their main concern was that the project must respect and avoid grave sites near the proposed location of the Little Chicago infrastructure site, near the Mackenzie River. Residents provided detailed information by marking up maps to identify cabins and burial sites in the Little Chicago area. To better understand the concerns, further evaluation of the options was undertaken and it was determined that the cabin and burial sites would not be disturbed. Imperial arranged a helicopter tour of the area near the Little Chicago pipeline route and proposed infrastructure sites with members of the Fort Good Hope community.

The public involvement activities are documented in [Section 10](#).

## EQUIPMENT (PART 10)

The following tables show an estimate of the equipment that might be required for the Little Chicago infrastructure site. An exact list and numbers will not be known until immediately before construction. [Table 4-5](#) lists the site construction equipment. [Table 4-6](#) lists site operations equipment.

**Table 4-5: Estimate of Site Construction Equipment**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
4x4 crew cabs and pick-ups – 2	4x4	Transporting crews
Bulldozers with GP buckets, U blades and brush rakes – 2	Large sized bulldozer (405 HP)	Site grading, pad and access road development, spreading granular material, snow removal
Dump trucks (double axle) – 2	Truck with trailer (12 m <sup>3</sup> )	Hauling granular material
Front end loader with GP bucket – 1	Large sized loader (5.5 m <sup>3</sup> bucket loader)	Site preparation work
Road grader – 1	Large sized grader (4.9 m blade)	Site preparation work, grading ramps and access roads
Tracked mechanical ditcher – 1	Medium sized excavator (1.45 m <sup>3</sup> bucket)	Excavating and removing organic material
Tree feller-buncher and skidder – 1	Tracked 35,490 kg feller-buncher with a high speed saw head	Site clearing and timber hauling
Compactor – 1	Medium sized compactor (20,879 kg sheepsfoot packer)	Compaction of camp site pad fill materials and access road construction

**Table 4-5: Estimate of Site Construction Equipment (cont'd)**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Cranes (tracked) – 1	Medium sized crane (100 t)	Unloading and placement of camp modules
Mechanics truck with welder – 1	4x4	Equipment repair
Water truck – 1	Tandem axle, 16-24 m <sup>3</sup>	Site and road work
Sea containers – 2	6 m	Storage
Mobile camp – 1	35 person	Site development
Fuel truck – 1	3785 L	Fuel for equipment
Skid steer loaders – 2	Large sized skid steer (80 HP)	Site work

**Table 4-6: Estimate of Equipment to Operate the Infrastructure Site**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Sea containers – 4	6 m	Storage
Tractor trailers – 4	Dry van 14.6 m or 16.2 m	Parts and supplies
Road graders – 2	Large sized grader (4.9 m blade)	Earthwork, road maintenance and snow removal
Front end loader with GP bucket – 1	Large sized loader (5.5 m <sup>3</sup> bucket loader)	Movement of camp supplies and snow removal
Snow machines – 6	Small sized snow machine (400 cc)	Personnel transport
4x4 crew cab pick-up – 4	4x4	Transporting crews
Crane (tracked) – 1	Medium sized crane (100 t)	Loading and unloading pipe, equipment and materials
Flatbed trucks with pickers – 2	10 ton truck	Transporting materials and maintenance
Truck and water tank trailers – 5	Tandem axle, 16-24 m <sup>3</sup>	Bringing water to the camp for domestic use and fire protection
Skid steer loaders – 2	Large sized skid steer (80 HP)	Site work

**FUELS (PART 11)**

[Table 4-7](#) itemizes fuel storage. This represents an estimate of fuel requirements.

**Table 4-7: Estimate of Fuel Storage at Little Chicago**

Fuels	Number of Containers	Capacity of Containers	Location
Diesel	18	500,000 L	Fuel Depot
Diesel	30	200,000 L	Fuel Depot

**PERIOD OF OPERATIONS (PART 14)**

Site operations will be continuous from 2006 through the summer of 2010, with the potential for limited activities after 2010. See [Section 3](#) for a schedule of development activities in the SSA.

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

Map coordinates of the site centroid are shown in [Table 4-8](#). A map showing the location of the site is provided in [Figure 4-5](#).

A photograph of the Little Chicago infrastructure site appears in [Figure 4-3](#).

**Table 4-8: Map Coordinates of Little Chicago Infrastructure Sites**

Activity	Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
Little Chicago barge landing site	67.1786	-130.2315	446699	7451823	9
Little Chicago camp site 1 of 2	67.1869	-130.2133	447508	7452729	9
Little Chicago camp site 2 of 2	67.1832	-130.2092	447675	7452313	9
Little Chicago stockpile site	67.1835	-130.2320	446692	7452370	9

**FEES (PART 18)**

The total land area required for activities contained in this subject is 59.2 ha.

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

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Figure 4.3 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>SSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	4: Infrastructure Sites
SUBJECT	2: Infrastructure Site for the Little Chicago Facility

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## INTRODUCTION

This section supports an application for the development of a temporary infrastructure site within the Little Chicago facility site footprint. It contains:

- an overview map with the site location ([Figure 4-4](#))
- an estimate of the personnel requirements
- a summary of the operations
- a description of potential environmental and resource effects
- construction equipment estimates

The infrastructure site at the Little Chicago facility site will be situated completely within the footprint of the facility and is shown in [Figure 4-4](#).

## PERSONNEL (PART 3)

The construction of the infrastructure site for the Little Chicago facility site will require clearing, grading, camp construction and mechanical crews. These crews, of up to 30 people, will be obtained from the main pipeline clearing and grading crews or will be established specifically for infrastructure development. They are planned to reside at a mobile pioneer camp.

The Little Chicago facility site infrastructure pad and a 120-person construction camp will be completed during the summer of 2007. Personnel constructing the compressor station will move from the mobile pioneer camp to the Little Chicago facility site camp as soon as it is commissioned. The camp will then be occupied through the summer of 2010.

This camp will require a support staff of about 12 people. These people are included in the 120-person total.

Figure 4.4 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.

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

The land use activities and operations associated with the infrastructure site at the Little Chicago facility site include developing and operating:

- a fuel storage site to support construction activities
- an administration office
- a stockpile site for storage of material, equipment, modules and pipe, and for construction equipment maintenance
- a 120-person camp for worker accommodation during construction activities
- an airstrip to support pipeline and facility construction activities
- a helipad within the site boundary

### **Preconstruction Activities**

Before site development begins:

- a preconstruction survey will be conducted to finalize the location and site-specific layout
- geotechnical evaluations will be conducted, as required, to support engineering of the infrastructure site components

### **Development Activities**

Initial development activities will commence in 2006 and will include clearing and construction of the pad that will support the proposed camp at the facility site. The pad material might be obtained from nearby borrow sites on both Sahtu private and Crown land. The borrow sites on Crown land will be included in the land use permit application for Crown lands within the SSA. More detailed discussion of development of borrow sites on private lands is included in [Section 5](#).

The infrastructure site layout, within the Little Chicago facility site footprint, is shown in the artist's impression in [Section 7](#). This figure demonstrates how the camp might be integrated into the facility site.

### **Infrastructure Site Access**

The infrastructure site for the Little Chicago facility site will be used as the staging area for the construction of the facility. Access to the infrastructure site

will be from the pipeline right-of-way and an airstrip adjacent to access road KG-A-A-222.5 (see [Figure 4-5](#) and [Table 4-9](#)).

**Table 4-9: Little Chicago Facility Site Infrastructure Access**

Access Road Name	Kilometre Post (KP)	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
KG-A-A-222.5	222.5		0.8		0.8
Total length of Little Chicago facility site access on private lands:			0.8		

Access to the infrastructure site will also be the same as for the Little Chicago facility site (see [Section 7](#)).

### Fuel Storage Depot

The fuel storage depot will require the installation of pads of a sufficient depth to permit truck movement around the site and to safely support refuelling activities. The pads will be sufficient to stabilize the traffic areas of the site, to provide a suitable driving surface and to support the fuel tanks. The fuel depot will be located within the overall infrastructure site footprint. Additional information on typical fuel storage depots is provided in [Section 3](#).

Storage tanks will be used to supply the site requirements for electric power generation and facility construction equipment. Tank storage for about 1 million L will be required at the Little Chicago facility site. These tanks are planned to contain diesel fuel.

The fuel storage depot at the Little Chicago facility site will be monitored by computerized systems and site security patrol. It will be equipped with management control systems for access, and authorization controls for fuel handling. An emergency shutdown system will also be provided.

### Stockpile Site

The stockpile site at the Little Chicago facility site will require the installation of pads to permit truck movement around the site and to safely support unloading and storing large loads of pipe, equipment, gas processing and other modules, and materials. The pad will be of sufficient depth to stabilize the storage areas of the stockpile site and provide a suitable driving surface for heavy truck traffic. Pad material requirements, the stockpile layout, and size will be finalized after the preconstruction survey. Typical stockpile sites are discussed in [Section 3](#).

## **Camp Site**

Development of the temporary self-contained camp will require the installation of pads of sufficient depth to permit the transport and erection of about 60 modular camp structures. Pad material requirements, camp site layout and size will be finalized after the preconstruction survey. Typical camp layout and services are described in [Section 3](#).

Start-up of camp activities will involve the mobilization of supplies and materials.

Water for the camp will likely be obtained from the Mackenzie River or from the Little Chicago infrastructure site. During the winter, the water will be transported by truck from the source to the camp site for use as camp and fire suppression water, or will be put into storage tanks for summer use at the site.

## **Airstrip (Dash-8 [100])**

An airstrip will be built about 1.0 km north of the Little Chicago facility site. The airstrip will be constructed to meet a minimum standard for maximum load bearing capacity per aircraft manufacturer's specifications for the largest aircraft designated for this location and according to the requirements of the Transport Canada TP312 requirement. This site is required to accommodate Dash-8 (100) usage.

As specified next, the required area will be cleared of all brush and timber. Typical runway construction consists of a three-layer build-up of compacted, consolidated construction materials. The sub-base will be made of crushed shale, limestone or well-drained, unfrozen tills. The base course will be made of the same materials, with a maximum aggregate size of 200 mm but must be placed in a discrete lift and compacted separately. The finishing surface will be made with 20 mm crushed gravel. Granular construction materials will be obtained from local granular sites.

The cleared area will be about 90 m wide and 1,400 m long. The runway will be a minimum of 19 m wide and 1,090 m long. A buffer or non-encroachment zone between the runway and the edge of the cleared area at a minimum distance of 50 m off the approach ends and 30 m off the sides of the runway is required. A further buffer or non-encroachment zone extending beyond the approach ends of the runway must be void of all obstacles taller than one percent elevation grade. An airstrip schematic for Dash-8 (100) usage is shown in [Section 3](#).

