REPORT

Developer's Assessment Proposal

Environmental Assessment Initiation Package for the Pine Point Project

Submitted to:

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Submitted by:

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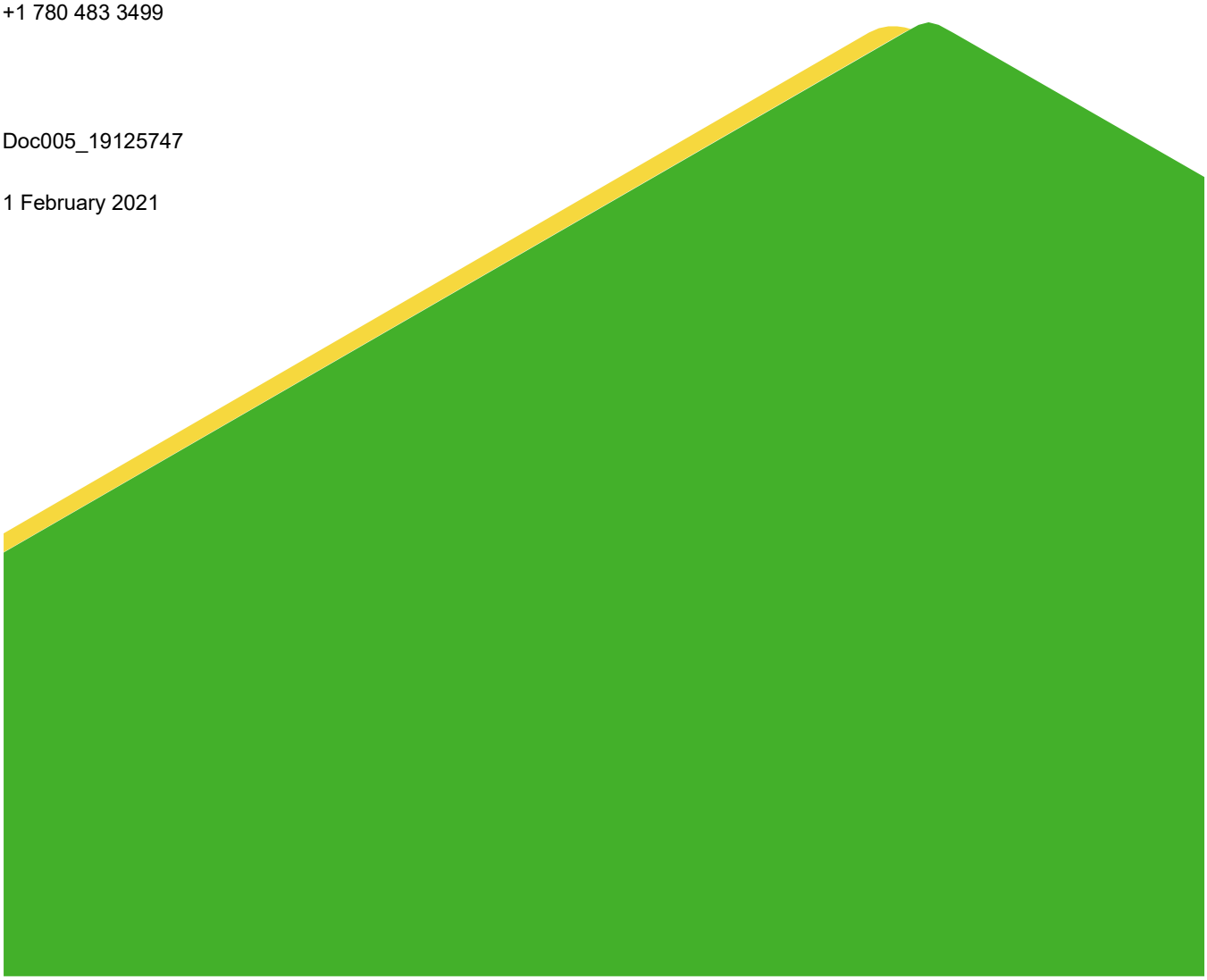
1 February 2021



Distribution List

One Digital Copy to Pine Point Mining Limited

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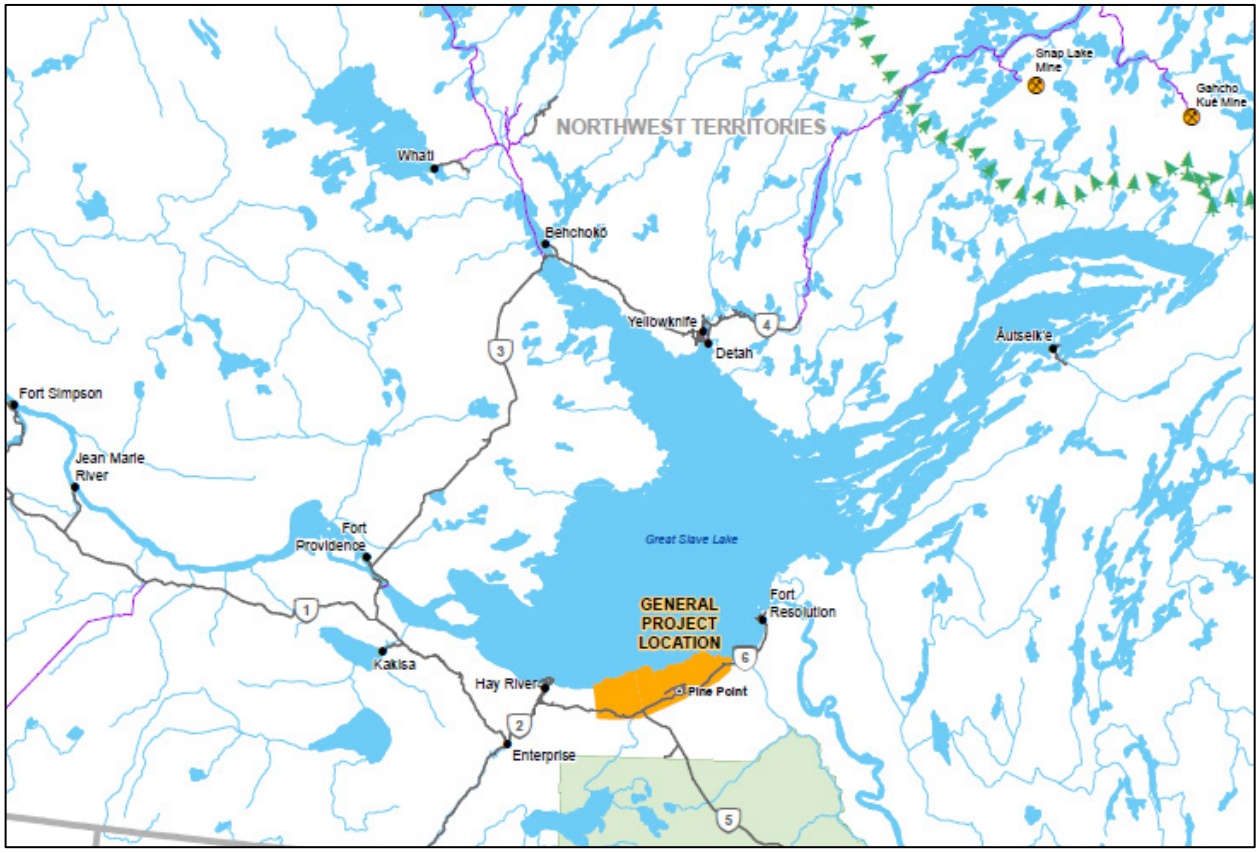
One Digital Copy to Mackenzie Valley Environmental Impact Review Board

PLAIN LANGUAGE SUMMARY

This document is a plain language summary of the Developer's Assessment Proposal for the Pine Point Project. It is much shorter than the Developer's Assessment Proposal and talks about only some of the topics. Readers should read the full Developer's Assessment Proposal if they are interested in more details about this information.

Pine Point Project

Pine Point Mining Limited (PPML) is proposing to build the Pine Point Project (Project), a zinc and lead mine, in the Northwest Territories (NWT), 175 kilometres (km) south of Yellowknife and 42 km east of Hay River.



The property where the Project will be built has a long history of mining activity by Cominco Ltd. The Project will take about a year and a half to build and mining will take 10 to 15 years. Zinc and lead will be mined using both open-pit and underground mining. A process plant, camp, and other facilities will be built. Once mining is finished, closure and reclamation will take place. More information about the Project is available in Volume 1.

Environmental Assessment in the Northwest Territories

To develop the Project, PPML must obtain a number of permits and licences from the governments of the NWT and Canada. To help with making a decision about whether these permits and licences can be issued, an environmental assessment is required. In the NWT, the government agency that oversees environmental assessment is the Mackenzie Valley Environmental Impact Review Board. The purpose of the environmental assessment will be to provide information about the Project and explain what the environmental effects might be. The document that will provide this information is called the "Developer's Assessment Report."

Developer's Assessment Proposal

As part of the early planning for the environmental assessment, PPML needs to provide the Review Board and affected communities and parties with a description of the key issues and topics they think should be made a priority in the Developer's Assessment Report. This information is provided in a document called the "Developer's Assessment Proposal."

The purpose of the Developer's Assessment Proposal is to list the main issues of concern for the Project and explain how environmental, social, and economic effects will be assessed. The Developer's Assessment Proposal forms a part of the "Environmental Assessment Initiation Package" that is needed by the Review Board as a first step to beginning an environmental assessment for a new project.

Valued Components

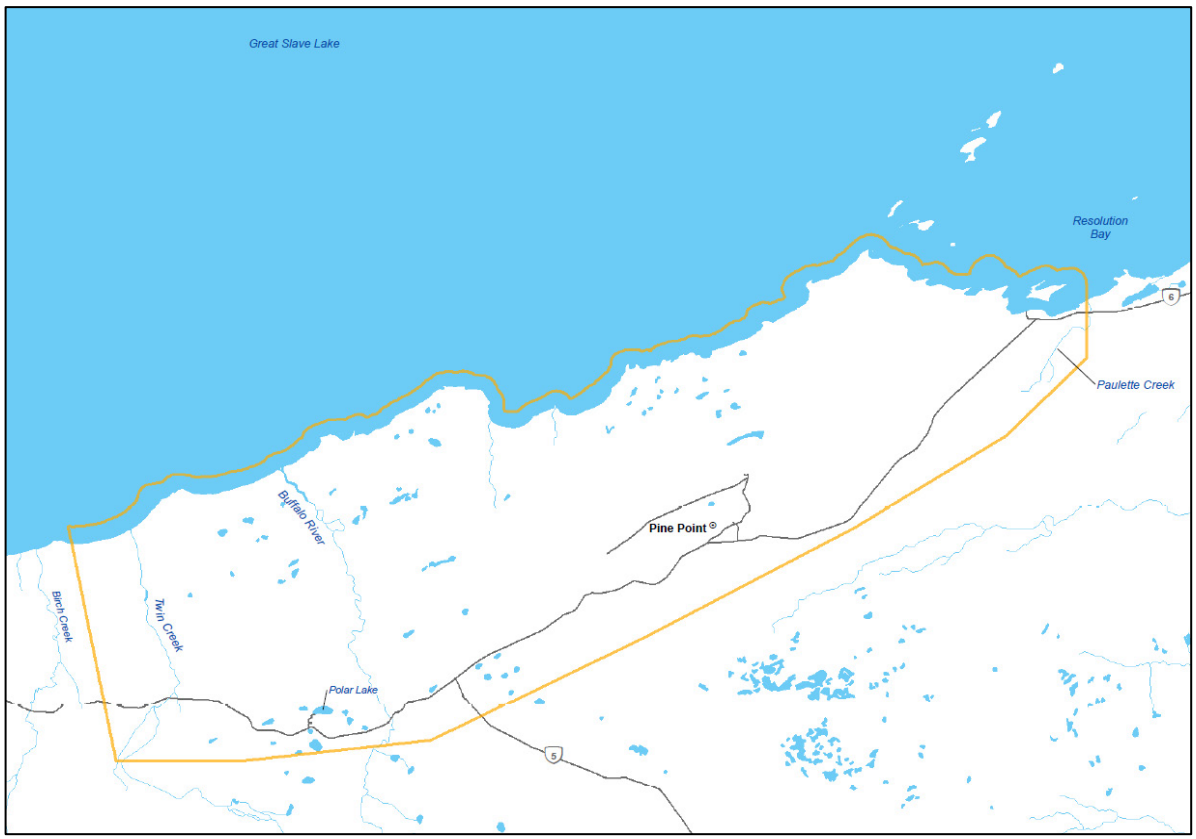
The Developer's Assessment Report will focus on "valued components," which are parts of the environment or society that are considered important by communities, governments, and the public. Valued components may be fish or wildlife species, or aspects of society, such as jobs, or the health and well-being of communities. Choosing specific valued components helps to focus the environmental assessment on the most important topics and concerns.

The types of information that PPML considered when selecting valued components include:

- results of early engagement with affected communities, governments, and the public
- information shared by Indigenous knowledge holders
- scientific knowledge
- information about the local environment
- potential for environmental, social, or economic effects
- presence of species of conservation concern, which are legally protected in the NWT and in Canada
- value to communities, governments, and the public

The initial list valued components chosen to be included in the Developer's Assessment Report are listed below:

- Fish
  - Fish communities in the main lakes and streams near the Project (Great Slave Lake Fish Community, Twin Creek Fish Community, Buffalo River Fish Community, and Paulette Creek Fish Community)



- Vegetation (for example, plants, trees, and lichen), including upland (meaning occurring on the land), wetland, and riparian (meaning occurring along rivers and lakes) ecosystems.


Photo of forest at Pine Point

- Wildlife
  - Four mammals: Woodland Caribou (Boreal Population), Wood Bison, Wolverine, and Gray Wolf
  - Two bats: Little Brown Myotis and Northern Myotis
  - Eleven birds: Short-eared Owl, Olive-sided Flycatcher, Whooping Crane, Common Nighthawk, Evening Grosbeak, Bank Swallow, Barn Swallow, Yellow Rail, Rusty Blackbird, Horned Grebe, and Red-necked Phalarope
  - One amphibian: Northern Leopard Frog
  - Two insects: Gypsy Cuckoo Bumble Bee and Yellow-banded Bumble Bee
  - Some of these wildlife species will be considered in more detail (Caribou, Wood Bison, Gray Wolf, Little Brown Myotis, Olive-sided Flycatcher, Whooping Crane, Evening Grosbeak, Yellow Rail, Rusty Blackbird)

Photo of a boreal caribou from a remote camera at Pine Point in 2018

- Heritage Resources (for example, archeological sites or culturally important sites)
- Traditional Land and Resource Use (meaning the use of the land and the resources it provides by Indigenous peoples)

- Socio-economics
  - Population Demographics (meaning the characteristics of communities such as population size)
  - Economic Development and Government Revenues (meaning the health and growth of the economy)
  - Employment and Education (for example, jobs, training opportunities, and contracts for local businesses)
  - Community Health and Wellbeing
  - Housing, Services, and Infrastructure
  - Non-Traditional Land and Resource Use (meaning the use of the land and the resources it provides by non-Indigenous peoples)

The Developer's Assessment Report will also consider supporting topics, called "intermediate components." These are topics that are important to understand when looking at how the Project could affect valued components. For example, the water quality of nearby lakes and streams is important to consider when looking at potential effects on fish communities and wildlife because water quality can affect the habitat and health of fish and wildlife species.

The intermediate components chosen to be included in the Developer's Assessment Report are listed below:

- Air Quality
- Noise
- Vibration
- Climate
- Groundwater Quantity and Quality
- Surface Water Quantity
- Surface Water Quality
- Terrain and Soils

Air quality monitoring station at Pine Point

The final list of valued and intermediate components included in the Developer's Assessment Report will incorporate feedback from reviewers of the Developer's Assessment Proposal.

Key Issues and Questions

The environmental assessment will focus on the issues and questions that concern people the most. “Key issues” are specific topics or areas of concern that are important to affected communities, governments, and the general public. For example, caribou are important to the culture of Indigenous peoples and other residents of the NWT. Therefore, effects on caribou will be considered as a key issue for the Developer’s Assessment Report.

The level of attention given to each key issue in the Developer’s Assessment Report will depend on its importance to local communities and government agencies. In the NWT, the most important issues considered in an environmental assessment are called “Key Lines of Inquiry.” These are topics that will be given the most attention in the Developer’s Assessment Report. The Key Lines of Inquiry that will be considered in the Developer’s Assessment Report are listed below.

- Impacts to Water Quality
  - *Impacts to Water Quality* was chosen as a Key Line of Inquiry because water quality is generally a concern for governments and communities. Water quality is important for the health of fish and wildlife, as well as Indigenous and other land-users in the NWT.
- Impacts to Caribou
  - *Impacts to Caribou* was chosen as a Key Line of Inquiry because caribou are important to the culture of Indigenous peoples and other residents of the NWT. They are a critical component of the diet of many northerners, and they are an important resource harvested by communities with traditional lands near the Project. People are particularly concerned about caribou because their numbers are declining.
- Impacts to Traditional Land and Resource Use
  - *Impacts to Traditional Land and Resource Use* was chosen as a Key Line of Inquiry because communities are generally concerned about being able to continue to use the land for traditional activities during construction, once the Project is built, and after closure. Therefore, protecting the resources provided by the land surrounding the Project is a key concern. These resources include fish, wildlife, plants, and water.
- Impacts to Social and Economic Conditions
  - *Impacts to Social and Economic Conditions* was chosen as a Key Line of Inquiry because communities and governments will be interested in understanding what opportunities and outcomes are expected from the Project. Opportunities and outcomes could include jobs for people and local businesses, learning opportunities, and changes to community health and wellness.

A number of other topics, called “Subjects of Note,” will be considered in the Developer’s Assessment Report. Subjects of Note are important issues that will be considered in the environmental assessment, but that are generally not considered as high of a priority as Key Lines of Inquiry. The Subjects of Note that will be considered in the environmental assessment include the topics listed below:

- Impacts to Air Quality, Noise, Vibration, and Climate
- Impacts to Groundwater Quantity and Quality
- Impacts to Surface Water Quantity

- Impacts to Fish and Fish Habitat
- Impacts to Terrain and Soils
- Impacts to Vegetation
- Impacts to Wildlife
- Impacts to Heritage Resources
- Impacts to Non-Traditional Land and Resource Use

Each of the Key Lines of Inquiry and Subjects of Note listed above will have its own section in the Developer's Assessment Report and will be investigated in detail as a part of the environmental assessment.

Project Effects and Mitigations

A main purpose of the Developer's Assessment Report will be to identify mitigations that can be used to reduce potential effects on the environment. The Developer's Assessment Report will provide information about which Project activities or components could affect valued or intermediate components. A list of Project effects, called "pathways" will be provided. An example of a pathway is that building the Project could change habitat for wildlife. For each pathway, a list of mitigations will be provided. Mitigations are actions that PPML will take to avoid or reduce effects on valued components. For example, PPML will make use of existing roads and facilities that were previously used by Cominco to help mitigate potential changes to wildlife habitat.

The Developer's Assessment Report will explain how the Project will affect each valued component, taking into consideration that mitigations will be used. Information about whether the effects on valued components are positive or negative, how long they might last, and how widespread they might be, will also be provided.

Engagement Plan Framework and Indigenous Traditional Knowledge

To accompany the Developer's Assessment Proposal, PPML has prepared an engagement plan for the Project. The purpose the engagement plan is to explain how PPML will engage with affected communities and other interested parties. The engagement plan can be found in a document called the "Engagement and Collaboration Framework" in Volume 2.

The information and concerns shared during engagement will considered when preparing the Developer's Assessment Report, as well as available Indigenous Traditional Knowledge. PPML's desire is that the list of valued components and key issues provided in this document reflect the priorities and concerns of affected communities and the public. Updates to the list of valued components and key issues will be made, as needed, so that the most important topics identified during engagement are considered in the Developer's Assessment Report.

