

## Soils, Landforms and Permafrost Setting

This borrow site lies within an extensive glaciolacustrine/deltaic plain that is composed of several terrain types. To the south, thin glaciofluvial sands overlie glaciolacustrine deposits. To the east of the borrow site, glaciofluvial sediments form a gently undulating plain. In the vicinity of the borrow site, glaciofluvial sediments form a hummocky terrain with kettle lakes. Wind action has locally shaped glaciolacustrine/deltaic sands into aeolian dune deposits.

The borrow site area is hummocky, and has gentle to moderate slopes, and is likely well to moderately well drained. Permafrost might be locally present in areas underlain with glaciolacustrine deposits (20 to 30% of area) or in hummocky terrain with kettle lakes (5 to 10% of area). Ice contents range from 30 to 100%, by weight, in deposits underlain with glaciolacustrine sediments and in the range of 5 to 20%, by weight, in kettled plain areas with poor drainage and mossy surface vegetation. The borrow site lies close to the pipeline right-of-way and will be accessed by roads crossing glaciofluvial sediments. [Figure 5-111](#) is a photograph of the soils and landforms setting at this borrow site.



**Figure 5-111: Soils and Landforms Setting in Borrow Site 20.086P**

## Soils, Landforms and Permafrost Potential Effects and Mitigation

The terrain is hummocky and has moderate slopes, therefore, the borrow site might be subject to erosion following disturbance of the surface layer. Stripping of soil before development could result in a reduction of soil quality by mixing.

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

### Vegetation Setting

The predominant vegetation type of the proposed borrow site is mature upland white spruce – trembling aspen – jack pine. A small lake also occurs within the borrow site in the southwest corner. Surrounding the lake is a graminoid fen dominated by water sedge, hairy-fruited sedge and blue-joint reed grass vegetation types. Shrubs are sparse, but include long beaked willow and hoary willow. A vegetation survey and two rare plant surveys were conducted in 2004. No rare plants were observed.

The mixedwood vegetation type is located in upland forested areas, with jack pine, trembling aspen and white spruce in the tree canopy with white spruce in the sub canopy as well. Shrubs include green alder, prickly rose, soapberry, white spruce, trembling aspen and low-bush cranberry. Mountain cranberry, bunchberry, northern comandra, twinflower and fireweed compose the ground cover with stair-step moss and Schreber’s moss dominating the forest floor.

Proposed access to the borrow site will begin at the pipeline right-of-way and will cross a white spruce – trembling aspen-jack pine vegetation community with some areas of upland jack pine. Vegetation in these areas will be similar in composition to the borrow site.

The vegetation types of the borrow site are regionally common. However, much of the surrounding landscape has been recently burned and as such mature forest stands are locally and regionally uncommon. The small lake and associated graminoid fen is also an unusual community within the upland area. [Figure 5-112](#) is a photograph of the vegetation at this borrow site.



**Figure 5-112: Example of Vegetation at Borrow Site 20.086P**

## **Vegetation Potential Effects and Mitigation**

Development of this borrow 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 borrow site expansion and potential changes in site drainage and along the access road.

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 borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow 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 borrow site and its access road.

## **Wildlife Setting**

Wildlife habitat at this borrow site is composed of mature upland mixedwood forest. The open shrub layer is composed primarily of alder. This habitat type is considered common in the region. Important wildlife features at the borrow site include a complex forest structure that provides high quality foraging and denning habitat for marten and lynx, forage for moose, and important habitat for many non-key bird species. South facing slopes provide suitable denning habitat for grizzly bear. In addition, a large wetland provides nesting habitat for many waterbird species including lesser yellowlegs.

The access road will cross regenerating upland aspen and rose habitat, and mixedwood forest. These habitat types are considered common in the region. Important wildlife features include snags that provide nesting habitat for boreal chickadee. Lowland areas of willow and alder provide cover for hare and forage for lynx and moose and a complex forest structure provides foraging habitat for marten. In addition, forbs and graminoids are abundant for grizzly bear.

Key wildlife species observed at the borrow site and along the access road during field surveys included moose. 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 bear, snowshoe hare, wood frog,

ring-necked duck, surf scoter, mallard, common goldeneye, bufflehead, ruffed grouse, yellow-bellied sapsucker, American robin, ruby-crowned kinglet, ovenbird, and Tennessee warbler.

An assessment of key habitat features, such as percent cover of forage species, indicated that the site provides high quality denning and foraging habitat for marten and lynx and forage for moose (Table 5-81). High quality denning habitat for grizzly bear was noted in addition to nesting habitat for lesser yellowlegs and boreal chickadee. High quality foraging habitat for moose, grizzly bear, marten and lynx was noted along the access road.

Overall habitat quality for wildlife at this borrow site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was considered high for birds and moderate for mammals. Habitat quality along the access road was considered high for wildlife. The site has not been previously disturbed.

**Table 5-81: Habitat Quality for Key Wildlife Species at Borrow Site 20.086P and Associated Access Road**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>	
			Borrow Site	Access Road
Mammals	Woodland caribou	Winter foraging	Moderate	Moderate
	Moose	Foraging	High	High
	Grizzly bear	Denning	High	Moderate
		Fall foraging	Moderate	High
		Spring foraging	Moderate	High
	Marten	Foraging	High	High
	Lynx	Foraging	High	High
	Beaver	Cover	Low	Low
Foraging		Moderate	Moderate	
Birds	Scaup	Nesting	Moderate	Low
	Peregrine falcon	Nesting	Low	Low
	Lesser yellowlegs	Foraging	High	Low
	Boreal chickadee	Nesting	High	Moderate
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.				

Based on habitat availability a variety of species might inhabit the borrow 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 5-82](#).

**Table 5-82: Special Status Species That Were Observed or That Might Occur at Borrow Site 20.086P and Associated Access Road**

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	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	-	-	-
Northern flicker	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-

**Table 5-82: Special Status Species That Were Observed or That Might Occur at Borrow Site 20.086P and Associated Access Road (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Rusty blackbird	Sensitive	-	-	-
Boreal chorus frog	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 – *Species At Risk Act*  
<sup>e</sup>IUCN – The World Conservation Union  
<sup>f</sup>SARA status is to be reassigned, that is, potentially added to Schedule 1, pending results of public consultation, stakeholder consultation and final Ministerial approval.

### Wildlife Potential Effects and Mitigation

Overall, this borrow site and its associated access road are composed of high quality habitat for wildlife. Habitat types are common in the region, indicating they are not a limiting resource for wildlife. The borrow site provides high quality denning habitat for marten, lynx, and grizzly bear and nesting habitat for lesser yellowlegs and boreal chickadee. High quality foraging habitat for moose, grizzly bear, marten, and lynx was also noted at the borrow site and along the access road.

General potential effects resulting from development and operation of the borrow 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 area 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 borrow site and along the access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- disturbance of denning grizzly bears during winter construction and operations, resulting in potential den abandonment and bear mortality
- displacement of grizzly bears from high quality foraging habitat during the spring, summer and fall (if site is active)
- disturbance of nesting birds near the borrow site during summer (if site is active) and potential abandonment of nest sites
- loss of riparian habitats during excavation activities

- disturbance of moose along the access road during winter
- increased hunting/poaching of wildlife such as moose, marten and lynx resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow 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 active denning and nesting sites, as determined during pre-construction surveys, to the extent practical
- reduce project activities during the spring, summer and fall (bird nesting season and grizzly bear active period) to the extent practical
- reduce clearing of riparian habitats
- 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**

This borrow site is located about 1.5 km north of the Mackenzie River in an area characterized by a series of small pothole lakes. Three small lakes occur within 500 m of the borrow site. None of the lakes appear to be connected to one another or to the Mackenzie River.

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

Runoff from the borrow site will likely be directed towards the Mackenzie River. An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and in mean sediment concentration on the Mackenzie River is expected to be limited.

### **Groundwater Setting**

Surface materials in this area are expected to provide groundwater storage and might provide recharge to nearby lakes. Geotechnical data indicates an active layer thickness of 2.0 m.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

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

The potential capacity for groundwater storage and recharge might be affected as a result of alterations to local groundwater flow patterns, increases in surface water runoff and changes in springs, seeps or groundwater-fed wetlands that may be associated with the area influenced by the borrow pit development. At site locations where continuous permafrost exists, groundwater flow is seasonal and restricted to the active layer. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **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**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed 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**

This borrow site is located about 1.5 km north of the Mackenzie River in an area characterized by a series of small lakes. Three small lakes occur within 500 m of the borrow site. None of the lakes appear to be connected to one another or to the Mackenzie River.

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

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment runoff.

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 borrow 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 borrow site 20.086P. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

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

### **Heritage Resources Setting**

This borrow site was inspected as part of the borrow resource component of the field reconnaissance programs. Heritage resource sites were previously recorded within a 5 km range of the development area, indicating prior use of this region. This location was considered to have high potential for the discovery of heritage resources. No new heritage sites were recorded as a result of the surface reconnaissance at this site.

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. Information is also 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.

### **PUBLIC INVOLVEMENT**

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

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TITLE	<b>SSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	29: Borrow Site 9.002PA

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## OVERVIEW

Borrow source 9.002 is a glacial outwash plain consisting of medium grained, well-graded sand and gravel. It is located about 75 km southeast of Tulita on the east bank of the Mackenzie River. It should provide good quality material, Class 2, suitable for base and surface course aggregates, embankments, or structural fill. The material might be used for infrastructure and pipeline right of way requirements.

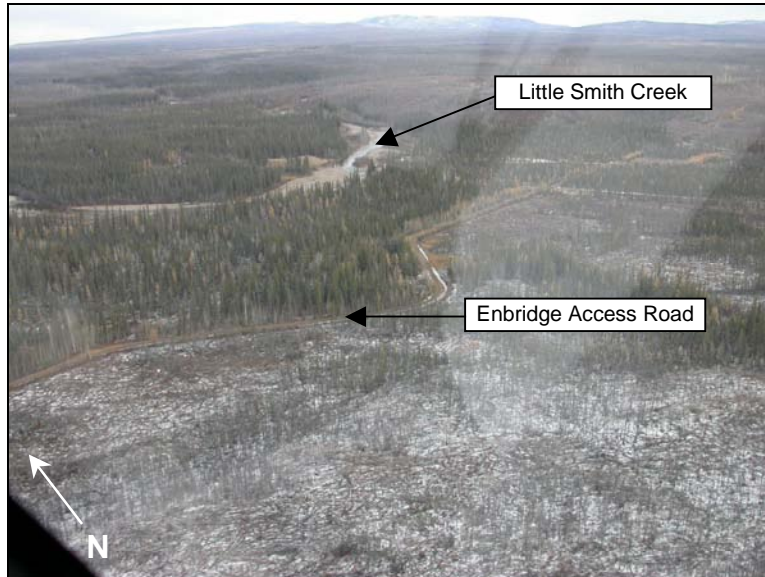
## SITE DESCRIPTION

Borrow site 9.002PA comprises the northern section of the large glacial outwash plain, and borrow site 9.002PB the southern section. Overall, the source is about 2,050 m long (north to south) and about 575 m wide encompassing an area about 120 ha. Borrow site 9.002PA is about 485 m wide and 550 m long encompassing an area of about 26.5 ha. See [Figure 5-114](#) for an overview map of the borrow site. See [Figure 5-117](#) for a site-specific map of the borrow site.

## Access

Borrow site 9.002PA is located about 1.6 km inland from the east bank of the Mackenzie River. Access to the site will be from the pipeline right-of-way, which is located about 1.0 km to the southwest. A winter access road, TD-B1-W-9.002PA, about 1.1 km in length will be required in order to travel northeast from the pipeline right-of-way to borrow site 9.002PA. Material required for infrastructure sites in the Little Smith Creek area will be transported along the pipeline right-of-way and existing access roads, as shown in [Figure 5-115](#). Adjacent terrain has potential to be thermally sensitive so the site is most readily accessed in the winter.

Figure 5.114 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.



**Figure 5-115: Looking Northeast at Borrow Site 9.002PA**

### Surface Conditions

Borrow site 9.002PA comprises the northern portion of a large glacial outwash plain that is broad and flat and rises about 3.0 m to 5.0 m above the surrounding terrain. The site is adjacent to the northeast bank of Little Smith Creek. The deposit appears to be well drained throughout. Overburden on the site typically consists of organic topsoil up to 0.2 m thick. The area has been repeatedly burned resulting in vegetation of low diversity.