## **Operations Activities**

The site will act as a staging area for the construction activities for the Little Chicago facility site.

### **Fuel Depot Operations**

Fuel will be delivered by truck to the fuel depot from the main fuel depot at the Little Chicago infrastructure site. This will reduce the size of the depot facilities at the infrastructure site for the Little Chicago facility site. This will require daily truck traffic through the fuel depot during construction operations.

### **Stockpile Operations**

The stockpile will be used to store the material required for construction of the Little Chicago facility site. The pipeline right-of-way, the winter access roads and the proposed all-weather access roads will be used for transporting equipment and material from the Little Chicago infrastructure site staging area to the Little Chicago facility site stockpile site. This activity will primarily take place in the winter once the winter access roads have been constructed.

A preliminary estimate of materials to be stockpiled at the infrastructure site for the Little Chicago facility site includes about 5,650 tonnes of equipment, facility and camp modules and supplies. A list of equipment that might be stored at the site is included in [Section 7](#).

During construction, the material required for constructing the facilities for the project will be hauled from the stockpile site and set in place at the facility site.

### **Camp Site Operations**

The camp will be used to feed and house construction personnel. The largest element of the operations will be catering and housekeeping for the camp residents. Other activities will include the maintenance operations of the camp and restocking of fuel and supplies by truck.

Food and other supplies will be flown into the Little Chicago facility airstrip. Daily water will be piped to bring the necessary volume of water (about 227 L per person daily or 57 m<sup>3</sup> daily at full occupancy) to the camp, or will have water tanks on site.

The camp will have attendants and facilities to handle medical problems as they arise. All project camps will have a zero tolerance policy for alcohol and illegal drugs.

### **Airstrip Operations**

The purpose of this airstrip is to support construction and operation of the project and to allow year-round access to the Little Chicago facility site.

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

A description of the potential environmental and resource effects and primary mitigation strategies for this site can be found in [Section 7](#).

### PUBLIC INVOLVEMENT

Several Fort Good Hope residents expressed concerns about the sensitive nature of the Little Chicago area. They were concerned that the area near Little Chicago is a historical site, on a bird migratory route and in a fishing and hunting area. Their main concern was that the project must respect and avoid grave sites near the proposed location of the Little Chicago infrastructure site, near the Mackenzie River. Residents provided detailed information by marking up maps to identify cabins and burial sites in the Little Chicago area. To better understand the concerns, further evaluation of the options was undertaken and it was determined that the cabin and burial sites would not be disturbed. Imperial arranged a helicopter tour of the area near the Little Chicago pipeline route and proposed infrastructure sites with members of the Fort Good Hope community.

The public involvement activities are documented in [Section 10](#).

### EQUIPMENT (PART 10)

The following tables show an estimate of the equipment that might be required at the infrastructure site for the Little Chicago facility site. An exact list and numbers will not be known until immediately before construction. [Table 4-10](#) lists the site construction equipment. [Table 4-11](#) lists site operations equipment.

**Table 4-10: Estimate of Site Construction Equipment**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Crew cabs and pick-ups – 2	4x4	Transporting crews
Bulldozers with GP buckets, U blades and brush rakes – 2	Large sized bulldozer (405 HP)	Site grading, pad and access road development, spreading granular material, snow removal.
Dump trucks (double axle) – 2	Truck with trailer (12 m <sup>3</sup> )	Hauling granular material
Front end loader with GP bucket – 1	Large sized loader (5.5 m <sup>3</sup> bucket loader)	Site preparation work
Road grader – 1	Large sized grade (4.9 m blade)	Site preparation work, grading ramps and access roads

**Table 4-10: Estimate of Site Construction Equipment (cont'd)**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Tracked mechanical ditcher – 1	Medium sized excavator (1.45 m <sup>3</sup> bucket)	Excavating and removing organic material
Tree feller-buncher and skidder – 1	Tracked 35,490 kg feller-buncher with a high speed saw head	Site clearing and timber hauling
Compactor – 1	Medium sized compactor (20,879 kg sheepsfoot packer)	Compaction of camp site pad fill materials and access road construction
Cranes (tracked) – 1	Medium sized crane (100 t)	Unloading and placement of camp modules
Mechanics truck with welder – 1	4x4	Equipment repair
Water trucks – 1	Tandem axle, 16-24 m <sup>3</sup>	Site and road work
Sea containers – 2	6 m	Storage
Mobile camps – 1	35 person	Site development
Fuel trucks – 1	3,785 L	Fuel for equipment
Skid steer loaders – 2	Large sized skid steer (80 HP)	Site work

**Table 4-11: Estimate of Equipment to Operate the Infrastructure Site**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Sea containers – 4	6 m	Storage
Tractor trailers – 4	Dry van 14.6 or 16.2 m	Parts and supplies
Road graders – 2	Large sized grader (4.9 m blade)	Earthwork, road maintenance and snow removal
Front end loader with GP bucket – 1	Large sized loader (5.5 m <sup>3</sup> bucket loader)	Movement of camp supplies and snow removal
Snow machines – 6	Small sized snow machine (400 cc)	Personnel transport
4x4 crew cab and pick-up – 4	4x4	Transporting crews
Cranes (tracked) – 1	Medium sized crane (100 t)	Loading and unloading pipe, equipment and materials
Flatbed trucks with pickers – 2	10 ton truck	Transporting materials and maintenance

**Table 4-11: Estimate of Equipment to Operate the Infrastructure Site (cont'd)**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Truck and water tank trailers – 5	Tandem axle, 16-24 m <sup>3</sup>	Bringing water to the camp for domestic use and fire protection
Skid steer loaders – 2	Large sized skid steer (80 HP)	Site work

**FUELS (PART 11)**

[Table 4-12](#) itemizes fuel storage. This represents an estimate of fuel requirements.

**Table 4-12: Estimate of Fuel Storage at the Little Chicago Facility Infrastructure Site**

Fuels	Number of Containers	Capacity of Containers	Location
Diesel	5	200,000 L	Fuel Depot

**PERIOD OF OPERATIONS (PART 14)**

Site operations will be continuous from 2006 through the summer of 2010. See [Section 3](#) for a schedule of development activities in the SSA.

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

Map coordinates of the site centroid are shown in [Table 4-13](#). A map showing the location of the site is provided in [Figure 4-5](#).

A photograph of the Little Chicago facility site appears in [Figure 4-6](#). The temporary infrastructure site will be situated completely within the footprint of the Little Chicago facility.

**Table 4-13: Map Coordinates of Little Chicago Facility Infrastructure Sites**

Activity	Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
Little Chicago facility infrastructure site	67.0646	-129.9773	457501	7438910	9
Little Chicago facility airstrip	67.0747	-129.9816	457332	7440039	9

**FEES (PART 18)**

The total land area required for activities contained in this subject is 20.4 ha. The area required for the camp is included within the footprint of the Little Chicago facility site.

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

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Figure 4.6 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>SSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	4: Infrastructure Sites
SUBJECT	3: Tulita (West) Infrastructure Site

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## INTRODUCTION

This section supports an application for the development of a temporary infrastructure site west of Tulita. It contains:

- an overview map with the site location ([Figure 4-7](#))
- an estimate of the personnel requirements
- a summary of the operations
- a description of potential environmental and resource effects
- construction equipment estimates

The location of the Tulita (West) infrastructure site is shown in the site-specific map and photograph provided in [Figure 4-8](#) and [Figure 4-9](#).

## PERSONNEL (PART 3)

The construction of the Tulita (West) infrastructure site will require clearing, grading, camp construction and mechanical crews. These crews, of up to 60 people, will be obtained from the main pipeline clearing and grading crews or will be established specifically for infrastructure development. The Tulita (West) pad will be completed during the winter of 2006-2007.

## SUMMARY OF OPERATION (PART 5)

The land use activities and operations associated with this site include:

- developing and operating:
  - a fuel storage site to support construction activities
  - an administration office
  - a stockpile site for storage of material, equipment, and pipe, and for construction equipment maintenance
  - a redeveloped seasonal barge landing
  - a day trailer for living accommodation to support construction activities
  - a helipad within the site boundary
- developing a new 2.1 km all-weather road from the barge landing site to the Tulita (West) infrastructure site

Figure 4.7 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.

## **Preconstruction Activities**

Before site development begins:

- a preconstruction survey will be conducted to finalize the location and site-specific layout
- geotechnical evaluations will be conducted, as required, to support engineering of the infrastructure site components

## **Development Activities**

Initial development activities will commence in 2006 and will include clearing and construction of the pad that will support the proposed infrastructure site. The pad material might be obtained from nearby borrow sites on both Sahtu private and Crown land. The borrow sites on Crown land will be included in the land use permit application for Crown lands within the SSA. Detailed discussion of development of borrow sites on private lands is included in [Section 5](#).

The temporary infrastructure site will be developed on the east bank of the Mackenzie River. By placing all the related facilities together, operational efficiencies are realized and the overall footprint of construction activities is reduced. These facilities include:

- a module, pipe, material and equipment stockpile
- a fuel storage depot a camp
- an administration office
- a helipad

A conceptual stockpile layout is provided in [Section 3](#).

## **Infrastructure Site Access**

Access to the Tulita (West) infrastructure site from the Mackenzie River will be from the barge landing along access road TD-BL-A-548.7.

Access from the infrastructure site to the pipeline right-of-way will be along the existing DOT winter access road, and various winter access roads (see [Figure 4-8](#) and [Table 4-14](#)).

**Table 4-14: Tulita (West) Infrastructure Access**

Access Road Name	Kilometre Post (KP)	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
TD-BL-A-548.7	548.7		2.1		2.1
Total length of Tulita (West) access on private lands:			2.1		

### Fuel Storage Depot

The fuel storage depot will require the installation of pads of a sufficient depth to permit truck movement around the site and to safely support refuelling activities. The pads will be sufficient to stabilize the traffic areas of the site, to provide a suitable driving surface and to support the fuel tanks. The fuel depot will be located within the overall infrastructure site footprint. Additional information on typical fuel storage depots is provided in [Section 3](#).

Storage tanks will be used to supply the site requirements for electric power generation and pipeline and facility construction equipment. Tank storage for about 200,000 L will be required at the Tulita (West) site. This tank is planned to contain diesel fuel.

The fuel storage depot at the Tulita (West) site will be monitored. It will be equipped with management control systems for access, and authorization controls for fuel handling. An emergency shutdown system will also be provided.

### Stockpile Site

The stockpile at the Tulita (West) site will require the installation of pads to permit truck movement around the site and to safely support unloading and storing large loads of pipe, equipment, modules and materials. The pad will be of sufficient depth to stabilize the storage areas of the stockpile site and provide a suitable driving surface for heavy truck traffic. Pad material requirements, the stockpile layout, and size will be finalized after the preconstruction survey. Typical stockpile sites are discussed in [Section 3](#).