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Abbreviations and Units of Measure

Abbreviation	Definition
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
Cominco	Cominco Ltd.
EA	environmental assessment
GNWT	Government of the Northwest Territories
ITK	Indigenous Traditional Knowledge
KLOI	Key Line of Inquiry
LSA	local study area
LWBMV	Land and Water Boards of the Mackenzie Valley
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVLWB	Mackenzie Valley Land and Water Board
NTLRU	non-traditional land and resource use
NWT	Northwest Territories
PPML	Pine Point Mining Limited
Project	Pine Point Project
RFD	reasonably foreseeable development
RSA	regional study area
SARA	*Species at Risk Act*
SON	Subject of Note
TLRU	traditional land and resource use
TOR	Terms of Reference
VC	valued component

Unit of Measure	Definition
ha	hectare
km	kilometre
m	metre
m^3	cubic metre
MW	megawatt
ppb	parts per billion

1.0 INTRODUCTION

1.1 Overview

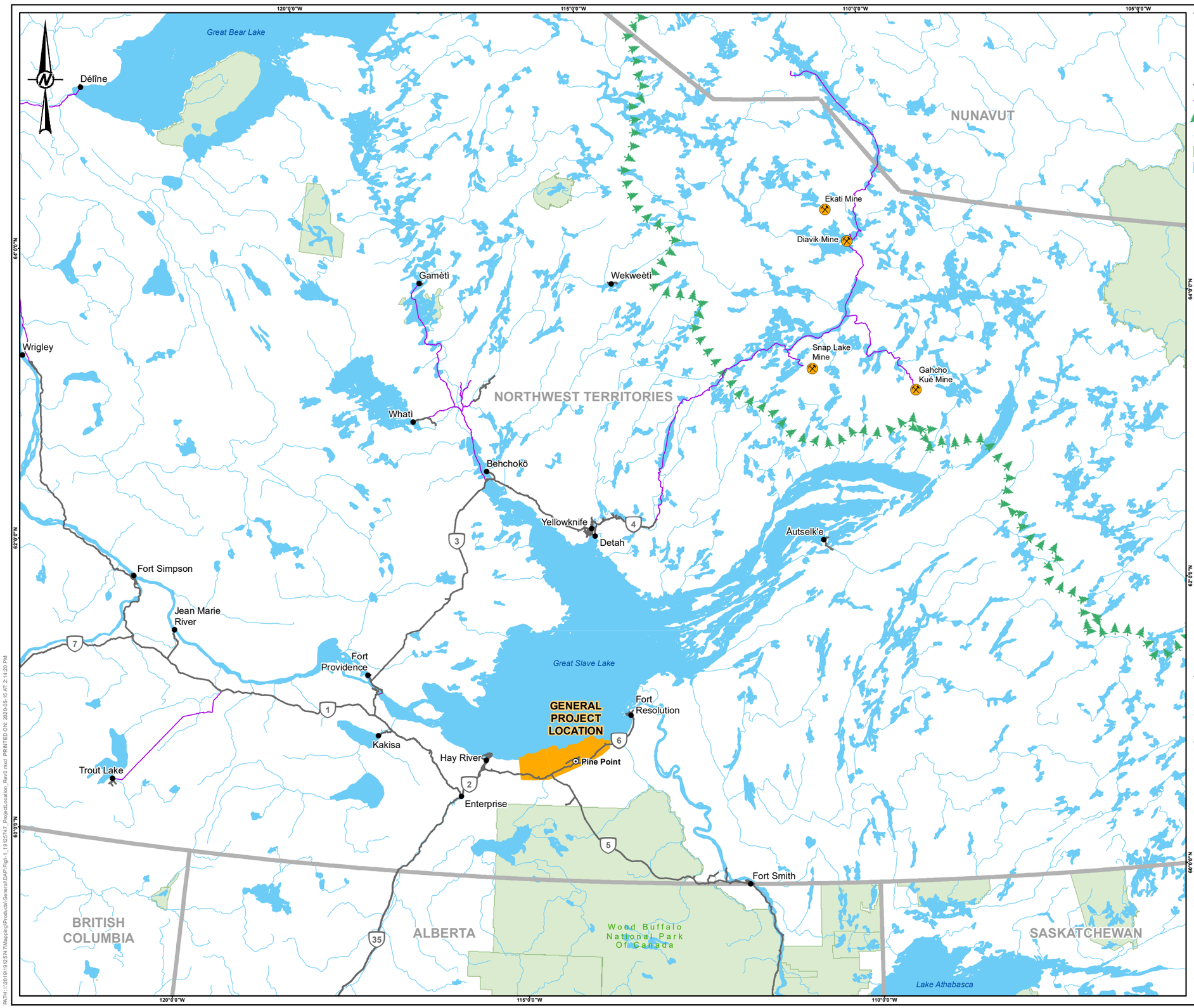
This document fulfills the requirement to provide a Developer's Assessment Proposal, as a component of the Environmental Assessment (EA) Initiation Package for the Pine Point Mining Limited (PPML or "the developer") Pine Point Project (Project), as outlined in the Mackenzie Valley Environmental Impact Review Board (MVEIRB) *Draft Environmental Assessment Initiation Guidelines for Developers of Major Projects* (EA Initiation Guidelines; MVEIRB 2018).

The Project is located in the Northwest Territories (NWT) within the South Slave Mining District, approximately 175 km south of Yellowknife (Figure 1-1 and Figure 1-2), on a brownfield site associated with historical mining activity by Cominco Ltd. (Cominco). The Project will consist of open pit and underground mining for zinc and lead, construction and operation of a processing mill (or "concentrator") and pre-concentration facilities, storage and management of processed mineralized material and waste materials, water management, construction and operation of ancillary support facilities including a camp for workers and the transportation of zinc and lead concentrates to global markets.

The Developer's Assessment Proposal for the Project has been prepared according to Section 5.0 of the EA Initiation Guidelines. The Developer's Assessment Proposal outlines the proposed valued components (VCs) and priority issues that have been identified during the early Project planning stages. It also outlines the proposed methods that PPML will use to assess effects on VCs through the EA process. The assessment methods described herein are intended to provide a proposed scope and methods that will direct the production of a future Developer's Assessment Report for the Project, and are informed by the Project-related information presented in other documents submitted as part of the EA Initiation Package, and which are referenced throughout this document:

- Volume 1: Project Description
- Volume 2: Engagement and Collaboration Plan
- Volume 3: Description of Existing Environment
- Volume 4: Identification of Potential Project-Interactions and Proposed Mitigation Measures
- Volume 6: Management and Monitoring Framework for the Biophysical and Human Environments

The information presented in the Developer's Assessment Proposal will be used by the MVEIRB as a starting point for identifying assessment priorities and assessment methods during scoping. The Developer's Assessment Proposal provides necessary and sufficient information early in the EA planning process to inform the development of a Terms of Reference (TOR) for the Developer's Assessment Report. The TOR, which will be issued by the MVEIRB, outlines the information PPML must provide in the Developer's Assessment Report, and sets out priority areas of investigation and assessment methods for the EA. Therefore, the Developer's Assessment Proposal is intended to provide information that results in a more informed, accurate, and tailored TOR, which will improve the focus and effectiveness of the subsequent Developer's Assessment Report and increase the overall efficiency and quality of the EA process.



LEGEND

- FORMER PINE POINT TOWN SITE
- POPULATED PLACE
- EXISTING MINE
- ALL-SEASON ROAD
- WINTER ROAD
- TREELINE
- WATERCOURSE
- PARK/PROTECTED AREA
- WATERBODY
- GENERAL PROJECT LOCATION

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REFERENCE(S)

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2. PARKS AND PROTECTED AREAS OBTAINED FROM CONSERVATION AREAS REPORTING AND TRACKING SYSTEM (CARTS), CANADIAN COUNCIL ON ECOLOGICAL AREAS, 2017.

PROJECTION: ALBERS CONIC EQUAL AREA

CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

TITLE
LOCATION OF PROJECT

CONSULTANT
GOLDER

YYYY-MM-DD	2020-05-15
DESIGNED	DC
PREPARED	BW
REVIEWED	LY
APPROVED	LY

PROJECT NO.	PHASE	REV.	FIGURE
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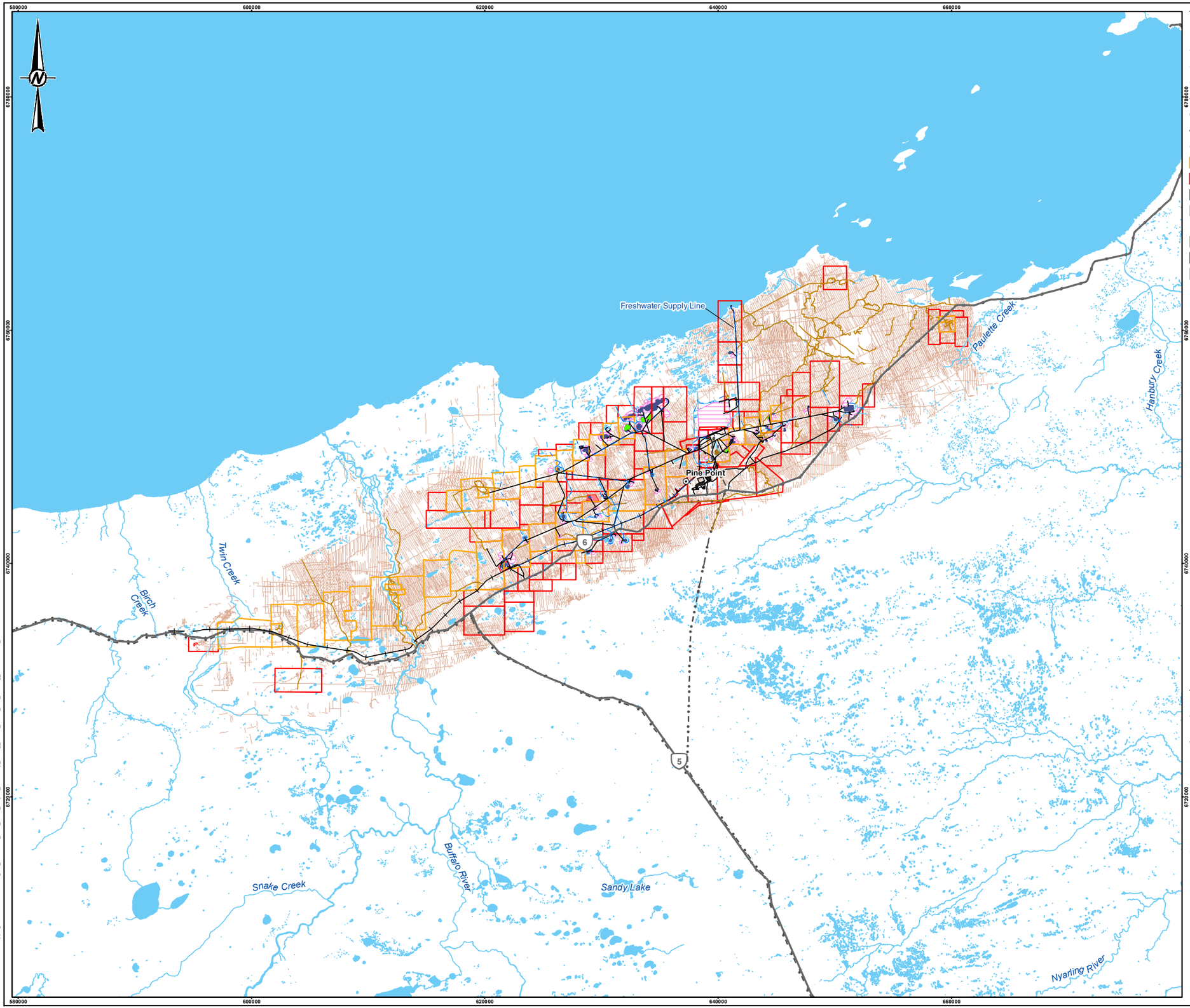

LEGEND

- FORMER PINE POINT TOWN SITE
- BUSH ROAD
- CUTLINE
- DRAINAGE DITCH
- HISTORIC RAILBED
- HIGHWAY
- TRANSMISSION LINE
- WATERCOURSE
- ACTIVE MINERAL LEASE
- ACTIVE MINERAL CLAIM
- CUTBLOCK
- WATERBODY

PINE POINT EXISTING MINING DISTURBANCE

- BACKFILLED PIT
- MINED PIT
- WASTE PILE

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PROJECTION: UTM ZONE 11N DATUM: NAD83

CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

TITLE
PINE POINT PROJECT BOUNDARY, MINING LEASE AREAS, AND EXISTING DISTURBANCES

CONSULTANT
GOLDER

YYYY-MM-DD	2020-11-05
DESIGNED	JV
PREPARED	MM/PMT
REVIEWED	DP
APPROVED	DP

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The proposed VCs, key issues, and assessment methods were developed with consideration of the preliminary Project Description (Volume 1), feedback from early engagement with the public and Indigenous communities (Volume 2), information related to the existing environment (Volume 3), and the current understanding of potential interactions between the Project and components of the environment (Volume 4). The results of engagement and feedback from previous regulatory applications for the site by other proponents were also considered. The proposed methods will be finalized in the Developer's Assessment Report following feedback from communities and regulators on the Developer's Assessment Proposal and based on the final TOR for the Project.

1.2 Organization

This document has been organized according to the requirements for the Developer's Assessment Proposal set out in Section 5.0 of the EA Initiation Guidelines:

- Section 2.0 provides a description of the proposed VCs for the EA, which includes representation of both the biophysical and human environments, and a rationale for selecting each VC.
- Section 3.0 provides a description of the proposed key issues (Project interactions) and questions prioritized in terms of Key Lines of Inquiry (KLOIs; Section 3.1) or Subjects of Note (SONs; Section 3.2).
- Section 4.0 provides a description of the proposed assessment methods for all VCs (Section 4.1) and the investigation of individual KLOIs and SONs (Sections 4.2), including:
  - general assessment approach and methods for each VC, including analytical and assessment techniques and study boundaries (temporal and spatial)
  - information sources to be used, including completed and planned data collection (i.e., baseline and site-specific studies)
  - timelines, assumptions, information gaps, uncertainties, and approach to addressing information gaps and uncertainties

Assessment methods and priority areas of investigation related to accidents and malfunctions and effects of the environment on the Project are provided in Section 4.3. A proposed table of contents for the Developer's Assessment Report for the Project is provided in Section 5.0.

2.0 VALUED COMPONENTS

This section outlines the list of VCs recommended to be advanced to the Developer's Assessment Report. Valued components are "*element*[s] *of the biophysical or human environment that may be affected by a proposed development and that* [are] *identified as important, such as having ecological, scientific, social, cultural, economic, historical, archaeological, or aesthetic importance*" (MVEIRB 2018). They are identified to be of concern by the proponent, scientists, government agencies, Indigenous peoples, or the public (MVEIRB 2004). The selection of appropriate VCs allows the assessment to be focused on those aspects of the biophysical and human environments that are of greatest importance to society and species conservation. Proposed VCs were selected with consideration of the results of existing baseline information for the Project and findings from early engagement with the public and Indigenous communities. Focusing the assessment on VCs facilitates effective decision-making with respect to the Project.

The following factors will be considered when developing the list of VCs for the Project and Developer's Assessment Report. This list of criteria includes consideration of the guidance outlined in the EA Initiation Guidelines for selecting VCs:

- feedback from early public and Indigenous engagement
- Indigenous Traditional Knowledge (ITK)
- scientific knowledge
- conditions of the existing environment
- potential for interaction with the Project and degree of interaction, including presence, abundance, and degree of spatial overlap of a component with the Project
- sensitivity to potential effects of the Project and level of risk should an adverse effect occur
- species conservation status or concern (e.g., rarity, sensitivity, and uniqueness)
- ecological and socio-economic value to communities, government agencies, and the public
- avoidance of ecological or socio-economic assessment redundancy with other VCs. That is, if two potential VCs represent the same issues, mitigation actions, and potential effects from the Project, only one would be evaluated as part of the assessment
- recent experience with similar projects
- professional judgment

The potential list and rationale for VCs to be included to the Developer's Assessment Report is provided in Table 2-1. Feedback from communities and regulators on the Developer's Assessment Proposal and engagement will be used to help determine the final list of VCs identified in the TOR for evaluation in the Developer's Assessment Report.

Table 2-1: Proposed Valued Components to be Used in the Developer's Assessment Report

Biological or Human Component	Valued Component	Rationale for Selection
Fish and Fish Habitat	Great Slave Lake Fish Community	■ Important commercial, recreational, and traditional subsistence fishery ■ Presence of Shortjaw Cisco (*Coregonus zenithicus*), which is designated by the Committee on the Status of Endangered Wildlife in Canada as Threatened and listed territorially as At Risk under the *Species at Risk (NWT) Act* ■ Presence of sport fish and forage fish ■ Potential connectivity to upstream waterbodies and watercourses affected by Project activities
	Twin Creek Fish Community	■ Drains several small lakes and wetlands south of the Project into Great Slave Lake ■ Presence of sport fish and forage fish and/or their habitats ■ Potential for effects from Project activities
	Buffalo River Fish Community	■ Drains several lakes and wetlands south of the Project into Great Slave Lake ■ Presence of sport fish and forage fish and/or their habitats ■ Commercial and traditional fishery at the mouth to Great Slave Lake ■ Potential for effects from Project activities
	Paulette Creek Fish Community	■ Watercourse with connectivity to Great Slave Lake ■ Presence of sport fish and forage fish and/or their habitats ■ Potential for effects from Project activities
Vegetation	Vegetation (upland, wetland, riparian ecosystems)	■ Loss or fragmentation of vegetation (upland, wetland, and riparian ecosystems) communities, listed plants, and traditional land use plants from vegetation clearing, which are important for ecosystem processes and services as well as spiritual, traditional, or aesthetic values ■ Traditional use plants with subsistence and cultural value ■ Listed plant species, which may be disproportionately affected by Project activities
Wildlife[(a)]	Woodland Caribou (Boreal Population)	■ Listed as Threatened under the federal *Species At Risk Act* (SARA) and the territorial *Species at Risk (NWT) Act* ■ Important subsistence and cultural species ■ Large home range and seasonal movements ■ Prey species for large carnivores ■ Population affected by predation as a result of habitat change
	Wood Bison	■ Listed as Special Concern under SARA and the *Species at Risk (NWT) Act* ■ Important subsistence, cultural and economic species ■ Expansive range with seasonal movements – the NWT Bison Control Area partially overlaps with the Project ■ Population affected by predation as a result of habitat change ■ Population affected by bovine tuberculosis and brucellosis

Table 2-1: Proposed Valued Components to be Used in the Developer's Assessment Report

Biological or Human Component	Valued Component	Rationale for Selection
Wildlife (cont'd)	Wolverine and Gray Wolf	■ Important fur-bearing and economic species ■ Large home ranges with local seasonal movements ■ Wolverine is an important predator and scavenger and is listed as Special Concern under SARA ■ Gray wolf is an important predator of woodland caribou and wood bison
	Little Brown Myotis and Northern Myotis	■ Species are listed as Endangered under SARA and of Special Concern under the *Species at Risk (NWT) Act* ■ Species ranges overlap with Project ■ Often roost in old mine sites
	Short-eared Owl	■ Listed as Special Concern under SARA ■ Species' range overlaps with Project ■ Threatened by habitat loss and alteration
	Olive-sided Flycatcher	■ Listed as Threatened under SARA ■ Species' range overlaps with Project ■ Associated with open areas containing tall live trees or snags for perching ■ Threatened by habitat loss and alteration
	Whooping Crane	■ Listed as Threatened under SARA ■ Species' range may overlap with Project ■ Associated with marshes, bogs and shallow lakes ■ Threated by habitat loss and alteration on wintering grounds
	Common Nighthawk	■ Listed as Threated under SARA ■ Species' range overlaps with Project ■ Threatened by habitat loss and alteration
	Evening Grosbeak	■ Listed as Special Concern under SARA ■ Species' range overlaps with Project ■ Associated with mixedwood forests where fir or white spruce are dominant species ■ Threatened by habitat loss and alteration ■ May also be threatened by declining insect populations, climate change, and habitat loss on wintering grounds
	Bank Swallow and Barn Swallow	■ Species are listed as Threatened under SARA ■ Species ranges overlap with Project ■ Threatened by loss of nesting and foraging habitat ■ May also be threatened by declining insect populations, climate change, and habitat loss on wintering grounds
	Yellow Rail	■ Listed as Special Concern under SARA ■ Threatened by habitat loss and degradation on breeding grounds and climate change ■ May also be threatened by declining insect populations and habitat loss on wintering grounds

