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TITLE	<b>GSA Private Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	10: Borrow Site 4.100P

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## OVERVIEW

Borrow source 4.100 is a shale bedrock outcrop that is located about 16 km north of the confluence of the Mackenzie and Thunder Rivers.

This source should provide Class 5 material (bedrock) that will be crushed to provide fill for pipeline right-of-way requirements.

## SITE DESCRIPTION

Borrow source 4.100 is a sharply defined bedrock ridge that is located about 27.5 km southeast of Travaillant Lake. Borrow site 4.100P is about 550 m wide and 600 m long, encompassing an area of about 32.9 ha. [Figure 5-41](#) is an overview map of the borrow site. [Figure 5-44](#) is a site-specific map of the borrow site.

### Access

Access to borrow site 4.100P will be from the pipeline right-of-way, which is located about 1.6 km to the southwest. A winter access road, G-B1-W-4.100P, about 2.8 km in length, will be required in order to travel north from the pipeline right-of-way to the borrow site.

### Surface Conditions

Borrow site 4.100P is a bedrock ridge. The material in the source is soft shale that is suitable for fair-quality borrow and may be used in sub-grade construction. Overburden on the borrow site consists of clay and weathered shale varying in thickness from 2.1 to 4.6 m. Overburden thickness increases quickly away from the ridge. Drainage on the borrow site is fair to good.

### Subsurface Information

One borehole on the source was completed in 1973 (EBA 1973). Another seven boreholes were completed on the source in 1974 (PWC 1974). See [Figure 5-42](#). Of these, all of the boreholes lie within borrow site 4.100P. The following borehole information has been extracted from these previous studies.

The borehole completed by EBA penetrated about 1.2 m of clay underlain by about 7.9 m of shale. The shale was light brown-to-brown, soft to medium hard material with low moisture content.

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**Figure 5-42: Cutline Evidence of Previous Investigation on Borrow Source 4.100**

The boreholes completed by Public Works Canada encountered peat and clay overburden thicknesses that ranged from 1.5 to 4.5 m. In all of the boreholes, soft to hard shale ranging in thickness from 3.0 to 10.7 m was encountered below the overburden. Material in the boreholes was frozen with low ice contents.

## **QUARRY DEVELOPMENT**

Available reserves of bedrock near the proposed quarry were considered to be unlimited (Hardy 1986). Up to 32,000 m<sup>3</sup> of rock might be removed from a part of the deposit for project purposes. Although the extent and nature of the rock occurrence at borrow site 4.100P require further investigation, only a small part of the overall deposit will be engaged by the proposed quarry development.

## **ENVIRONMENT**

The following topics provide specific biophysical and human environment setting effects and mitigation information for borrow site 4.100P. This information includes data gathered during the 2004 field studies.

### **Biophysical Environment**

#### **Air Quality Setting**

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

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

Potential effects on air quality associated with the development of the borrow source, 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 the regional setting for the GSA described in [Section 8](#).

### **Noise Setting**

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

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

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

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

This borrow site lies east of the pipeline right-of-way in an area of rolling moraine. Wet, lowland areas between upland moraine hills are typically composed of organic veneers of fen over moraine. Rolling moraines typically have very gentle to gentle slopes and are commonly well drained. The borrow site lies within a zone of extensive discontinuous permafrost and is characterized by soils of the Cryosolic Order.

The borrow site is associated with a small hill in an area of rolling moraine. The small hill likely marks a near-surface exposure of bedrock that is concealed by a cover of till. The hill is bordered by flat lowland areas covered by organic fens. The access road to the borrow site crosses flat lying fens and areas of rolling moraine. The moraine typically has very gentle to gentle slopes, although the access road might locally have to ascend moderate slopes. A slump structure near a cut line in an area of rolling moraine was found during an aerial survey of the region surrounding the borrow site.

Two pits were dug to determine soil conditions. The first pit was excavated in the mid-slope of the hill assumed to mark the bedrock source. A Brunisolic Eutric Turbic Cryosol was developed over moderately well drained surficial materials. The sample site had a moderate slope. Permafrost was found at a depth of 1.0 m in August 2004.