### Barge Landing Site

The existing seasonal barge landing site is situated on the east shore of the Mackenzie River about 2.0 km downstream of the Great Bear River. The barge landing site will be redeveloped primarily on the beach area of the Mackenzie River (see [Figure 4-9](#)). The developed area will be used for unloading material and equipment from the barges onto trucks for subsequent transport to the stockpile site.

The selected location of the barge landing site:

- reduces the impacts on commercial river traffic
- is close to existing infrastructure to reduce physical impacts

In-stream activities will be restricted to the excavating required to prepare a smooth flat base for beaching a 600 Series spud barge. Work on the river bank will involve installing temporary mooring points, consisting of anchor blocks or screw-in anchors, and constructing the barge access ramp adjacent to the spud barge for transferring material and equipment to trucks. No pier piles are required at this site. The material excavated from the river edge will either be used, if suitable, as fill to create the barge access ramp, or to level and fill low-lying areas at the barge landing site. The barge access ramps will be constructed by building up granular materials to the level of the spud barge's deck. Fill material will be obtained from local granular sites and granular resource suppliers. The need for rig mats or geotextiles to stabilize the fill material and improve the weight-bearing capacity of the ramps will be determined in the field during construction.

The multi-year use of the barge landing site might require the barge ramp to be replaced each season because of the wash-out effects caused by the spring ice flows on the Mackenzie River. This might require maintaining a small stockpile (about 1,000 m<sup>3</sup>) of till and granular resources for annually reconstructing the barge landing site. The need for and size of this stockpile will be determined at the site after the quality of the excavated material and local beach material has been assessed.

## **Operations Activities**

The site will act as a staging area for the construction activities for a section of the project.

### **Fuel Depot Operations**

Fuel will be delivered by barge to the Tulita (West) barge landing. The fuel storage tank will be filled using fuel trucks shuttling between the barge landing and the tanks. If the fuel storage site is close enough, a temporary surface pipeline might be installed to connect the barge landing area to the fuel storage site so that fuel can be pumped directly into fuel storage tanks.

Required fuel will be delivered from the depot to the construction sites. This will require daily truck traffic through the fuel depot during construction operations.

### **Stockpile Operations**

The stockpile will be used to store material required for construction of the pipeline. The all-weather access road (TD-BL-A-548.7) will be used for transporting equipment and material from the barge landing site to the Tulita

(West) stockpile site. This activity will primarily take place in the summer during the open-water barging season.

During the barge-unloading period (about seven weeks each year), trucks will operate continuously until all the required material has been stockpiled. A preliminary estimate of materials to be stockpiled at the infrastructure site includes about 6,500 tonnes of pipe and 100 tonnes of modules and supplies. A list of equipment that might be stored at the site is included in [Section 6](#) and [Section 7](#) of this application.

During construction, the material required for constructing the project will be hauled from the stockpile site to various locations along the pipeline right-of-way. When construction is underway, truck activity will occur along the DOT winter road and the winter access roads.

### **Barge Site Operations**

The 600 Series spud barge will be used for unloading cargo barges of pipeline materials, pipeline construction equipment and construction consumables for the Mackenzie Gas Project's construction activities. The spud barge will be berthed at the barge landing site for about three weeks each season, to unload that season's materials.

About six 1500 Series cargo barges could be moored simultaneously near the barge landing site while waiting to be unloaded. They will be moored where they will not interfere with other river traffic or result in potential safety concerns. The immediate shore area will not need to be disturbed for mooring, as the cargo barges will be moored in the Mackenzie River. The mooring distance from the shore will depend on the water depth and the draft of the barges. Tie lines to temporary mooring points on shore, such as mooring screw anchors or anchor blocks, will be required to secure the barges to the shore while they wait to be unloaded. The temporary mooring points will be re-established each operation season, if they are destroyed or removed by ice activity.

## **SUMMARY OF POTENTIAL ENVIRONMENTAL AND RESOURCES EFFECTS (PART 6)**

The following topic provides specific biophysical and human environment setting, effects and mitigation information for Tulita (West) infrastructure site. This information includes data collected during the 2004 field programs.

### **Biophysical Environment**

#### **Air Quality Setting**

The air quality setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

### **Air Quality Potential Effects and Mitigation**

Potential effects on air quality associated with the development of the infrastructure site, such as dust, vehicle and equipment emissions, are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

### **Noise and Light Setting**

The noise setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

The site is currently undeveloped and therefore, no manmade sources of light occur.

### **Noise and Light Potential Effects and Mitigation**

Potential effects on noise levels associated with the development of the infrastructure site are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

Industrial lighting can cause increases in ambient light. Sources of light include vehicles, flares and lighting around the site.

Lighting will be used during non-daylight hours, which, during the winter months, might mean periods where lighting is required on a 24 hour basis. Conversely, during the late spring and through summer months, lighting will not be required at all because of the extended daylight hours.

The potential visual effect of lighting can be partially reduced by proper placement and use of lighting only in areas where it is required.

### **Soils, Landforms and Permafrost Setting**

This infrastructure site lies in a region characterized by both extensive (65 to 90%) and intermediate (35 to 65%) discontinuous permafrost with moderate visible ice contents ranging from 5 to 15%. The area surrounding the infrastructure site is characterized by soils of the Cryosolic Order.

The site lies on a fluvial terrace along the east bank of the Mackenzie River. Fluvial terraces develop a variety of soils including soils of the Brunisolic, Cryosolic and Gleysolic Orders. Drainage commonly varies between well drained and poorly drained. Permafrost is expected beneath about 20 to 40% of the area with ice contents between 30 and 40% by weight. The infrastructure site is located away from moderate to strong slopes at the edge of the terrace along the Mackenzie River.

## **Soils, Landforms and Permafrost Potential Effects and Mitigation**

Terrain-related environmental sensitivities are not predicted for the infrastructure site. Construction of infrastructure pads will result in drainage disruption and soil loss because the pads will be placed directly on the surface material.

General mitigation strategies to offset potential effects are outlined in [Section 8](#).

## **Vegetation Setting**

The vegetation at the barge landing site is a riparian willow – grey alder type. This is a tall shrub community in which shrubby willow, Alaska willow and grey alder are dominant tall shrubs and red-osier dogwood, prickly rose and low-bush cranberry are common low shrubs. Two vegetation surveys and one rare plant survey were conducted at this location. No rare plants were observed. White sweet clover, which is listed as a weed, was observed at this site.

The vegetation at the stockpile and storage site is a mosaic of regenerating black spruce – Labrador tea/mountain cranberry and regenerating upland white spruce – Alaska birch types. The regenerating black spruce type is dominated by green alder, blue-green willow and prickly rose in the shrub layer, and mountain cranberry, northern Labrador tea, fireweed and bog bilberry in the ground cover. The regenerating white spruce type is dominated by Labrador tea, black spruce, green alder, willow species and shrubby cinquefoil in the shrub layer, and cloudberry, red bearberry, mountain cranberry and horsetail in the ground cover. A vegetation survey and a rare plant survey were conducted at this site.

## **Vegetation Potential Effects and Mitigation**

Development of this infrastructure site and its associated access road will affect vegetation through clearing and mechanical damage to trees, shrubs, forbs and non-vascular species, the permanent loss of vegetation and underlying substrates through site expansion and potential changes in site drainage and along the access road.

Access to the infrastructure site will be mainly via existing access roads, however, these roads will need to be improved, and some new small roads might be required. Clearing of trees and shrub will be necessary for this work.

The majority of effects on vegetation will occur because of project activities arising from site construction and operations. These effects might include the potential influence of dust deposition on the health and growth of nearby vegetation, as well as the potential accidental introduction of non-native plant. Effects on vegetation due to the site and access road will persist into the far future (effect extends beyond 30 years past decommissioning and abandonment) given the slow rate of vegetation growth in the North. When the site and access road are decommissioned, introduction of non-native reclamation species might also occur.

Vegetation on the infrastructure site and along the access road might develop into a different vegetation community than what was there before development.

White sweet clover is present at the barge landing site and might need to be controlled during or following activities at this site to prevent its spread.

Implementation of primary mitigation measures, as described in [Section 8](#), will help reduce the magnitude of effects on vegetation at this infrastructure site and its access road.

### **Wildlife Setting**

This infrastructure site is close to Bear Rock, an important nesting site for peregrine falcons. The infrastructure site has high value as hunting grounds for this species as well as hawk owls and several woodpecker species.

The storage and stockpile site has been previously used as a borrow site and does not support much wildlife habitat. However, an open shrub layer of willow and alder along with open grassy areas and some regenerating poplar and spruce occur at the infrastructure site and provide forage for moose and grizzly bear (spring).

Wildlife habitat at the proposed barge landing site is composed of riparian willow and alder and regenerating black spruce habitat. The closed shrub layer primarily consists of willow. Habitat types are considered common in the region with the exception of riparian willow habitat. An important habitat feature at this site is the Mackenzie River. The river shoreline and mudflats provide important habitat features for many bird species (including shorebirds and waterfowl), as well as forage for moose, beaver, and grizzly bear (fall).

Key wildlife species reported at the storage and stockpile site and barge landing (by sign or visual observation) included moose and peregrine falcon. Key species are species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. Other species reported during field surveys included black bear, snowshoe hare, wood frog, sandhill crane, Townsend's solitaire, ruby-crowned kinglet, alder flycatcher, fox sparrow, white-throated sparrow, chipping sparrow, Lincoln's sparrow, Swainson's thrush, American robin, common raven, and Tennessee warbler.

An assessment of key habitat features, such as percent cover of forage species, indicated that the site provides high quality foraging habitat for moose, beaver, and grizzly bear ([Table 4-15](#)).

Overall habitat quality for wildlife at the storage and stockpile site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, is considered low for wildlife. The barge landing site provides low quality habitat for birds and moderate quality habitat for mammals.

Habitat types at the infrastructure site are considered common in the region, with the exception of riparian willow and alder habitat. An existing disturbance occurs at the storage and stockpile site.

**Table 4-15: Habitat Quality for Key Wildlife Species at the Tulita (West) Infrastructure Site**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>	
			Storage and Stockpile Site	Barge Landing
Mammals	Woodland caribou	Winter foraging	Low	Low
	Moose	Foraging	High	High
	Grizzly bear	Denning	Low	Moderate
		Fall foraging	Moderate	High
		Spring foraging	High	Moderate
	Marten	Foraging	Low	Moderate
	Lynx	Foraging	Moderate	Moderate
	Beaver	Cover	Low	Moderate
Foraging		Low	High	
Birds	Scaup	Nesting	Low	Low
	Peregrine falcon	Nesting	Low	Low
	Lesser yellowlegs	Nesting	Low	Low
	Boreal chickadee	Nesting	Low	Low
<p>NOTE:  <sup>a</sup>Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements, such as shrub availability for moose.</p>				

Based on habitat availability a variety of species might inhabit the infrastructure site, these include several species that have special status designation at the national and territorial levels, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Department of Resources, Wildlife and Economic Development (RWED, now ENR), respectively. These species are summarized in [Table 4-16](#).