Table 2-1: Proposed Valued Components to be Used in the Developer's Assessment Report

Biological or Human Component	Valued Component	Rationale for Selection
Wildlife (cont'd)	Rusty Blackbird	■ Listed as Special Concern under SARA ■ Threatened by habitat loss and degradation on breeding grounds and climate change ■ May also be threatened by declining insect populations and habitat loss on wintering grounds
	Horned Grebe	■ Listed as Special Concern under SARA ■ Threatened by habitat loss and degradation on breeding grounds and climate change ■ May also be threatened by declining insect populations and habitat loss on wintering grounds
	Red-necked Phalarope	■ Listed as Special Concern under SARA ■ Threatened by habitat loss and degradation on breeding grounds and climate change ■ May also be threatened by declining insect populations and habitat loss on wintering grounds
	Northern Leopard Frog	■ Listed as Special Concern under SARA and Threatened under *Species at Risk (NWT) Act* ■ Species' range overlap with Project ■ Threatened by habitat loss and alteration
	Gypsy Cuckoo Bumble Bee and Yellow-banded Bumble Bee	■ Gypsy cuckoo species listed as Endangered under SARA ■ Yellow-banded species listed as Special Concern under SARA ■ Species ranges overlap with Project ■ Threatened by habitat loss and alteration
Heritage Resources	Heritage Resources	■ Compliance with applicable territorial and federal regulations ■ Ground disturbance has potential to affect heritage resource sites located in Project footprint
Traditional Land and Resource Use	Traditional Land and Resource Use	■ The land and its resources are used by Indigenous peoples for cultural, spiritual, recreational, subsistence, and economic purposes
Socio-economics	Population Demographics	■ Population volume influences demand for infrastructure, services, and housing ■ Mobility and migration can affect community composition and viability of community services
	Economic Development and Government Revenues	■ The territory relies heavily on mining for contributions to economic activity as measured by Gross Domestic Product ■ Local business spending is a key driver of local benefit capture and revenues ■ Resource development is a key economic development priority for the territory ■ Traditional economic activities are an important livelihood for the Indigenous population ■ Government revenues are the basis for funding territorially supported infrastructure, services, and programs

Table 2-1: Proposed Valued Components to be Used in the Developer's Assessment Report

Biological or Human Component	Valued Component	Rationale for Selection
Socio-economics (cont'd)	Employment and Education	■ Employment is a key driver of local benefits associated with development, generating incomes ■ Competition for labour between industrial developments can influence labour market conditions territorially ■ Employment incomes can create induced employment in the broader economy ■ Education and training are long-term benefits that build capacity in the labour force
	Community Health and Wellbeing	■ New markets, some illegal, follow development and associated incomes. Illegal markets may have a negative effect on communities ■ Increased employment incomes are often associated with a rise in substance misuse, family violence and crime ■ Community-defined facets of wellbeing are nuanced, and can be impacted by other social and economic effects of development
	Housing, Services, and Infrastructure	■ Population changes in communities can yield varying demand for and pressure on infrastructure and housing relied upon by local residents ■ Changes in population levels can increase demand on health, social and protective services ■ Changes in rates of communicable diseases can influence demand for health services ■ Changes in crime rates can influence demand for protective services
	Non-traditional Land and Resource Use	■ Non-traditional land uses represent important economic and recreational activities for the local population ■ Regional land use planning prioritizes different areas for different uses, including areas of high mineral extraction potential

a) It is anticipated that not all potential wildlife valued components will be assessed comprehensively in the Developer's Assessment Report (see Section 4.2.1.9)

Intermediate components of the biophysical environment will also be assessed to support VC assessments (Table 2-2). Intermediate components are critical to the assessment; however, the VC is the ultimate receptor of concern. For example, the importance of predicted changes in air quality, surface water quality, or groundwater quality will be evaluated considering the consequences that these changes have on VCs such as plants, fish, wildlife, and traditional and non-traditional land and resource use. Except for significance determination (Section 4.1.9), there is no difference in the way that VCs and intermediate components will be assessed in the Developer's Assessment Report. Like VCs, intermediate components will be analyzed to determine the Project-specific environmental changes using a rigorous science-based approach which integrates ITK, and includes cumulative effects analysis, if applicable. Significance determination for components, such as surface water quality, cannot be made in isolation of the effects on aquatic or terrestrial receptors (i.e., fish and wildlife) or land use (i.e., drinking water). For example, an increase of a parameter in milligrams per litre cannot be determined to be significant based solely on the change itself. The determination of the magnitude of the change must be based on the potential for this change to cause an adverse effect on fish, wildlife, or land use. Water quality guidelines, which are generally used as screening criteria, are based on the potential for change to these receptors (i.e., for aquatic life, for wildlife, or for drinking water).

Table 2-2: Proposed Intermediate Components to be Used in the Developer's Assessment Report

Environmental or Social Component	Intermediate Component	Rationale
Air Quality, Noise, and Climate	Air Quality	■ Sensitivity of the biophysical environment (soils, water, plants, animals) and people to air quality and dust emissions ■ Compliance with applicable standards
	Noise	■ Influence on Indigenous and other land and resource use ■ Sensitivity of some wildlife species to noise
	Vibration	■ Influence on Indigenous and other land and resource use ■ Sensitivity of some wildlife species to vibration ■ Potential for damage to buildings and other structures
	Climate	■ Greenhouse gas (GHG) emissions contribute to territorial and national GHG emissions and climate change
Groundwater Quantity and Quality	Groundwater Quantity and Quality	■ Important component in the hydrologic cycle ■ Linked to surface water quantity through exchange with overlying surface water features, which is important for fish and fish habitat ■ Linked to surface water quality through overlying surface water features, which is important for fish and fish habitat, overall ecological integrity, and traditional and non-traditional land and resource use
Surface Water Quantity	Surface Water Quantity	■ Strong link to fish and fish habitat ■ Key attribute of healthy and functioning aquatic and terrestrial ecosystems
Surface Water Quality	Surface Water Quality	■ Compliance with applicable territorial and federal regulations ■ Indigenous and other land users may use local waterbodies and watercourses for recreational or cultural practices ■ Key attribute of healthy and functioning aquatic and terrestrial ecosystems
Terrain and Soils	Terrain and Soils	■ Provides physical structure and foundation for aquatic and terrestrial ecosystems

3.0 ISSUES PRIORITIZATION

The purpose of this section is to identify key issues associated with the Project and to prioritize them to the extent possible, so that the Developer's Assessment Report is focused on the most important issues. Priority issues are organized in the context of Key Lines of Inquiry (KLOIs) and Subjects of Note (SONs). KLOIs are areas of concern that have been identified as requiring the most attention in the Developer's Assessment Report, whereas SONs are topics that require a thorough analysis but do not require the same level of attention and detail as KLOIs.

As a requirement of the EA Initiation Package for the Project, a pathway analysis was undertaken to identify risks to the biophysical and human environments from the Project for each intermediate and valued component (Volume 4). A pathway analysis defines a comprehensive list of potential interactions between the Project and environment (i.e., effect pathways), identifies mitigation that could be used to eliminate and/or minimize potential adverse effects, and focuses further assessment on key or principal effects from the Project that remain after practicable mitigation has been applied. A detailed summary of the approach and methods used to complete the pathway analysis are provided in Volume 4. The results are provided in a tabular format for each EA component (Volume 4). As indicated in the EA Initiation Guidelines, the pathway analysis considered all potential Project-environment interactions that are possible at the current stage of planning for the Project.

The results of the pathway analysis were used to inform the selection of KLOIs and SONs. Other criteria noted in Section 4.3 of the EA Initiation Guidelines for identifying key issues were also considered when selecting KLOIs and SONs (i.e., feedback from public and community engagement and ITK, conditions of the existing environment, scientific knowledge, and professional judgment based on previous EA experience). The following subsections identify the KLOIs and SONs proposed to be advanced to the Developer's Assessment Report. The KLOIs and SONs will be finalized in the Developer's Assessment Report following feedback from communities and regulators on the Developer's Assessment Proposal and based on the final TOR for the Project. KLOIs and SONs will be defined in the "Introduction" section of the Developer's Assessment Report, according to the table of contents proposed for the Developer's Assessment Report in Section 5.0.

3.1 Proposed Key Lines of Inquiry

KLOIs are areas of concern that have been identified as requiring the most attention during the EA and the most rigorous analysis and detail in the Developer's Assessment Report. KLOIs are identified to provide a comprehensive, detailed analysis of the issues that were identified as bringing about potential significant public concern. A standalone assessment will be provided in the Developer's Assessment Report for each identified KLOI. The assessment for each KLOI will consider Project-specific residual effects and potential cumulative effects from the Project and other previous, existing, and reasonably foreseeable developments (if applicable).

Two KLOIs pertaining to the biophysical environment and two KLOIs pertaining to the human environment were identified for the Project:

- KLOI-1: Impacts to Water Quality
- KLOI-2: Impacts to Caribou
- KLOI-3: Impacts to Traditional Land and Resource Use
- KLOI-4: Impacts to Social and Economic Conditions

These four topics will be considered as the primary focus of the Developer's Assessment Report. The VCs associated with these KLOIs are defined in Section 4.1.2. A description of Project-related effects on the VCs associated with each KLOI is provided. Proposed assessment methods for the investigation of each KLOI are provided in Section 4.2.

KLOI-1: Impacts to Water Quality

Impacts to Water Quality was selected as a KLOI as water quality is a cornerstone of the aquatic ecosystem; water quality in receiving environments helps facilitate functioning and healthy aquatic and terrestrial ecosystems and is an important component of traditional land and resource use (TLRU). Water quality is generally a concern for regulators and communities (i.e., water in the receiving environment is safe for aquatic life and drinking by wildlife and humans). However, water quality is an intermediate component as changes to water quality (i.e., concentrations of parameters) only matter to the receptor (e.g., fish and fish habitat, TLRU). Similar to other intermediate components, there is no determination of significance for effects on surface water quality. Thresholds for water quality are related to guidelines, and guidelines for water quality are explicitly linked to aquatic organisms, wildlife, and people. Therefore, the consequences and significance of changes in surface water quality will be evaluated in applicable sections of the fish and fish habitat, caribou, wildlife, and TLRU sections of the Developer's Assessment Report. Overall, the Project has the potential to affect water quality through site water management, including mine water discharge (if required), surface runoff, and groundwater inflow and seepage from the Project.

KLOI-2: Impacts to Caribou

Impacts to Caribou was selected as a KLOI as caribou in the NWT are a wildlife species of concern for regulators and communities. Therefore, understanding Project effects on the ability of caribou populations to be self-sustaining and ecologically effective is expected to be a primary focus of the Developer's Assessment Report. This information will also be used in the TLRU assessment. The Project has the potential to affect caribou through direct and indirect habitat loss and alteration, sensory disturbance, and changes to access leading to increased predation on or harvesting of caribou.

KLOI-3: Impacts to Traditional Land and Resource Use

Impacts to Traditional Land and Resource Use was selected as a KLOI as the ability to continue to use the land for traditional activities during construction and operation and following closure of a project is a concern of communities. Therefore, understanding the effect of the Project on the ability to practice TLRU in the area is expected to be a primary focus of the Developer's Assessment Report. The Project has the potential to affect TLRU in the surrounding landscape through: direct disturbance to traditional use areas; direct and indirect effects on water quality, fish, vegetation, and wildlife; changes in access; and sensory disturbance influencing the experience of Indigenous land users practicing traditional activities.

KLOI-4: Impacts to Social and Economic Conditions

Impacts to Social and Economic Conditions was selected as a KLOI as communities and governments will be interested in understanding the opportunities and beneficial outcomes generated by the Project, and the developer's approach to maximizing the capture of local benefits. Positive economic opportunities and benefits may include employment, contracting and spending with local businesses, and training and educational opportunities. The Project also represents a potential driver of adverse effects on community and family cohesion, wellbeing, service provision, and infrastructure capacity and condition.

3.2 Proposed Subjects of Note

The Developer's Assessment Report will include an assessment SONs that contain other VCs and intermediate components described in Section 2.0 that are not KLOIs (Sections 3.1 and 4.1.2). Every concern identified in the Developer's Assessment Proposal requires a sufficient analysis to demonstrate whether the development is likely to cause significant adverse effects on VCs. The SONs also provide supporting information to KLOIs. For example, results from the assessments of changes to groundwater quality and surface water quantity are used in the assessments of surface water quality and TLRU. The SONs represent lower priority relative to KLOIs but will be evaluated as standalone sections in the Developer's Assessment Report.

Nine SONs were identified for the Project:

- SON-1: Impacts to Air Quality, Noise, Vibration, and Climate
- SON-2: Impacts to Groundwater Quantity and Quality
- SON-3: Impacts to Surface Water Quantity
- SON-4: Impacts to Fish and Fish Habitat
- SON-5: Impacts to Terrain and Soils
- SON-6: Impacts to Vegetation
- SON-7: Impacts to Wildlife
- SON-8: Impacts to Heritage Resources
- SON-9: Impacts to Non-traditional Land and Resource Use

The valued or intermediate components associated with SONs are defined in Section 4.1.2. Proposed assessment methods for the investigation of each SON are provided in Section 4.2.

4.0 ENVIRONMENTAL ASSESSMENT METHODS

The purpose of this section is to describe the scope and EA approach and methods that are proposed to be used in the Developer's Assessment Report for the Project. The scope of the assessment will be to identify and evaluate the potential adverse effects and benefits associated with the Project. At the current stage of planning for the Project, this includes an 18 to 24-year period from the beginning of construction to the end of closure and reclamation. Longer term effects from the Project that extend beyond closure will also considered, where necessary.

As indicated in the EA Initiation Guidelines, descriptions are provided for the general assessment approach that will be used for all valued and intermediate components (Section 4.1) and the specific methods that will be used for the investigation of individual KLOIs and SONs (Section 4.2). Assessment methods related to accidents and malfunctions and effects of the environment on the Project are provided in Section 4.3.

4.1 General Methods

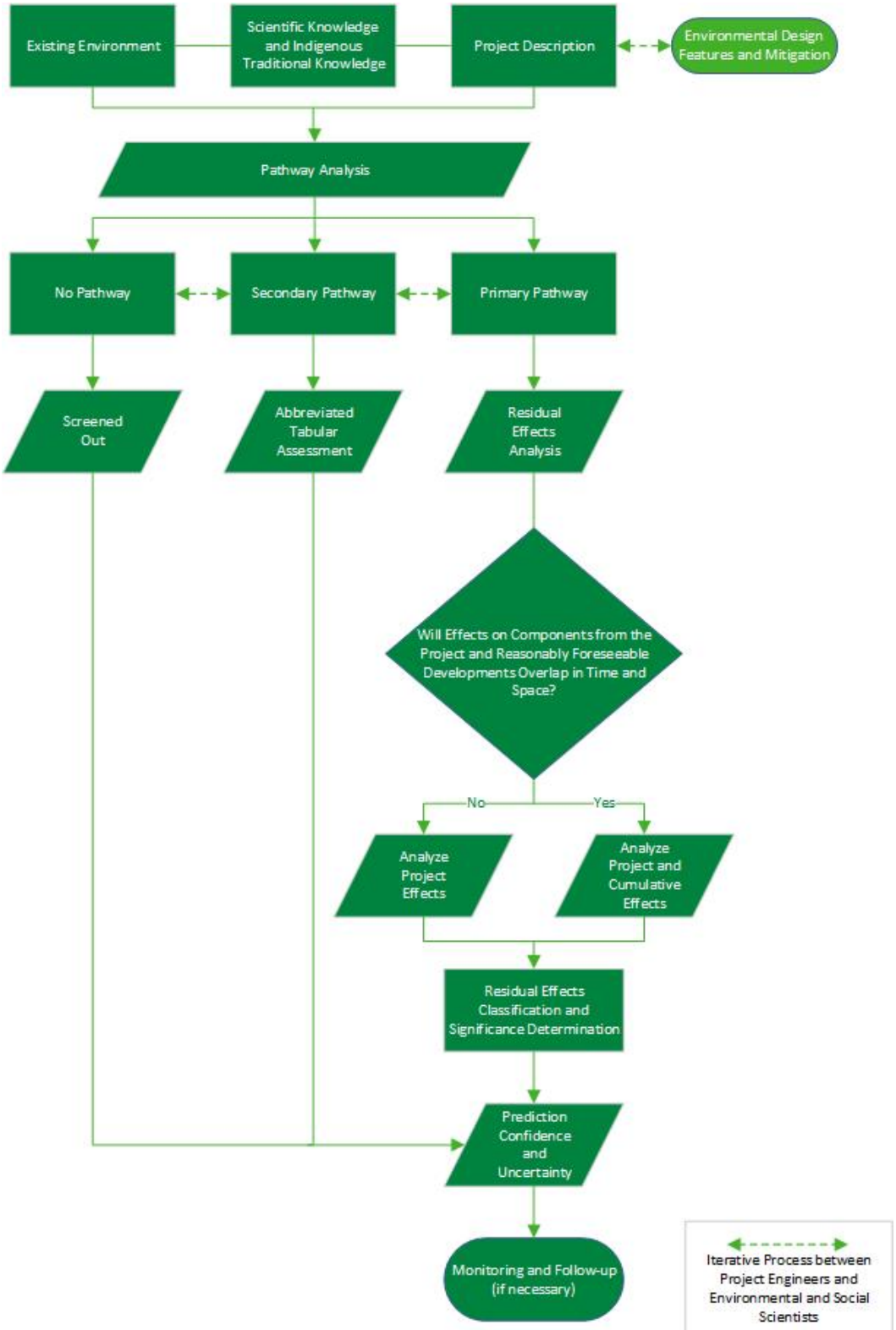
This section provides an overview of the general assessment approach that will be used to complete the EA and to prepare the Developer's Assessment Report. The methods presented will be provided in an "Environmental Assessment Approach and Methods" section included in the Developer's Assessment Report, as per the table of contents proposed for the Developer's Assessment Report in Section 5.0.