### Subsurface Information

Pemcan Services completed seven boreholes and one test pit on the southern portion of the source in 1973 (Pemcan 1972). No borehole information is available for the northern portion of the deposit, borrow site 9.002PA, although it is assumed that the material will be similar to that found in borrow site 9.002PB. The following information has been extracted from this previous study.

Available information suggests that the granular material in both portions of this deposit is good quality stratified fine to medium grained, well-graded sand and gravel suitable for general fill for the construction of road bases, or backfill in the pit run condition, or both.

### PIT DEVELOPMENT

For borrow source 9.002 as a whole, proven reserves of 2,400,000 m<sup>3</sup>, probable reserves of 3,000,000 m<sup>3</sup> of well-graded, medium grained sand and gravel have been estimated (EBA 1988). With the expectation that the distribution and characteristics of the granular materials encountered in the boreholes are

representative, an average exploitable granular material thickness of 4.5 m has been assumed. Based on this 4.5 m thickness and a borrow site area of 26.5 ha, it is estimated that borrow site 9.002PA contains about 1,192,500 m<sup>3</sup> of exploitable granular material. An estimated 184,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.002PA is unfrozen or is frozen with low ice contents. Therefore, ripping and some drilling or blasting might be required during the extraction process.

## **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.002PA. 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 borrow 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](#).

At the present time, there are no man-made sources of light at the site.

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

Potential effects on noise levels associated with the development of the borrow 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 the summer months, lighting will likely not be required 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 borrow site is a large outwash plain adjacent to a tributary of Little Smith Creek. The top of the plain is very gently to gently sloping. A moderate to strong slope is found along the edge of the plain adjacent to the tributary. This slope locally shows evidence of active gully erosion. Access roads to the borrow site will ascend this slope. The site lies within the zone of extensive discontinuous permafrost.

Glaciofluvial sediments have commonly developed soils of the Brunisolic Order. The borrow site is expected to be rapidly drained near the slope, and moderately to imperfectly drained on the plain above. The occurrence of permafrost is expected to be between 0 and 10% in this landform.

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

Erosion on slopes at the edge of the glaciofluvial plain is the greatest terrain-related sensitivity for the borrow site. Slopes adjacent to the borrow site could also be susceptible to erosion if water from borrow site development is allowed to drain downslope. This area will be protected from disturbance by buffer zones. Access roads might also be susceptible to erosion where they cross slopes at the edge of the plain. Stripping of soil before further development could result in a reduction of soil quality by mixing.

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

### **Vegetation Setting**

Vegetation of the borrow site is primarily burned black spruce – white spruce/stair-step moss vegetation with the lowland areas in the northwest corner of the borrow site being burned black spruce/Labrador tea/mountain cranberry vegetation type. Based on surveys of the area, the vegetation is characterized by numerous fire-killed snags, short (2 to 5 m in height) regenerating trembling aspen with jack pine and smaller amounts of white and black spruce, and by dense shrub cover. There are some areas of mature forest of both vegetation types throughout the borrow site in areas of unburned fire-skips. A vegetation survey for the borrow site was conducted.

Black spruce – white spruce/stair-step moss vegetation is often scattered throughout upland terrain, often on ridges and knolls. White spruce and black spruce dominate the regenerating tree canopy while green alder, black spruce, prickly rose and Labrador tea are common in the shrub layer. Red bearberry, mountain cranberry and dwarf raspberry compose the ground cover layer along with twinflower, dwarf scouring-rush, miter wort and northern comandra. Stair-step moss is characteristic of this vegetation community and densely covers the forest floor.

Regenerating black spruce/Labrador tea/mountain cranberry vegetation is found in burned lowland areas with level topography. Black spruce is found in both the tree and the shrub layer. Labrador tea, willow, sweet gale, green alder and bog bilberry comprise the shrub layer along with Alaska birch, shrubby cinquefoil and prickly rose. The ground cover layer includes red bearberry and fireweed with an abundance of club lichens, pelt lichens and reindeer lichens.

Access to this site will cross burned areas of black spruce – white spruce/stair-step moss and black spruce – Labrador tea/mountain cranberry, similar in vegetation composition to that described for the borrow site. Access will also cross small areas of white spruce/stair-step moss, upland white spruce – trembling aspen – jack pine and riparian willow vegetation. Clearing of regenerated trees and shrubs will be required on the cutline.

All vegetation types associated with the proposed development are common regionally with the exception of the white spruce/stair-step moss and riparian willow vegetation types, which are uncommon. [Figure 5-116](#) is a photograph of the vegetation at this borrow site.



**Figure 5-116: Example of Vegetation at Borrow Site 9.002PA**

## **Vegetation Potential Effects and Mitigation**

Development of this borrow 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 borrow site expansion and potential changes in site drainage and along the access road.

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 borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow site and along the access road might develop into a different vegetation community than what was there before development.

White spruce/stair-step moss habitats are uncommon locally and regionally. They support tall forest stands and provide important buffers for watercourses. Riparian drainages that support white spruce/stair-step moss, and particularly tall forest stands in these habitats, will be avoided where possible. Riparian willow vegetation types are also uncommon. The access right-of-way crossings of riparian areas will be narrowed as much as practical.

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

## **Wildlife Setting**

Wildlife habitat at this borrow site is composed of regenerating black spruce bog and spruce forest. The closed shrub layer is composed primarily of willow. The habitat types are considered common in the region. Important wildlife features at the borrow site include south facing slopes suitable for grizzly bear dens and shrub provides browse for moose. Little Smith Creek runs next to the borrow site and provides important habitat for many waterbird species. In addition, large amounts of deadfall might provide excellent cover and subniveal access for small mammals and furbearers.

The access road to the borrow site will cross through a variety of habitats including regenerating black spruce bog, mature mixedwood forest, and spruce forest. Aspen is the dominant shrub species present. The habitat types are common in the region and likely support a variety of wildlife species. An important wildlife feature along the access road is Little Smith Creek. The

shoreline and riparian willow provide important habitat for many bird species including shorebirds and waterfowl as well as providing forage for beaver and moose. The area is also likely used as a travel corridor by many species. Other important features include a mature mixedwood habitat with large spruce trees, snags and regenerating shrub that provides nesting habitat for boreal chickadee and foraging habitat for moose. A high cover of forbs and graminoids was also noted along the access road as grizzly bear forage (spring).

Key wildlife species observed along the access road during field surveys included moose and beaver. Sign of caribou was also noted at the borrow site. 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 species or wildlife sign recorded along the access road included black bear, wolf, small mammal, grouse, geese, spotted sandpiper, pileated woodpecker, American robin, warbling vireo, Tennessee warbler, yellow warbler, yellow-rumped warbler and white-throated sparrow. Wildlife species or wildlife signs were not observed during an aerial survey of the borrow site.

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 denning habitat for grizzly bear (Table 5-83). High quality foraging habitat was noted along the access road for moose, grizzly bear (spring), and beaver. High quality nesting habitat was also noted for boreal chickadee along the road.

Overall habitat quality for wildlife at the borrow site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was rated as moderate for wildlife. Habitat quality along the access road was considered moderate mammals and high for birds. The borrow site has been previously disturbed by an existing road and a right-of-way. The Little Smith Creek airstrip also occurs in the area.

**Table 5-83: Habitat Quality for Key Wildlife Species at Borrow Site 9.002PA and Associated Access Road**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>	
			Borrow Site	Access Road
Mammals	Woodland caribou	Winter foraging	Unknown	Low
	Moose	Foraging	High	High
	Grizzly bear	Denning	High	Low
		Fall foraging	Unknown	Moderate
		Spring foraging	Unknown	High
	Marten	Foraging	Low	Moderate

**Table 5-83: Habitat Quality for Key Wildlife Species at Borrow Site 9.002PA and Associated Access Road (cont'd)**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>	
			Borrow Site	Access Road
Mammals (cont'd)	Lynx	Foraging	Unknown	Moderate
	Beaver	Cover	Low	Moderate
		Foraging	Moderate	High
Birds	Scaup	Nesting	Low	Low
	Peregrine falcon	Nesting	Low	Low
	Lesser yellowlegs	Foraging	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.

Based on habitat availability a variety of species might inhabit the borrow 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 5-84](#).

**Table 5-84: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.002PA and Associated Access Road**

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	Sensitive	Threatened	Schedule 1 – threatened	Lower risk – least concern
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-

**Table 5-84: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.002PA and Associated Access Road (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Golden eagle	Sensitive	Not at risk	-	-
Rock ptarmigan	Sensitive	-	-	-
Northern flicker	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
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 – *Species At Risk Act*  
<sup>e</sup>IUCN – The World Conservation Union  
<sup>f</sup>SARA status is to be reassigned, that is, potentially added to Schedule 1, pending results of public consultation, stakeholder consultation and final Ministerial approval.

### Wildlife Potential Effects and Mitigation

This borrow site is located near previously existing disturbance including an airstrip and gravel pit. Overall, this borrow site is composed of moderate to high quality habitat for wildlife. This area already experiences human disturbance, which likely affects the species of wildlife present. Habitat diversity at the borrow site is relatively high, suggesting that the borrow site might support several wildlife species. However, the habitats are common in the region, with the exception of riparian willow habitat, indicating they are not a limiting resource for wildlife. Of note, the borrow site provides high quality foraging habitat for moose. Suitable denning habitat for grizzly bear also occurs at the borrow site. Forage for moose, grizzly bear (spring), and beaver and nesting habitat for boreal chickadee occurs along the access road.

General potential effects resulting from development and operation of the borrow 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 area 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 borrow site and along the access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- disturbance of denning grizzly bears during winter construction and operations, resulting in potential den abandonment and bear mortality
- displacement of grizzly bears from high quality foraging habitat during the spring (if site is active)
- disturbance of nesting birds near the borrow site during summer (if site is active) and potential abandonment of nest sites
- loss of riparian habitat during excavation activities and road construction
- displacement of woodland caribou from high quality foraging habitat during winter
- disturbance of woodland caribou and disruption of movements
- disturbance of moose along the access road during winter
- increased hunting/poaching of wildlife such as caribou and beaver resulting from increased access

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

- use the waste management plan described in [Section 11](#)
- avoid active denning and nesting sites, as determined during pre-construction surveys, to the extent practical
- reduce activities during the spring, summer and fall (bird nesting season and grizzly bear active period)
- reduce clearing in riparian habitats
- monitor occurrence of caribou near the borrow site during winter and schedule peak construction activities during mid to late winter when fewer caribou might occur in the area

- prohibit the recreational use of associated access roads by project staff while on the job site
- establish and enforce regulations to prevent harassment of wildlife

### **Hydrology Setting**

This borrow site is located about 1 km south of Little Smith Creek and about 2 km east of the Mackenzie River. The area encompassing this borrow site that contributes runoff to the mouth of Little Smith Creek is about 524 km<sup>2</sup>.

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

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and in mean sediment concentration on Little Smith Creek is expected to be limited.

### **Groundwater Setting**

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

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

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

The potential capacity for groundwater storage and recharge might be affected as a result of alterations to local groundwater flow patterns, increases in surface water runoff and changes in springs, seeps or groundwater-fed wetlands that may be associated with the area influenced by the borrow pit development. At site locations where continuous permafrost exists, groundwater flow is seasonal and restricted to the active layer. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **Water Quality Setting**

This borrow site is located about 1 km south of Little Smith Creek and 2 km east of the Mackenzie River. Historical water quality data, such as, field measured

parameters, hardness, total alkalinity, total dissolved solids, total suspended solids, major ions, nitrate, total iron and total manganese, available for Little Smith Creek is summarized in [Table 5-85](#).

The pH values of Little Smith Creek, ranging from 7.2 to 8.4, were within aquatic life and drinking water guideline values during summer, fall and winter ([Table 5-85](#)). The water was well-oxygenated during summer and fall, although dissolved oxygen values were below the minimum chronic aquatic life guideline value of 6.5 mg/L during winter.

Major ions levels, as indicated by conductance values, ranged from moderately low to moderate during summer, and were moderate during winter. Major ion concentrations were slightly higher during fall, as indicated by the moderate to moderately high levels of total dissolved solids. Bicarbonate, calcium and sulphate were the most abundant major ions. Total alkalinity values indicated that the watercourse was well buffered and not sensitive to acid deposition.

Total suspended solids concentrations were usually low during fall. Total iron and manganese levels were below detection limits during winter.