**Table 4-16: Special Status Species That Might Occur at the Tulita (West) Infrastructure Site**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern <sup>f</sup>	Lower risk – least concern
River otter	Sensitive	-	-	Lower risk – least concern
Wolverine	Secure	Special concern	Schedule 3 – special concern <sup>f</sup>	Vulnerable
Woodland caribou (boreal population)	Sensitive	Threatened	Schedule 1 – threatened	Lower risk – least concern
Northern pintail	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Golden eagle	Sensitive	Not at risk	-	-
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	-	-	-
Lesser yellowlegs	Sensitive	-	-	-
Least sandpiper	Sensitive	-	-	-
Common snipe	Sensitive	-	-	-
Red-necked phalarope	Sensitive	-	-	-
Black tern	Sensitive	Not at risk	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Bank swallow	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
Harris' sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-
NOTES:				
<sup>a</sup> A hyphen indicates no status has been assigned for that species.				
<sup>b</sup> RWED – Resources, Wildlife and Economic Development (known as ENR since April 1, 2005)				
<sup>c</sup> COSEWIC – Committee on the Status of Endangered Wildlife in Canada				
<sup>d</sup> SARA – <i>Species at Risk Act</i>				
<sup>e</sup> IUCN – The World Conservation Union				
<sup>f</sup> SARA status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation and final Ministerial approval.				
SOURCE: (Environment Canada 2004)				

## Wildlife Potential Effects and Mitigation

This infrastructure site is composed of low quality habitat for wildlife while the barge landing site provides low quality habitat for birds and moderate quality habitat for mammals. The area already experiences human disturbance, which likely affects the species of wildlife present. Habitat types at the infrastructure site are also common in the region, with the exception of riparian willow and alder habitat, indicating this might be a limiting resource for wildlife. The Tulita (West) infrastructure site provides high quality foraging habitat for moose, beaver, and grizzly bear.

General potential effects resulting from development and operation of the infrastructure site and access road on wildlife include direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small footprint of disturbances relative to regional habitat availability, suggests that the magnitude of project effects on birds and most mammals, including those with special status designation, will be low. However, specific issues of concern at the Tulita (West) infrastructure site include:

- attraction of grizzly bears to the infrastructure site and potential mortality of problem bears
- displacement of grizzly bears from high quality foraging habitat during spring, summer, and fall (if site is active)
- disturbance of nesting birds during spring, summer, and fall, and potential abandonment of nest sites
- loss of riparian habitat along the Mackenzie River during barge landing and access road construction
- disturbance of moose along the access road during winter
- increased hunting/poaching of wildlife such as moose and beaver resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during infrastructure site and access road development and operations. Specifically, the following mitigation measures are considered important for this site:

- use the a waste management plan described in [Section 11](#)
- avoid known nesting sites (as determined during pre-construction surveys) to the extent practical

- reduce project activities during the bird nesting season and grizzly bear active period to the extent practical
- reduce clearing in riparian habitats
- prohibit the recreational use of associated access roads by project staff while on the job site
- establish and enforce regulations to prevent wildlife harassment

### **Hydrology Setting**

This infrastructure site is located on the east bank of the Mackenzie River. Runoff from the site is expected to flow directly to the Mackenzie River. The area encompassing this infrastructure site that contributes runoff to the length of the Mackenzie River banks that might be affected by this runoff is about 24.3 km<sup>2</sup>.

### **Hydrology Potential Effects and Mitigation**

Effects of any potential increase in mean annual runoff due to the higher runoff coefficient of the disturbed area and an increase in mean sediment concentration are expected to be limited in comparison with the high flows in the Mackenzie River and the high background concentrations of sediment and high dilution capacity of the river.

### **Groundwater Setting**

Low rates of shallow groundwater flow are expected in this area due to the presence of fine-grained surface materials. Groundwater is expected to flow towards the Mackenzie River.

### **Groundwater Potential Effects and Mitigation**

General mitigation measures, such as the installation of ditches or culverts to restore surface water drainage patterns, will be used, as required.

Groundwater data for this site is expected to be similar to regional SSA data described in [Section 8](#).

### **Water Quality Setting**

Water quality data for this site is expected to be similar to regional data described in [Section 8](#).

### **Water Quality Potential Effects and Mitigation**

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed by on a site-specific basis. Limited effects were

predicted on mean annual flow and mean annual total suspended sediment (TSS) concentrations in the Mackenzie River due to changes in runoff. These effects represent a non-detectable change in the natural range in flows and water levels, and in mean annual TSS levels. Consequently, no effects are expected on water quality.

### **Fish and Fish Habitat Setting**

The proposed barge landing site is located 2 km downstream of the confluence of the Great Bear and Mackenzie River, about 4 km downstream of the settlement of Tulita. A temporary spud landing exists on the east bank of the Mackenzie River at the barge landing location. The Mackenzie River at the barge landing site is split by Windy Island.

Fish capture or reported to have been captured from the Mackenzie River included at least 16 species: 10 large-bodied, major species and six small-bodied, minnow species. Longnose sucker was the dominant species, with other major species including Arctic grayling, northern pike, walleye, goldeye, burbot, inconnu, mountain whitefish, broad whitefish and Arctic lamprey.

The Mackenzie River in this area also provides a corridor for movement of diadromous fish species between the Beaufort Sea and upstream areas of the Mackenzie River. Species that have been found include chum salmon, Arctic cisco and least cisco.

Fish communities at this site are likely influenced by the Great Bear River, about 2 km upstream. Fish reported to be present in the lower reach of the Great Bear River include Arctic cisco, least cisco, lake whitefish, round whitefish, inconnu, Arctic grayling, lake trout, bull trout, northern pike, walleye, burbot, longnose sucker, lake chub, emerald shiner, longnose dace, ninespine stickleback, trout-perch, slimy sculpin and spottail shiner.

Spawning migration of Arctic cisco into the lower 25 km of the Great Bear River, from the Mackenzie River, during the late August to September period have also been reported.

The Mackenzie River at the barge landing site is comprised entirely of deep run habitat. Wetted channel widths ranged from 765 to 1,107 m, with a mean width of 972 m. Mean water depth ranged from 5.1 to 6.2 m, with a maximum depth of 10.4 m.

Channel bed material was primarily sand and gravel, with some cobble, boulders and woody debris. Water depth and turbulence, with occasional boulders, provide most of the instream cover near the barge landing site.

Windy Island, immediately across the river from the barge landing site, had backwater holding habitats around gravel point bars. Banks were armoured, and

adjacent to the river were sparsely vegetated. Riparian areas, 3 to 25 m from the water, on both banks, included coniferous forest, shrubs, grass and forbs.

Cover provided by depth, and seasonally by turbidity, makes the run habitats of near-shore east bank potentially suitable for rearing, and adult feeding and holding by species such as northern pike, longnose sucker, whitefish species and burbot (see Table 4-17). However, the influence of the Great Bear River, which reduces turbidity and water temperature along this shore, might discourage rearing by some species. Boulders in shallow margin areas provide rearing cover, for species such as walleye.

**Table 4-17: Potential Use of Site BL-63 – Tulita (West) Barge Landing**

Species <sup>a</sup>	Overwintering	Spawning and Incubating	Rearing	Adult Feeding and Holding
Arctic grayling	Yes	No	No	No
Northern pike	Yes	No	Yes	Yes
Longnose sucker	Yes	No	Yes	Yes
Whitefish species	Yes	Yes	Yes	Yes
Burbot	Yes	No	Yes	Yes
NOTE: <sup>a</sup> Of the species and species groups listed, none have been confirmed near the barge landing site during the present study.				

The potential for mainstem spawning is limited. The nearby Great Bear River likely provides spawning habitat for fall spawners, such as Arctic cisco and whitefish species. Based on river depth, at a maximum greater than 10 m, and bathymetric profiles, it is likely that some parts of the river near the barge site are suitable overwintering habitat.

### **Fish and Fish Habitat Potential Effects and Mitigation**

Development of this infrastructure site might affect fish and fish habitat directly through activities associated with improvement to the existing barge landing site and indirectly through introduction of sediment carried by surface run from the infrastructure site.

The temporary spud barge landing is an existing facility that is currently in use. Although upgrade to the facility might be required to accommodate increased use, dredging is not anticipated. Any adverse effects on shoreline and nearshore habitat associated with this facility occurred when the barge landing was initially developed and additional effects are not expected to occur. Disturbance to nearshore or riparian habitat the might occur through the continued use of the barge landing will limited and short term and will be associated with the annual placement and removal of the spud barge.

The effects of runoff-induced changes in sediment yield from the infrastructure site are considered to be limited because the changes in TSS concentration in the Mackenzie River from any single episodic event will not exceed 50 mg/L above background. TSS levels in the Mackenzie River are typically high and have been known to exceed 400 mg/L. Short term increases that are less than 50 mg/L are not expected to result in any adverse effects on fish or fish habitat.

Maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will prevent sediment from the site reaching surface waters.

## **Human Environment**

This topic contains a description of the protected areas and heritage resource setting and potential effects and mitigation for the Tulita West site. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

This infrastructure site is located within the proposed Mackenzie River Special Management Area. This area is described in the SPDLUP as a very important regional and territorial travel and transportation corridor, heritage place and traditional use location. This site might also lie within the proposed Great Bear River conservation area.

### **Protected Areas Potential Effects and Mitigation**

The development of this site in the proposed Mackenzie River Special Management Area will result in a decrease in the land base available for other land uses within this area. The presence of development within this area will be a permanent change to the landscape.

### **Heritage Resources Setting**

The Tulita (West) infrastructure site was inspected as part of the 2004 field program. The location was considered to have low potential for the discovery of heritage resources. Heritage resource sites were previously recorded within a 2 km range of the development area, indicating prior use of this region. No heritage sites were recorded as a result of the surface reconnaissance at this site.

The nature of the heritage resource potential and results of preliminary investigations at this location were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2003-933. Information will also be included in the report that will be submitted to the Prince of Wales Northern Heritage Centre under permit 2004-956.

## Heritage Resources Potential Effects and Mitigation

Before the development of this site, a Heritage Resource Impact Assessment will be conducted, if required, and provided to the Prince of Wales Northern Heritage Centre. If it is determined that the development will affect any heritage resources, mitigation plans will be prepared.