The EA approach for the Developer's Assessment Report will be applied to individual discipline components of the biophysical and human environments (e.g., climate, air quality and noise; groundwater quantity and quality; surface water quantity; water quality; fish and fish habitat; terrain and soils; vegetation; caribou; wildlife; heritage resources; TLRU; socio-economics; and non-traditional land and resource use [NTLRU]). The EA in the Developer's Assessment Report is expected to include the following steps (Figure 4-1), as applicable. Additional information for each of these steps is provided here, with the subsections shown in parentheses:

- Provide the information sources that will be considered to support the scoping process for the Developer's Assessment Report (Section 4.1.1).
- Define the valued and intermediate components of the biophysical and human aspects of the environment potentially affected by the Project, and associated assessment endpoints and measurement indicators (Section 4.1.2).
- Define the spatial and temporal boundaries of the assessment (Section 4.1.3).
- Describe how public and Indigenous engagement for the Project will occur and how the findings will be incorporated into the Developer's Assessment Report (Section 4.1.4).
- Describe how ITK will be collected and incorporated into the Developer's Assessment Report (Section 4.1.5).
- Describe the existing environment, which includes the cumulative effects of previous and existing developments, to provide context for evaluating potential incremental (i.e., Project-specific) and cumulative effects from the Project (Section 4.1.6).
- Provide the definition of pathways, environmental design features and mitigation, and approach and methods for evaluating relevant effects pathways (interactions) between the Project and biophysical, socio-economic, and cultural components (Section 4.1.7).
- Complete an assessment for each component and associated primary pathways to predict Project-specific residual effects, including cumulative effects from the Project and other previous, existing, and reasonably foreseeable developments, if applicable (Section 4.1.8).
- Classify residual effects and determine significance (Section 4.1.9). Residual effects are classified and tabulated using criteria such as magnitude, geographic extent, duration, frequency, and probability of occurrence to provide structure and comparability across intermediate and valued components. Significance determination is completed for VCs only.
- Identify key uncertainties and explain how these uncertainties were addressed to achieve a precautionary assessment. The implications of these approaches for confidence in the residual effects analysis and classification are presented (Section 4.1.10).
- Identify monitoring and follow-up to test predicted residual effects, evaluate success of planned mitigation designs, policies, and practices, and address key sources of uncertainty (Section 4.1.11).

Although all biophysical and human environment components will follow the general framework, approach, and methods presented in Section 4.1, the specific approach that will be used in the investigation of each KLOI and SON may vary to account for differences among the individual disciplines and the selected components. Component-specific assessment methods are presented for each KLOI and SON section of the Developer's Assessment Report in Section 4.2.

Figure 4-1: Flow Diagram for Assessment Approach



4.1.1 Information Sources

Information sources that will be used to support the analyses in the Developer's Assessment Report are anticipated to include the following:

- the Project Description, which identifies the physical works and activities associated with the Project (current version in Volume 1)
- results of Project engagement activities (currently described in Volume 2 and Section 4.1.4)
- ITK provided through Project engagement and ITK studies (currently described in Volume 2 and Section 4.1.5)
- the 2007 Developer's Assessment Report prepared by Tamerlane Ventures Inc. for the Pine Point Pilot Project, and related materials
- materials describing effects of similar projects in the NWT and Canada
- baseline reports prepared for each EA component (i.e., climate, air quality and noise; groundwater quantity and quality; surface water quantity; water quality; fish and fish habitat; terrain and soils; vegetation; caribou; wildlife; heritage resources; TLRU; socio-economics; and NTLRU)
- previous environmental and socio-economic monitoring studies completed by Tamerlane Ventures Inc. for the Pine Point Pilot Project
- historical reports prepared by Cominco for the Pine Point site
- framework or conceptual versions of environmental management plans (e.g., Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Spill Contingency Plan, Waste Management Plan, Closure and Reclamation Plan)
- framework or conceptual versions of environmental monitoring plans (e.g., Air Quality Mitigation and Monitoring Plan, Aquatic Effects Monitoring Program, Wildlife Protection Plan)
- framework or conceptual versions of socio-economic management plans (e.g., Socio-economic Management Plan and Engagement and Collaboration Plan)
- territorial and federal environmental legislation and regulations
- MVEIRB guidelines related to environmental and socio-economic impact assessment
  - *Environmental Impact Assessment Guidelines* (MVEIRB 2004)
  - *Socio-Economic Impact Assessment Guidelines* (MVEIRB 2007)
- MVEIRB *Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment* (MVEIRB 2005)

Additional information sources will be considered in the scoping process undertaken by individual biophysical and human environment components. These additional information sources are described further in Section 4.2.

4.1.2 Selection of Valued Components, Assessment Endpoints, and Measurement Indicators

4.1.2.1 Valued Components

A list of potential VCs and intermediate components to be used in the assessment of effects from the Project on the biophysical and human environments, along with a rationale for selecting each VC and intermediate component, is provided in Section 2.0. The criteria used to select the final list of VCs and intermediate components that will be applied in the Developer's Assessment Report are also outlined in Section 2.0.

4.1.2.2 Assessment Endpoints and Measurement Indicators

Assessments undertaken for each VC will use assessment endpoints and measurement indicators to help structure analyses and facilitate assessment conclusions and determination of significance. Assessment endpoints are qualitative expressions that represent the key properties of VCs that should be protected; assessment endpoints are considered as significance thresholds but are typically not quantifiable. Sustainability concepts, scientific principles, and the outcomes from community engagement will be used to help define the assessment endpoints for biological and human environment VCs. For example, an assessment endpoint for a biophysical VC may involve the maintenance of self-sustaining and ecologically effective populations of fish or wildlife, whereas human environment VCs may consider the maintenance of way of life or community well-being. Unlike VCs, intermediate components do not have assessment endpoints (Section 4.1.2). This is because the importance or significance of changes in intermediate component measurement indicators (Section 4.1.2) can only be evaluated in context of effects on a VC. For example, changes to water quantity or quality can only be evaluated in the context of how these changes affect the receptor; numerical changes in flows or concentrations are meaningless except in how these changes would affect fish and fish habitat or vegetation.

Measurement indicators represent physical and biological/human attributes of the biophysical and human environments that can be measured and used to characterize changes to VCs to inform conclusions about effects on VCs, and ultimately, assessment endpoints. Measurement indicators may be quantitative (e.g., concentrations of metals in surface water, amount of employment and income) or qualitative (e.g., descriptions of expected movement and behaviour of wildlife in response to noise and general human activity or descriptions of expected changes in community cohesion).

Determining whether an assessment endpoint is maintained or achieved typically requires the interpretation and compilation of the results from several measurement indicators and predicted effects on VCs that collectively provide a meaningful evaluation of the assessment endpoint. For example, changes in habitat quantity and quality (measurement indicators) are used to determine the significance of residual effects from the Project on the ability of a wildlife population to be self-sustaining and ecologically effective (an assessment endpoint). Measurement indicators also provide the primary factors for discussing the uncertainty of effects on VCs (and intermediate components, see below) and, subsequently, can be key variables for study in potential follow-up and monitoring activities.

The proposed assessment endpoints and measurement indicators recommended to be used in the assessment for VCs are presented in Table 4-1, and measurement indicators recommended to be used in the assessment for intermediate components are presented in Table 4-2. The assessment endpoints and description of measurement indicators for VCs and intermediate components will be provided in each component section of the Developer's Assessment Proposal. The final assessment endpoints and measurement indicators will incorporate feedback from engagement and comments on the Developer's Assessment Proposal.

Table 4-1: Proposed Assessment Endpoints and Measurement Indicators for Valued Components

Valued Component	Key Line of Inquiry/ Subject of Note	Assessment Endpoint(s)	Measurement Indicators
Fish and Fish Habitat ■ Great Slave Lake Fish Community ■ Twin Creek Fish Community ■ Buffalo River Fish Community ■ Paulette Creek Fish Community	SON-4: Impacts to Fish and Fish Habitat	■ Ongoing fisheries productivity ■ Self-sustaining and ecologically effective fish populations	■ Habitat quantity (water quantity, flow discharge, surface area) ■ Habitat quality (water quality, substrate, depth) ■ Habitat distribution (arrangement and connectivity) ■ Fish survival and reproduction
Vegetation (upland, wetland, and riparian ecosystems)	SON-6: Impacts to Vegetation	■ Self-sustaining and ecologically effective ecosystems	■ Ecosystem availability (amount) ■ Ecosystem and wetland distribution (arrangement and connectivity) ■ Ecosystem condition (e.g., plant community composition, plant species at risk, proliferation of invasive species)
Woodland Caribou (Boreal Population)	KLOI-2: Impacts to Caribou	■ Self-sustaining and ecologically effective caribou population	■ Habitat availability (quantity and quality) ■ Environment and Climate Change Canada (Environment Canada 2012) threshold for undisturbed caribou habitat for critical habitat identification (i.e., 65% undisturbed habitat) ■ Habitat distribution (arrangement and connectivity) ■ Animal survival and reproduction
Wildlife[(a)] ■ Wood Bison ■ Gray Wolf ■ Wolverine ■ Little Brown Myotis and Northern Myotis ■ Short-eared Owl ■ Olive-sided Flycatcher ■ Whooping Crane ■ Common Nighthawk ■ Evening Grosbeak ■ Bank Swallow and Barn Swallow ■ Yellow Rail ■ Rusty Blackbird ■ Horned Grebe ■ Red-necked Phalarope ■ Northern Leopard Frog ■ Gypsy Cuckoo Bumble Bee and Yellow-banded Bumble Bee	SON-7: Impacts to Wildlife	■ Self-sustaining and ecologically effective wildlife populations	■ Habitat availability (quantity and quality) ■ Habitat distribution (arrangement and connectivity) ■ Animal survival and reproduction

Table 4-1: Proposed Assessment Endpoints and Measurement Indicators for Valued Components

Valued Component	Key Line of Inquiry/ Subject of Note	Assessment Endpoint(s)	Measurement Indicators
■ Heritage Resources (archaeological or historical sites, burial sites, artifacts and other objects of historical, cultural, or religious significance)	SON-8: Impacts to Heritage Resources	■ Preservation of Heritage Resources	■ Number of archaeological sites ■ Quality (e.g., scientific or cultural significance) of documented sites
Traditional Land and Resource Use	KLOI-3: Impacts to Traditional Land and Resource Use	■ Continued opportunities to practice TLRU	■ Availability of traditional use areas ■ Availability of traditionally harvested wildlife, fish, and plant resources ■ Physical access to TLRU areas ■ Sensory disturbances (e.g., noise, odours, and visual disturbance) ■ Social and economic factors affecting participation in traditional activities ■ Changes in the intangible values associated with TLRU (e.g., sense of place, ability to transfer knowledge)
Population Demographics	KLOI-4: Impacts to Social and Economic Conditions	■ Population stability. The effects of population change potentially affects other VCs (e.g., housing, service capacity, infrastructure)	■ Population growth or decline ■ In- and out-migration ■ Ethnicity ■ Age and gender ■ Language ■ Household size
Economic Development and Government Revenues		■ Continued economic productivity in the territory ■ Maximization of local participation in the Project ■ Maintenance of the viability of the traditional and mixed economies ■ Continued government revenue streams	■ Capital investment ■ Gross Domestic Product ■ Local business ■ Taxes and royalties ■ Municipal and regional revenues ■ Municipal and regional expenditure
Employment and Education		■ Enhancement of the capacity of the labour force ■ Increase in skills relative to labour market ■ Maximization of local participation in the Project	■ Local and regional employment ■ Labour force participation, employment, and unemployment rates ■ Income levels and distribution ■ Educational attainment ■ Educational services and training initiatives

Table 4-1: Proposed Assessment Endpoints and Measurement Indicators for Valued Components

Valued Component	Key Line of Inquiry/ Subject of Note	Assessment Endpoint(s)	Measurement Indicators
Community Health and Well-being	KLOI-4: Impacts to Social and Economic Conditions (cont'd)	■ Avoidance of contributions to adverse social conditions in communities affecting wellbeing	■ Morbidity and disease ■ Household composition ■ Family violence ■ Income disparity between communities ■ Rates of substance use ■ Occupational health and safety ■ Public security and crime rates ■ Indicators of wellbeing
Housing, Service, and Infrastructure		■ Maintenance of capacity of health, social, and protective services ■ Maintenance of the capacity and condition of infrastructure in communities and the territory ■ Avoidance of a spike in housing demand that would result in price increases	■ Housing stock and condition ■ Crowding ■ Service capacity ■ Demand for service ■ Infrastructure capacity ■ Infrastructure condition ■ Traffic levels
Non-traditional Land and Resource Use	SON-9: Impacts to Non-traditional Land and Resource Use	■ Continued opportunities for NTLRU	■ Tourism ■ Hunting (outfitting) ■ Commercial and sport fishing ■ Outdoor recreation ■ Parks and protected areas ■ Other development potentially affected by the Project

a) It is anticipated that not all potential wildlife VCs will be assessed comprehensively in the Developer's Assessment Report (see Section 4.2.1.9)
SON = Subject of Note; KLOI = Key Line of Inquiry; TLRU = traditional land and resource use; VC = valued component; NTLRU = non-traditional land and resource use

Table 4-2: Proposed Measurement Indicators for Intermediate Components

Intermediate Component	Key Line of Inquiry / Subject of Note	Measurement Indicators
Air Quality	SON-1: Impacts to Air Quality, Noise, and Climate	■ Comparison of Project criteria air contaminant emissions to applicable territorial and federal ambient air quality criteria: ▪ total suspended particulates ▪ fine particulate matter ($PM_{2.5}$) ▪ sulphur dioxide ▪ nitrogen dioxide ▪ carbon monoxide
Noise		■ Equivalent continuous sound levels for the daytime period (Leq,day) and the nighttime period (Leq,night), expressed in A-weighted decibels (dBA) and C-weighted decibels (dBC) ■ Combined day-night sound levels (Ldn), expressed in dBA
Vibration		■ Peak particle velocity ground vibration expressed in millimetres per second (mm/s) ■ Peak pressure level airblast overpressure expressed in linear decibels (dBL)
Climate		■ Project greenhouse gas (GHG) emissions ■ Contribution to NWT and national GHG emissions
Water Quality	KLOI-1: Impacts to Water Quality	■ In situ water quality parameters (e.g., temperature, pH, dissolved oxygen, conductivity) ■ Concentration of major ions, suspended solids, nutrients, and metals in water
Groundwater Quality and Quantity	SON-2: Impacts to Groundwater Quantity and Quality	■ Groundwater levels and flow patterns ■ Spatial and temporal distribution of groundwater ■ Concentrations of physical analytes (e.g., pH, conductivity) ■ Concentrations of major ions and nutrients ■ Concentrations of dissolved metals
Surface Water Quantity	SON-3: Impacts to Surface Water Quantity	■ Surface water levels and discharges ■ Basin water yields ■ Stream channel parameters (e.g., channel depth, width, and wetted perimeter)
Terrain and Soils	SON-5: Impacts to Terrain and Soils	■ Distribution of terrain units ■ Topography and slope stability ■ Distribution of soil map units ■ Soil quality (productivity)

SON = Subject of Note; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; KLOI = Key Line of Inquiry

4.1.3 Environmental Assessment Boundaries

4.1.3.1 Spatial Boundaries

Defining spatial boundaries within which the assessment will be constrained is a key element of the assessment scoping process. Spatial boundaries will be selected for intermediate and valued components of the biophysical and human environments using the following criteria:

- physical extent of the Project footprint
- physical extent of Project-related effects, including those that extend beyond the Project footprint
- spatial extent of key ecological and socio-economic systems (e.g., watershed boundary of potentially affected lakes and streams, jurisdictional boundaries of affected Indigenous communities)

- geographic distribution, movement, and spatial interaction of intermediate and valued components

The recommended spatial boundaries that will be considered for each VC or intermediate component and the rationale for their selection are identified in Section 4.2. These study areas will be finalized in the Developer's Assessment Report following feedback from communities and regulators on the Developer's Assessment Proposal and any changes to the Project design. For some components (e.g., air quality) study areas cannot be defined for the Developer's Assessment Proposal because details on the location and size of Project facilities and infrastructure are currently too uncertain. Multiple spatial scales will be considered, depending on the assessment requirements of the components. Biological populations and communities function within the environment at different spatial and temporal scales (Wiens 1989), and the response of physical, chemical, and biological processes to changes in the environment can occur across several spatial scales at the same time (Holling 1973; Levin 1992). Similar cross-scale patterns exist in socio-economic systems (Folke 2006).

Although additional spatial scales are possible for individual VCs, spatial scales typically are expected to include a minimum of a local study area (LSA) and a regional study area (RSA). The LSA is defined at a scale that contains most, or all, of the expected effects of the Project on a VC and supporting intermediate components; as such, more detailed data are typically collected in the LSA to describe environmental conditions. The RSA provides broader context for the assessment of the effects of the Project on components and may also be a scale at which some effects of the Project can be measured (e.g., downstream water quality). The RSA for intermediate and valued components will be defined to be an appropriate scale for the assessment of cumulative effects where there is potential for spatial overlap or interactions with effects from the Project and other previous, existing, and reasonably foreseeable developments.

4.1.3.2 Temporal Boundaries

The temporal scope of the assessment will focus on the period from the beginning of construction to the end of closure and reclamation and is intended to evaluate the shorter and longer term changes from the Project and associated Project-specific and cumulative effects on the biophysical and human environments. At the current stage of planning for the Project, the period from the beginning of construction to the end of closure and reclamation is anticipated to last 18 to 24 years. The duration of effects may extend beyond specific phases of the Project, including closure, and is dependent on the physical, biological, social, and/or cultural properties and resilience of intermediate and valued components. The minimum temporal boundary for the effects assessment is defined by the following Project phases:

- **Construction**—includes site preparation; open pit, underground mine, process plant, and additional infrastructure development; transportation of people and materials to and from the Project site; and all activities associated with constructing the Project up until the operation phase commences. Construction activities are expected to occur for a period of approximately 18 months. At this stage of planning for the Project, and pending receipt of all applicable permits and approvals, construction is anticipated to commence in the third quarter of 2023.
- **Operation**—includes all activities associated with mining and processing mineralized materials; open pit and underground mining and mine development; tailings management; management of waste rock and mine water, and domestic waste and hazardous materials; operational discharge; surface storage of clean material; site maintenance; progressive reclamation; and transportation of the people and materials to and from the Project site. The operation phase is expected to occur for a period of 10 to 15 years. At this stage of planning for the Project, and pending receipt of all applicable permits and approvals, the operation phase is anticipated to commence in the fourth quarter of 2024.

- **Closure and reclamation**—includes demolition activities, removal of physical infrastructure, reclamation and remediation of disturbed areas developed or used by the Project, and any other activities required to achieve closure objectives and to return the site to a safe and stable condition. Closure and reclamation activities will also involve a period of monitoring to verify that closure objectives and criteria for the Project have been met. Active closure and reclamation, and associated monitoring activities, are expected to occur over a period of about five to seven years.

Baseline studies associated with each VC identify temporal variation (e.g., annual or seasonal changes in water flow or landcover types, or trends over time in community populations and employment) and other biophysical and socio-economic constraints relevant to the assessment of the Project.

The actual temporal boundaries that will be used in the assessment are component specific and will include the Project phases described above. For some components, residual effects will be assessed for all phases of the Project, but not necessarily for each specific phase. For example, Project effects on wildlife begin during the construction phase with the removal and alteration of habitat (i.e., results in direct and indirect changes) and continue through the operation and closure and reclamation phases, and post-closure until effects are reversed or determined to be irreversible (i.e., permanent). Therefore, effects on wildlife will be analyzed and predicted from construction through closure and reclamation and typically beyond, which generates the maximum potential spatial and temporal extent of effects and provides confident and ecologically relevant effects predictions.

Alternatively, for some valued and intermediate components, the assessment will be completed for those phases of the Project where predicted effects would be expected to peak, or at several key snapshot points in time. These snapshots may be taken at several points within a Project phase or phases. An example is evaluating water quantity predictions at specific times that represent key milestones throughout the life of the Project.

Similarly, the temporal boundaries identified for cumulative effects assessments often vary among intermediate and valued components. Temporal boundaries include the duration of residual effects from previous and existing developments that overlap with residual effects of the Project, and the period during which the residual effects from reasonably foreseeable developments (RFDs) will overlap with residual effects from the Project.

Recommended temporal boundaries that will be considered for individual components and the rationale for their selection are described in Section 4.2. These recommended temporal boundaries will be finalized in the Developer's Assessment Report and reflect the final Project description and comments on the Developer's Assessment Proposal.