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

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed on a site-specific basis. Limited effects were predicted on mean annual flow and mean annual total suspended sediment (TSS) concentrations in Little Smith Creek 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.

Table 5-85: Little Smith Creek – Water Quality (1972-1999)

Parameter	Units	Summer <sup>a</sup>				Fall <sup>a</sup>				Winter <sup>a,b</sup>			
		Median or Value	Min.	Max.	n <sup>c</sup>	Median or Value	Min.	Max.	n <sup>c</sup>	Median or Value	Min.	Max.	n <sup>c</sup>
<b>Field Measured</b>													
pH	N/A <sup>d</sup>	8.3	7.2	8.4	5	8.4	8.4	8.4	2	7.8	7.5	8	2
Conductance	µS/cm	268	195	483	6	-	-	-	-	410	400	420	2
Temperature	°C	13.9	9	18	5	5.5	4	7	2	3.3	2	4.5	2
Dissolved oxygen	mg/L	10.5	9.8	11.2	2	11.5	-	-	1	5.4 <sup>c</sup>	4.8 <sup>c</sup>	6 <sup>c</sup>	2
<b>Conventional Parameters</b>													
Hardness	mg/L	226	-	-	1	-	-	-	-	-	-	-	-
Total alkalinity	mg/L	174	-	-	1	-	-	-	-	-	-	-	-
Total dissolved solids	mg/L	-	-	-	-	325	278	371	2	-	-	-	-
Total suspended solids	mg/L	-	-	-	-	8	5	11	2	-	-	-	-
<b>Major Ions</b>													
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	236	218	254	2
Calcium	mg/L	60	-	-	1	-	-	-	-	71	60	83	2
Chloride	mg/L	3	-	-	1	-	-	-	-	9	4	14	2
Magnesium	mg/L	-	-	-	-	-	-	-	-	20	20	20	2
Potassium	mg/L	1	-	-	1	-	-	-	-	2	1	2	2
Sodium	mg/L	5	-	-	1	-	-	-	-	9	4	15	2
Sulphate	mg/L	54	-	-	1	-	-	-	-	67	53	82	2
<b>Nutrients</b>													
Nitrate	mg/L	-	-	-	-	-	-	-	-	0.23	-	-	1

**Table 5-85: Little Smith Creek – Water Quality (1972-1999) (cont'd)**

Parameter	Units	Summer <sup>a</sup>			Fall <sup>a</sup>			Winter <sup>a,b</sup>					
		Median or Value	Min.	Max.	n <sup>c</sup>	Median or Value	Min.	Max.	n <sup>c</sup>	Median or Value	Min.	Max.	n <sup>c</sup>
<b>Total Metals</b>													
Iron	mg/L	-	-	-	-	-	-	-	-	<0.06	<0.05	<0.06	2
Manganese	mg/L	-	-	-	-	-	-	-	-	<0.01	<0.008	<0.012	2

**NOTES:**  
<sup>a</sup>A hyphen indicates data not available.  
<sup>b</sup>Boldface indicates values are higher than water quality guideline levels.  
<sup>c</sup>n – number of samples  
<sup>d</sup>N/A – not applicable  
<sup>e</sup>Concentration higher than the relevant chronic aquatic life guideline or beyond the recommended dissolved oxygen range.

**SOURCES:** GeoNorth and Golder 2000; McCart 1974 in McCart et al. 1974; Reid et al. 1974; Shotton 1973

## Fish and Fish Habitat Setting

There are no aquatic features within the boundaries of this borrow site. The closest watercourse to the borrow site is an unnamed tributary of Little Smith Creek located about 200 m downslope and to the south. Little Smith Creek is about 1 km to the north.

The classification of the unnamed tributary of Little Smith Creek is not known; however, it is likely a Vegetated or Active II Channel. These watercourses are typically dry or frozen to the bed in winter. Consequently they only support fish during periods of flow. Little Smith Creek is an Active I Channel crossed by the pipeline right-of-way, about 700 m west of the borrow site. Active I Channels have perennial flows and are not expected to freeze to the bed during the winter.

Fish captured or reported to have been captured in Little Smith Creek include Arctic grayling, longnose suckers, northern pike and slimy sculpin bull trout, broad whitefish, burbot, flathead chub, lake chub, longnose sucker, northern pike, round whitefish, slimy sculpin, spottail shiner, and walleye.

Wetted channel widths ranged from 3.5 m to 10.5 m, with a maximum water depth of 0.56 m. Shallow run habitat made up 53% of the total habitat area. With moderate-depth run and riffle habitats making up the remainder. The dominant substrate was gravel. Cobble, boulder, sand and silt substrate were also present. Stream banks within the surveyed area were stable, with only 5% of the left downstream bank having unstable or slumping banks.

Instream cover was provided mainly by turbulence and depth in the deeper sections. Boulder gardens, woody debris, overhanging vegetation, aquatic vegetation and undercut banks also contributed to the instream cover available. Riparian vegetation was grasses, forbs, shrubs and deciduous forest. Farther back from the bank was coniferous forest habitat.

Abundant cobble and gravel substrate in riffle and run habitats could provide suitable spawning habitat for Arctic grayling and sucker species (Table 5-86). Cover including boulder garden, woody debris, depth and turbulence, occurred throughout the surveyed section. Shallow and moderate-depth run habitats would be suitable for rearing by large-bodied species. Deep run areas would provide feeding and holding habitat for adult fish.

Areas of low velocity, instream cover and fines provide northern pike juvenile rearing, and adult feeding and holding habitat. Backwater areas with silt substrate, woody debris, and small areas of aquatic vegetation along side watercourses in the surveyed area would also provide spawning habitat for northern pike. Although bull trout have not been collected from the watercourse above the confluence area, habitat conditions in the watercourse would be suitable to support bull trout rearing or summer feeding.

**Table 5-86: Potential Use of Little Smith Creek**

<b>Species<sup>a</sup></b>	<b>Overwintering<sup>b</sup></b>	<b>Spawning and Incubating</b>	<b>Rearing</b>	<b>Adult Feeding and Holding</b>
Arctic grayling	Yes	Yes	Yes	Yes
Northern pike	Yes	Yes	Yes	Yes
Sucker species	Yes	Yes	Yes	Yes
Bull trout <sup>c</sup>	Yes	No	Yes	Yes
Whitefish species	Yes	No	Yes	Yes
Burbot	Yes	No	Yes	Yes

NOTES:  
<sup>a</sup>Except for bull trout, all of the species and species groups listed have been confirmed in the watercourse.  
<sup>b</sup>Previous studies indicated the watercourse was frozen to the bed of the watercourse in winter. However, the preliminary analysis of April 2004 data indicated presence of water and sufficient dissolved oxygen.  
<sup>c</sup>Bull trout have been collected only from the confluence area.

The presence of flow and water depth up to 1.3 m and evidence of groundwater suggest that that the reach near the crossing location could provide overwintering habitat or sustain incubating egg. However earlier studies indicated that segments of Little Smith Creek freezes to the bed in winter.

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

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment runoff.

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 borrow 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 borrow site 9.002PA. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

This borrow 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.

### **Heritage Resources Setting**

This borrow site was inspected as part of the borrow resource component of the 2003 field reconnaissance programs. This location was considered to have high potential for the discovery of heritage resources. Heritage resource sites were previously recorded within 2 km of the development area, indicating prior use of this region. No new heritage resource sites were recorded as a result of the surface reconnaissance at this site.

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. Information is also 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.

## **PUBLIC INVOLVEMENT**

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

Figure 5.117 as 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	5: Borrow Sites
SUBJECT	30: Borrow Site 9.002PB

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## OVERVIEW

Borrow source 9.002 is a glacial outwash plain consisting of medium grained, well-graded sand and gravel. It is located about 75 km southeast of Tulita on the east bank of the Mackenzie River. It should provide good quality material, Class 2, suitable for base and surface course aggregates, embankments, or structural fill. The material might be used for infrastructure and pipeline right-of-way requirements.

## SITE DESCRIPTION

Borrow site 9.002PA comprises the northern section of the large glacial outwash plain, and borrow site 9.002PB the southern section. Overall, the source is about 2,050 m long (north to south) and about 575 m wide encompassing an area about 120 ha. Borrow site 9.002PB is about 410 m wide and 685 m long encompassing an area of about 28.2 ha. See [Figure 5-118](#) for an overview map of the borrow site. See [Figure 5-120](#) for a site-specific map of the borrow site.

## Access

Borrow site 9.002PB is located about 1.6 km inland from the east bank of the Mackenzie River. Access to borrow site 9.002PB will be from the pipeline right-of-way, which bisects the site. Material required for infrastructure sites in the Little Smith Creek area will be transported along the pipeline right-of-way and existing access roads, as shown in [Figure 5-119](#). Adjacent terrain has potential to be thermally sensitive so the site is most readily accessed in the winter.

Figure 5.118 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.

## Surface Conditions

Borrow site 9.002PB comprises the southern portion of a large glacial outwash plain that is broad and flat and rises about 3.0 m to 5.0 m above the surrounding terrain. The deposit appears to be well drained throughout. Overburden on the site typically consists of organic topsoil up to 0.2 m thick. The area has been repeatedly burned resulting in vegetation of low diversity.

The majority of the southwest area of the borrow source, west of the airstrip, has been developed, as shown in [Figure 5-119](#). Although material in the pit seems similar, there has been very sporadic development. Up to 5.0 m of material has been excavated in the area of the pit, and it is estimated that 50% of the material is remaining. Once the available material in borrow site 9.002PB has been exhausted, borrow site 9.002PA will be developed.



**Figure 5-119: Looking Southwest at Borrow Site 9.002B over Existing Little Smith Creek Airstrip**

## **Subsurface Information**

Pemcan Services completed seven boreholes and one test pit on the southern portion of the source in 1973 (Pemcan 1972). Of these, two of the boreholes lie within borrow site 9.002PB and a third borehole is located about 100 m to the east of the site. The following borehole information has been extracted from this previous study.

Available information suggests that the granular material in both parts of this deposit is good quality stratified fine to medium grained, well-graded sand and gravel that is suitable for general fill for the construction of road bases or backfill in the pit run condition or both.

Of the three boreholes, borehole C393A penetrated a negligible layer of peat underlain by about 1.4 m of well graded gravel, and about 3.0 m of poorly-graded sand. Material in the borehole was unfrozen.

Borehole C554B penetrated about 2.1 m of unfrozen well-graded gravel.

Borehole C556B penetrated about 1.5 m of unfrozen poorly-graded sand with gravel, cobbles, and boulders.

## **PIT DEVELOPMENT**

For borrow source 9.002 as a whole, proven reserves of 2,400,000 m<sup>3</sup>, probable reserves of 3,000,000 m<sup>3</sup> of well-graded, medium grained sand and gravel have been estimated (EBA 1988). With the expectation that the distribution and characteristics of the granular materials encountered in the boreholes are representative, an average exploitable granular material thickness of 4.5 m has been assumed. Based on this 4.5 m thickness and a borrow site area of 28.2 ha, it is estimated that borrow site 9.002PB contains about 1,269,000 m<sup>3</sup> of exploitable granular material. It is estimated that 184,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.002PB is unfrozen or is frozen with low ice contents. Therefore, ripping and some drilling or blasting will be required during the extraction process.

## **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.002PB. 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 Sahtu Settlement Area (SSA) described in [Section 8](#).

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

Potential effects on air quality associated with the development of the borrow 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](#).

At the present time, there are no man-made sources of light at the site.

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

Potential effects on noise levels associated with the development of the borrow 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 likely not be required 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 borrow site lies along the pipeline right-of-way in an area where glaciofluvial sediments form an outwash plain. 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, with expected occurrences to comprise

about 20 to 30%. Areas of permafrost within these sediments typically have ice contents between 15 and 30% by weight.

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

Terrain-related environmental sensitivities are not predicted for the borrow site area. Stripping of soil before further development could result in a reduction of soil quality by mixing.

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

### **Vegetation Setting**

The borrow site is vegetated with a lowland area of primarily burned black spruce/Labrador tea/mountain cranberry with small pockets of unburned black spruce – tamarack vegetation. Vegetation surveys were conducted at this site.

Regenerating black spruce/Labrador tea/mountain cranberry vegetation is found in burned lowland areas with level topography. Black spruce is found in both the tree and the shrub layer. Labrador tea, willow, sweet gale, green alder and bog bilberry vegetation types comprise the shrub layer along with Alaska birch, shrubby cinquefoil and prickly rose. The ground cover layer includes red bearberry and fireweed with an abundance of club lichens, pelt lichens and reindeer lichens.