Regulations in the Northwest Territories prevent the publication or distribution of this information to the public. This information can only be obtained, with explicit approval, from the Prince of Wales Northern Heritage Centre.

## PUBLIC INVOLVEMENT

No concerns regarding the Tulita (West) infrastructure site have been expressed by the local SSA communities in meetings or discussions with Imperial. The public involvement activities are documented in [Section 10](#).

## EQUIPMENT (PART 10)

The following tables show an estimate of the equipment that might be required for the Tulita (West) infrastructure site. An exact list and numbers will not be known until immediately before construction. [Table 4-18](#) lists the site construction equipment. [Table 4-19](#) lists site operations equipment.

**Table 4-18: Estimate of Site Construction Equipment**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
4x4 crew cab pick-ups – 2	4x4	Transporting crews
Bulldozers with GP buckets, U blades and brush rakes – 2	Large sized bulldozer (405 HP)	Site grading, pad and access road development, spreading granular material, snow removal.
Dump trucks (double axle) – 2	Truck with trailer (12 m <sup>3</sup> )	Hauling granular material
Front end loader with GP bucket – 1	Large sized loader 5.5 m <sup>3</sup> bucket loader	Site preparation work
Road grader – 1	Large sized grader (4.9 m blade)	Site preparation work, grading ramps and access roads
Tracked mechanical ditchers – 1	Medium sized excavator (1.45 m <sup>3</sup> bucket)	Excavating and removing organic material
Tree feller-buncher and skidder – 1	Tracked 35,490 kg feller-buncher with a high speed saw head	Site clearing and timber hauling

**Table 4-18: Estimate of Site Construction Equipment (cont'd)**

<b>Type and Approximate Number per Site</b>	<b>Size, Model or Equivalent</b>	<b>Proposed Use</b>
Compactor – 1	Medium sized compactor (20,879 kg sheepsfoot packer)	Compaction of camp site pad fill materials and access road construction
Cranes (tracked) – 1	Medium sized crane (100 t)	Unloading and placement of camp modules
Mechanics truck with welder – 1	4x4	Equipment repair
Water truck – 1	Tandem axle, 16-24 m <sup>3</sup>	Site and road work
Sea containers – 2	6 m	Storage
Mobile camp – 1	35 person	Site development
Fuel truck – 1	3,785 L	Fuel for equipment
Skid steer loaders – 2	Large sized skid steer (80 HP)	Site work

**Table 4-19: Estimate of Equipment to Operate the Infrastructure Site**

<b>Type and Approximate Number per Site</b>	<b>Size, Model or Equivalent</b>	<b>Proposed Use</b>
Sea containers – 4	6 m	Storage
Tractor trailers – 4	Dry van 14.6 m or 16.2 m	Parts and supplies
Road graders – 2	Large sized grader (4.9 m blade)	Earthwork, road maintenance and snow removal
Front end loader with GP bucket – 1	Large sized loader (5.5 m <sup>3</sup> bucket loader)	Movement of camp supplies and snow removal
Snow machines – 6	Small sized snow machine (400 cc)	Personnel transport
4x4 crew cab pick-up – 4	4x4	Transporting crews
Cranes (tracked) – 1	Medium sized crane (100 t)	Loading and unloading pipe, equipment and materials
Flatbed trucks with pickers – 2	10 ton truck	Transporting materials and maintenance
Truck and water tank trailers – 5	Tandem axle, 16-24 m <sup>3</sup>	Bringing water to the camp for domestic use and fire protection
Skid steer loaders – 2	Large sized skid steer (80 HP)	Site work

## FUELS (PART 11)

[Table 4-20](#) itemizes fuel storage. This represents an estimate of fuel requirements.

**Table 4-20: Estimate of Fuel Storage at the Tulita (West) Infrastructure Site**

Fuels	Number of Containers	Capacity of Containers	Location
Diesel	1	200,000 L	Fuel Depot

## PERIOD OF OPERATIONS (PART 14)

Site operations will be continuous from 2006 through the summer of 2010, with the potential for limited activities after 2010. See [Section 3](#) for a schedule of development activities in the SSA.

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

Map coordinates of the site centroid are shown in [Table 4-21](#). A map showing the location of the site is provided in [Figure 4-8](#).

A photograph of the Tulita (West) infrastructure site appears in [Figure 4-9](#).

**Table 4-21: Map Coordinates of Tulita (West) Infrastructure Sites**

Activity	Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
Tulita (West) stockpile site	64.9073	-125.6345	375361	7200918	10
Tulita (West) barge landing site	64.9031	-125.6634	373976	7200313	10

## FEES (PART 18)

The total land area required for activities contained in this subject is 11.0 ha.

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

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Figure 4.9 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.



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TITLE	<b>SSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	4: Infrastructure Sites
SUBJECT	4: Little Smith Creek Infrastructure Site

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## INTRODUCTION

This section supports an application for the development of a temporary infrastructure site near Little Smith Creek. It contains:

- an overview map with the site location ([Figure 4-10](#))
- an estimate of the personnel requirements
- a summary of the operations
- a description of potential environmental and resource effects
- construction equipment estimates

The location of the Little Smith Creek infrastructure site is shown in the site-specific map and photographs provided in [Figure 4-11](#), [Figure 4-12](#) and [Figure 4-13](#).

## PERSONNEL (PART 3)

The construction of the infrastructure site at Little Smith Creek will require clearing, grading, camp construction and mechanical crews. These crews, of up to 60 people, will be obtained from the main pipeline clearing and grading crews or will be established specifically for infrastructure development. The Little Smith Creek camp pad will be completed during the fall of 2006 and a 120-person construction camp will be installed in the winter of 2006-2007. This camp will require a support staff of about 12 people. These people are included in the 120-person total.

In the summer of 2007, the 120-person construction camp will be expanded to a capacity of about 950 personnel. This camp will require a camp support staff of about 86 people. These people are included in the 950-person total.

Construction personnel will occupy the expanded camp over three winter construction seasons (2007-2008 for right-of-way clearing, 2008-2009 for pipeline construction and 2009-2010 for commissioning and reclamation). Personnel will begin arriving in November. Numbers will peak in mid-winter and taper off toward spring. A minimal camp support staff will remain on the site between construction seasons.

Figure 4.10 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.

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

The land use activities and operations associated with this site include:

- developing and operating:
  - a fuel storage site to support construction activities
  - an administration office
  - a stockpile site for storage of material, equipment, and pipe, and for construction equipment maintenance
  - a redeveloped seasonal barge landing
  - sequentially, a 120-person camp expanding to a 950-person camp for worker accommodation during construction activities
  - a helipad within the site boundary
  - upgrade existing airstrip
- developing a new 2.7 km all-weather road from the Little Smith Creek barge landing to the Little Smith Creek infrastructure site

### **Preconstruction Activities**

Before site development begins:

- a preconstruction survey will be conducted to finalize the location and site-specific layout
- geotechnical evaluations will be conducted, as required, to support engineering of the infrastructure site components

### **Development Activities**

Initial development activities will commence in 2006 and will include clearing and construction of the pad that will support the proposed infrastructure site. The pad material might be obtained from nearby borrow sites on both Sahtu private and Crown land. The borrow sites on Crown land will be included in the land use permit application for Crown lands within the SSA. Detailed discussion of development of borrow sites on private lands is included in [Section 5](#).

The temporary infrastructure site will be developed on the east side of the Mackenzie River. By placing all the related facilities together, operational efficiencies are realized and the overall footprint of construction activities is reduced. These facilities include:

- a module, pipe, material and equipment stockpile
- a fuel storage depot
- a camp
- an administration office
- a helipad

A conceptual 950-person camp layout is provided in [Section 3](#).

### Infrastructure Site Access

Access to the Little Smith Creek infrastructure site will be from the barge landing along access road TD-BL-A-632.0.

Access from the infrastructure site to the pipeline right-of-way will be along the existing DOT winter road (see [Figure 4-12](#) and [Table 4-22](#)).

**Table 4-22: Little Smith Creek Infrastructure Access**

Access Road Name	Kilometre Post (KP)	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
TD-BL-A-632.0	632.0		2.7		2.7
Total length of Little Smith Creek access on private lands:			2.7		

### Fuel Storage Depot

The fuel storage depot will require the installation of pads of a sufficient depth to permit truck movement around the site and to safely support refuelling activities. The pads will be sufficient to stabilize the traffic areas of the site, to provide a suitable driving surface and to support the fuel tanks. The fuel depot will be located within the overall infrastructure site footprint. Additional information on typical fuel storage depots is provided in [Section 3](#).

Storage tanks will be used to supply the site requirements for electric power generation and pipeline and facility construction equipment. Tank storage for about 2.0 million L will be required at the Little Smith Creek site. These tanks are planned to contain diesel fuel.

The fuel storage depot at the Little Smith Creek site will be monitored by computerized systems and site security patrol. It will be equipped with management control systems for access, and authorization controls for fuel handling. An emergency shutdown system will also be provided.

### **Stockpile Site**

The stockpile at the Little Smith Creek site will require the installation of pads to permit truck movement around the site and to safely support unloading and storing large loads of pipe, equipment, modules and materials. The pad will be of sufficient depth to stabilize the storage areas of the stockpile site and provide a suitable driving surface for heavy truck traffic. Pad material requirements, the stockpile layout, and size will be finalized after the preconstruction survey. Typical stockpile sites are discussed in [Section 3](#).

### **Camp Site**

Development of the temporary self-contained camp will require the installation of pads of sufficient depth to permit the transport and erection of about 230 modular camp structures. Pad material requirements, camp site layout and size will be finalized after the preconstruction survey. Typical camp layout and services are described in [Section 3](#).

Start-up of camp activities will involve the mobilization of supplies and materials.

Water for the camp will likely be obtained from the Mackenzie River. The water will be transported by truck from the source to the camp site for use as camp and fire suppression water.

### **Barge Landing Site**

The existing seasonal barge landing site is situated about 3.0 km west of the Little Smith Creek infrastructure site on the east side of the Mackenzie River. The barge landing site will be redeveloped primarily on the beach area of the Mackenzie River (see [Figure 4-13](#)). The developed area will be used for unloading material and equipment from the barges onto trucks for subsequent transport to the stockpile site.

The selected location of the barge landing site:

- reduces the impacts on commercial river traffic
- is close to existing infrastructure to reduce physical impacts

In-stream activities will be restricted to the excavating required to prepare a smooth flat base for beaching a 600 Series spud barge. Work on the river bank will involve installing temporary mooring points, consisting of anchor blocks or screw-in anchors, and constructing the barge access ramp adjacent to the spud barge for transferring material and equipment to trucks. No pier piles are required

at this site. The material excavated from the river edge will either be used, if suitable, as fill to create the barge access ramp, or to level and fill low-lying areas at the barge landing site. The barge access ramps will be constructed by building up granular materials to the level of the spud barge's deck. Fill material will be obtained from local granular sites and granular resource suppliers. The need for rig mats or geotextiles to stabilize the fill material and improve the weight-bearing capacity of the ramps will be determined in the field during construction.