4.1.3.3 Assessment Cases

The concept of assessment cases will be applied to the associated component-specific EA boundaries to estimate the incremental and cumulative effects from the Project and other developments. The approach will incorporate temporal and spatial boundaries for analyzing the potential effects from previous, existing, approved, and reasonably foreseeable developments before, during, and after the anticipated life of the Project. Assessment cases will include a Base Case, Application Case, and Reasonably Foreseeable Development (RFD) Case. The amount and level of analysis in assessment cases can vary among components depending on the number, size, and type of existing and known or hypothetical projected human activities and developments in the spatial boundary of the assessment. Assessment cases that will be considered in the effects analysis for individual components are identified in Section 4.2 and will be defined in each component section in the Developer's Assessment Report.

4.1.3.3.1 Base Case (Existing Environment)

To provide context for evaluating potential changes from the Project, each discipline component assessment will include a description of the existing environment (Section 4.1.6; Volume 3). In the context of assessment cases, the Base Case is generally represented by the existing environment. The Base Case describes the existing environment in the local and regional study areas before the application of the Project to provide an understanding of the current physical, biological, economic, social, and cultural conditions that may be influenced by the Project. The temporal boundary of the Base Case includes the combined effects from approved previous and existing developments and activities within the spatial assessment boundaries of intermediate and valued components, which will include Cominco's historical mining operations, on the landscape. The description of the existing environment represents the cumulative effects of historical and current environmental pressures that have influenced the observed condition/patterns of a component.

4.1.3.3.2 Application Case

The Application Case represents the residual effects of the Project relative to the Base Case (i.e., incremental or Project-specific effects). This case is also used to identify and discuss the predicted cumulative effects from the Project and existing environment or the Base Case (i.e., existing and approved developments and activities plus the Project).

The temporal boundary of the Application Case includes the combined effects from the Base Case, the period from Project construction to closure and reclamation, and the duration of residual effects from the Project. For several intermediate and valued components, the temporal extent of some effects may be greater than the lifespan of the Project because the effects will not be reversible until beyond closure. For other components, some effects may be determined to be irreversible. Such effects may be permanent, or the duration of the effect may not be known, except that it is expected to be extremely long and uncertain.

4.1.3.3.3 Reasonably Foreseeable Development Case

The RFD Case includes the Base Case, Application Case, and projects/activities that are currently under application review or that have officially entered a regulatory application process and are therefore considered reasonably foreseeable. Thus, the temporal boundary of the RFD Case will include the predicted duration of residual effects from the Project, plus residual effects from other previous, existing, and future projects and activities. Only effect pathways that are predicted to have a greater than negligible residual effect on valued or intermediate components (Section 4.1.7) will be considered in the RFD Case. The difference between the Application and RFD cases is that the Application Case considers the incremental effect from the Project in isolation of potential future land use activities. RFDs are defined as projects that fit the following criteria:

- are currently under regulatory review or have officially entered a regulatory application process
- have a reasonable likelihood of being initiated during the life of the Project, or may be induced by the Project
- have the potential to change the Project or the effects predictions
- occur in the spatial assessment boundary defined by the intermediate and valued components

The RFD Case may not be required for all components, as it will depend on the review of the RFDs within the spatial and temporal assessment boundaries and the potential to overlap with the component. At the current stage of planning for the Project, it is unclear which components will include an RFD Case in their respective assessments. Additional information is needed to confirm whether residual effects from the Project and from RFDs have the potential to overlap in time and space. Confirmation of Project design details, and the results of

environmental modelling (e.g., groundwater, air quality, surface water quantity, water quality), are needed to determine if Project activities will result in greater than negligible effects on valued and intermediate components. Confirmation of the RSAs that will be used for each component is required, as the RSA is the spatial scale that is considered when evaluating cumulative effects from the Project and other previous, existing, and reasonably foreseeable developments.

A key criterion for selecting other projects to include in the assessment is that those projects must cause similar effects on the same intermediate and valued components influenced by the Project (Hegmann et al. 1999). A summary of the RFDs that are to be considered in the Developer's Assessment Report based on the above definition and criteria is provided in Table 4-3, with a map showing their locations in Figure 4-2. Not all RFDs may necessarily be included in the effects analysis for each component that will include an RFD Case. The list of RFDs that will be considered in the effects assessment for each discipline will be provided in the respective component sections of the Developer's Assessment Report. The list will consider additional material from the updated Project Description, available information regarding potential RFDs, input from engagement, and feedback on the Developer's Assessment Proposal.

Depending on the level of information available for RFDs, the analysis may necessarily be qualitative or conceptual. However, projects should only be considered in the assessment if there is enough information about the potential developments to evaluate their effects. In cases where it is expected that an RFD Case will be included for individual components, a brief summary of the proposed assessment methods that will be used in the Developer's Assessment Report has been provided in Section 4.2.

Table 4-3: Summary of Reasonably Foreseeable Developments that may be Considered in the Developer's Assessment Report

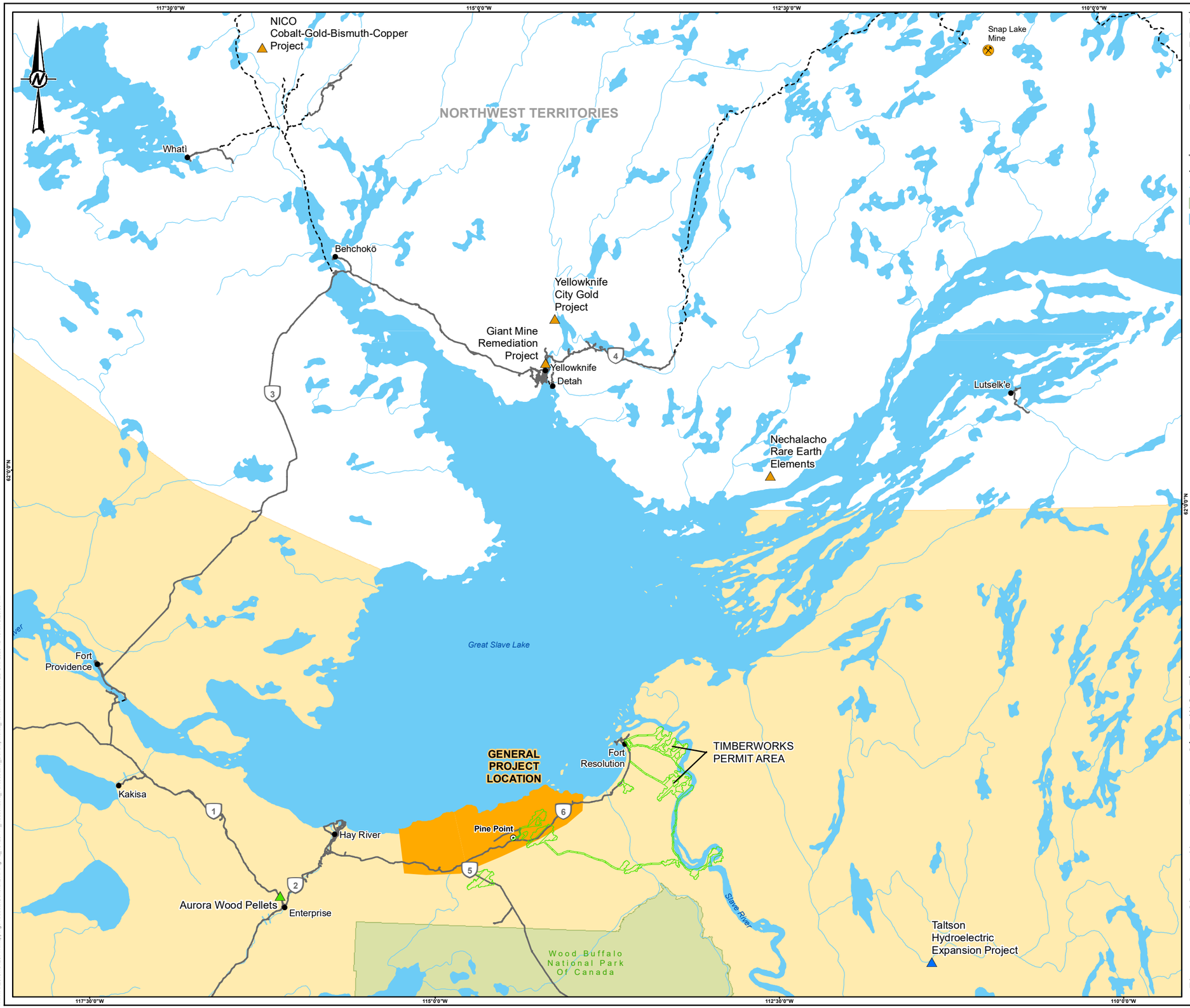
Project	Proponent	Overview
Yellowknife City Gold Project	Gold Terra Resource Corporation (Gold Terra)	The Yellowknife Gold Project is an advanced gold exploration project located 88 km north of Yellowknife near the historical Discovery Mine site. In September 2006, applications for the development of the Yellowknife Gold Project were referred by the Mackenzie Valley Environmental Impact Review Board (MVEIRB) to EA; however, due to inactivity, the EA was suspended. In 2019 Gold Terra updated the Mackenzie Valley Land and Water Board (MVLWB) Land-Use permit for the site and announced commencement of a drilling program in 2020. Although the existing mine plan is expected to change in response to results of a 2012 feasibility study (SRK Consulting, Lyntek Incorporated, Knight Piésold Consulting 2012) and an anticipated date of construction and development is not known, the Yellowknife Gold Project is expected to last for approximately 14 years once operational and employ over 250 people. Access to the project is via an existing winter road built from Prosperous Lake. However, this project has been in the EA process since 2005, and the process has been suspended indefinitely by the MVEIRB until such time as the proponent can show cause why it should be reinstated.
Giant Mine Remediation Project	Governments of Canada and the Northwest Territories	The former Giant Mine is located approximately 5 km north of Yellowknife, lying within the city limits and in close proximity to the communities of Ndilǫ and Dettah. Gold was found at the site in 1935 and the mine operated between 1948 and 2004. Remediation of the site became the responsibility of the Government of Canada when the final owner went bankrupt. The Giant Mine Remediation Project addresses long-term containment and management of arsenic trioxide waste, demolition and removal of buildings on the surface, and the remediation of surface areas including the tailings ponds at the former Giant Mine site. It also includes water management and treatment options. The project was referred to EA and the Developer's Assessment Report was submitted in 2010. The project was approved in 2014. The application for a Type A Water Licence was submitted to the MVLWB in 2019. The remediation plan is currently undergoing revisions and will be resubmitted as a Closure and Reclamation Plan. The remediation of the Giant Mine is anticipated to begin in 2020-2021.
NICO Cobalt-Gold-Bismuth-Copper Project	Fortune Minerals Limited (Fortune)	The NICO Project is a cobalt, gold, and bismuth deposit located in the Tłı̨chǫ region, approximately 50 km northwest from the community of Whatì. Fortune Minerals Limited proposes to mine the deposit using a combination of open pit and underground methods. Ore processing will be limited to crushing, grinding, and flotation consisting of primary and secondary stages to produce bulk concentrate. The resulting bulk concentrate will be thickened and filtered, packaged, and shipped to a second site, the Saskatchewan Metals Process Plant in Langham, Saskatchewan. The EA process is complete and the federal and Tłı̨chǫ governments have approved the NICO mine and mill. Fortune has received its Type A Water Licence and Land Use Permit for the site. It is estimated that NICO reserves will support an 18- to 20-year mine and employ up to 300 people. Access to the NICO Project requires an all-season road connection to Highway 3 near Behchokǫ̀. Construction of the project is expected to commence as soon as financing is secured.
Nechalacho Rare Earth Element Project	Avalon Advanced Materials (Avalon)	The Nechalacho Project is a rare earth elements deposit located approximately 100 km southeast of Yellowknife near Hearne Channel on the East Arm of Great Slave Lake. Rare earth elements will be mined underground from the Nechalacho deposit. Ore will be processed at a hydrometallurgical plant, which is to be constructed at the old Pine Point site on the southern shores of Great Slave Lake. Concentrates will be loaded into bulk transport containers, hauled to the seasonal dock facility along the north shore of Great Slave Lake, and barged during the summer to the hydrometallurgical plant. In November 2013, the federal minister of Aboriginal Affairs and Northern Development Canada approved the MVEIRB's Report of EA recommending project approval. The project was put on hold in 2014 following substantial decline in rare earth element prices. Due to rising prices, work on the project was re-initiated in 2018, with preliminary construction activities beginning in 2019. Access to the mine site will be via air and barge. Access to the hydrometallurgical site will be via existing highways and all-season access roads (MVEIRB 2013).

Table 4-3: Summary of Reasonably Foreseeable Developments that may be Considered in the Developer's Assessment Report

Project	Proponent	Overview
Aurora Wood Pellet Project	Aurora Wood Pellets Limited (Aurora Wood Pellets)	Aurora Wood Pellets is proposing to construct a wood pellet mill north of Enterprise. The mill is expected to create an annual demand for 125,000 m^3 of wood. More than 40 people will be employed at the Enterprise site with the potential to create additional jobs in the region. The mill would purchase sustainably harvested timber from local suppliers and harvest the timber into pellets.
Timber harvesting	Timberworks Inc.	Timberworks Inc. is a business partnership between the Deninu Kųę First Nation and the Fort Resolution Métis Council, and has been awarded timber harvesting rights within a Forest Management Agreement (FMA) area extending from the Slave River to the Buffalo River. The development would, at first, harvest trees from the existing road network at Pine Point and eventually expand to other areas. Some of the harvested timber would be supplied to the Aurora Wood Pellet Project to develop a local forest biomass industry. Eventually, this expanded forestry operation is estimated to support 34 jobs within the community of Fort Resolution. The Annual Sustainable Harvest Level for the Fort Resolution FMA is currently set at 180,600 m^3/yr.
Taltson Hydroelectric Expansion Project	Government of Northwest Territories	The Taltson Hydroelectric Project would expand the existing Taltson generating station and connect the NWTs' hydroelectric systems to provide clean energy to the Slave Geological Province and resource sector. The project would connect the Taltson Hydro System to the North Slave Hydro System and add 60 megawatts (MW) of additional capacity to the existing 18 MW facility and connect the NWT electrical grid to the southern electrical grid. The 60 MW run-of-the-river expansion project would have no new flooding. Approximately 270 km of transmission lines would connect Taltson to North Slave hydro system. The project would provide partnership opportunities for Indigenous governments and job opportunities for Northerners and would stabilize electricity rates for NWT residents and businesses. A previous proponent of the project, Deze Energy Corporation (Deze), initiated a regulatory process for long-term development of the Taltson Hydroelectric Project. The MVLWB referred the project to EA in 2007; however, the EA process was terminated in 2012. Federal funding was secured in late 2018 to review and update feasibility work completed by Deze. The Government of Canada has committed additional funding over the next three years to advance the project.

Note: The list of reasonably foreseeable developments considered for each discipline in the Developer's Assessment Report will depend on residual effects of the Project and whether the developments have the potential to overlap in time and space.

MVEIRB = Mackenzie Valley Environmental Impact Review Board; EA = environmental assessment; MVLWB = Mackenzie Valley Land and Water Board



LEGEND

REASONABLY FORESEEABLE DEVELOPMENTS

- FORESTRY
- HYDROELECTRIC
- MINING

EXISTING DEVELOPMENTS/FEATURES

- FORMER PINE POINT TOWN SITE
- EXISTING MINE
- ALL-SEASON ROAD
- WINTER ROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- WATERBODY
- GENERAL PROJECT LOCATION
- SOUTH SLAVE REGION

0 25 50

1:1,500,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. PARKS AND PROTECTED AREAS OBTAINED FROM CONSERVATION AREAS REPORTING AND TRACKING SYSTEM (CARTS), CANADIAN COUNCIL ON ECOLOGICAL AREAS, 2017.

PROJECTION: ALBERS CONIC EQUAL AREA

CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

TITLE
REASONABLY FORESEEABLE DEVELOPMENTS THAT MAY BE CONSIDERED IN THE DEVELOPER'S ASSESSMENT REPORT

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-15
DESIGNED	LJ
PREPARED	MM
REVIEWED	JV
APPROVED	JV

PROJECT NO.	PHASE	REV.	FIGURE
19125747	B9000	0	4-2

4.1.4 Input from Engagement

Volume 2 presents the Engagement and Collaboration Framework. The framework outlines the PPML's approach to engagement, potentially affected parties, and the reporting requirements for engagement as the Project advances. The Engagement and Collaboration Framework is a living document that will be updated following the MVEIRB's EA Initiation Package scoping consultation with input provided by communities to create an Engagement and Collaboration Plan. The plan will include an Engagement Log, as well as engagement summaries for specific parties engaged. At reporting milestones, the summary of engagement will be updated to reflect the overall evolution of engagement and relationships with potentially affected parties over the life of the Project. The Engagement Plan, Log, and summaries will be included in the Developer's Assessment Report submitted to the MVEIRB.

Project engagement activities will be guided by the Land and Water Boards of the Mackenzie Valley[1] *Engagement and Consultation Policy* (LWBMV 2018a) and *Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits* (LWBMV 2018b). The LWBMV recommends that "*proponents focus their engagement efforts towards parties that will likely be the most directly impacted.*" This is done to focus engagement activities on those parties with the greatest interest in the Project, and to avoid consultation fatigue. PPML has, at this time, prioritized potentially affected parties for involvement based on the expected level of effect. A preliminary list of potentially affected parties has been developed based on a review of previous work completed on the Pine Point property, engagement activities, and Crown-Indigenous Relations and Northern Affairs Canada's *NWT Land Information Related to Aboriginal Groups* (CIRNAC 2018) resource.

The Project is within the South Slave Region, and within the traditional territories of the Deninu Kue First Nation, K'atl'odeeche First Nation, and Northwest Territory Métis Nation. The Deninu Kųę First Nation is in close proximity to the Project, and has to date been the most engaged. The Hay River Métis Council and the Fort Resolution Métis Council were initially engaged separately; however, more recently, engagement has been through the Northwest Territory Métis Nation. It has been proposed that these Indigenous groups be prioritized for a high level of involvement throughout the Project engagement process. Other potentially affected parties have been identified for engagement based the potential for interaction with Project land use, development, or environmental effects, or previously asserted interest in the Project (Volume 2). The list of potentially affected parties will be updated as the Project advances based on feedback from those engaged and other parties that self-identify throughout Project development. At this stage, it is anticipated that feedback obtained through the MVEIRB's EA Initiation Package scoping consultations will result in refinement of the list of potentially affected parties for engagement.

The EA Initiation Package includes information regarding the Project and the assessment approach for comments from communities, government, and public. Input received through PPML's preliminary engagement has been incorporated into the Developer's Assessment Proposal in advance of MVEIRB's EA Initiation Package scoping consultations. Information relevant to the biophysical and human environments baseline studies and associated effects assessments will be extracted from the Engagement Log for consideration in each respective study as future Project engagement activities unfold. Information from engagement can help to inform the selection of study areas, valued components, and assessment approach, and highlight potential effects that are of greatest importance to Indigenous communities and other people interested in the Project. It is anticipated that the approach to the assessment will be refined with the results of PPML's engagement activities, and the results of the MVEIRB's EA Initiation Package scoping consultations.

[1] Mackenzie Valley Land and Water Board (MVLWB), Sahtu Land and Water Board, Gwich'in Land and Water Board, Wek'èezhìı Land and Water Board.

As engagement activities unfold and more information is made available regarding the Project's development, it is anticipated that concerns and aspirations will be raised by potentially affected parties. Further, with more detailed information regarding the Project Description, it is expected that those engaged may have suggestions regarding mitigation or benefit enhancement measures. Such information will be used in the assessment of the potential effects of the Project on the biophysical and human environments. The effects assessment will document and identify how mitigation measures or Project design elements address issues of concern or enhance the benefits of the Project to communities. Issues, concerns, and aspirations will be grouped thematically and included in a table in the introduction section of each KLOI and SON within the Developer's Assessment Report. In addition to identifying the engagement feedback relevant to each specific environmental and socio-economic component of the Developer's Assessment Report, the tables will direct the reader to the section(s) where the issue or concern is addressed.