A second pit was excavated in an organic fen that lies at the base of the hill along the access road route. The surface of the fen is level and poorly drained. A Terric Mesic Organic Cryosol was developed over the surficial materials. Permafrost was found at a depth of 45 cm in August 2004.

## Soils, Landforms and Permafrost Potential Effects and Mitigation

Potential effects on soils, landforms and permafrost at this site are expected to be limited. Erosion and thaw settlement are not expected to occur because the bedrock borrow sites are generally stable and are typically well drained. Stripping of soil before development could result in a reduction of soil quality by mixing.

The access road to the borrow site crosses level fens and gently rolling moraine. Local areas of moderate slope along the access route might be susceptible to erosion. The occurrence of slump structures in the area also suggests areas of steeper slope near surface disturbances might be subject to slope instability.

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

## Vegetation Setting

This borrow site covers an area of both patterned graminoid wetland in the level, lower lying areas of the eastern half of the proposed site, and upland white spruce/Alaska birch on the mid to upper slopes, and crest of the hill in the western half of the site (see [Figure 5-43](#)). Both vegetation types were surveyed during rare plant and ecological land classification surveys in the summer of 2004. The access road will cross graminoid wetland, ground birch/water sedge wetland, upland white spruce/Alaska birch and black spruce/Labrador tea/mountain cranberry vegetation types.



**Figure 5-43: Example of Vegetation at Borrow Site 4.100P**

The areas of forested vegetation are characterized by an open canopy of Alaska birch, and white and black spruce. The forest stand appears to be young with a

diverse canopy structure and all tree species recorded as being on average 5.0 m tall. Species characteristic of the site include understory white spruce and Alaska birch, green alder, Labrador tea, mountain cranberry, bog bilberry and red bearberry. No rare plants were identified in the areas of upland white spruce/Alaska birch.

The wetland is composed of ridges and wet areas with distinct vegetation composition. Ridges are characterized by an open black spruce canopy, with trees averaging 5.0 m in height. The associated understory vegetation is dominated by bog bilberry, northern Labrador tea and lichens, with occasional shrubby cinquefoil. The wet areas include small patches of open water and are dominated by graminoid species, in particular water sedge and cotton grasses. The rare plant survey of the patterned graminoid wetland identified potentially rare sedge species at the site. This field identification is pending confirmation subject to expert appraisal. In patterned fens similar to this one, rare plants (circumpolar sedge and weak sedge) were observed during preliminary rare plant surveys in 2003 and in follow-up surveys in 2004.

### **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 in the construction phase of the borrow site, 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 to the borrow site and along the access road. Effects on vegetation for the borrow site and access road will persist into the far future (effect extends beyond 30 years past decommissioning and abandonment) given the slow rate of vegetation growth in the North. When the site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow site and 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 along the access road.

### **Wildlife Setting**

Wildlife habitat at this borrow site consists of a small hill covered with open, mature mixedwood (white spruce-Alaska birch) forest. The hill is surrounded by open black spruce forest. The upland mixedwood forest is considered less

common in the region, whereas the black spruce forest is widely distributed in the GSA. Shrub cover in the upland forest is open and consists of alder and willow. A noteworthy habitat feature at the site is the presence of abundant coarse woody debris. No existing disturbances occur at the site.

Moose was the only key wildlife species noted at the site during field surveys. Key species were 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 recorded included snowshoe hare and red squirrel. The borrow site provides high-quality denning and foraging habitat for grizzly bears, as well as high-quality winter foraging habitat for moose, marten and lynx (Table 5-25) based on an assessment of key habitat features, such as, percent cover of forage species. Habitat quality for caribou and boreal chickadee was considered moderate.

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 moderate to high for mammals and high for birds. The upland mixedwood forest is uncommon in the region and provides important habitat for several bird and mammal species.