The multi-year use of the barge landing site might require the barge ramp to be replaced each season because of the wash-out effects caused by the spring ice flows on the Mackenzie River. This might require maintaining a small stockpile (about 1,000 m<sup>3</sup>) of till and granular resources for annually reconstructing the barge landing site. The need for and size of this stockpile will be determined at the site after the quality of the excavated material and local beach material has been assessed.

### **Airstrip (Dash-8 (100))**

An existing airstrip will be upgraded to accommodate Dash-8 (100) usage, adjacent to the Little Smith Creek infrastructure site. The airstrip will be constructed to meet a minimum standard for maximum load bearing capacity per aircraft manufacturer's specifications for the largest aircraft designated for this location and according to the requirements of the Transport Canada TP312 requirement.

As specified next, the required area will be cleared of all brush and timber. Typical runway construction consists of a three-layer build-up of compacted, consolidated construction materials. The sub-base will be made of crushed shale, limestone or well-drained, unfrozen tills. The base course will be made of the same materials, with a maximum aggregate size of 200 mm but must be placed in a discrete lift and compacted separately. The finishing surface will be made with 20 mm crushed gravel. Granular construction materials will be obtained from local granular sites.

The cleared area will be about 90 m wide and 1,400 m long. The runway will be a minimum of 19 m wide and 1,090 m long. A buffer or non-encroachment zone between the runway and the edge of the cleared area at a minimum distance of 50 m off the approach ends and 30 m off the sides of the runway is required. A further buffer or non-encroachment zone extending beyond the approach ends of the runway must be void of all obstacles taller than one percent elevation grade. An airstrip schematic for Dash-8 (100) usage is shown in [Section 3](#).

### **Operations Activities**

The site will act as a staging area for the construction activities for a section of the project.

## **Fuel Depot Operations**

Fuel will be delivered by barge to the Little Smith Creek barge landing. Fuel storage tanks will be filled using fuel trucks shuttling between the barge landing and the tanks. If the fuel storage site is close enough, a temporary surface pipeline might be installed to connect the barge landing area to the fuel storage site so that fuel can be pumped directly into fuel storage tanks.

Required fuel will be delivered from the depot to the construction sites. This will require daily truck traffic through the fuel depot during construction operations.

## **Stockpile Operations**

The stockpile will be used to store material required for construction of the pipeline. The all-weather access road (TD-BL-A-632.0) will be used for transporting equipment and material from the barge landing site to the Little Smith Creek stockpile site. This activity will primarily take place in the summer during the open-water barging season.

During the barge-unloading period (about seven weeks each year), trucks will operate continuously until all the required material has been stockpiled. A preliminary estimate of materials to be stockpiled at the infrastructure site includes about 19,700 tonnes of pipe and 5,190 tonnes of camp modules and supplies. A list of equipment that might be stored at the site is included in [Section 6](#) of this application.

During construction, the material required for constructing the project will be hauled from the stockpile site and set in place at the infrastructure site. When construction is underway, truck activity will occur along the proposed all-weather and winter access roads and the DOT winter road.

## **Camp Site Operations**

The camp will be used to feed and house construction personnel. The largest element of the operations will be catering and housekeeping for the camp residents. Other activities will include the maintenance operations of the camp and restocking of fuel and supplies by truck.

Daily transport of personnel will be required during construction activities along the pipeline right-of-way, and to and from the Little Smith Creek infrastructure site. This will be accomplished with buses and light trucks. Food and other supplies will be trucked in periodically. Daily water truck cycles will bring the necessary volume of water (about 227 L per person daily or 216 m<sup>3</sup> daily at full occupancy) to the camp.

The camp will have attendants and facilities to handle medical problems as they arise. All project camps will have a zero tolerance policy for alcohol and illegal drugs.

### **Barge Site Operations**

The 600 Series spud barge will be used for unloading cargo barges of pipeline materials, pipeline construction equipment and construction consumables for the Mackenzie Gas Project's construction activities. The spud barge will be berthed at the barge landing site for about three weeks each season, to unload that season's materials.

About six 1500 Series cargo barges could be moored simultaneously near the barge landing site while waiting to be unloaded. They will be moored where they will not interfere with other river traffic or result in potential safety concerns. The immediate shore area will not need to be disturbed for mooring, as the cargo barges will be moored in the Mackenzie River. The mooring distance from the shore will depend on the water depth and the draft of the barges. Tie lines to temporary mooring points on shore, such as mooring screw anchors or anchor blocks, will be required to secure the barges to the shore while they wait to be unloaded. The temporary mooring points will be re-established each operation season, if they are destroyed or removed by ice activity.

### **Airstrip Operations**

The purpose of this airstrip is to support construction and operation of the project and to allow year-round access to the Little Smith Creek infrastructure site.

## **SUMMARY OF POTENTIAL ENVIRONMENTAL AND RESOURCES EFFECTS (PART 6)**

The following topic provides specific biophysical and human environment setting, effects and mitigation information for Little Smith Creek infrastructure site, which includes a campsite, airstrip and barge landing. This information includes data collected during the 2004 field programs.

### **Biophysical Environment**

#### **Air Quality Setting**

The air quality setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

#### **Air Quality Potential Effects and Mitigation**

Potential effects on air quality associated with the development of the infrastructure site, such as dust, vehicle and equipment emissions, are expected to

be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

### **Noise and Light Setting**

The noise setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

The site is currently undeveloped and therefore, no manmade sources of light occur.

### **Noise and Light Potential Effects and Mitigation**

Potential effects on noise levels associated with the development of the infrastructure site are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

Industrial lighting can cause increases in ambient light. Sources of light include vehicles, flares and lighting around the site.

Lighting will be used during non-daylight hours, which, during the winter months, might mean periods where lighting is required on a 24 hour basis. Conversely, during the late spring and through summer months, lighting will not be required at all because of the extended daylight hours.

The potential visual effect of lighting can be partially reduced by proper placement and use of lighting only in areas where it is required.

### **Soils, Landforms and Permafrost Setting**

The components of the infrastructure site lie to the east of the pipeline right-of-way in an area where a thin blanket of glaciofluvial sediments overlies glaciolacustrine deposits. The site is located in the zone of extensive discontinuous permafrost. The land surface is level to very gently sloping and is well-drained to moderately well-drained. Glaciofluvial sediments have commonly developed soils of the Brunisolic and Cryosolic Orders and are underlain by discontinuous permafrost. Areas of permafrost within these sediments are expected to have ice contents between 15 and 30% by weight. Permafrost coverage is expected to be in the range of 20 to 30% of the area.

### **Soils, Landforms and Permafrost Potential Effects and Mitigation**

Terrain-related environmental sensitivities are not predicted for the infrastructure site. Construction of infrastructure pads on the site will result in drainage disruption and soil loss because the pads will be placed directly on the surface material.

General mitigation strategies to offset potential effects are outlined in [Section 8](#).

### **Vegetation Setting**

The vegetation at the proposed barge landing is a riparian balsam poplar/green alder type within a black spruce – white spruce/stair-step moss type. The riparian habitat is characterized by balsam poplar in the tree canopy, green alder, prickly rose, red osier dogwood and shrubby willow in the shrub layer, and twinflower and dwarf raspberry in the ground cover. White sweet clover, which is a weed, was found at this barge landing site. In the black spruce – white spruce/stair-step moss habitat, common shrubs and ground cover include green alder, prickly rose, red bearberry, and mountain cranberry. Rare plant surveys were conducted in the riparian area and on the shore of the Mackenzie River; no rare plants were found. A rare plant, fragrant golden rod (*Euthamia graminifolia*), was found upstream of this site, on the north side of the Little Smith Creek. Access to the barge landing will be via an existing gravel road. Rare plant mitigation is found in [Section 8](#).

The vegetation at the proposed camp site is regenerating black spruce-tamarack and black spruce/Labrador tea/mountain cranberry types. Shrubs include Labrador tea, black spruce, green alder, ground birch, willow and regenerating black spruce and tamarack. Ground cover includes mountain cranberry, red bearberry and fireweed and *Ceratodon* moss species.

There is an existing airstrip at this site that will be expanded. The majority of the vegetation in the area to be developed is the same regenerating habitat as that of the proposed camp site, but there are some unburned areas. The unburned areas have taller black spruce and more tamarack, and more established moss layers including stair-step and golden moss.

Access to the camp site and airstrip will be via existing roads. All vegetation types in the area are common to the region.

### **Vegetation Potential Effects and Mitigation**

Development of the Little Smith Creek infrastructure site components will affect vegetation through clearing and mechanical damage to trees, shrubs, forbs and non-vascular, the permanent loss of vegetation and underlying substrates through infrastructure site component expansion and potential changes in site drainage.

The majority of effects on vegetation will occur because of project activities arising from site construction and operations. These effects might include the potential influence of dust deposition on the health and growth of nearby vegetation, as well as the potential accidental introduction of non-native plant species. Effects on vegetation due to the infrastructure site and access road will persist into the far future (effect extends beyond 30 years past decommissioning and abandonment) given the slow rate of vegetation growth in the North. When the site and access road are decommissioned, introduction of non-native

reclamation species might also occur. Vegetation on the infrastructure site and along the access road might develop into a different vegetation community than what was there before development.

White sweet clover is present at the barge landing site and might need to be controlled during or following activities at this site to prevent its spread.

Implementation of primary mitigation measures, as described in [Section 8](#), will help reduce the magnitude of effects on vegetation at this site and its access road.

### **Wildlife Setting**

The existing airstrip is disturbed and does not support wildlife habitat. As a result, wildlife surveys were limited to the proposed camp site and barge landing.

Wildlife habitat at the proposed camp site is composed of regenerating black spruce bog and regenerating upland mixed wood habitat. The closed shrub layer is primarily composed of aspen. These habitat types are considered common in the region. The proposed camp site is located near the existing airstrip, and thus likely experiences some human disturbance. Important wildlife features at the camp site includes regenerating shrubs that provide forage for moose and lynx, and a high cover of berries and forbs that provides spring forage for grizzly bear.

Wildlife habitat at the proposed barge landing site is composed of riparian willow and mixed wood habitat. The closed shrub layer primarily consists of willow. The riparian willow habitat is considered uncommon in the region. An important habitat feature at this site is the Mackenzie River. The shoreline, mudflats, and islands provide important habitat features for many bird species (including shorebirds and waterfowl), forage for moose and beaver, and a travel corridor for wildlife.