Previous engagement activities associated with the Project's exploration activities were focused on potential for employment and contracting, land rights, and the approach to interaction between PPML and communities. Recent engagement with communities regarding the Project Description has yielded some key, overarching themes for consideration as the Project advances. PPML has met with the Deninu Kųę First Nation (9 September 2020), K'atl'odeeche First Nation (25 August 2020), and Northwest Territory Métis Nation (31 August 2020), as communities prioritized for involvement in the Project. PPML is also actively engaging with other communities farther from the Project who may have an interest in Project development to deliver similar presentations. To date, PPML has been able to meet with the Łutsel K'e Dene First Nation (26 August 2020). PPML will continue efforts to reach out to communities regarding the Project.

Indigenous communities have expressed the need for advanced notice of Project opportunities and requirements, and for employment and contracting opportunities to be kept local as much as possible to benefit those communities that may be most affected by the Project. To facilitate access to opportunities, early training will be required so that the local labour force is positioned to participate in Project opportunities. PPML will work with communities as the Project evolves to communicate economic opportunities and associated requirements, and to facilitate the accessibility of such opportunities to Indigenous candidates and companies. Considerations around worker and public safety with the ongoing and evolving COVID-19 pandemic, as well as the safety of Indigenous women in light of Canada's Missing and Murdered Indigenous Women and Girls, are of high priority to the communities. PPML is committed to following all applicable territorial protocols regarding workforce management during the COVID-19 pandemic. Water management, site remediation, and the effects on the environment and traditional lands of Indigenous peoples have also at this stage been highlighted as focal areas of concern for communities.

4.1.5 Incorporation of Indigenous Traditional Knowledge

The MVEIRB requires developers to consider and incorporate ITK during Project development and throughout the EA process, and has developed the *Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment* (MVEIRB 2005) as a resource that outlines MVEIRB's expectations and processes for incorporating ITK in the Developer's Assessment Report. In addition, the EA Initiation Guidelines stipulate that developers are required to provide a description of how ITK will be considered and incorporated into Project planning as part of the Project overview.

Communities will be engaged to determine the most appropriate and effective approach to gather information, based on their cultural protocols. Information gathering can be completed through consultation with communities representing the Indigenous groups identified in Section 4.1.4. Ideally, and at this preliminary stage, a series of maps could be created with the Project and traditional territories overlain for mark-up at community meetings, or

in the Indigenous groups' preferred forum according to their ITK protocols. Participants, including Elders, women, and youth, would be provided the opportunity to identify preferred traditional harvesting sites, relevant ITK (e.g., caribou seasonal ranges, furbearer denning sites, fish habitat), culturally important sites and landscapes, and other aspects of TLRU on the maps for inclusion in the TLRU baseline. At the discretion of the knowledge holders, maps and ITK reports themselves may or may not be made publicly available; however, information gathered during the engagement process would inform the TLRU baseline and effects assessment, which ultimately become public documents. Where ITK collected through community-specific studies is withheld, it cannot be used in the EA process.

The Developer's Assessment Report will consider and integrate ITK alongside scientific knowledge. Data collection methods and approaches that will be used for the incorporation of ITK into the Project will be developed collaboratively with Indigenous communities. ITK will be summarized as it relates to specific biophysical or human environment EA components (e.g., air quality, groundwater, surface water quantity and quality, fish and fish habitat, vegetation; wildlife, heritage resources, TLRU and socio-economics), and incorporated into EA sections prepared for each component. ITK gathered during engagement will help inform the selection of VCs, component baseline reporting, identification of potential Project effects or pathways, and the design of mitigation measures, management plans, and monitoring programs.

Specific information types and sources of ITK that may be considered in the individual EA sections are summarized in Section 4.2. The ability to include this information will depend upon the outcomes of the ITK collection process, including whether the information is available and shared by the knowledge holders, and whether they approve its inclusion in the Developer's Assessment Report. The ITK information types and sources outlined in Section 4.2 will be discussed with Indigenous groups and governments to help guide the ITK data collection process for the Project.

4.1.6 Existing Environment

For the purpose of this document, and the future Developer's Assessment Report, *baseline* conditions refer to *existing* environmental conditions, and comprise the current physical, chemical, biological, social, economic, and cultural setting in which the Project is located, and where Project effects might be expected to occur. As a result of past mining activities and the brownfield nature of the historical Pine Point Mine site, the existing environment does not necessarily reflect historical background conditions (i.e., before any industrial development occurred). Rather, the existing environment represents the outcome of historical and current environmental and socio-economic pressures or factors that have shaped the observed condition of biophysical, social, economic, and cultural components of the surrounding environment. Environmental and socio-economic pressures can be natural (e.g., weather, wildfire, predation, and disease) and human-related (e.g., previous mining development, remediation activities, fishing, and hunting).

The description of the existing environment (i.e., Base Case) provided in the Developer's Assessment Report for each VC and intermediate component will expand on the information included in Volume 3 (Existing Environment). Information that will be used to support the description of the existing environment will include published and unpublished material, and data from baseline studies conducted within the anticipated Project footprint and local and regional study areas. Baseline studies identify temporal variation (e.g., annual or seasonal changes in water flow or landcover types, or trends over time in community populations and employment) and other conditions relevant to the assessment of the Project. Other available data and information obtained from government and industry will also be used to establish and characterize the existing environment for the physical, biological, economic, social, and cultural components that may be influenced by the Project.

Data collected in the anticipated Project footprint and in the immediate vicinity of the Project (i.e., LSA) will be used to provide measures of environmental conditions prior to construction of the Project and predict the direct and indirect changes resulting from the Project on intermediate and valued components (e.g., changes to terrestrial and aquatic habitat from the physical footprint or from dust and air emissions). Data collected at larger scales (i.e., RSA) will be used to measure broader scale environmental conditions and provide regional context for the effects of the Project.

A baseline study plan (Volume 3, Appendix C) has been developed for the Project based on the results of a gap analysis completed for previous environmental data from the site, and other publicly available information (Golder 2019). The purpose of the gap analysis was to identify environmental data gaps or missing information and provide recommendations for additional data collection that may be required to support the EA. Additional information recommended to be collected for individual EA components in the baseline study plan (Volume 3, Appendix C) will be included in the existing environment description provided in the Developer's Assessment Report.

4.1.7 Project Interactions and Mitigations

Assessing the adverse effects of the Project begins by identifying the risks to the biophysical and human environments from the Project for each intermediate and valued component and applying practicable mitigation to avoid or minimize the potential adverse effects generated from that risk. As a requirement of the EA Initiation Package, a pathway analysis was undertaken to identify risks to the biophysical and human environments from the Project for each intermediate and valued component (Volume 4). A pathway analysis provides a comprehensive list of potential interactions between the Project and environment, identifies mitigation that could be used to eliminate and/or minimize potential adverse effects, and focuses further assessment on key or principal effects from the Project that remain after mitigation has been applied. The approach and methods used to complete the pathway analysis for the EA Initiation Package are summarized in Volume 4. Section 2.0 of Volume 4 (Pathway Analysis Methods) provides additional information related to the concepts discussed below.

The results of the pathway analysis completed for the EA Initiation Package are provided in Volume 4. For each KLOI and SON, a table provides a description of the Project components/activities that may interact with the associated intermediate or valued components, specific pathways that may change measurement indicators and result in effects on the component, Project design and mitigation measures that are expected to avoid or limit effects, and a categorization of predicted residual effects from the pathway (i.e., no pathway, secondary, or primary). As indicated in the EA Initiation Guidelines, the pathway analysis considered all potential Project-environment interactions that are possible at the current stage of planning for the Project. Hence, the analysis was precautionary, and consequently, there is the potential that some pathways may be no longer be considered (i.e., no pathway or pathway does not exist) once additional details on Project design and mitigation become available.

While the process used to identify effect pathways and associated mitigation was comprehensive and considered information from early engagement and experience with similar projects, there is potential that ongoing engagement and additional Project design details could result in identification of new effect pathways and/or refinement of mitigation. The residual effects categorization applied for certain pathways will need to be confirmed through planned environmental modelling work, baseline data collection, and additional information related to Project design. While the pathway designations provided in Volume 4 are preliminary, it is anticipated that they provide a reasonable estimation of the likelihood and magnitude of residual effects.

The pathway analysis completed as part of the EA Initiation Package will be finalized in the Developer's Assessment Report, and will consider updates to the Project Description, feedback from engagement, and reviewer comments on the Developer's Assessment Proposal. The methods used in the Developer's Assessment Report to complete the final pathway analysis are proposed to be those provided in Volume 4. With the intent of focusing the EA on the most important issues and avoiding assessment of interactions that are unlikely to result in measurable or greater than negligible adverse effects, it is recommended that:

- The interactions categorized as no pathway in Volume 4 are screened out of the Developer's Assessment Report. These potential Project-interactions can be removed by mitigation, and consequently the Project would result in no measurable environmental change relative to existing conditions or guideline values (e.g., air, soil, or water quality guidelines), and therefore, would have no residual effect on a VC or intermediate component. The mitigation that is proposed for these Project-interactions include standard mitigation and best management practices that are typically used and demonstrated to be effective at other mines/developments in the NWT and Canada. The mitigation and management practices are standard management practices that are often implemented as fundamental elements of management plans. Based on the implementation and effectiveness of these standard mitigation at other mines, the mitigation is considered to 100% effective for these interactions. Additional screening information for the Project-interactions classified as no pathway is provided in Appendix A.
- It is proposed that these pathways are not considered in the effects assessment provided in each component section of the Developer's Assessment Report (i.e., these interactions would be excluded from the final pathways effects tables and the supporting text).
- Secondary pathways will be addressed in the Developer's Assessment Report using an abbreviated, tabular format. Secondary pathways are interactions that could result in a measurable minor environmental change but would have a negligible residual effect on a VC or intermediate component. As the predicted magnitude of residual effects is negligible, these pathways are not considered to be priority issues for the Project EA and review process. While it is recommended that they be considered in the EA, these pathways do not warrant a substantial level of detail or attention in the Developer's Assessment Report. These pathways will not be advanced for further assessment in the detailed analysis described in Section 4.1.8.

The evaluation of secondary pathways will consist of tables providing a description of each secondary pathway, and a brief, bulleted list of predicted changes to VCs and intermediate components. The tables would be presented in the effects assessment for each KLOI and SON and would be supported by the pathway of effects and mitigations tables (i.e., the final versions of the tables provided in Volume 4). An example of a secondary pathway assessment using this approach is provided in Table 4-4. Previous EAs submitted to the MVEIRB have provided a reasoned narrative describing the predicted effects for secondary pathways on VCs and intermediate components; this narrative has often been lengthy and repeats the same type of information presented in other EAs. This is inefficient and contributes to an unnecessarily long and less focused Developer's Assessment Report. The tabular approach has been used successfully for EAs submitted to other regulatory boards (e.g., the Nunavut Impact Review Board).

It is important to emphasize that the Project interactions designated as secondary or no pathway are still considered for determining the potential effects of the Project. However, these pathways are not key issues for the EA, as they are predicted to result in either non-measurable (no pathway) or negligible (secondary) residual effects on VCs following implementation of mitigation. The environmental risks associated with the activities or mechanisms contributing to these pathways can be removed or reduced through implementation of environmental management and monitoring systems, which are being developed for the Project (Volume 6). These plans will incorporate adaptive management to monitor and respond to changing or unexpected conditions. An environmental management and monitoring framework for the Project is provided in Volume 6.

By screening out interactions designated as no pathway and evaluating secondary pathways using an abbreviated approach, the EA can be focused on priority issues, resulting in a shorter, and more efficient Developer's Assessment Report. This is consistent with the concepts noted in the EA Initiation Guidelines, which emphasizes that the Developer's Assessment Report should be focused on priority effects and mitigations and should leave out effects that are unlikely to lead to significant effects.

Primary pathways, which are likely to result in environmental change that could contribute to greater than negligible residual effects on a VC, will be the focus of a detailed analysis described in Section 4.1.8. These are the most important issues for the Project and will be given the most attention in the Developer's Assessment Report.

Table 4-4: Example of the Proposed Assessment Approach for Secondary Pathways

Secondary Pathway	Summary of Predicted Effects
Release of sediment during instream construction and from ground disturbance may alter fish habitat quality	■ Increases in suspended sediment concentrations may occur directly due to disturbance of bed materials during instream construction, or indirectly due increased erosion delivered to the waterbody from site runoff. ■ Increases in fine sediment can cause effects on fish ranging from minor physiological stress to mortality. Turbidity can affect the visual ability of fish to detect prey and predators, which can result in reduced growth rates. ■ Release of fine sediment can result in sediment deposition that alters substrate composition and modifies the suitability of habitats used by fish and benthic invertebrates, which are an important food source for fish. ■ Introduction of fine sediment to waterbodies from instream activities and runoff is expected to result in small, localized increases in suspended sediment concentrations and deposition, primarily during the construction phase. ■ Effects from sediment release are expected to be minimal with implementation of the mitigation measures outlined in Volume 4, the Surface Water Management Plan and the Sediment and Erosion Control Plan. ■ Consequently, this Project interaction is anticipated to have a negligible residual effect on fish and fish habitat VCs.

VC = valued component

4.1.8 Residual Effects Analysis

The residual effects analysis will be based on the Project interactions that are determined to be primary in the pathway analysis (Section 4.1.7) and will describe the effects of the Project on intermediate and valued components relative to the Base Case (existing environment). Residual effects will be described for each primary pathway influencing a component and associated measurement indicator(s) in the local and regional study areas (Section 4.1.3.1). Effects that occur during the temporal boundaries of the assessment will be described (numerically or qualitatively), with emphasis on periods when the predicted adverse effects are largest.

The concept of assessment cases (Section 4.1.3.3) will be applied to estimate the incremental and cumulative adverse effects from the Project, as well as previous, existing, and reasonably foreseeable developments. Individual discipline component assessments (i.e., KLOIs and SONs) will describe the approach for residual effects analysis that will be completed for the Application Case and the RFD Case (if applicable). Identification of components that require a cumulative effects assessment under the RFD Case will consider the extent of the adverse effects from the Project and potential to overlap or interact spatially and temporally with effects from other projects/activities.

The assessment of the RFD Case will also consider mitigation and monitoring programs for future projects/activities (if known) intended to reduce the likelihood of adverse cumulative effects. Any assumptions or uncertainty regarding the implementation of anticipated mitigation for other projects/activities (e.g., similar mitigation as the Project, or land use and water licence permit conditions) will be described. Existing territorial and/or federal management actions and policies (e.g., territorial hunting regulations, federal recovery strategies for listed species) applicable to biophysical and socio-economic components will also be included in the evaluation of cumulative effects. Mitigation policies and actions implemented by the Project are expected to avoid and limit the Project's contribution to cumulative effects.

The residual effects analysis for intermediate and valued components will include the concepts of effects criteria, such as direction, magnitude, duration, and geographic extent, which are defined in Section 4.1.9.1. The actual effects criteria terms (e.g., direction, magnitude, geographic extent) may not necessarily be used to describe how changes to measurement indicators from the Project influence VCs and intermediate components. Results will be presented in the form of an integrated narrative that will highlight the predicted effects at the point when adverse effects of the Project are anticipated to be greatest during the temporal boundary of the assessment case(s). For VCs, the outcome of the residual effects analysis will be described considering the influence on the assessment endpoints.

Environmental context, which forms part of the existing environment, will also be used in the analysis of effects on VCs. Context for biophysical VCs will include consideration of current status and trends, ecological thresholds, resilience and adaptive capacity, and applicable legislation and best management practices. Similarly, context for socio-economic VCs will include existing social pressures, tolerance limits and vulnerability, political trends, applicable legislation, standards, plans and policies, and traditional way of life for Indigenous people.

Primary pathways that will be carried forward to the residual effects analysis for components associated with KLOIs and SONs are outlined in Section 4.2, along with a description of the proposed assessment methods that will be used to evaluate effects on valued and intermediate components. The methods follow the principles outlined in this section, but the details vary among components. The proposed assessment methods outlined in Section 4.2 were developed based on experience with similar projects, feedback from early engagement, and in certain cases, feedback from previous regulatory applications for the property.

The final methods and results of the residual effects analysis for VCs and intermediate components will be provided in each component section (i.e., KLOI or SON) of the Developer's Assessment Report. The final methods will consider the results of future engagement activities and feedback on the Developer's Assessment Proposal. Presentation of large amounts of data and detailed and lengthy analyses or modelling will be provided in appendices. Results from the residual effects analysis will be used to inform residual effects classification for intermediate and valued components and to help determine the significance of Project effects on VCs.

4.1.9 Residual Effects Classification and Determination of Significance

4.1.9.1 Residual Effects Classification

A summary or classification of the residual effects analysis will be provided in the Developer's Assessment Report in tabular form for both intermediate and valued components. The use of effects criteria to facilitate classification of residual effects is an accepted practice in EA. The purpose of the residual effects classification is to describe the incremental and cumulative effects from the previous and existing developments and the Project (Application Case) and future developments (RFD Case, if applicable) using a common set of classification criteria. The classification of residual effects criteria in tabular form is intended to provide structure and comparability across all intermediate components and VCs assessed for the Project. The residual effects classification will then be used to help make significance determinations for VCs (Section 4.1.9.2).

The residual effects classification will use direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence as criteria. The classification for the Application Case will be completed for the phase or period (temporal snapshot) when adverse effects from the Project are predicted to be greatest. For the RFD Case, the classification will also be completed under the assumption of capturing the maximum combined overlapping temporal and spatial effects of the existing and approved developments, the Project, and future developments (if applicable). Definitions of categories that will be used to describe changes in each effect criterion will be presented in each component section of the Developer's Assessment Report. General classification schemes that will be applied to each effect criterion used in the Developer's Assessment Report are as follows:

Direction—Typically classified as negative (i.e., net loss or adverse effect), neutral (i.e., no change), or positive (i.e., net gain or beneficial effect). Direction may change over time (i.e., the Project could have adverse effects during some time periods and positive effects during others).

Magnitude—Magnitude is a measure of the intensity or the degree of change (effect size) caused by the Project (and other developments, if applicable) relative to conditions prior to the implementation of the Project, guideline values, or known threshold values. Magnitude will be presented as a quantitative or qualitative expression of effect size for most components (e.g., quantity of groundwater or surface water flow, concentration of constituents of potential concern, hectares of habitat, amount of change in animal connectivity or movement). Magnitude values will be presented quantitatively where possible, and qualitatively where necessary. When categorical definitions are used, magnitude will be classified as negligible, low, moderate, or high and supported by a reasoned narrative.

Geographic extent—Geographic or spatial extent refers to the area (or distance covered, range, or zone of influence) of the effect on the component. The geographic extent of effects can occur at several different scales within the spatial boundary of the assessment and is component specific. Categorical classifications may include effects that are confined to the Project footprint, effects that may extend beyond the Project footprint but are confined to the LSA, effects that may extend beyond the LSA but are confined to the RSA, and effects that may extend beyond the RSA.

Duration—Duration will be presented as numerical values for most components (e.g., days, months, years, decades). When duration is classified categorically, it is typically expressed as short-term or long-term relative to Project activity periods or phases. Duration has two components: the amount of time between the start and end of a Project activity or stressor (which is related to Project phases), plus the time required for the effect on the component to be reversible. In some cases, the duration of a residual effect may not be known, except that it is expected to last for a very long time, well beyond the temporal boundary of the Project. In such cases, where science and logic predict that the likelihood of reversibility is very low or uncertain, the residual effect will be considered permanent (i.e., apply a precautionary approach).