The unburned black spruce – tamarack vegetation type is located on both upland and lowland terrain, frequently along drainages in strips and clusters. The tree layer is an open canopy of black spruce and tamarack, with Labrador tea, black spruce, green alder, willow, ground birch and prickly rose in the shrub layer. Sedges, red bearberry, mountain cranberry and dwarf scouring rush comprise the ground cover along with an abundance of stair-step moss, reindeer lichen and pelt lichen.

No access to this borrow site is proposed as the right-of-way runs through the middle of the borrow site. Thus, the same vegetation types as described above are traversed. All vegetation types associated with the proposed development are common regionally.

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

Development of this borrow site 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 borrow site 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 to the borrow site. Effects on vegetation due to the borrow site will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site is decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow site 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 borrow site and its access road.

### **Wildlife Setting**

Wildlife habitat at this borrow site is composed of regenerating black spruce bog and young conifer forest. The open shrub layer is composed primarily of aspen. These habitat types are considered common in the region. Important wildlife features at the borrow site includes regenerating shrub that provides forage for moose and nesting and foraging habitat for many bird species and sedges that provide spring forage for grizzly bear. The borrow site has been disturbed by fire and large amounts of deadfall might provide excellent cover and subnival access for small mammals and furbearers.

Key wildlife species reported at the borrow site, by sign or visual observation, included woodland caribou and moose. 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, small mammals, American robin, white-throated sparrow and pileated woodpecker.

An assessment of key habitat features, such as percent cover of forage species, indicated that the site provides moderate quality foraging habitat for grizzly bear, moose, lynx and beaver ([Table 5-87](#)). Suitable denning habitat for grizzly bear was not observed.

Overall habitat quality for wildlife at this borrow site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was considered low for wildlife. The borrow site has been previously disturbed by fire and a right-of-way.

**Table 5-87: Habitat Quality for Key Wildlife Species at Borrow Site 9.002PB**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals	Woodland caribou	Winter foraging	Low
	Moose	Foraging	Moderate
	Grizzly bear	Denning	Low
		Fall foraging	Moderate
		Spring foraging	Moderate
	Marten	Foraging	Low
	Lynx	Foraging	Moderate
	Beaver	Cover	Low
Foraging		Moderate	
Birds	Scaup	Nesting	Low
	Peregrine falcon	Nesting	Low
	Lesser yellowlegs	Foraging	Low
	Boreal chickadee	Nesting	Low

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.

Based on habitat availability a variety of species might inhabit the borrow 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 5-88](#).

**Table 5-88: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.002PB**

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
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

**Table 5-88: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.002PB (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Rock ptarmigan	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree 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 – *Species at Risk Act*

<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.

### Wildlife Potential Effects and Mitigation

This borrow site's sensitivity to disturbance is rated as low. It has moderate wildlife value; however, is located near previously existing disturbance including an airstrip and gravel pit.

Overall, this borrow site is composed of low quality habitat for wildlife. Habitat types at the borrow site are considered common in the region, indicating they are not a limiting resource for wildlife. Overall, the borrow site provides moderate quality foraging habitat for grizzly bear, moose, lynx, and beaver. No suitable denning habitat was reported for grizzly bear.

General potential effects resulting from development and operation of the borrow site includes direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small area 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 borrow site include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- disturbance of nesting birds during summer
- increased hunting/poaching of wildlife due to increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow site 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)
- reduce activities during the nesting season
- 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 borrow site is located south of Little Smith Creek and about 2 km east of the Mackenzie River. Runoff from the borrow site would likely flow directly to the Mackenzie River.

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

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and an increase in mean sediment concentration on the Mackenzie River are expected to be limited.

### **Groundwater Setting**

Shallow groundwater is expected to flow to the west following the surface topography.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

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

The potential capacity for groundwater storage and recharge might be affected as a result of alterations to local groundwater flow patterns, increases in surface water runoff and changes in springs, seeps or groundwater-fed wetlands that may be associated with the area influenced by the borrow pit development. At site locations where continuous permafrost exists, groundwater flow is seasonal and restricted to the active layer. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **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**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed 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**

There are no aquatic features within 500 m of the borrow site.

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

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment runoff.

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 borrow site reaching surface waters.

## **Human Environment**

This topic contains a description of the protected areas and heritage resources setting and potential effects and mitigation for borrow site 9.002PB. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

This borrow 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 borrow site was inspected as part of the borrow resource component of the field reconnaissance programs. Investigations at the borrow site included limited ground reconnaissance in 2002 and aerial overflights in 2003. This location was considered to have low potential for the discovery of heritage resources. Heritage resource sites have been previously recorded within a 5 km range of the development area, indicating prior use of this region. No new heritage resource sites were recorded as a result of the surface reconnaissance at this site.

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. Information is also 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.

## **PUBLIC INVOLVEMENT**

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

Figure 5.120 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	5: Borrow Sites
SUBJECT	31: Borrow Site 9.017P

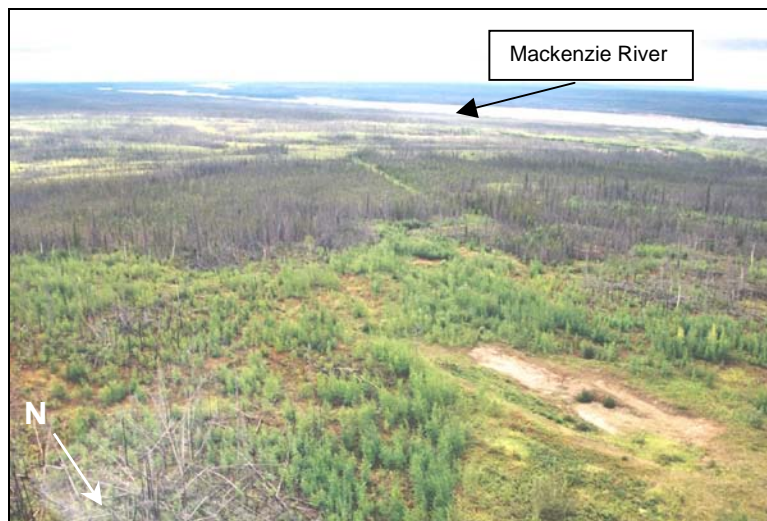
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## OVERVIEW

Borrow source 9.017 is a glaciofluvial plain consisting of fine to medium grained, well graded sand with little gravel and variable silt content. It is located about 85 km southeast of Tulita 500 m from the south bank of the Saline River. It should provide fair quality material, Class 3, suitable for general fill. The material might be used for pipeline right-of-way requirements. This is the site of a previous pit.

## SITE DESCRIPTION

Borrow source 9.017 is located 500 m from the south bank of the Saline River, about 1,500 m upstream from the mouth of the Mackenzie River. The site is a broad, flat glaciofluvial plain that contains both level and hummocky terrain, as shown in [Figure 5-121](#). Overall, the source is about 2,400 m long (east to west) and about 1,600 m wide encompassing an area of about 384 ha. Borrow site 9.017P is about 500 m wide and 630 m long encompassing an area of about 31.6 ha. See [Figure 5-122](#) for an overview map of the borrow site. See [Figure 5-126](#) for a site-specific map of the borrow site.



**Figure 5-121: Borrow Source 9.017**

Figure 5.122 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.

## Access

Access to borrow site 9.017P will be from the pipeline right-of-way, which is located about 750 m to the south. A winter access road, TD-B1-W-9.017P, about 800 m in length will be required in order to travel north from the pipeline right-of-way to borrow site 9.017P. Adjacent terrain has potential to be thermally sensitive so the site is most readily accessed in the winter.

## Surface Conditions

Borrow site 9.017P is located on a large glaciofluvial plain that is broad and flat, and rises between 3.0 and 4.0 m above the surrounding terrain. The steep crest of the south bank of the Saline River forms the northern boundary of the site and a small stream channel forms the southern boundary. The site area is fairly well drained and the steep south bank of the Saline River exhibits numerous erosional gullies. Overburden on the site consists of organic material that varies in thickness from about 0.3 to 1.8 m. There is evidence on the site of a recent burn.

A small existing gravel pit is located within the site. A large area on the site has been previously cleared, and it appears that more gravelly material might have been high-graded from the pit, as shown in [Figure 5-123](#).



**Figure 5-123: Exposed Granular Material on Borrow Source 9.017  
(Direction Unknown)**

## Subsurface Information

Pemcan Services completed six boreholes on the source in 1973 (Pemcan 1972). Of these, two of the boreholes lie within borrow site 9.017P. The following borehole information has been extracted from this previous study.

Available information suggests that the granular material in this site is primarily fine to coarse grained sand with a highly variable silt content. Scattered pockets or layers of medium grained gravel, with a little silt, were encountered at depths in excess of 4.5 m below the ground surface in some areas of the site. The sand from this site in the pit run condition is considered suitable for lower quality fill material in the construction of road subgrades, berms and utility backfill. Moisture content in the granular material is low to medium.

Borehole DH-1 penetrated about 0.3 m of organic topsoil with a trace of sand, underlain by about 2.4 m of fine grained, poorly graded sand with some silt, and about 3.6 m of fine to coarse grained, well graded gravel and sand. The soils encountered in borehole DH-1 revealed visible ice crystals with medium ice contents.

Borehole DH-2 penetrated about 0.3 m of organic topsoil with some silt, underlain by about 5.8 m of variable sand. The upper 1.2 m of the sand layer contains silty sand with a trace of low plastic clay, followed by about 2.7 m of fine grained, poorly graded sand with a trace silt, and about 1.8 m of fine grained, poorly graded sand with a trace of gravel. The soils encountered in borehole DH-2 revealed random and stratified ice in the upper 1.5 m and visible ice crystals in the lower 4.5 m. Ice contents in the borehole were medium.

## **PIT DEVELOPMENT**

For borrow source 9.017 as a whole, proven reserves of 1,500,000 m<sup>3</sup>, and probable reserves of 2,700,000 m<sup>3</sup> of fine to medium grained, well graded sand with little gravel and variable silt content have been estimated (EBA 1986). With the expectation that the distribution and characteristics of the granular materials encountered in the boreholes are representative, an average exploitable granular material thickness of 4.5 m has been assumed. Based on this 4.5 m thickness and a borrow site area of 31.6 ha, it is estimated that borrow site 9.017P contains about 1,422,000 m<sup>3</sup> of exploitable granular material. It is estimated that 11,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.017P is frozen with low to medium ice contents. Therefore, ripping and some drilling or blasting will be required during the extraction process.

## **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.017P. 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 borrow 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](#).

At the present time, there are no man-made sources of light at the site.

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

Potential effects on noise levels associated with the development of the borrow 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 likely not be required 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 borrow site consists of an upland glaciofluvial plain adjacent to the Saline River valley. The glaciofluvial plain contains both flat and hummocky terrain with local areas of gentle slope. The Saline River valley along the northern side of the borrow site has strong to very strong slopes, and shows evidence of active gully erosion. The borrow site is separated from the pipeline right-of-way by a sloping unit of glaciolacustrine sediment. The glaciolacustrine unit locally has

areas of moderate slope, although slopes along the access route are gentle. The borrow site lies within the region of extensive discontinuous permafrost.

Hummocky glaciofluvial sediments are rapidly to moderately well drained and have typically developed soils of the Brunisolic Order. Limited drilling at the deposit suggests the borrow site is frozen. Ice contents are expected to be in the range of 5 to 20% by weight. The glaciolacustrine sediments are moderately well drained and have likely developed soils of the Brunisolic and Cryosolic Orders. The glaciolacustrine sediments are characterized by a blanket slope drainage pattern indicating that drainage might be in part controlled by the permafrost table. Permafrost areas in glaciolacustrine sediments commonly contain between 50 and 70% ice content by weight. Permafrost is expected in 30 to 50% of the glaciolacustrine area.

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

Terrain-related environmental sensitivities are not predicted for the borrow site area. The slopes of the Saline River valley to the north of the deposit are also susceptible to erosion, although this area is unlikely to be disturbed by activities at the borrow site. The access road to the borrow site might be susceptible to thaw settlement and pond formation, erosion and drainage disruption in sloping areas after surface disturbance. Stripping of soil before further development could result in a reduction of soil quality by mixing.