Key wildlife species reported at the camp site and barge landing (by sign or visual observation) included caribou, moose, marten, beaver, and peregrine falcon. Key species are species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. Other species reported during field surveys included black bear, wolf, snowshoe hare, red fox, grouse, bald eagle, Canada geese, sandhill crane, spotted sandpiper, hermit thrush, American robin, gray jay, common raven, bank swallow, three-toed woodpecker, warbling vireo, alder flycatcher, Tennessee warbler, pine grosbeak, and crossbill.

An assessment of key habitat features, such as percent cover of forage species, indicated that the site provides high quality foraging habitat for moose and grizzly bear (spring) ([Table 4-23](#)). The barge landing provides high quality foraging habitat for moose and beaver and nesting habitat for boreal chickadee.

**Table 4-23: Habitat Quality for Key Wildlife Species at the Little Smith Creek Infrastructure Site**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>	
			Camp Site	Barge Landing
Mammals	Woodland caribou	Winter foraging	Low	Low
	Moose	Foraging	High	High
	Grizzly bear	Denning	Low	Moderate
		Fall foraging	Moderate	Moderate
		Spring foraging	High	Moderate
	Marten	Foraging	Low	Low
	Lynx	Foraging	Moderate	Moderate
	Beaver	Cover	Low	Moderate
		Foraging	Moderate	High
Birds	Scaup	Nesting	Low	Low
	Peregrine falcon	Nesting	Low	Low
	Lesser yellowlegs	Nesting	Low	Low
	Boreal chickadee	Nesting	Low	High
NOTE: <sup>a</sup> Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements, such as shrub availability for moose.				

Overall habitat quality for wildlife at this site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, is considered low for wildlife. The barge landing provides high quality habitat for birds and moderate quality habitat for mammals. Habitat types at the infrastructure site are considered common in the region, with the exception of riparian willow. An existing disturbance occurs near the camp site.

Based on habitat availability a variety of species might inhabit the infrastructure site. These include several species that have special status designation at the national and territorial levels, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Department of Resources, Wildlife and Economic Development (RWED, now ENR), respectively. These species are summarized in [Table 4-24](#).

**Table 4-24: Special Status Species That Might Be Present in the Areas of the Little Smith Creek Infrastructure Site**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern <sup>f</sup>	Lower risk – least concern
Northern flying squirrel	Sensitive	-	-	Lower risk – least concern
River otter	Sensitive	-	-	Lower risk – least concern
Wolverine	Secure	Special concern	Schedule 3 – special concern <sup>f</sup>	Vulnerable
Woodland caribou (boreal population)	Sensitive	Threatened	Schedule 1 – threatened	Lower risk – least concern
Northern pintail	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Golden eagle	Sensitive	Not at risk	-	-
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	-	-	-
Lesser yellowlegs	Sensitive	-	-	-
Least sandpiper	Sensitive	-	-	-
Common snipe	Sensitive	-	-	-
Red-necked phalarope	Sensitive	-	-	-
Black tern	Sensitive	Not at risk	-	-
Northern flicker	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Bank swallow	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-

**Table 4-24: Special Status Species That Might Be Present in the Areas of the Little Smith Creek Infrastructure Site (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
White-throated sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-
NOTES:				
<sup>a</sup> A hyphen indicates no status has been assigned for that species.				
<sup>b</sup> RWED – Resources, Wildlife and Economic Development (known as ENR since April 1, 2005)				
<sup>c</sup> COSEWIC – Committee on the Status of Endangered Wildlife in Canada				
<sup>d</sup> SARA – <i>Species at Risk Act</i>				
<sup>e</sup> IUCN – The World Conservation Union				
<sup>f</sup> SARA status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation and final Ministerial approval.				
SOURCE: Environment Canada 2004				

### Wildlife Potential Effects and Mitigation

This camp site is composed of low quality habitat for wildlife while the barge landing site provides high quality habitat for birds and moderate quality habitat for mammals. The area already experiences human disturbance, which likely affects the species of wildlife present. Habitat types at the infrastructure site are also common in the region, with the exception of riparian willow, indicating this might be a limiting resource for wildlife. The camp site provides high quality foraging habitat for moose and grizzly bear (spring). The barge landing provides high quality foraging habitat for moose and beaver and nesting habitat for boreal chickadee.

General potential effects resulting from development and operation of the infrastructure site components on wildlife include direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small footprint of disturbances relative to regional habitat availability, suggests that the magnitude of project effects on birds and mammals, including those with special status designation, will be low. However, specific issues of concern at the infrastructure site include:

- attraction of grizzly bears to the site and potential mortality of problem bears
- displacement of grizzly bears from high quality foraging habitat during spring (if site is active)
- disturbance of nesting birds during spring, summer, and fall and potential abandonment of nest sites

- loss of riparian habitat along the Mackenzie River during barge landing and access road construction
- diseased hunting/poaching of wildlife such as moose and lynx resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during infrastructure site and access road development and operations. Specifically, the following mitigation measures are considered important for this site:

- use the waste management plan described in [Section 11](#)
- avoid known nesting sites (as determined during pre-construction surveys) to the extent practical
- reduce project activities during bird nesting season and grizzly bear active period to the extent practical
- reduce clearing in riparian habitats
- prohibit the recreational use of associated access roads by project staff while on the job site
- establish and enforce regulations to prevent wildlife harassment

### **Hydrology Setting**

This proposed camp site is located adjacent to a small watercourse that is a tributary to Little Smith Creek and is about 1.5 km upslope of the mouth of the Little Smith Creek. The area encompassing the components of the infrastructure site that contributes runoff to the mouth of this small watercourse is about 30 km<sup>2</sup>. The barge landing site is located on the banks of the Mackenzie River at the mouth of the Little Smith Creek.

### **Hydrology Potential Effects and Mitigation**

Effects of any potential increase in mean annual runoff due to the higher runoff coefficient of the disturbed area and an increase in mean sediment concentration on the tributary to Little Smith Creek are expected to be low. The runoff and sediment from the barge landing site might enter the Mackenzie River, however, the effects on the Mackenzie River are expected to be limited and localized.

### **Groundwater Setting**

Shallow groundwater might provide recharge to the nearby Little Smith Creek and tributaries.

## Groundwater Potential Effects and Mitigation

General mitigation measures, such as the installation of ditches or culverts to restore surface water drainage patterns, will be used, as required.

Groundwater data for this site is expected to be similar to regional data described in [Section 8](#).

## Water Quality Setting

The infrastructure site is located adjacent to a small watercourse that is a tributary to Little Smith Creek. Water quality data, such as, field measured and conventional parameters, major ions, nutrients, phenolics, total recoverable hydrocarbons and total metals, collected from the unnamed watercourse during summer 2004 is summarized in [Table 4-25](#).

The water was well oxygenated, and the range of pH levels, such as, 7.9 to 8.2, was within the drinking water and aquatic life guidelines (see [Table 4-25](#)).

Major ion concentrations, as indicated by conductance and total dissolved solids values, were moderate. The most abundant major ions were bicarbonate, calcium and sulphate. The single alkalinity value indicated that the water was well buffered and not sensitive to acid deposition.

The water was moderately coloured, with the single colour measurement above the drinking water guideline. The turbidity and total suspended solids values were low.

The total Kjeldahl nitrogen concentration was high, and the total phosphorous concentration indicated mesotrophic conditions or a moderate level of nutrients. In contrast, the chlorophyll *a* concentration was low, indicating oligotrophic conditions or a low level of productivity, at the time of sampling. The total organic carbon level was moderate.

Total phenolics and total recoverable hydrocarbon concentrations were below detection limits. Concentrations of total cadmium, mercury and silver were below water quality guidelines.

**Table 4-25: Unnamed Tributary to Little Smith Creek – Water Quality**

Parameter	Units	Unnamed Stream (UNS-W11)
		August 7, 2004 <sup>a</sup>
<b>Field Measured</b>		
pH	N/A <sup>b</sup>	8.2
Conductance	µS/cm	330
Temperature	°C	9.3

**Table 4-25: Unnamed Tributary to Little Smith Creek – Water Quality (cont'd)**

Parameter	Units	Unnamed Stream (UNS-W11)
		August 7, 2004 <sup>a</sup>
Dissolved oxygen	mg/L	11.3
Turbidity	NTU <sup>c</sup>	0.8
<b>Conventional Parameters</b>		
Colour	TCU <sup>d</sup>	50 <sup>w</sup>
Conductance	µS/cm	391
Dissolved organic carbon	mg/L	16
Hardness	mg/L	200
pH	N/A <sup>b</sup>	7.9
Total alkalinity	mg/L	203
Total dissolved solids	mg/L	236
Total organic carbon	mg/L	11
Total suspended solids	mg/L	3
<b>Major Ions</b>		
Bicarbonate	mg/L	248
Calcium	mg/L	48
Carbonate	mg/L	<1
Chloride	mg/L	0.2
Magnesium	mg/L	20
Potassium	mg/L	1
Sodium	mg/L	4
Sulphate	mg/L	43
<b>Major Ions (cont'd)</b>		
Sulphide	mg/L	0.007
<b>Nutrients and Chlorophyll a</b>		
Nitrate	mg/L	<0.05
Nitrite	mg/L	<0.05
Nitrogen – ammonia	mg/L	<0.1
Nitrogen – Kjeldahl	mg/L	0.7
Nitrogen – total	mg/L	0.7
Phosphorus – total	mg/L	0.025
Phosphorus – dissolved	mg/L	<0.02

**Table 4-25: Unnamed Tributary to Little Smith Creek – Water Quality (cont'd)**

Parameter	Units	Unnamed Stream (UNS-W11)
		August 7, 2004 <sup>a</sup>
Chlorophyll a	µg/L	0.076
<b>General Organics</b>		
Total phenolics	mg/L	<0.002
Total recoverable hydrocarbons	mg/L	<0.1
<b>Total Metals</b>		
Cadmium	mg/L	0.000012
Mercury	mg/L	<0.0000006
Silver	mg/L	0.0000024
NOTES: <sup>a</sup> Boldface indicates values that exceed water quality guideline levels. <sup>b</sup> N/A – not applicable <sup>c</sup> NTU – nephelometric turbidity unit <sup>d</sup> TCU – true colour unit <sup>w</sup> Concentration is higher than the relevant drinking water guideline.		

### Water Quality Potential Effects and Mitigation

The Little Smith Creek infrastructure site might affect water quality through the release of treated domestic wastewater from the camp, leaks and spills, sediment releases from disturbed land and activities associated with the barge landing sites, and changes in surface water flow and level associated with changes in surface runoff or water withdrawals.

Effects of small-scale leaks will be reduced through management practices, contingency plans, mitigation and emergency response plans.