Reversibility—After removal of the Project activity or stressor, reversibility is the likelihood that the Project will no longer influence a component at a future predicted time. This criterion usually has one of two alternatives: reversible or irreversible. The period will be provided for reversibility (i.e., duration) if a residual effect is reversible. Permanent residual effects are considered irreversible.

Frequency—Frequency refers to how often an effect will occur during the temporal boundary of the assessment. Occasional residual effects occur once or a few times (e.g., once during the installation of a culvert). Continuous effects occur all the time for a specified duration. Periodic effects occur consistently at regular intervals or associated with temporal events (e.g., during breeding or spawning season, spring freshet, low flows, growing season or plant harvest season).

Probability of occurrence—The probability of an effect occurring is typically described in parallel with uncertainty, which may be influenced by a variety of factors such as the likelihood of a negative response by the component occurring or the likelihood of mitigation being successful. Defined categorically as unlikely, possible, probable, or certain.

4.1.9.2 Significance Determination

Following the classification of residual adverse effects from associated primary pathways, a determination of significance will be completed only for VCs, which have assessment endpoints or qualitatively defined significance thresholds.

Significance will be determined for both the residual effects of the Project alone and the cumulative effects of the Project combined with other developments. However, a determination of significance generally cannot be accomplished without a cumulative effects assessment because effects of a single Project infrequently cause an environmentally significant effect on their own (McCold and Saulsbury 1996), and many environmental effects of primary concern are cumulative (Canter and Ross 2010). Therefore, significance will be determined by combining the cumulative effects identified in the Base Case with the incremental effects identified for the Application Case, and then for RFD Case (if applicable) to assess the total predicted cumulative effect. Although the significance of the incremental effects of the Project in isolation will not be determined, the relative contribution of the Project to potential significant adverse cumulative effects will be discussed. Understanding the contribution of the Project to a significant adverse effect is necessary because it enables decision makers to properly weigh the adverse effects and benefits of the Project.

The predicted changes in measurement indicators and associated residual effects classification of primary pathways provide the foundation for determining the significance of incremental and cumulative effects from the Project and other previous, existing, and future projects on VC assessment endpoints. The determination of significance will consider the entire set of primary pathways and affected measurement indicators that influence a particular assessment endpoint. Thus, significance is not explicitly assigned to each pathway or measurement indicator. Rather, the relative contribution of each pathway or measurement indicator will be used to determine the significance of potential adverse effects of the Project and other developments on an assessment endpoint. The approach is based on a “weight of evidence” or an evaluation of the persuasiveness of the collective evidence. The relative effect from each pathway will be discussed; however, pathways that are predicted to have the greatest influence on effects on assessment endpoints are assumed to contribute the most to the determination of significance.

Ecological and socio-economic context is often relevant when describing the significance of residual effects on biophysical and socio-economic VCs. Ecological context relates to the potential for environmental effects to cause disruption of ecological functions and processes in the receiving environment, which may be fragile with little resilience to further imposed stresses or may be already adversely affected by human activities (Holling 1973). For example, the magnitude of an effect on a fish or wildlife VC depends on the current level of disturbance, population status and trend, and resilience of the VC to further changes in habitat availability and connectivity. Similarly, duration includes consideration of reversibility, and the duration of residual effects on VCs with high resilience (ability to recover from disturbance) would be expected to be shorter relative to VCs with lower resilience or adaptive capacity to disturbance.

Consistent with the notion of ecosystem resilience, a resilient human community is one that has the capacity to cope with change and disturbance without shifting into a qualitatively different state. A resilient community can tolerate change and, if disturbed, can adapt. This adaptation and renewal can be accelerated through mitigation.

In contrast, a vulnerable community has a limited capacity to adapt to further disturbances. Where relevant, ecological or socio-economic context is discussed in the determination of significance.

Details on the approach and methods for determining significance on VCs will be provided in each KLOI and SON section. In general, significance determination of residual effects will be accomplished by evaluating the following against assessment endpoints defined for each VC:

- magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence of the residual adverse effect for each applicable measurement indicator and related intermediate component
- uncertainty in effects predictions

Magnitude, geographic extent, and duration will be the primary factors affecting significance determination, with other criteria used as modifiers. Resilience, tolerance, and adaptive capacity provide important ecological and socio-economic context for determining significance. Where possible and appropriate, established guidelines, thresholds, and screening values will be used to support the conclusion. If a cumulative adverse effect of the Project and other developments has a sufficiently high magnitude, affects a sufficiently large area, and lasts for a sufficient duration to cause a significance threshold defined by the assessment endpoint for a VC to be exceeded, then a significant adverse effect will be identified. Where uncertainty is high and the effect either significant or not significant, the assessment will use a precautionary approach and identify the effect as significant. Additional follow-up actions will then be proposed to reduce the uncertainty.

4.1.10 Prediction Confidence and Uncertainty

The purpose of an EA is to predict the future conditions of the biophysical and socio-economic environments as a result of the Project and previous, existing, and future projects. Because the biophysical and socio-economic environments change naturally and continually through time and across space, most assessments of effects and predictions about future conditions embody some degree of uncertainty.

The assessment will apply a precautionary approach to address uncertainty by identifying the greatest magnitude, duration, and geographic extent of potential adverse effects when a range of possible outcomes are possible. Consequently, uncertainty will be addressed in a manner that increases the level of confidence that residual effects are not be worse than predicted.

Confidence in effects analyses can be related to many elements, including the following:

- adequacy of the baseline data for providing an understanding of the existing environment and the direction, magnitude, and spatial extent of future fluctuations in ecological, cultural, and socio-economic variables, independent of effects from the Project and other developments (e.g., climate change, fire, or flood)
- assumptions, conditions, and constraints of model inputs
- understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space (e.g., how and why the Project will influence wildlife and TLRU)
- knowledge and experience with the type of effect in the system
- knowledge of the effectiveness of Project (environmental) design features or mitigation for removing or reducing effects
- uncertainties associated with the exact location, physical footprint, activity level, and the timing and rate of future developments

Uncertainty in these elements can decrease confidence in the residual effects analysis and determination of significance. Key sources of uncertainty that are relevant to each component discipline, and that will be addressed in the Developer's Assessment Report, are summarized in Section 4.2. The KLOI and SON assessments provided in the Developer's Assessment Report will provide a qualitative discussion to assess prediction confidence to the extent reasonable. Where appropriate, residual uncertainty will be addressed by additional mitigation and in monitoring and follow-up programs. Each KLOI and SON section will include a discussion of how uncertainty will be addressed and will provide a qualitative evaluation of the resulting level of confidence. The implications of uncertainty will also be included in the residual effects analysis and classification (probability of occurrence criterion) and in the determination of significance.

4.1.11 Monitoring and Follow-up

Monitoring programs will be proposed in the Developer's Assessment Report to address the uncertainties associated with the effects predictions and to evaluate the performance of mitigation. In general, monitoring is used to verify the effects predictions. Monitoring is also used to identify any unanticipated effects and provide for the implementation of adaptive management to limit these effects. Typically, monitoring includes one or more of the following categories, which may be applied during the development of the Project:

- **Compliance monitoring**—monitoring activities, procedures, and programs undertaken to confirm the implementation of approved design standards, mitigation, and conditions of approval, and company commitments (e.g., inspecting the installation of a silt fence, monitoring the quality of water discharged from the Project).
- **Follow-up monitoring**—programs designed to test the accuracy of effects predictions, reduce or address uncertainties, determine the effectiveness of mitigation, or provide appropriate feedback to operations for implementing adaptive management. Results from these programs can be used to update environmental effects predictions (i.e., as an aspect of operational environmental monitoring programs such as aquatic effects monitoring programs; MVLWB and GNWT 2019) and can increase the certainty of effect predictions in future EAs.

These programs will form part of the Environmental Management System for the Project. If monitoring or follow-up detects effects that are different from predicted effects or identifies the need for improved or modified design features and mitigation, then adaptive management will be implemented. This may include increased monitoring, changes in monitoring plans, or additional mitigation.

A conceptual Management and Monitoring Framework for the Biophysical and Human Environments (Volume 6) has been developed for the Project to support the EA Initiation Package. The Developer's Assessment Proposal provides framework versions of a subset of management and monitoring plans that will be considered in the environmental management system for the Project. A similar approach will be used in the Developer's Assessment Report, which will provide versions of monitoring and management plans to support the EA. The conceptual Management and Monitoring Framework for the Biophysical and Human Environments will be provided as a supporting section of the Developer's Assessment Report, according to the table of contents proposed for the Developer's Assessment Report in Section 5.0. These monitoring and management plans will be referenced in Developer's Assessment Report by component disciplines, where applicable.

Anticipated monitoring activities or programs that are relevant to individual component disciplines are outlined in Section 4.2. Proposed monitoring and follow-up activities or programs will be finalized in each KLOI and SON section of the Developer's Assessment Report and, where relevant, conceptual monitoring activities or programs will be proposed to deal with the uncertainties associated with the effect predictions and mitigation. Upon Project

approval, these management and monitoring plans will be included in the Project's Environmental Management System. The conceptual management and monitoring framework included with the Developer's Assessment Report, and recommendations for individual components, will consider feedback from engagement and the Developer's Assessment Proposal.

4.2 Methods for Key Lines of Inquiry and Subjects of Note

This section provides details relating to the methods that will be used to assess effects from the Project for the KLOIs and SONs identified in Section 3.0, for biophysical (Section 4.2.1) and human (Section 4.2.2) environment components.

4.2.1 Biophysical Environment

4.2.1.1 SON-1: Impacts to Air Quality, Noise, and Climate

The investigation of SON-1: Impacts to Air Quality, Noise (including vibrations), and Climate will be separated into three sections. Descriptions of the assessment methods expected to be used in the Developer's Assessment Report for the air quality, noise, and climate components are provided in Table 4-5, Table 4-6, and Table 4-7 respectively.

Table 4-5: Assessment Methods for Air Quality

Assessment Approach for SON-1: Impacts to Air Quality		
Information Sources	Information sources that will be used to support the air quality assessment are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ The Air Quality, Noise, and Climate Baseline Report ■ Territorial and federal legislation and guidance such as the Territorial Ambient Air Quality Standards (Draft) ■ Compendia of published emission factors for industrial sources ■ Additional regulatory guidance sourced from other jurisdictions for which there is a regulatory gap in the NWT for compounds assessed that may be unique to this Project and Pine Point Mining Limited (PPML) becomes aware of during the assessment process ■ PPML's engineering team will be an important source of information. Project-specific details including site layout, fleet and processing information, power supply options, Project boundaries, building dimensions, and other details will be required to complete the air quality assessment. A comprehensive emissions request document will be prepared that requests these details at the onset of the assessment	
Intermediate Components and Measurement Indicators	Intermediate Component(s)	Air quality will be considered as an intermediate component in the Developer's Assessment Report. A rationale for the selection of air quality as an intermediate component is provided in Section 2.0 and Table 2-2.
	Measurement Indicators	Measurement indicators for air quality are defined in Section 4.1.2 and Table 4-2. As air quality is an intermediate component, an assessment endpoint is not defined (Section 4.1.2).
Environmental Assessment Boundaries	Spatial Boundaries	Details related to the location and size of existing and new facilities and infrastructure for the Project (i.e., physical Project footprint) are currently being developed through the design process and cannot be included in the EA Initiation Package. These details on the Project Description are necessary to define the spatial boundaries for air quality and are expected to be available for the Developer's Assessment Report. The spatial boundaries considered in the air quality assessment will include a local study area (LSA) and a broader regional study area (RSA; Section 4.1.3): ■ The LSA would likely include the Project footprint plus a minimum of a 10 km area beyond the Project footprint. ■ The RSA will be sized to evaluate air quality predicted concentrations to approximately 10% of the affiliated air quality standard. For example, if the nitrogen dioxide (NO_2) 1-hour standard is 213 parts per billion (ppb), the study area would be sized to enclose the 21 ppb air quality prediction contour. The RSA cannot be defined fully until the scope of the emissions inventory is better understood and basic testing of the air dispersion model is completed.

Table 4-5: Assessment Methods for Air Quality

Assessment Approach for SON-1: Impacts to Air Quality		
Environmental Assessment Boundaries (cont'd)	Temporal Boundaries	The temporal boundaries for the air quality assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. It is likely that the operation phase of the Project will yield the highest emissions rates of all the phases, and within the operation phase, it is further likely that there will be a peak year of operation that is expected to be the basis of the air quality assessment. The peak year of emissions will be considered with other factors in determining a snapshot year to consider as the potential "worst case." Other factors to consider include the location and duration of emissions within the Project boundary. Other phases of the Project will be considered more peripherally, without an explicit modelling assessment because the construction and closure and reclamation phases, as well as post-closure, will likely result in smaller changes in air quality than the peak of the operation phase.
	Assessment Cases	■ The air quality residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, possibly, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the air quality section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Section 4.1.4 and Volume 2) will be considered in the air quality assessment; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the air quality assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the air quality assessment are anticipated to include the following information types and sources: ■ feedback and observations provided by Indigenous community members ■ locations of cabins, camps, and other dwellings where people may be present and potentially exposed to changes in air quality as a result of the Project ■ recreational, spiritual, and cultural locations where specific air quality predictions may be made through dispersion modelling	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for air quality will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of existing environment will incorporate historical and recent baseline sampling information regarding existing air quality and meteorology. The existing baseline information related to air quality is considered adequate to complete the effects assessment. A small, supplemental air quality baseline data collection program is being conducted in summer 2020 (Volume 3, Appendix C).	
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the air quality component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for air quality, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.	

Table 4-5: Assessment Methods for Air Quality

Assessment Approach for SON-1: Impacts to Air Quality	

Residual Effects Analysis	The residual effects analysis for the air quality component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). Three Project-environment interactions were determined to be primary for air quality. Assessment methods that will be used to evaluate the potential residual environmental effects of these pathways on the air quality intermediate component are described below.
	■ Emissions of criteria air contaminants from mobile and stationary combustion sources including nitrogen and sulphur oxides, particulates, and carbon monoxide can affect air quality.
	■ Emissions of mercury, dioxins, and furans may adversely affect air quality.
	■ Emissions of fugitive dust can affect air quality.
	  ■ Emissions are expected from the operation of on-site vehicles, mining and processing equipment, power generation, waste management, fugitive dust emissions from site roads and wind erosion from stockpiles. All of these emission sources will be quantified in an emissions calculation exercise and will be the primary inputs to the CALPUFF dispersion model, which will predict ground level concentrations of the key parameters.
	  ■ The air quality dispersion modelling assessment will be used to predict ground-level concentrations of air quality parameters beyond the developed area boundary of the Project. The CALPUFF dispersion model will be used. The model inputs will consist of emissions estimates from all important sources at the Project, a representative meteorological dataset, and digital terrain information. Background concentrations of key parameters (e.g., NO_2) will also be used to inform the assessment. The output of the model will be processed and compared to the measurement endpoints defined by the NWT air quality standards. CALPUFF is the most appropriate model to use when changes to air quality need to be evaluated over a large area. It is the most common refined air dispersion model used in Canada for projects of this nature, including most of the mining projects in the NWT and Nunavut.
	Technically and economically feasible mitigation will be identified in coordination with PPML's mine design team.

Residual Effects Classification	The residual effects classification completed for the air quality assessment will follow the methods defined in Section 4.1.9. Component-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. A determination of significance will not be completed for air quality, which will be considered as an intermediate component in the Developer's Assessment Report (Section 4.1.9).
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the air quality assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ Air quality modelling inputs, specifically estimates of Project emissions, which will likely be conservative estimates, and modelling results that will be derived from the CALPUFF dispersion model that attempt to estimate the conditions likely to occur in a dynamic environment. Air dispersion modelling results will be designed to "err on the high side" to account for some of the inherent uncertainty in the assessment process. ■ Adequacy of baseline data for understanding current conditions and future changes unrelated to the Project. ■ Knowledge of the final proposed mitigation and environmental design features designed for reducing or removing Project effects. Air quality dispersion modelling assessment requires specific and detailed information to make reasonable predictions of potential changes to air quality and it is common that final information of this nature is unavailable early in the Project development stages when environmental work is generally completed. The usual approach to mitigate this uncertainty is to make what are believed to be conservative estimates of emissions at the outset of the exercise and to carry those assumptions through the assessment (i.e., freeze the Project design for assessment). It must be understood further, however, that it is probable that changes to the design will be required at some point when additional Project details are known. Finalized data of this nature may not be available in some cases until after the air quality assessment is complete. It will be the goal of the assessment to mitigate this uncertainty to the extent possible through detailed information requests, ongoing communication with the Project design team, and maintenance of conservative, yet reasonable assumptions throughout the assessment process.
Monitoring and Follow-up	The air quality section of the Developer's Assessment Report will include a brief description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring. Monitoring of air quality is anticipated and is expected to include the following elements to be developed after the Developer's Assessment Report, in the permitting phase of the Project: ■ Air Quality Effects Mitigation and Monitoring Program ■ Emissions Management Plan Monitoring activities defined for waste management (Volume 6) are also relevant to the air quality component and will be considered in the air quality section of the Developer's Assessment Report. The air quality section of the Developer's Assessment Report will include a description of the specific objectives, monitoring techniques and general analysis procedures that will be used for the planned monitoring activities. Where applicable, links to adaptive management responses will be defined. The design of monitoring activities will also consider previously collected data and will incorporate ITK and information gathered through engagement with communities, where appropriate.

Table 4-5: Assessment Methods for Air Quality

Assessment Approach for SON-1: Impacts to Air Quality	
Supporting Annexes	Supporting documentation relevant to air quality is anticipated to include the following annexes which will be appended to the air quality section of the Developer's Assessment Report: ■ Air Quality, Noise, and Climate Baseline Report ■ Air Quality Modelling Report ■ Air Quality Emissions Report ■ Air Quality Meteorology Report Other information sources will be considered in the air quality assessment (see the "Information Sources" section above) but will not be appended to the air quality section of the Developer's Assessment Report.

Table 4-6: Assessment Methods for Noise (Including Vibration)

Assessment Approach for SON-1: Impacts to Noise (Including Vibration)		
Information Sources	Information sources that will be used to support the noise and vibration assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ project equipment lists, plot plans, building drawings, and mine plans ■ the Air Quality, Noise, and Climate Baseline Report ■ federal guidance such as Environment Canada's *Environmental Code of Practice for Metal Mines* and Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise* ■ noise and vibration guidance documents from other jurisdictions such as Alberta Energy Regulator Directive 038: Noise Control and the Australia and New and New Zealand Environment Council's *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*	
Intermediate Components and Measurement Indicators	Intermediate Component(s)	Noise and vibration will be considered as intermediate components in the Developer's Assessment Report. A rationale for the selection of noise and vibration as intermediate components is provided in Section 2.0 and Table 2-2.
	Measurement Indicators	The measurement indicators recommended to be used in the noise and vibration assessment are defined in Table 4-2. As noise and vibration are intermediate components, an assessment endpoint is not defined (Section 4.1.2)
Environmental Assessment Boundaries	Spatial Boundaries	Similar to air quality, details related to the location and size of existing and new facilities and infrastructure for the Project (i.e., physical Project footprint) are currently being developed through the design process and cannot be included in the EA Initiation Package. These details on the Project Description are necessary to define the spatial boundaries for noise and vibration and are expected to be available for the Developer's Assessment Report. The spatial boundaries considered in the noise and vibration assessment will include a local study area (LSA) and a broader regional study area (RSA): ■ The LSA would likely include the Project footprint plus a 1.5 km buffer. This definition is based on guidance provided in Alberta Energy Regulator Directive 038: Noise Control (AER 2007). There is no equivalent guidance available in the NWT. ■ The RSA would likely include the Project footprint plus a 5 km buffer. This RSA is large enough to capture potential cumulative noise and vibration effects arising from interaction between the Project and other sources/facilities.
	Temporal Boundaries	The temporal boundaries for the noise and vibration assessment will include the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. Noise and vibration during post-closure will not be assessed, as it is anticipated that there will be no noise or vibration sources present on site following closure and reclamation. It is anticipated that quantitative modelling for the noise and vibration assessment will focus on one snapshot of construction activities and one or two snapshots of activities during operation. Specific assessment snapshots will aim to capture the maximum effects of the Project, and so may include the year when Project activities are most intense (e.g., greatest production or largest equipment fleet) and/or the year when Project activities are closest to sensitive receptors. Specific assessment snapshots will be selected once additional Project design details become available. Noise and vibration during closure and reclamation will be discussed qualitatively, as it is anticipated that Project activities during this phase will be similar, but less intense, than during construction.
	Assessment Cases	■ The noise and vibration residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, possibly, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the noise and vibration section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated

Table 4-6: Assessment Methods for Noise (Including Vibration)

Assessment Approach for SON-1: Impacts to Noise (Including Vibration)		
		that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the noise and vibration assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the noise and vibration assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the noise and vibration assessment are anticipated to include the following information types and sources: ■ locations of cabins, camps, and other dwellings where disturbance from noise and vibration may occur ■ hunting and fishing locations where disturbance from noise and vibration may occur ■ recreational, spiritual, and cultural locations where disturbance from noise and vibration may occur ■ observations and knowledge of how noise and vibration from anthropogenic sources may disturb or otherwise affect wildlife	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for noise and vibration will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of existing environment will incorporate historical and recent baseline sampling information regarding representative noise and vibration levels in the LSA and RSA for a variety of environmental conditions. The existing baseline information related to noise and vibration is considered adequate to complete the effects assessment. No additional baseline information is recommended to be collected for the noise and vibration component (Volume 3, Appendix C).	
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the noise and vibration component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for noise and vibration, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.	