General mitigation strategies to offset potential effects are outlined in [Section 8](#). [Figure 5-124](#) is a photograph of the soils and landforms setting at this borrow site.



**Figure 5-124: Soils and Landforms Setting at Borrow Site 9.017P**

## Vegetation Setting

The primary vegetation is a regenerating upland white spruce – trembling aspen – jack pine forest. There are smaller sections of regenerating black spruce/Labrador tea/mountain cranberry vegetation type located to the southwest section of the proposed area along with some black spruce – tamarack. Immediately north of the borrow site is the Saline River valley, which is dominated by a regenerating riparian white spruce community. A small wetland has formed in the hummocky terrain of the borrow site and is dominated by aquatic grass and sedge cover. The area was surveyed for rare plants in 2004, and none were found. Based on information collected during the rare plant survey and previous reconnaissance efforts, it appears a large part of the central area was logged to provide woodchips for the Enbridge line, which was followed by the 1998 fire. There is a granular resource extraction site already established. The surrounding, unlogged regenerating vegetation cover is currently dominated by aspen with components of willow, Alaska birch, rose and fireweed with a 50% cover of bryophytes.

The burnt mixedwood vegetation type is located in upland forested areas, with jack pine, trembling aspen and white spruce regenerating into the tree canopy. Shrubs include green alder, prickly rose, soapberry, white spruce, trembling aspen and low-bush cranberry. Mountain cranberry, bunchberry, northern comandra, twinflower and fireweed compose the ground cover with stair-step moss and Schreber's moss dominating the forest floor.

Regenerating black spruce/Labrador tea/mountain cranberry vegetation is found in burned lowland areas with level topography. Black spruce is found in both the tree and the shrub layer. Labrador tea, willow, sweet gale, green alder and bog bilberry comprise the shrub layer along with Alaska birch, shrubby cinquefoil and prickly rose. The ground cover layer includes red bearberry and fireweed with an abundance of club lichens, pelt lichens and reindeer lichens.

Access to the borrow site begins at the pipeline right-of-way and will cross through the regenerating vegetation types described above. The two main vegetation types described here for the borrow site are common regionally. The small kettle like wetland is an unusual feature due to unusual topographic positioning in an upland location and its extensive species composition. If possible, it will be avoided. [Figure 5-125](#) is a photograph of the vegetation at this borrow site.



**Figure 5-125: Example of Vegetation at Borrow Site 9.017P (Direction Unknown)**

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

Development of this borrow 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 borrow site expansion and potential changes in site drainage and along the access road.

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 borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow 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 borrow site and its access road.

### **Wildlife Setting**

This borrow site is located on a glaciofluvial plain containing both level and hummocky terrain. Wildlife habitat at this borrow site is composed of regenerating mixedwood forest and regenerating black spruce bog. Early

successional aspen and rose thickets make up the shrub layer with some white spruce and raspberry. This habitat type is considered common in the region. Important wildlife features at the borrow site include a small wetland that provides breeding habitat for boreal chorus frogs, regenerating shrub provides forage for moose, and berries and graminoids provide fall forage for grizzly bear. The borrow site provides gravel for grouse and mineral licks for ungulates and the Saline and Mackenzie Rivers flow nearby, indicating a higher diversity of wildlife might occur at the borrow site.

Surveys were not completed along the access road due to unsafe conditions resulting from potential for extensive downfall of trees in the area. The road will cross the same habitat types found at the borrow site and wildlife occurrence and use of the area is considered to be similar.

Key wildlife species or wildlife sign recorded at the borrow site included woodland caribou and moose. 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, wood frog, boreal chorus frog, merlin, grouse, American robin, tree swallow, alder flycatcher, orange-crowned warbler, white-throated sparrow, white-crowned sparrow and pine siskin.

An assessment of key habitat features, such as percent cover of forage species, indicated that the site provides high quality fall foraging habitat for grizzly bear and important habitat for many non-key bird species (Table 5-89). Moderate quality habitat for grizzly bear (spring forage and denning), moose and lynx was also noted.

Overall habitat quality for wildlife at this borrow site and associated access road, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was rated as moderate for wildlife. The borrow site has been previously disturbed by gravel extraction activities.

**Table 5-89: Habitat Quality for Key Wildlife Species at Borrow Site 9.017P and Associated Access Road**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>	
			Borrow Site	Access Road
Mammals	Woodland caribou	Winter foraging	Low	Low
	Moose	Foraging	Moderate	Moderate
	Grizzly bear	Denning	Moderate	Moderate
		Fall foraging	High	High
		Spring foraging	Moderate	Moderate

**Table 5-89: Habitat Quality for Key Wildlife Species at Borrow Site 9.017P and Associated Access Road (cont'd)**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>	
			Borrow Site	Access Road
Mammals (cont'd)	Marten	Foraging	Low	Low
	Lynx	Foraging	Moderate	Moderate
	Beaver	Cover	Low	Low
		Foraging	Moderate	Moderate
Birds	Scaup	Nesting	Low	Low
	Peregrine falcon	Nesting	Low	Low
	Lesser yellowlegs	Foraging	Low	Low
	Boreal chickadee	Nesting	Low	Low

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.

Based on habitat availability a variety of species might inhabit the borrow 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 5-90](#).

**Table 5-90: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.017P and Associated Access Road**

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
Wolverine	Secure	Special concern	Schedule 3 – Special concern <sup>f</sup>	Vulnerable
Woodland caribou (boreal population)	Secure	Threatened	Schedule 1 – threatened	Lower risk – least concern
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	-	-	-

**Table 5-90: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.017P and Associated Access Road (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Olive-sided flycatcher	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-
Boreal chorus frog	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 – *Species at Risk Act*  
<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.

### Wildlife Potential Effects and Mitigation

This borrow site's sensitivity to disturbance is rated as high. Overall, this borrow site and its associated access road are composed of moderate quality habitat for wildlife and the area already experiences human disturbance in the form of an existing gravel pit. Habitat types are common in the region, indicating they are not a limiting resource for wildlife. The borrow site provides high quality fall foraging habitat for grizzly bear (moderate spring forage) and moderate quality habitat for moose and lynx. In addition, moderate grizzly bear denning habitat was noted. Based on habitat types, the access road would provide similar quality habitat as the borrow site for wildlife.

General potential effects resulting from development and operation of the borrow 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 area 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 this borrow site and along the associated access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- displacement of grizzly bears from high quality foraging habitat during the fall (if site is active)

- disturbance of denning grizzly bears during winter construction and operations, resulting in potential den abandonment and bear mortality
- disturbance of nesting birds during summer and potential abandonment of nest sites
- disturbance of moose along the access road during winter
- increased 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 active denning and nesting sites, as determined during pre-construction surveys, to the extent practical
- reduce activities during the spring, summer and fall (bird nesting season and grizzly bear active period)
- 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**

The borrow site is located between the Saline River to the north and an unnamed watercourse to the south. Runoff from the borrow site is expected to flow towards the Mackenzie River. A very small unnamed watercourse flows through the borrow site, but it is likely vegetated. The area encompassing this borrow site that contributes runoff to the Mackenzie River about 16 km<sup>2</sup>.

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

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and in mean sediment concentration is expected to be limited on the Mackenzie River and on the nearby unnamed watercourse.

### **Groundwater Setting**

Shallow groundwater might provide seasonal recharge to the nearby Saline River.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

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

The potential capacity for groundwater storage and recharge might be affected as a result of alterations to local groundwater flow patterns, increases in surface water runoff and changes in springs, seeps or groundwater-fed wetlands that may be associated with the area influenced by the borrow pit development. At site locations where continuous permafrost exists, groundwater flow is seasonal and restricted to the active layer. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **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**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

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**

An unnamed watercourse originates from the southeast corner of this borrow site. The unnamed watercourse is a tributary of a second unnamed watercourse, classified as a Vegetated Channel that is crossed by the pipeline right-of-way about 750 m downstream. Vegetated Channels are poorly defined, have ephemeral flow and are dry or frozen to the bed in winter. Therefore they are unable to provide overwintering habitat and are only able to support fish during the brief period when they are flowing. The Saline River, located more than 1.5 km to the north, is the largest watercourse near the borrow site.

### **Fish and Fish Habitat Potential Impacts and Mitigation**

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment runoff.

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 borrow 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 borrow site 9.017P. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

This borrow 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 Impacts 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 borrow site was inspected as part of the borrow resource component of the field reconnaissance programs. Investigations at this borrow site included limited ground reconnaissance in 2002 and aerial overflights in 2003. This location was considered to have low potential for the discovery of heritage resources. Heritage resource sites have been previously recorded within a 5 km range of the development area, indicating prior use of this region. No new heritage resource sites were recorded as a result of the surface reconnaissance at this site.

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. Information is also 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.

## **PUBLIC INVOLVEMENT**

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

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TITLE	<b>SSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	32: Borrow Site 9.024AP

---

## OVERVIEW

Borrow source 9.024 is a glaciofluvial outwash terrace consisting of poorly to well graded, silty, stratified sand and gravel. It is located on the east bank of the Mackenzie River about 100 km southeast of Tulita, and about 750 m south of Steep Creek. It should provide good quality material, Class 2, suitable for base and surface course aggregates, embankments, or structural fill. The material might be used for pipeline right-of-way requirements.

## SITE DESCRIPTION

Borrow source 9.024 is a glaciofluvial outwash terrace. Overall, the source is about 1,000 m long (north to south) and about 500 m wide encompassing an area of about 50 ha. Borrow site 9.024AP is about 510 m wide and 540 m long encompassing an area of about 27.5 ha. See [Figure 5-127](#) for an overview map of the borrow site. See [Figure 5-129](#) for a site-specific map of the borrow site.

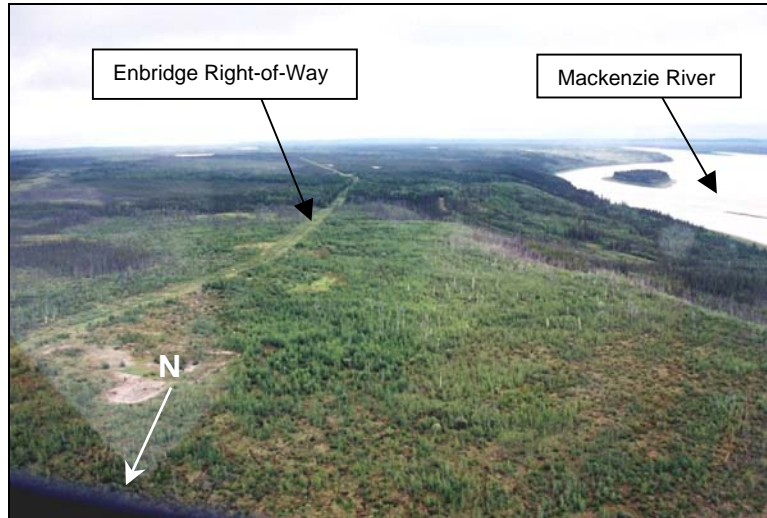
### Access

Access to borrow site 9.024AP will be from the pipeline right-of-way, which is located about 500 m to the east. The winter road is adjacent to the southwest corner of the site, and the Enbridge pipeline right-of-way traverses the eastern side of the site, as shown in [Figure 5-128](#). A winter access road, TD-B1-W-9.024AP, about 600 m in length will be required in order to travel west from the pipeline right-of-way to the site.

### Surface Conditions

Borrow site 9.024AP is located on a glaciofluvial outwash terrace that is flat to sloping and is bounded on the north and west sides by steep banks. The site area is well drained and existing borehole information suggests that the deposit is unfrozen to depths of at least 4.5 m. The granular material consists of stratified silty sand and gravel. The southern portion of the site might contain material with finer sand and silt content. The terrace is free of overburden except for a thin mat of vegetation. The site is located within a large burn and is passed on its eastern edge by the Enbridge pipeline. Immediately south and east of the deposit is a glaciolacustrine plain containing silt and clay.

Figure 5.127 as been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.



**Figure 5-128: Existing Pit on Borrow Source 9.024**

### Subsurface Information

Northern Engineering Services Company Limited completed one test pit on the source in 1975 (NESCL 1976-1977). The following test pit information has been extracted from this previous study.

Available information suggests that the granular material in this site is stratified silty sand and gravel. The sand is light brown, poorly graded, fine to coarse grained and contains varying amounts of silt. The gravel is light brown, fine to coarse grained, well graded, with occasional cobbles, and some silt.