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed by the hydrology component on a site-specific basis. Limited effects are expected on surface water flow in the tributary to Little Smith Creek due to changes in runoff. These effects represent a change of less than 2% of the natural range in flows and water levels. Consequently, no effects on water quality are expected.

The hydrology component predicted the effect on mean annual total suspended sediment (TSS) concentrations to be limited, that is, less than 10 mg/L, in the tributary to Little Smith Creek. Limited effects are expected on the water quality parameters associated with sediment inputs, that is, nutrients and metals.

The effect on runoff and TSS concentrations in the Mackenzie River due to activities associated with the barge landing sites is expected to be limited. Limited

effects are expected on water quality parameters associated with sediment inputs, that is, nutrients and metals.

### **Fish and Fish Habitat Setting**

The proposed barge landing site is located on the east bank of the Mackenzie River, about 100 m upstream of the Little Smith Creek confluence. The nearest community is Tulita, about 78 km downstream of this site. A temporary spud landing exists at the proposed barge landing location. The proposed camp site is located adjacent to a small watercourse that is a tributary to Little Smith Creek and is about 1.5 km upslope of the mouth of the Little Smith Creek.

Fish captured or reported to have been captured from the Mackenzie River included at least 16 species: 10 large-bodied, major species and six small-bodied, minnow species. Longnose sucker was the dominant species, with other major species including Arctic grayling, northern pike, walleye, goldeye, burbot, inconnu, mountain whitefish, broad whitefish and Arctic lamprey.

The Mackenzie River in this area also provides a corridor for movement of diadromous fish species between the Beaufort Sea and upstream areas of the Mackenzie River. Species that have been found include chum salmon, Arctic cisco and least cisco.

At the barge landing site, the Mackenzie River is entirely deep run habitat. Wetted channel widths at ranged from 650 to 739 m, with a mean width of 684 m. Mean water depths ranged from 6.4 to 8.0 m, with a maximum depth of 13.4 m.

Channel bed material was dominated by sand, with some gravel and cobble. Water depth and turbulence, with occasional boulders and woody debris, provided most of the instream cover.

The east bank was depositional, composed primarily of cobble and sand. A small backwater area was present immediately downstream of the barge landing site, at the Little Smith Creek confluence. Riparian areas adjacent to both banks were barren. Farther back, both banks were dominated by coniferous forest, with some shrub and grasses and forbs.

The cover provided by depth, and seasonally by high turbidity, makes the near-shore run habitats suitable for rearing, and adult feeding and holding by species such as northern pike, longnose sucker, whitefish species and burbot (see [Table 4-26](#)). Spawning in the mainstem is unlikely, and spring spawning species more likely move into small tributaries, such as Little Smith Creek or others.

**Table 4-26: Potential Use of Site BL-10 – Little Smith Creek Barge Landing**

Species <sup>a</sup>	Overwintering	Spawning and Incubating	Rearing	Adult Feeding and Holding
Arctic grayling	Yes	No	Yes	No
Northern pike	Yes	Yes	Yes	Yes
Longnose sucker	Yes	Yes	Yes	Yes
Whitefish species	Yes	Yes	Yes	Yes
Burbot	Yes	Yes	Yes	Yes

NOTE:  
<sup>a</sup>Of the species and species groups listed, only northern pike have been confirmed near the barge landing site during the present study.

Protected depositional areas, backwaters and near-shore shallow flat habitats might be used in the open-water season for rearing by longnose sucker, northern pike, inconnu, Arctic grayling, walleye, and forage and minnow species. Based on river depth and bathymetric profiles, it is likely that some parts of the channel near the barge site are suitable for overwintering. The Mackenzie River in this area also provides a corridor for movement of fish species between the Beaufort Sea and upstream areas of the Mackenzie River.

### **Fish and Fish Habitat Potential Effects and Mitigation**

Developing the Little Smith Creek infrastructure site might affect fish and fish habitat directly through the activities associated with improvements to the existing barge landing site and indirectly through introduction of sediment carried by surface run from the site.

The temporary spud barge landing is an existing facility that is currently in use. Although upgrades might be required to accommodate increased use, dredging is not anticipated. Any adverse effects on shoreline and nearshore habitat associated with this facility occurred when the barge landing was initially developed and additional effects are not expected to occur. Disturbance to nearshore or riparian habitat that might occur through the continued use of the barge landing will be limited and short term and will be associated with the annual placement and removal of the spud barge.

The effects of runoff-induced changes in sediment yield from the infrastructure site are considered to be limited because the changes in TSS concentration in the Mackenzie River from any single episodic event will not exceed 50 mg/L above background. TSS levels in the Mackenzie River are typically high and have in the past exceed 400 mg/L. Short term increases that are less the 50 mg/L are not expected to result in any adverse effects on fish or fish habitat.

Maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will prevent sediment from the infrastructure site reaching surface waters.

## **Human Environment**

This topic contains a description of the protected areas and heritage resource setting and potential effects and mitigation for Little Smith Creek infrastructure site. Other human environment information is discussed in [Section 8](#).

### **Protected Areas Setting**

This infrastructure site is located within the proposed Mackenzie River Special Management Area. This area is described in the SPDLUP as a very important regional and territorial travel and transportation corridor, heritage place and traditional use location.

### **Protected Areas Potential Effects and Mitigation**

The development of this site in the proposed Mackenzie River Special Management Area will result in a decrease in the land base available for other land uses within this area. The presence of development within this area will be a permanent change to the landscape.

### **Heritage Resources Setting**

This infrastructure site was inspected during the field programs. The location was considered to have high potential for the discovery of heritage resources. Heritage resource sites were previously recorded within a 2.0 km range of the development area, indicating prior use of this region. No heritage sites were recorded as a result of the surface reconnaissance at this site.

The nature of the heritage resource potential and results of preliminary investigations at this location were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2003-933. An aerial reconnaissance was conducted in 2004 in support of the 2003 field assessment and further information is included in the report that was submitted to the Prince of Wales Northern Heritage Centre under permit 2004-956.

### **Heritage Resources Potential Effects and Mitigation**

Before the development of this site, a Heritage Resource Impact Assessment will be conducted and provided to the Prince of Wales Northern Heritage Centre. If it is determined that the development will affect any heritage resources, mitigation plans will be prepared. Regulations in the Northwest Territories prevent the publication or distribution of this information to the public. This information can

only be obtained, with explicit approval, from the Prince of Wales Northern Heritage Centre.

## PUBLIC INVOLVEMENT

No concerns regarding the Little Smith Creek infrastructure site have been expressed by the local SSA communities in meetings or discussions with Imperial. The public involvement activities are documented in [Section 10](#).

## EQUIPMENT (PART 10)

The following tables show an estimate of the equipment that might be required for the Little Smith Creek infrastructure site. An exact list and numbers will not be known until immediately before construction. [Table 4-27](#) lists the site construction equipment. [Table 4-28](#) lists site operations equipment.

**Table 4-27: Estimate of Site Construction Equipment**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
4x4 crew cab and pick-up – 2	4x4	Transporting crews
Bulldozers with GP buckets, U blades and brush rakes – 2	Large sized bulldozer (405 HP)	Site grading, pad and access road development, spreading granular material, snow removal.
Dump trucks (double axle) – 2	Truck with trailer (12 m <sup>3</sup> )	Hauling granular material
Front end loader with GP bucket – 1	Large sized loader (5.5 m <sup>3</sup> bucket loader)	Site preparation work
Road grader – 1	Large sized grader (4.9 m blade)	Site preparation work, grading ramps and access roads
Tracked mechanical ditchers – 1	Medium sized excavator (1.45 m <sup>3</sup> bucket)	Excavating and removing organic material
Tree feller-buncher and skidder – 1	Tracked 35,490 kg feller-buncher with a high speed saw head	Site clearing and timber hauling

**Table 4-27: Estimate of Site Construction Equipment (cont'd)**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Compactor – 1	Medium sized crane (100 t)	Compaction of camp site pad fill materials and access road construction
Cranes (tracked) – 1	Medium sized crane (100 t)	Unloading and placement of camp modules

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Mechanics truck with welder – 1	4x4	Equipment repair
Water truck – 1	Tandem axle, 16-24 m <sup>3</sup>	Site and road work
Sea containers – 2	6 m	Storage
Mobile camps – 1	35 person	Site development
Fuel trucks – 1	3,785 L	Fuel for equipment
Skid steer loaders – 2	Large sized skid steer (80 HP)	Site work

**Table 4-28: Estimate of Equipment to Operate the Infrastructure Site**

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Sea containers – 4	6 m	Storage
Tractor trailers – 4	Dry van 14.6 m or 16.2 m	Parts and supplies
Road graders – 2	Large sized grader (4.9 m blade)	Earthwork, road maintenance and snow removal
Front end loader with GP bucket – 1	Large sized loader (5.5 m <sup>3</sup> bucket loader)	Movement of camp supplies and snow removal
Snow machines – 6	Small sized snow machine (400 cc)	Personnel transport
4x4 crew cab pick-up – 4	4x4	Transporting crews
Crane (tracked) – 1	Medium sized crane (100 t)	Loading and unloading pipe, equipment and materials
Flatbed trucks with pickers – 2	10 ton truck	Transporting materials and maintenance
Truck and water tank trailers – 5	Tandem axle, 16-24 m <sup>3</sup>	Bringing water to the camp for domestic use and fire protection
Skid steer loaders – 2	Large sized skid steer (80 HP)	Site work

**FUELS (PART 11)**

[Table 4-29](#) itemizes fuel storage. This represents an estimate of fuel requirements.

**Table 4-29: Estimate of Fuel Storage at the Little Smith Creek Infrastructure Site**

Fuels	Number of Containers	Capacity of Containers	Location
Diesel	2	500,000 L	Fuel Depot
Diesel	5	200,000 L	Fuel Depot

**PERIOD OF OPERATIONS (PART 14)**

Site operations will be continuous from 2006 through the summer of 2010, with the potential for limited activities after 2010. See [Section 3](#) for a schedule of development activities in the SSA.

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

Map coordinates of the site centroid are shown in [Table 4-30](#). A map showing the location of the site is provided in [Figure 4-11](#).

Photographs of the Little Smith Creek infrastructure site appear in [Figure 4-12](#) and [Figure 4-13](#).

**Table 4-30: Map Coordinates of Little Smith Creek Infrastructure Sites**

Activity	Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
Little Smith Creek airstrip	64.4253	-124.7259	416876	7145540	10
Little Smith Creek barge landing site	64.4287	-124.7732	414610	7145975	10
Little Smith Creek camp site	64.4282	-124.7218	417083	7145852	10

**FEES (PART 18)**

The total land area required for activities contained in this subject is 41.8 ha.

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

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Figure 4.13 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.