**Table 5-25: Habitat Quality for Key Wildlife Species at Borrow Site 4.100P**

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

Some species-at-risk, such as sensitive or threatened species, might also occur at the borrow site. Species-at-risk that were observed, or that might occur based on habitat availability, are summarized in [Table 5-26](#).

Species with regulatory status designation are those that either COSEWIC or the Government of the Northwest Territories has ranked as sensitive to disturbance. They also include species listed under SARA and the IUCN *Red List of Threatened Species*.

**Table 5-26: Species-at-Risk That Were Observed or That Might Occur at Borrow Site 4.100P**

Species	Status <sup>b</sup>			
	RWED <sup>c</sup>	COSEWIC <sup>d</sup>	SARA <sup>e</sup>	IUCN <sup>f</sup>
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern <sup>a</sup>	Lower risk – least concern
Northern flying squirrel	Sensitive	-	-	Lower risk – least concern
Woodland caribou (boreal population)	Sensitive	Threatened	Schedule 1 – threatened	Lower risk – least concern
Wolverine	Secure	Special concern	Schedule 3 – special concern <sup>a</sup>	Vulnerable
Blackpoll warbler	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Golden eagle	Sensitive	Not at risk	-	-
Gray-headed chickadee	May be at risk	-	-	-
Northern flicker	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-

NOTE:  
<sup>a</sup>Indicates that status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation, and final ministerial approval.  
<sup>b</sup>A hyphen indicates no status has been assigned for that species.  
<sup>c</sup>RWED – Resources, Wildlife and Economic Development  
<sup>d</sup>COSEWIC – Committee on the Status of Endangered Wildlife in Canada  
<sup>e</sup>SARA – *Species At Risk Act*  
<sup>f</sup>IUCN – IUCN–The World Conservation Union

## Wildlife Potential Effects and Mitigation

### *Mammals*

Although this borrow site provides important habitat for a number of mammal species, vegetation clearing at the borrow site will only result in the loss of a small amount of habitat for wildlife. However, the upland mixedwood habitat is

considered less common in the region and provides higher-quality habitat for various mammals.

In addition to direct habitat loss, caribou, moose, marten and lynx might be affected by sensory disturbance during winter, resulting in displacement of some individuals from the vicinity of work sites. This will result in some habitat loss and potential disruption of wildlife movements. These effects will be localized, involve a small number of animals, and be limited to the duration of borrow site operations, resulting in no long-term effect on wildlife populations. Because sensory disturbance will primarily occur during winter, grizzly bears will likely not be displaced from the vicinity of the borrow site during their active period.

The borrow site also provides high-quality denning habitat for grizzly bears. As a result, there is a potential that bears might den in the area. No den sites were reported during site surveys. Prior to clearing, a survey of the site will be performed to identify any grizzly bear dens.

Access road development could result in increased trapping of marten and lynx, as well as increased hunting and predation of caribou and moose, especially during winter. In addition, animals could be killed or injured by collisions with vehicles. Prohibiting recreational use of the access road by project staff while on the job site, and enforcing speed limits, will reduce potential wildlife mortality. In addition, reclamation of the access road following borrow pit development, where agreed upon through community consultation and development agreements, will reduce potential long-term mortality of wildlife.

Implementation of general mitigation measures, outlined in [Section 8](#), will reduce potential effects on mammals during borrow site and access road development and operations.

### ***Birds***

Although this borrow site provides habitat for several migratory bird species, they will be absent from the borrow site area from October to April and thus will not be affected by sensory disturbance during winter operations. Little sensory disturbance will occur at the borrow site during the spring and summer nesting season. Effects on migratory species are therefore limited primarily to direct loss of nesting habitat. Clearing will result in the loss of a small amount of habitat relative to habitat availability within the GSA. However, the upland mixedwood forest is considered less common in the region and of higher value to wildlife.

Resident species such as the boreal chickadee will be affected during winter by noise and visual disturbances during site clearing, borrow site excavation, and reclamation activities. These effects might result in the displacement of some birds from the immediate vicinity of work sites. However, these effects will be localized and limited to the duration of borrow site operations, resulting in little long-term effect on bird populations.