Test pit B6-1 penetrated about 0.3 m of silty sand, underlain by about 1.5 m of fine to coarse grained, well graded gravel with some silt. The soils encountered in test pit B6-1 were unfrozen with low moisture contents. Sieve analysis on material from the test pit contained about 67% gravel, about 30% sand, and about 3% silt.

### PIT DEVELOPMENT

For borrow source 9.024 as a whole, proven reserves of 500,000 m<sup>3</sup>, and probable reserves of 1,000,000 m<sup>3</sup> of fine to medium grained, well graded sand with little gravel and variable silt content have been estimated (EBA 1988). With the expectation that the distribution and characteristics of the granular materials encountered in the boreholes are representative, an average exploitable granular material thickness of 4.5 m has been assumed. It is estimated that 6,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests, as noted, that borrow site 9.024AP is unfrozen or is frozen with low ice content. Therefore, ripping and some drilling or blasting might be required during the extraction process.

## **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.024AP. 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 borrow 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](#).

At the present time, there are no man-made sources of light at the site.

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

Potential effects on noise levels associated with the development of the borrow 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 likely not be required 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 borrow site is developed over a small glaciofluvial terrace deposit on a plateau adjacent to Steep Creek. The glaciofluvial material was deposited over a glaciolacustrine plain, and glaciolacustrine deposits might underlie the proposed access route to the borrow site. The borrow site area is bordered to the north by steep colluvial slopes of the incised Steep Creek valley, and to the west by colluvial slopes adjacent to the Mackenzie River. The site lies within a zone of extensive discontinuous permafrost.

Glaciofluvial sediments have very gentle slopes, are well to moderately well drained and have likely developed soils of the Brunisolic Order. Previous work suggests the borrow site is unfrozen to a depth of 5 m. Glaciolacustrine sediments adjacent to the borrow site are flat lying, moderately to imperfectly drained and have likely developed soils of the Cryosolic and Brunisolic Orders. Areas of permafrost within glaciolacustrine deposits commonly contain between 50 and 70% ice content by weight and cover areas between 30 to 50% of the deposits.

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

Terrain-related environmental sensitivities are not predicted for the borrow site area. Colluvial slopes adjacent to the borrow site area are likely unstable and susceptible to erosion if water from the pit is allowed to drain downslope. The short access road to the borrow site is primarily over the glaciofluvial sediments, although the road might cross glaciolacustrine sediments at its eastern end. Glaciolacustrine sediments are susceptible to thaw settlement and pond formation and altered drainage. Stripping of soil before further development could result in a reduction of soil quality by mixing.

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

## **Vegetation Setting**

The vegetation of this site has been burned and is primarily composed of a mosaic of black spruce/Labrador tea/mountain cranberry vegetation in lowland areas, and white spruce – trembling aspen – jack pine vegetation on better drained, upland areas. The northwest corner of the borrow site extends into a community of unburned upland white spruce/trembling aspen/jack pine combined with white spruce/stair-step moss, while the southern tip of the borrow site is unburned white spruce/trembling aspen/jack pine. Vegetation surveys of this site were completed in 2004.

Regenerating black spruce/Labrador tea/mountain cranberry vegetation is characterized by black spruce in both the tree layer and the shrub layer. Labrador tea is the dominant shrub along with willow, sweet gale, green alder and bog bilberry. The ground cover layer includes red bearberry and fireweed, as well as club lichens, pelt lichens and reindeer lichens.

The regenerating mixedwood is comprised of upland white spruce, trembling aspen and jack pine in the tree canopy. Green alder, prickly rose, soapberry and low-bush cranberry are common shrubs. The ground cover is comprised of mountain cranberry, bunchberry, fireweed and twinflower, while the forest floor regenerates stair-step moss and Schreber's moss. In areas of this site that have not been affected by fire, these species are more mature and present in greater abundance.

White spruce/stair-step moss vegetation communities are found in riparian zones with white spruce being the dominant species in the tree canopy. Shrubs include green alder, prickly rose, white spruce, soapberry and red-osier dogwood. Bunchberry, sedges, mountain cranberry and twinflower comprise the majority of ground cover, with stair-step moss dominating the forest floor.

Proposed access to the borrow site will be shared with the Steep Creek crossing site and will cross vegetation similar to that described for the borrow site; burned areas of primarily black spruce/Labrador tea/mountain cranberry and upland white spruce – trembling aspen – jack pine with some areas of black spruce – tamarack vegetation. Vegetation in these areas will be similar in composition to that of those described for the borrow site.

All vegetation types associated with the proposed development are common regionally, except for the northwest corner of mixed white spruce/stair-step moss vegetation, which is uncommon.

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

Development of this borrow 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 borrow site expansion and potential changes in site drainage and along the access road.

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 borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow site and along the access road might develop into a different vegetation community than what was there before development.

White spruce/stair-step moss habitats are uncommon vegetation types locally and regionally. They support tall forest stands and provide important buffers for

watercourses. Riparian drainages that support white spruce/stair-step moss, and particularly tall forest stands in these habitats, will be avoided where possible. The access right-of-way crossings of riparian areas will be narrowed as much as practical.

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

### Wildlife Setting

Wildlife habitat at this borrow site is composed of regenerating upland aspen with a secondary component of regenerating upland jack pine. The closed shrub layer is composed primarily of aspen. The habitat type is considered uncommon in the region due to the extent of fire disturbance. An important habitat feature of the borrow site is its proximity to the Mackenzie River and Steep Creek which provide important habitat for waterbirds and swallows. The watercourse valleys are most likely used as travel corridors for several species. Other important features at this site include a high density of snags that provide important nesting habitat for boreal chickadee and regenerating shrub that provides forage for moose, hare and lynx. In addition, a high cover of forbs and graminoids provides forage for grizzly bear (spring).

Key wildlife species observed at the borrow site during field surveys included woodland caribou and moose. 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 species or wildlife sign recorded at the borrow site included black bear, small mammals, and alder flycatcher.

An assessment of key habitat features, such as percent cover of forage species, indicated that the site provides high quality forage for moose, lynx and grizzly bear (spring) and high quality nesting habitat for boreal chickadee ([Table 5-91](#)). Habitat quality was generally rated as moderate to high for other wildlife species.

**Table 5-91: Habitat Quality for Key Wildlife Species at Borrow Site 9.024AP and Associated Access Road**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals	Woodland caribou	Winter foraging	Moderate
	Moose	Foraging	High
	Grizzly bear	Denning	Low
		Fall foraging	Moderate
		Spring foraging	High

**Table 5-91: Habitat Quality for Key Wildlife Species at Borrow Site 9.024AP and Associated Access Road (cont'd)**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals (cont'd)	Marten	Foraging	Moderate
	Lynx	Foraging	High
	Beaver	Cover	Low
		Foraging	Low
Birds	Scaup	Nesting	Low
	Peregrine falcon	Nesting	Low
	Lesser yellowlegs	Foraging	Low
	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.

Overall habitat quality for wildlife at this borrow site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was considered low for birds and moderate for mammals. The habitat type at the borrow site is not well represented in the region. In addition, the borrow site has been previously disturbed by a right-of-way, a winter road, fire, and an existing borrow pit.

Based on habitat availability a variety of species might inhabit the borrow 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 5-92](#).

**Table 5-92: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.024AP and Associated Access Road**

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

**Table 5-92: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.024AP and Associated Access Road (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Woodland caribou (boreal population)	Sensitive	Threatened	Schedule 1 – threatened	Lower risk – least concern
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Golden eagle	Sensitive	Not at risk	-	-
Peregrine falcon (anatum)	At risk	Threatened	Schedule 1 – threatened	
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	Not at risk	-	-
Common snipe	Sensitive	-	-	-
Black tern	Sensitive	-	-	-
Northern flicker	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Bank swallow	Sensitive	-	-	-
Barn swallow	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
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 – *Species at Risk Act*

<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.

**Wildlife Potential Effects and Mitigation**

This borrow site's sensitivity to disturbance is rated as high. It has moderate habitat value for moose. The greatest concern with developing this site is that it lies adjacent to two major valleys, which both have high value for large species. If

development does occur at this site, efforts will need to be taken to reduce effects on animal movement along Steep Creek, particularly for caribou.

Overall, this borrow site is composed of moderate to high quality habitat for wildlife. Habitat types at the borrow site are considered uncommon in the region, indicating they might be a limiting resource for wildlife. The borrow site provides high quality foraging habitat for moose, lynx, and grizzly bear (spring only), and high quality nesting habitat for boreal chickadee. The borrow site does not provide suitable denning habitat for grizzly bear.

General potential effects resulting from development and operation of the borrow site 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 area 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 borrow site and along the access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- displacement of grizzly bears from high quality foraging habitat during the spring (if site is active)
- disturbance of nesting birds near the borrow site during summer (if site is active) and potential abandonment of nest sites
- increased trapping of lynx resulting from increased access
- disturbance of moose along the access road during winter

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow 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](#)
- reduce activities during the spring, summer and fall (bird nesting season and grizzly bear active period)
- avoid known nesting sites (as determined during pre-construction surveys) and reduce clearing of riparian habitats
- 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 borrow site is located upslope of Steep Creek to the north and Mackenzie River to the west. Depending on the exact location, runoff from the borrow site might flow either to Steep Creek or directly to the Mackenzie River. The area encompassing this borrow site that contributes runoff to Steep Creek is about 150 km<sup>2</sup>.

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

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and in mean sediment concentration is expected to be limited on either the Mackenzie River or Steep Creek.

### **Groundwater Setting**

Near surface materials include mainly sand and gravel. Shallow groundwater is expected to flow westward towards the Mackenzie River. Several springs were identified in the area during the 2004 field investigation about 3 to 4 km upstream of the pipeline right-of-way crossing. Geotechnical data indicates an active layer thickness of 4.5 m.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

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

The potential capacity for groundwater storage and recharge might be affected as a result of alterations to local groundwater flow patterns, increases in surface water runoff and changes in springs, seeps or groundwater-fed wetlands that may be associated with the area influenced by the borrow pit development. At site locations where continuous permafrost exists, groundwater flow is seasonal and restricted to the active layer. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

## **Water Quality Setting**

Runoff from the borrow site might flow to Steep Creek or the Mackenzie River. Historical water quality data for Steep Creek is summarized in [Table 5-93](#).

The range of pH values, 7 to 9, was similar during all seasons, with occasional winter values and most summer values above the drinking water guideline of 8.5 ([Table 5-93](#)). The water was well-oxygenated, with the exception of occasional winter dissolved oxygen values below the minimum aquatic life guideline of 6.5 mg/L.

Major ion concentrations, as indicated by conductance levels, ranged from moderately low to high during summer, and moderate to very high during winter. A single very high total dissolved solids value measured during fall was above the drinking water guideline value. Bicarbonate, calcium and sulphate were the most abundant major ions. Total alkalinity values indicated that the water was well buffered and not sensitive to acid deposition.

The single total antimony value was above the drinking water guideline value. Single measurements of total iron and manganese were below detection limits during winter.

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

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed 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 and Steep Creek 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.

Table 5-93: Steep Creek – Water Quality

Parameter	Units	Historical Data (1973-1999) <sup>a,b</sup>											
		Summer				Fall				Winter			
		Median or Value	Min.	Max.	n <sup>c</sup>	Median or Value	n <sup>c</sup>	Median or Value	Min.	Max.	n <sup>c</sup>		
<b>Field Measured</b>													
pH	N/A <sup>d</sup>	8.8 <sup>w</sup>	7	8.9 <sup>w</sup>	5	8.4	1	8	7.1	9 <sup>w</sup>	5		
Conductance	µS/cm	308	200	690	8	-	-	468	450	870	4		
Temperature	°C	9	6.5	14	8	3.2	1	3	2	4	5		
Dissolved oxygen	mg/L	11.2	9.6	12.6	8	12.9	1	12.8	3.8 <sup>c</sup>	17	5		
<b>Conventional Parameters</b>													
Conductance	µS/cm	900	-	-	1	-	-	-	-	-	-		
Hardness	mg/L	423	-	-	1	-	-	-	-	-	-		
pH	N/A <sup>d</sup>	8.4	-	-	1	-	-	-	-	-	-		
Total alkalinity	mg/L	190	154	226	2	-	-	222	-	-	1		
Total dissolved solids	mg/L	-	-	-	-	632 <sup>w</sup>	1	-	-	-	-		
Total suspended solids	mg/L	-	-	-	-	6	1	13	-	-	1		
<b>Major Ions</b>													
Bicarbonate	mg/L	276	-	-	1	-	-	273	271	275	2		
Calcium	mg/L	103	-	-	1	-	-	97	97	98	2		
Chloride	mg/L	5	-	-	1	-	-	8	6	11	2		
Magnesium	mg/L	40	-	-	1	-	-	47	45	49	2		
Potassium	mg/L	2	-	-	1	-	-	2	-	-	1		

Table 5-93: Steep Creek – Water Quality (cont'd)

Parameter	Units	Historical Data (1973-1999) <sup>a,b</sup>									
		Summer					Fall		Winter		
		Median or Value	Min.	Max.	n <sup>c</sup>	Median or Value	n <sup>c</sup>	Median or Value	Min.	Max.	n <sup>c</sup>
<b>Major Ions (cont'd)</b>											
Sodium	mg/L	20	-	-	1	-	-	6	-	-	1
Sulphate	mg/L	200	-	-	1	-	194	191	197	2	
<b>Nutrients</b>											
Nitrate + nitrite	mg/L	-	-	-	-	-	0.1	-	-	1	
<b>Total Metals</b>											
Antimony	mg/L	-	-	-	-	<b>100<sup>w</sup></b>	-	-	-	-	
Iron	mg/L	-	-	-	-	-	<0.06	-	-	1	
Manganese	mg/L	-	-	-	-	-	<0.008	-	-	1	
<b>NOTES:</b>											
<sup>a</sup> A hyphen indicates data not available											
<sup>b</sup> Boldface indicates values are higher than water quality guideline levels.											
<sup>c</sup> n – number of samples											
<sup>d</sup> N/A – not applicable											
<sup>e</sup> Concentration higher than the relevant chronic aquatic life guideline or beyond the recommended dissolved oxygen range.											
<sup>w</sup> Concentration higher than the relevant water quality guideline.											
<b>SOURCES:</b> GeoNorth and Golder 2000; Interprovincial Pipelines Ltd. 1985; McCart 1974; McCart and McCart 1982; Reid et al. 1974; Shotton 1973; Slaney, F.F. & Company Ltd. 1974											

## **Fish and Fish Habitat Setting**

There are no aquatic features within the boundaries of this borrow site. The closest watercourses are Steep Creek and the Mackenzie River, each located about 500 m from the site.

Steep Creek, also known as Birch Island Creek, is crossed by the pipeline 500 m east of the borrow site. It is classified as an Active I Channel. Active I Channels have perennial flow and are not expected to freeze to the bed during the winter.

Fish species captured or reported to have been captured in Steep Creek include Arctic grayling, longnose sucker and slimy sculpin northern pike, burbot and lake chub. Bull trout have been captured at the confluence of Steep Creek and the Mackenzie River. However, bull trout have not been reported in any of the other watercourses near Steep Creek.

The wetted channel widths at the crossing location ranged from 5.5 to 14.0 with maximum depths of 0.41 m. Instream habitat was mainly comprised of rapids and riffles, interspersed with shallow and moderate-depth runs. Boulders were the dominant substrate type, with a mixture of cobble and gravel. Unstable or slumping banks were observed along 38% of the left downstream bank and 6% of the right downstream bank. Abundant instream cover was provided primarily by boulder gardens and turbulence. Riparian vegetation was predominantly grasses, forbs and shrubs near the watercourse.

Open-water areas and flow with dissolved oxygen levels near saturation (13.8 mg/L) were reported in winter surveys conducted in winter 2002. Open water and flow was maintained by water contributions from three groundwater springs about 3 to 4 km upstream of the crossing location.

Riffle and shallow run habitats with clean gravel would provide habitat for Arctic grayling and sucker spawning (Table 5-94). The availability of run habitat and abundant instream cover would provide fry and juvenile rearing habitat for most of the major species in the watercourse, except northern pike, which prefer slower flowing habitats with aquatic vegetation. The presence of northern pike suggests that rearing and possibly spawning habitat is available elsewhere in the watercourse.

Contributions from groundwater springs upstream of the pipeline crossing maintain flow despite shallow depths. These together with high dissolved oxygen levels made the reach near the crossing location suitable as overwintering habitat. The area also was suitable for egg incubation for fall spawning species.

**Table 5-94: Potential Use of Steep Creek at Site RPR-371**

Species <sup>a</sup>	Overwintering <sup>b</sup>	Spawning and Incubating	Rearing	Adult Feeding and Holding
Arctic grayling	Yes	Yes	Yes	Yes
Northern pike	No	No	Yes	Yes
Sucker species	Yes	Yes	Yes	Yes
Bull trout	Yes	Yes	Yes	No
Whitefish species	Yes	Yes	Yes	Yes
Burbot	Yes	No	Yes	No

NOTES:  
<sup>a</sup>Assessment incorporates preliminary analysis of April 2004 data.  
<sup>b</sup>Of the species and species groups listed only Arctic grayling, northern pike and burbot have been confirmed in the watercourse.

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

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment runoff.

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 borrow 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 borrow site 9.024AP. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

This borrow 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 borrow site was inspected as part of the borrow resource component of the 2003 field reconnaissance programs. This location was considered to have high 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 new heritage resource sites were recorded as a result of the surface reconnaissance at this site.

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. Information is also 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.

## **PUBLIC INVOLVEMENT**

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

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TITLE	<b>SSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	33: Borrow Site 9.038PB

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## OVERVIEW

Borrow source 9.038 is a longitudinal segment of a glaciofluvial plain consisting of stratified well graded sand and gravel. It is located about 90 km north of Wrigley and 8.0 km northwest of the Blackwater River, on the north side of the Mackenzie River channel. This borrow source is on Tulita District private land within the Deh Cho Region (DCR). It should provide fair quality material, Class 3, suitable for general fill. The material might be used for pipeline right-of-way requirements.

## SITE DESCRIPTION

Borrow source 9.038 is a large longitudinal segment of a glaciofluvial plain, which is comprised in part of sand and gravel deposits. Two borrow sites are located on this source, borrow site 9.038PA on the southern portion of the plain, and borrow site 9.038PB on the northern portion. The glaciofluvial plain is about 4.0 km in length and ranges from about 305 m to 760 m in width. The total area of the glaciofluvial plain is about 220 ha. Borrow site 9.038PB is about 420 m wide and 945 m long encompassing an area about 39.5 ha. See [Figure 5-130](#) for an overview map of the borrow site. See [Figure 5-132](#) for a site-specific map of the borrow site.

### Access

Access to borrow site 9.038PB will be from the pipeline right-of-way, which is located about 3.0 km to the northeast. A new winter access road, G-B2-W-9.038PBa, about 3.9 km in length will be required in order to travel southwest from the pipeline right-of-way to borrow site 9.038PB. This access will cross over the winter road, which is located about 2.0 km northeast of the site.

### Surface Conditions

Borrow site 9.038PB is located on the northern portion of a north-south trending glaciofluvial plain that is a broad, low feature rising about 3.0 m to 4.0 m above the adjacent landscape. A small tributary stream crosses the northern tip of the glaciofluvial plain northeast of borrow site 9.038PB. The material in the site is expected to be fair quality stratified, well graded, sand and gravel. The terrain to the east of the borrow site is slightly depressional, exhibiting thermally sensitive features such as small ponds and muskeg bogs, as shown in [Figure 5-131](#). Drainage on the borrow site is fair to good with an organic topsoil layer that is relatively shallow.

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**Figure 5-131: Small Ponds Bordering Borrow Site 9.038PB**

### **Subsurface Information**

No boreholes were completed previously on borrow site 9.038PB, although Public Works Canada completed five boreholes in the area of borrow site 9.038PA (PWC 1981). The material in borrow site 9.038PB is expected to be similar to the material found in borrow site 9.038PA.

Available information suggests that the material in borrow site 9.038PB consists of glaciofluvial deposits that vary from silty sands to gravelly sands to sandy gravels. Little or no permafrost is expected in the material with moisture contents less than five percent.

### **PIT DEVELOPMENT**

Limited subsurface information makes it difficult to estimate reserves. Average exploitable granular material thickness is yet to be determined accurately. It is estimated that 8,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.038PB is unfrozen or frozen with low ice content. Therefore, ripping and some drilling or blasting might be required during the extraction process.

### **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.038PB. This information includes data collected during the 2004 field.

## **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 borrow 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](#).

At the present time, there are no man-made sources of light at the site.

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

Potential effects on noise levels associated with the development of the borrow 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 likely not be required 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 borrow site lies within an extensive glaciofluvial outwash plain within the zone of extensive discontinuous permafrost. Less than 10% of the area of the borrow site might be underlain by permafrost. If present, ice contents might vary from 5 to 20%, by weight. The borrow site area will be separated from the pipeline right-of-way by a glaciolacustrine plain that is locally overlain by organic deposits. Access roads to the borrow site will cross the glaciolacustrine plain. Permafrost might be encountered within 30 to 50% of the area of glaciolacustrine

plain. Areas that are overlain by organics are more likely to be underlain by permafrost (70 to 100% of area) and ice contents might range from 1000 to 2000%, by weight in the organics and 50 to 70%, by weight in glaciolacustrine.

Glaciofluvial sediments form a flat-topped plain with moderately sloping sides. These sediments are well drained and have likely developed Orthic Eutric Brunisols. Previous geotechnical work suggests the surficial materials are unfrozen or frozen with low ice contents.

Glaciolacustrine deposits between the borrow site and the pipeline form an undulating plain that is moderately well to imperfectly-drained. Glaciolacustrine deposits have likely developed soils of the Brunisolic and Cryosolic Orders. Low lying depressions have commonly developed organic fen that are very poorly drained. Fen areas have likely developed soils of the Cryosolic or Organic Orders. Permafrost might be absent from very poorly drained areas with sedges.

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

Terrain-related environmental sensitivities are not predicted for the borrow site area. Access roads might be subject to erosion where they ascend the small rise at the edge of the glaciofluvial deposits. Access roads crossing the glaciolacustrine plain are subject to drainage disruption and pond formation. Stripping of soil before further development could result in a reduction of soil quality by mixing.

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

### **Vegetation Setting**

This borrow site occurs in an area of regenerating upland white spruce – trembling aspen – jack pine forest. The area was burned in 1994-1995. Vegetation surveys were completed at the borrow site in 2004.

Tree cover is moderate and is dominated by short, about 2 m tall, jack pine and Alaska birch, with a smaller component of short white spruce. Also in this layer, but with a low cover, are taller green alder.

Access to the borrow site does not follow any existing disturbance. Access will cross undisturbed areas of regenerating upland jack pine, upland white spruce – trembling aspen – jack pine, and regenerating low-lying areas of black spruce/Labrador tea/mountain cranberry and shrub fen vegetation type. Small areas of tall mature trees might occur along the route as a result of fire skips. Most of the route will cross areas of upland white spruce – trembling aspen – jack pine, and regenerating low lying areas of black spruce/Labrador tea/mountain cranberry.

All of the vegetation types of the proposed site and access are common. However, as much of the surrounding landscape has burned recently, areas of mature, seed producing tall trees are a vegetation community of concern.

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

Development of this borrow 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 borrow site expansion and potential changes in site drainage and along the access road.

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 borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow 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 borrow site and its access road.

### **Wildlife Setting**

Regional biophysical information is addressed in [Section 8](#).

### **Wildlife Potential Effects and Mitigation**

Regional biophysical effects and mitigation is addressed in [Section 8](#).

General potential effects resulting from development and operation of the borrow 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 borrow site and along the access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears

- displacement of grizzly bears from high quality foraging habitat during the spring
- disturbance of nesting birds near the borrow site during summer (if site is active) and potential abandonment of nest sites
- displacement of caribou from high quality foraging habitat during winter
- disturbance of caribou and disruption of movements
- increased hunting/poaching of wildlife such as marten resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow 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 active nesting 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 associated access roads by project staff while on the job site
- establish and enforce regulations to prevent harassment of wildlife

### **Hydrology Setting**

The borrow site is located about 0.5 km upslope of an unnamed watercourse. The unnamed watercourse discharges into the Mackenzie River. Part of the runoff from the borrow site could flow toward a series of small lakes located east of the borrow site. The area encompassing this borrow site that contributes runoff to the unnamed watercourse at its mouth into Mackenzie River is 72 km<sup>2</sup>.

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

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and in mean sediment concentration on the unnamed watercourse and on Mackenzie River are expected to be limited.