Because clearing and excavation activities will primarily occur during the winter, development of the borrow site and access road will not disturb migratory bird nests. However, work activities might overlap with the early nesting period of some resident birds, such as owls. Nesting birds will likely avoid the borrow site if clearing or excavation activities are underway. As a result, little or no bird mortality is expected to occur because of activities at the borrow site and along the access road.

Implementation of general mitigation measures, outlined in [Section 8](#), will reduce potential effects on birds during borrow site development and operations.

### **Hydrology Setting**

There are several unnamed lakes in and near the site. The site is located on a ridge, with runoff from the site flowing towards potentially three headwater basins.

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

Changes in runoff coefficients might occur with the development of the site. Runoff discharge and velocity will be greater in areas where vegetation has been removed and the land surface grade. An increased runoff coefficient resulting from operations at the site is not expected to increase water levels in local waterbodies.

### **Groundwater Setting**

Permafrost was found at a depth of 45 cm at this site. The presence of groundwater related features at this site has not been determined. Groundwater flow would be expected to be seasonal and restricted to active layers. Regional groundwater data is described in [Section 8](#).

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

The removal of borrow materials has potential to reduce or remove an area of groundwater storage and recharge. This could result in alterations to groundwater flow patterns, increases in surface water runoff and changes to springs, seeps or groundwater-fed wetlands associated with this area of groundwater recharge. At site locations where continuous permafrost exists, groundwater flow is seasonal and restricted to the active layer. The removal of borrow material also has potential to result in siltation of shallow aquifers, where present, because of an increased sediment load in surface waters recharging the aquifer. These effects can be effectively managed by the implementation of the following mitigation measures:

- maintaining sufficient permeable surface area to permit groundwater recharge in these areas, as necessary

- implementing drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **Water Quality Setting**

Water quality data for this borrow site is expected to be similar to regional GSA 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 borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs due to 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

The effects on runoff and suspended sediment concentration were assessed on a site-specific basis and found to result in an increase of less than 2.0% in mean annual runoff and less than 10 mg/L in mean annual sediment concentration.

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

A small unnamed lake is located about 50 m north of the site boundary and a series of unnamed lakes is located about 0.5 km to the east. The small lake is joined to the series of lakes by an unnamed watercourse that passes by the northeast corner of the site boundary. The classification of the watercourse is not known, but it is likely a vegetated or Active II channel. Vegetated and Active II channels exhibit ephemeral or intermittent flows and are typically dry or frozen to the bottom in winter. The depth of the lakes or their ability to support fish is not known. The lakes are connected to the Thunder River drainage. The Thunder River and connecting waterbodies support a diverse fish community including Arctic grayling, broad whitefish, lake chub, lake trout, lake whitefish, longnose sucker, northern pike, pond smelt, round whitefish and slimy sculpin.

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

Effects of the borrow site on fish and fish habitat are primarily related to direct disturbance direct disturbance of fish habitat by activities associated with

development of the borrow site and extraction and processing of borrow material and indirect effects resulting from sediment in runoff.

This borrow site is sufficiently far from any waterbody or watercourse to avoid any direct effects on potential fish habitat.

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

### **Human Environment Setting**

This topic contains a description of the protected areas and heritage resource setting for borrow site 4.100P. Regional human environment information is described in [Section 8](#).

There are no communities in the immediate vicinity of the site.

### **Protected Areas Setting**

This borrow site is located within the Lakes Around Travaillant Lake Special Management Zone.

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

The development of this site in the special management zone will result in a slight decrease in the land base available for other land uses within this area. Development within this zone will bring about a permanent change to the landscape.

### **Heritage Resources Setting**

This borrow site was inspected as part of the borrow resource component of the 2004 field reconnaissance program. No new heritage site were recorded during an aerial reconnaissance and no existing sites have been recorded in the immediate area. The location was considered to have low potential for the discovery of heritage resources.

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

Before the development of this site, and if required, 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 GSA communities in meetings or discussions with Imperial. The public involvement activities are documented in [Section 10](#) of this application.

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