### **Groundwater Setting**

Surface materials are expected to include silt, sand and clay. Shallow groundwater is expected to follow topography and flow southwestwards towards the nearby watercourse.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

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

The potential capacity for groundwater storage and recharge might be affected as a result of alterations to local groundwater flow patterns, increases in surface water runoff and changes in springs, seeps or groundwater-fed wetlands that may be associated with the area influenced by the borrow pit development. At site locations where continuous permafrost exists, groundwater flow is seasonal and restricted to the active layer. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **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**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters

- maintaining a vegetated buffer between the site and local waterbodies, where practical

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, limited effects are expected on water quality.

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

There are no aquatic features within the boundaries of this borrow site. The closest aquatic features are two small unnamed lakes located about 100 m and 250 m away. An unnamed watercourse is located about 250 m from the western site boundary.

Typically small lakes such as these are shallow and freeze to the bottom in winter. Therefore, they are unable to support large bodied fish all year. The unnamed watercourse, classified as a Vegetated Channel, will be crossed by the pipeline right-of-way about 5 km northwest of the borrow site. Vegetated Channels have poorly defined channels, ephemeral flows and are likely to be dry or frozen to the bed in winter. Therefore they are unlikely to provide fish habitat except for the brief period when they are flowing.

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

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment runoff.

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 borrow 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 borrow site 9.038PB. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

According to the SPDLUP, this site is located within an area designated for multiple use. Multiple use areas have no restrictions to development as long as their effects on resource users and values are reduced.

This site is also located within the DCR and may be governed by the June 2005 Draft Land Use Plan, *Respect for the Land: The Dehcho Land Use Plan*.

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

Because this site is located within a proposed multiple use area, no effects on protected areas are expected.

### **Heritage Resources Setting**

This borrow site was inspected as part of the borrow resource component of the field reconnaissance programs. Investigations at this borrow site included limited ground reconnaissance in 2002 and aerial overflights in 2003. This location was considered to have high potential for the discovery of heritage resources. No heritage sites were recorded as a result of the surface reconnaissance and no heritage resource sites have been previously recorded in the immediate area.

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. Information is also 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.

## **PUBLIC INVOLVEMENT**

No concerns regarding this borrow site have been expressed by the local SSA communities in meetings or discussions with Imperial. However, during the MVEIRB Environmental Assessment of the proposed Field Geotechnical Investigation Program in the DCR, the communities of Fort Simpson and Wrigley expressed concern over development of this borrow site. According to these communities, this area is an extremely significant cultural meeting place and has many spiritual sites (sacred rock, people turn to stone), harvest areas (moose pastures and caribou migration zone) as well as a managed candidate protected area. The public involvement activities are documented in [Section 10](#) of this application.

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TITLE	<b>SSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	34: Borrow Site 9.038PA

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## OVERVIEW

Borrow source 9.038 is a longitudinal segment of a glaciofluvial plain consisting of stratified well graded sand and gravel. It is located about about 90 km north of Wrigley and 6.5 km northwest of the Blackwater River, on the north side of the Mackenzie River channel. This borrow source is on Tulita District private land within the DCR. It should provide fair quality material, Class 3, suitable for general fill. The material might be used for pipeline right-of-way requirements.

## SITE DESCRIPTION

Borrow source 9.038 is a large longitudinal segment of a glaciofluvial plain, which is comprised in part of sand and gravel deposits. Two borrow sites are located on this source, borrow site 9.038PA on the southern portion of the plain, and borrow site 9.038PB on the northern portion. The glaciofluvial plain is about 4.0 km in length and ranges from about 305 m to 760 m in width. The total area of the glaciofluvial plain is about 220 ha. Borrow site 9.038PA is about 395 m wide and 435 m long encompassing an area about 15.3 ha. See [Figure 5-133](#) for an overview map of the borrow site. See [Figure 5-135](#) for a site-specific map of the borrow site.

### Access

Access to borrow site 9.038PA will be from the pipeline right-of-way, which is located about 3.0 km to the northeast. A new winter access road, G-B2-W-9.038PAa, about 5.0 km in length will be required in order to travel southwest from the pipeline right-of-way to the borrow site. About 1.0 km of this access is along the winter road, which is located about 2.0 km northeast of the site.

### Surface Conditions

Borrow site 9.038PA is located in the southern portion of a north-south trending glaciofluvial plain that is a broad, low feature rising about 3.0 m to 4.0 m above the adjacent landscape. The southern perimeter of the borrow site consists of the steep Mackenzie River bank, as shown in [Figure 5-134](#). The material in the site is expected to be fair quality stratified, well graded, sand and gravel. The terrain to the east of the borrow site is slightly depressional, exhibiting thermally sensitive features such as small ponds and muskeg bogs. Drainage on the borrow site is fair to good with an organic topsoil layer that is relatively shallow.

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**Figure 5-134: Looking East to Borrow Site 9.038PA on Mackenzie River Embankment**

### **Subsurface Information**

Public Works Canada completed five boreholes on the southern portion of borrow source 9.038, although no borehole logs are available for this site (PWC 1981).

Available information suggests that the borrow material in borrow site 9.038PA consists of glaciofluvial deposits that vary from silty sands to gravelly sands to sandy gravels. Little or no permafrost is expected in the material with moisture contents less than five percent.

### **PIT DEVELOPMENT**

Limited subsurface information makes it difficult to estimate reserves. Average exploitable granular material thickness is yet to be determined accurately. It is estimated that 8,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.038PA is unfrozen or frozen with low ice content. Therefore, ripping and some drilling or blasting might be required during the extraction process.

### **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.038PA. 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 borrow 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](#).

At the present time, there are no man-made sources of light at the site.

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

Potential effects on noise levels associated with the development of the borrow 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 likely not be required 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 borrow site lies within an extensive glaciofluvial outwash plain within the zone of extensive discontinuous permafrost. Less than 10% of the area of the borrow site might be underlain by permafrost. If present, ice contents might vary from 5 to 20%, by weight. The borrow site area is separated from the pipeline right-of-way by a glaciolacustrine plain that is locally overlain by organic deposits. Access roads to the borrow site will cross the glaciolacustrine plain. Permafrost might be encountered within 30 to 50% of the area of glaciolacustrine

plain. Areas that are overlain by organics are more likely to be underlain by permafrost (70 to 100% of area) and ice contents might range from 1000 to 2000%, by weight in the organics and 50 to 70%, by weight in glaciolacustrine.

Glaciofluvial sediments form a flat-topped plain with moderately sloping sides. These sediments are well drained and have likely developed Orthic Eutric Brunisols. Previous geotechnical work suggests the surficial materials are unfrozen or frozen with low ice contents.

Glaciolacustrine deposits form an undulating plain that is moderately well to imperfectly-drained. Glaciolacustrine deposits have likely developed soils of the Brunisolic and Cryosolic Orders. Low lying depressions have commonly developed organic fen that are very poorly drained. Fen areas have likely developed soils of the Cryosolic or Organic Orders. Permafrost might be absent from very poorly drained areas with sedges.

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

Terrain-related environmental sensitivities are not predicted for the borrow site area. Access roads might be subject to erosion where they ascend the small terrace step at the edge of the glaciofluvial deposits. Access roads crossing the glaciolacustrine plain are subject to drainage disruption and pond formation. Stripping of soil before further development could result in a reduction of soil quality by mixing.

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

### **Vegetation Setting**

The borrow site and surrounding area were burned in 1994-1995. The dominant vegetation on three quarters of the borrow site is young, regenerating upland white spruce – trembling aspen – jack pine forest. The remainder of the borrow site is regenerating trembling aspen/prickly rose forest. Vegetation surveys were completed at the borrow site in 2004.

The upland white spruce – trembling aspen – jack pine forest area is characterized by a short tree layer, averaging about 2 m tall, dominated by jack pine and a smaller component of Alaska birch. Shrub species have a moderate cover, with green alder and various willow species the most common.

The regenerating trembling aspen/prickly rose forest is also composed of a short tree layer. Alaska birch dominates the area and jack pine is a smaller component. Willow species are the most common shrub and have a moderate cover.

Access to the borrow site crosses a mosaic of regenerating forest types consisting of upland trembling aspen/prickly rose and upland white spruce – trembling aspen – jack pine forest, on slightly elevated areas, and black spruce/Labrador

tea/mountain cranberry forest, black spruce/cloudberry – lichen bog and shrub fen, in wetter low lying areas. A few small areas of mature tall trees, missed by the fire, also occur. Except for a small segment following the existing winter road, the proposed access is undisturbed and vegetation clearing will be required.

All of the vegetation types on the borrow site and access road are common. Stands of mature tall trees are uncommon. In addition, black spruce/cloudberry – lichen bog is a vegetation type of concern due to sensitivity to disturbance.

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

Development of this borrow 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 borrow site expansion and potential changes in site drainage and along the access road.

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 borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow 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 borrow site and its access road.

### **Wildlife Setting**

Regional biophysical information is addressed in [Section 8](#).

### **Wildlife Potential Effects and Mitigation**

Regional biophysical effects and mitigation are addressed in [Section 8](#). General potential effects resulting from development and operation of the borrow 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 borrow site and along the access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- displacement of grizzly bears from high quality foraging habitat during the spring
- disturbance of nesting birds near the borrow site during summer (if the site is active) and potential abandonment of nest sites
- increased hunting/poaching of wildlife such as marten resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow site and access road development and operations. Specifically, the following mitigation measure is considered important for this site: developing and implementing a waste management plan.

### **Hydrology Setting**

The borrow site is located about 500 m upslope on the east bank of the Mackenzie River. Part of the runoff from the borrow site could flow west towards an unnamed watercourse located about 1 km from the borrow site. The area encompassing this borrow site that contributes runoff to the unnamed watercourse at its mouth into the Mackenzie River is about 74 km<sup>2</sup>.

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

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and an increase in mean sediment concentration on the unnamed watercourse and on the Mackenzie River are expected to be limited.

### **Groundwater Setting**

Surface materials are expected to include silt, sand and clay. Groundwater is expected to flow southwards towards the Mackenzie River.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

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

The potential capacity for groundwater storage and recharge might be affected as a result of alterations to local groundwater flow patterns, increases in surface water runoff and changes in springs, seeps or groundwater-fed wetlands that may be associated with the area influenced by the borrow pit development. At site locations where continuous permafrost exists, groundwater flow is seasonal and restricted to the active layer. The removal of borrow resources also has potential

to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **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**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

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**

There are no aquatic features within the boundaries of this borrow site. The closest aquatic feature is a small unnamed lake located about 100 m to the north of the borrow site and an unnamed watercourse located 750 m away from the borrow site. Typically small lakes such as this one are shallow and freeze to the bottom in winter. As such they are unable to support large bodied fish all year.

The unnamed watercourse, classified as a Vegetated Channel, will be crossed by the pipeline right-of-way about 6 km northwest of the borrow site. Vegetated Channels have poorly defined channels, ephemeral flows and are likely to be dry or frozen to the bed in winter. Therefore they are unlikely to provide fish habitat except for the brief period when they are flowing.

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

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment runoff.

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 borrow 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 borrow site 9.038PA. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

According to the SPDLUP, this site is located within an area designated for multiple use. Multiple use areas have no restrictions to development as long as their effects on resource users and values are reduced.

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

Because this site is located within a proposed multiple use area, no effects on protected areas are expected.

### **Heritage Resources Setting**

This borrow site was inspected as part of the borrow resource component of the 2003 field reconnaissance programs. This location was considered to have high potential for the discovery of heritage resources. Heritage resource sites were previously recorded within a 5 km range of the development area, indicating prior use of this region. No new heritage resource sites were recorded as a result of the surface reconnaissance at this site.

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. Information is also 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.

### **PUBLIC INVOLVEMENT**

No concerns regarding this borrow site have been expressed by the local SSA communities in meetings or discussions with Imperial. However, during the MVEIRB Environmental Assessment of the proposed Field Geotechnical Investigation Program in the DCR, the communities of Fort Simpson and Wrigley expressed concern over development of this borrow site. According to these communities, this area is an extremely significant cultural meeting place and has many spiritual sites (sacred rock, people turn to stone), harvest area (moose pastures and caribou migration zone) as well as a managed candidate protected area. Imperial plans to provide further clarification and conduct an evaluation of these concerns. The public involvement activities are documented in [Section 10](#) of this application.

Figure 5.135 as 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.