Residual Effects Analysis	The residual effects analysis for the noise and vibration component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). Two Project-environment interactions were determined to be primary for noise and vibration. Assessment methods that will be used to evaluate the potential residual environmental effects of these pathways on the noise and vibration intermediate component are described below.
	■ Noise emissions from Project activities and equipment will increase sound levels.
	  ▪ Computer noise models will be developed for one snapshot of construction activities and one or two snapshots of activities during operation. The computer noise models will make use of the ISO 9613-2 (ISO 1996) technical standard to simulate noise propagation. Inputs to the computer models will include source noise emissions in the form octave band sound power levels, as well as environmental parameters that influence propagation (e.g., wind speed/direction, temperature, ground cover).
	  ▪ Computer noise models will be used to predict Project sound levels ($L_{eq,day}$, $L_{eq,night}$, L_{dn}) at sensitive receptors identified based on ITK and for a receptor grid that covers the LSA and RSA.
	  ▪ Predicted Project sound levels will be compared to thresholds from appropriate guidance documents. Guidance documents that may be considered in the noise assessment include Environment Canada's *Environmental Code of Practice for Metal Mines*, Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise*, and Alberta Energy Regulator Directive 038: Noise Control. There is no equivalent guidance available in the NWT.
	  ▪ Predicted Project sound levels will also be compared to existing noise levels measured in the LSA and RSA to characterize Project-related changes.
	  ▪ Sound levels from closure and reclamation will not be modelled but will instead be assessed qualitatively, on the understanding that Project activities during this phase will be similar, but less intense, than during construction.
	  ▪ There are no regulatory or guidance documents that provide noise assessment thresholds specific to caribou or other wildlife species. As such, it will not be possible to provide a quantitative assessment of effects on wildlife as part of the noise and vibration component. Instead, noise modelling results will be provided to the wildlife component for consideration in a holistic assessment of sensory disturbance to wildlife.
	■ Blasting will result in ground vibration and airblast overpressure.
	  ▪ Numerical models of explosive blasting will be developed for one snapshot of construction activities and one or two snapshots of operation activities. The numerical models will make use of empirical formulae from blasting handbooks. Inputs to the numerical models will include charge mass, burden depth, and parameters that describe the blasting substrate.
	  ▪ Numerical blasting models will be used to predict ground vibration (peak particle velocity) and airblast overpressure (peak pressure level) at sensitive receptors identified based on ITK and as a function of distance from the blast site.	

Table 4-6: Assessment Methods for Noise (Including Vibration)

Assessment Approach for SON-1: Impacts to Noise (Including Vibration)	
	▪ Predicted Project ground vibration and airblast overpressure levels will be compared to thresholds from appropriate guidance documents. Guidance documents that may be considered in the vibration assessment include Environment Canada's *Environmental Code of Practice for Metal Mines* and the Australia and New and New Zealand Environment Council's *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*. There is no equivalent guidance available in the NWT. ▪ There are no regulatory or guidance documents that provide ground vibration or airblast overpressure thresholds specific to caribou or other wildlife species. As such, it will not be possible to provide a quantitative assessment of effects on wildlife as part of the noise and vibration component. Instead, blast modelling results will be provided to the wildlife component for consideration in a holistic assessment of sensory disturbance to wildlife.
Residual Effects Classification	The residual effects classification completed for the noise and vibration assessment will follow the methods defined in Section 4.1.9. Component-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. Due to the considerations noted in Section 4.1.9, a determination of significance will not be completed for vibration and noise, which will be considered as an intermediate component in the Developer's Assessment Report.
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to noise and vibration, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ location and noise emissions for Project equipment and activities ■ location, size, and construction materials used in Project buildings ■ location, charge mass, burden depth, and substrate parameters for Project blasting ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project
Monitoring and Follow-up	The noise and vibration section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring. Noise and vibration monitoring is anticipated to consist of the following: ■ One round of noise and vibration monitoring during the construction phase. The monitoring should occur during a period when construction activities are expected to be most intense. Specific monitoring locations will be selected based on the results of noise and vibration modelling. ■ One round of noise and vibration monitoring during the operation phase. The monitoring should occur as soon as practical after the commencement of full operation. Specific monitoring locations will be selected based on the results of noise and vibration modelling. The noise and vibration section of the Developer's Assessment Report will include a description of the specific objectives, monitoring techniques and general analysis procedures that will be used for the planned monitoring activities. The design of monitoring activities will incorporate ITK and information gathered through engagement with communities, where appropriate.
Supporting Annexes	Supporting documentation relevant to the noise and vibration assessment is anticipated to include the following annex which will be appended to the noise and vibration section of the Developer's Assessment Report: ■ Noise and Vibration Modelling Report Other information sources will be considered in the noise and vibration assessment (see the "Information Sources" section above) but will not be appended to the noise and vibration section of the Developer's Assessment Report.

Table 4-7: Assessment Methods for Climate

Assessment Approach for SON-1: Impacts to Climate		
Information Sources	Information sources that will be used to support the climate assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ The Air Quality, Noise, and Climate Baseline Report ■ The emission inventory developed for the air quality assessment based primarily on fuel use information provided by PPML ■ Published emission factors and greenhouse gas data presented in Canada's Official Greenhouse Gas Inventory (Government of Canada n.d.) ■ The *Draft Strategic Assessment of Climate Change* document produced by Environment and Climate Change Canada (ECCC) (Government of Canada 2019) provides guidance on how federal assessments will consider a project's greenhouse gas (GHG) emissions and its resilience to climate change effects. Although this is not a federal assessment, the methods for evaluation will remain the same.	
Intermediate Components and Measurement Indicators	Intermediate Component(s)	Climate will be considered as an intermediate component in the Developer's Assessment Report. A rationale for the selection of climate as an intermediate component is provided in Section 2.0 and Table 2-2.
	Measurement Indicators	Measurement indicators for climate are defined in Section 4.1.2 and Table 4-2. As climate is an intermediate component, an assessment endpoint is not defined (Section 4.1.2).
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the climate assessment will be considered in the spatial context of the NWT and of Canada.
	Temporal Boundaries	The climate change assessment will be based on the highest predicted GHG emissions year projected for the Project.
	Assessment Cases	The climate change assessment will be based on the Project emissions relative to existing emissions in the NWT and Canada
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Section 4.1.4 and Volume 2) will be considered in the climate assessment; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the climate assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the climate assessment are anticipated to include the following information types and sources: ■ Feedback from communities gathered in the consultation process will be incorporated in the climate assessment to the extent possible.	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for climate will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The existing baseline information related to climate is considered adequate to complete the effects assessment. No additional baseline information is recommended to be collected for the climate component (Volume 3, Appendix C).	
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the climate component will follow the general methods outlined in Section 4.1.7.	
Residual Effects Analysis	The residual effects analysis for the climate component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). One Project-environment interaction was determined to be primary for climate. Assessment methods that will be used to evaluate the potential residual environmental effects of this pathways on the climate intermediate component are described below. ■ Greenhouse gas emissions from land use change and fossil fuel combustion can affect climate. ■ Greenhouse gas emissions will be quantified from Project activities and evaluated in the context of the territorial and national totals.	
Residual Effects Classification	The residual effects classification completed for the climate assessment will follow the methods defined in Section 4.1.9. Component-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. A determination of significance will not be completed for climate, which will be considered as an intermediate component in the Developer's Assessment Report (Section 4.1.9).	
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the climate assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ Preliminary fuel combustion information is expected to be used to estimate the GHG emissions from the Project. The level of certainty regarding the predicted emissions is directly related to the level of certainty in the fuel consumption estimates provided by PPML	
Monitoring and Follow-up	Direct greenhouse gas monitoring is not expected for the Project; however, fuel records will be maintained and emissions of GHGs will reported to the territorial and federal programs as appropriate and dependent upon meeting emissions thresholds.	
Supporting Annexes	There are no supporting annexes planned for the climate assessment.	

4.2.1.2 SON-2: Impacts to Groundwater Quantity and Quality

A description of the assessment methods expected to be used in the Developer's Assessment Report for the groundwater quantity and quality component is provided in Table 4-8.

Table 4-8: Assessment Methods for Groundwater Quantity and Quality

Assessment Approach for SON-2: Impacts to Groundwater Quantity and Quality		
Information Sources	Information sources that will be used to support the groundwater quantity and quality assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Groundwater Quantity and Quality Baseline Report ■ public sources for hydrogeological information ■ published information from other mine sites in the north ■ the site water balance ■ environmental management and monitoring plans, including framework or conceptual versions of the Water Management Plan, Tailings and Waste Rock Management Plan, Waste Management Plan, and Closure and Reclamation Plan ■ territorial and federal legislation and guidance such as the NWT's *Mackenzie Valley Resource Management Act* and *Waters Act*	
Intermediate Components and Measurement Indicators	Intermediate Component(s)	Groundwater quantity and quality will be considered as an intermediate component in the Developer's Assessment Report. A rationale for the selection of groundwater quantity and quality as an intermediate component is provided in Section 2.0 and Table 2-2.
	Measurement Indicators	Measurement indicators for groundwater quantity and quality are defined in Section 4.1.2 and Table 4-2. As groundwater quantity and quality is an intermediate component, an assessment endpoint is not defined (Section 4.1.2).
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the groundwater quantity and quality assessment will include a local study area (LSA) and a broader regional study area (RSA; Section 4.1.3): ■ The LSA includes all active mineral claims, existing bush roads, cutlines, historic railbed, waste rock piles, and backfilled and mined pits (Figure 4-3). The western and eastern boundaries of the LSA are defined by the western boundary of the Twin Creek watershed and the eastern boundary of the Paulette Creek watershed, respectively. The northern extent of the LSA includes a 10-m buffer north of the shoreline of Great Slave Lake and the outlets of the Twin Creek, Buffalo River, and Paulette Creek. The southern extent of the LSA includes Highway 6, connecting the western and eastern boundaries. It will align with the surface water quantity, water quality, and fish and fish habitat LSA. The LSA is anticipated to be large enough to capture direct and indirect effects on groundwater flow and quality resulting from the Project. ■ The RSA includes the LSA plus Birch Creek, which is located 5 km to the west of the LSA (Figure 4-4). The RSA boundary extends 2 km into Great Slave Lake and provides broader context for characterizing baseline conditions and capturing the maximum potential effects from the Project. It will align with the RSA for surface water quantity and water quality.
	Temporal Boundaries	The temporal boundaries for the groundwater quantity and quality assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. The assessment will also consider potential effects on groundwater quantity and quality during post-closure, where relevant. It is anticipated that quantitative modelling for the groundwater quantity and quality assessment will focus on the following three time snapshots: ■ baseline (pre-Project / existing conditions) focused on stream flows and groundwater levels and quality ■ when maximum areal extent of the Project is reached and maximum pit depth/extents are achieved (i.e., often end of mine life, but not always) ■ far future scenario; post-closure when the groundwater system reaches steady state conditions (i.e., often used is 100 years after end of mining operations)
	Assessment Cases	■ The groundwater quantity and quality residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, if required, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the groundwater quantity and quality section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is

Table 4-8: Assessment Methods for Groundwater Quantity and Quality

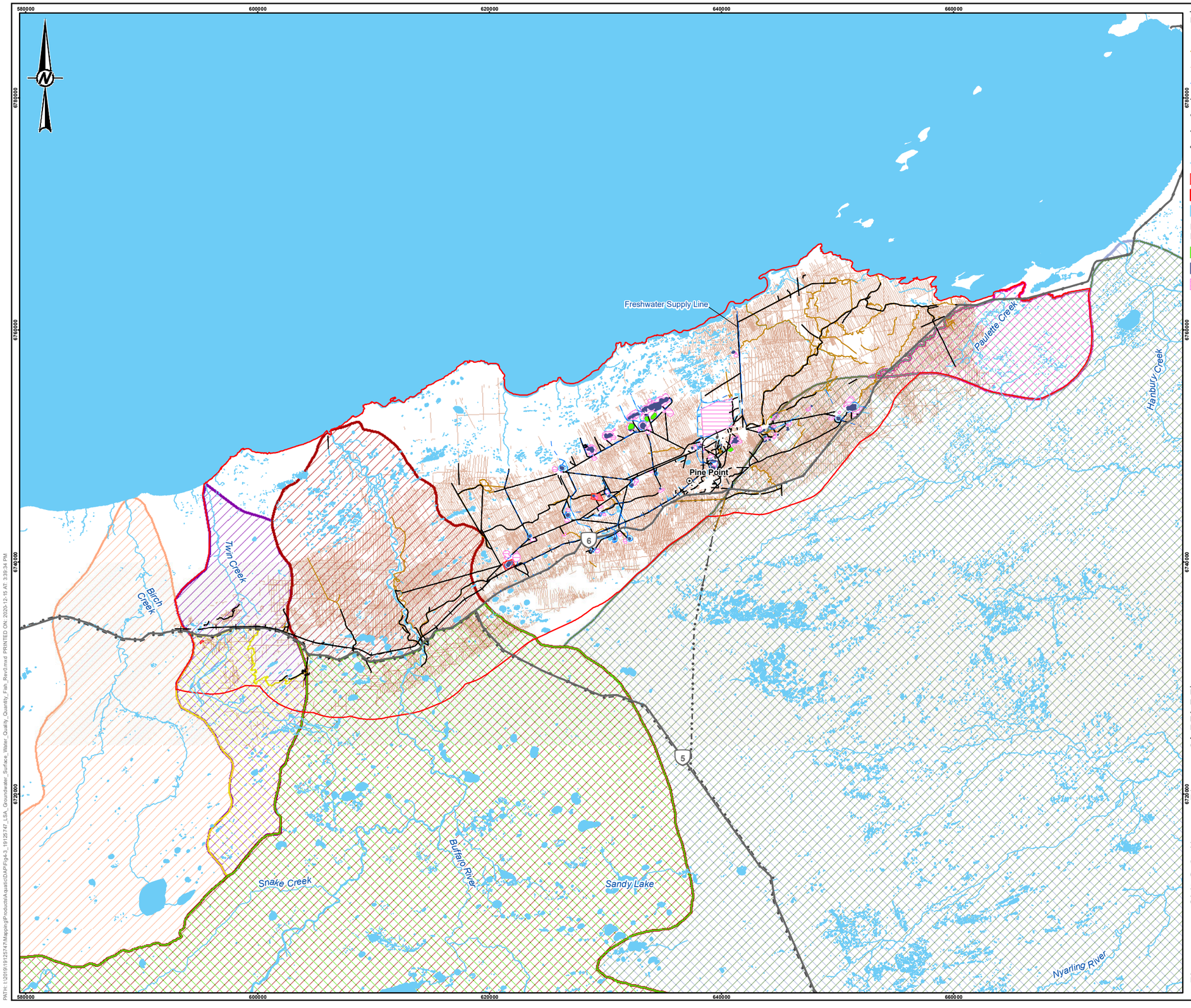
Assessment Approach for SON-2: Impacts to Groundwater Quantity and Quality		
		anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the groundwater quantity and quality assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the groundwater quantity and quality assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the groundwater quantity and quality assessment are anticipated to include the following information types and sources: ■ observations on the locations of springs, wells, or areas of groundwater upwelling or artesian flows ■ observations related to groundwater flows or seasonal fluctuations in groundwater ■ Indigenous use of groundwater resources (i.e., as drinking water or for other purposes)	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for groundwater quantity and quality will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of existing environment will include characterization of groundwater flow, recharge and discharge sources, hydraulic conductivity of hydrostratigraphic units, groundwater quantity, and groundwater quality. Additional information recommended to be collected for the groundwater quantity and quality component in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description.	
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the groundwater quantity and quality component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for groundwater quantity and quality, along with the associated residual effects categorization (i.e., no pathway, secondary or primary) and proposed mitigation measures, is provided in Volume 4.	
Residual Effects Analysis	The residual effects analysis for the groundwater quantity and quality component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined primary in the pathway analysis (Volume 4). One Project-environment interaction was determined to be primary for groundwater quantity and quality: ■ Development of open pits and underground mines can change groundwater flow patterns and distribution. In addition, one Project-environment interaction may be assessed as either primary or secondary depending on the outcome of environmental modelling work and confirmation of Project design details. In the event that this pathway is determined to be secondary in the pathway analysis, it will not be carried forward to the residual effects analysis. ■ Development of open pits and underground mines can change groundwater quality. Assessment methods that will be used to evaluate the potential residual environmental effects of these pathways on the surface water quantity intermediate component are described below. The effects on measurement indicators of groundwater quantity and quality will be evaluated with an industry standard numerical groundwater flow model (e.g., FEEFLOW or MODFLOW). As a result of mining operations, groundwater drawdown and groundwater discharge to the mine pits will be simulated for various assessment cases and time snapshots. The drawdown simulation results will be compared to existing (baseline) conditions. Changes to groundwater discharge will also be computed at locations of discharge to surface water. Particle tracking analysis will be completed to delineate the mine contact groundwater seepage pathways to the receptors and quantify the seepage rates. To evaluate potential changes to groundwater quality, groundwater discharge rates will be multiplied by geochemical source term concentrations and combined with the larger runoff component for contact water to compute the change in concentrations and loading for surface water quality. The groundwater model predictions will be used as inputs to the surface water quantity (hydrology) and surface water quality assessments. Technically and economically feasible mitigation options will be identified in coordination with the hydrology and surface water quality components.	
Residual Effects Classification	The residual effects classification completed for the groundwater quantity and quality assessment will follow the methods defined in Section 4.1.9. Component-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. Due to the considerations noted in Section 4.1.9, a determination of significance will not be completed for groundwater quantity and quality, which will be considered as an intermediate component in the Developer's Assessment Report.	
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the surface water quantity assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ groundwater modelling inputs (e.g., pit inflow volumes, groundwater quality) and results ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project	

Table 4-8: Assessment Methods for Groundwater Quantity and Quality

Assessment Approach for SON-2: Impacts to Groundwater Quantity and Quality	

Monitoring and Follow-up	The groundwater quality and quantity section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring.
	Monitoring of groundwater quality and levels is anticipated and will include the following elements:
	■ A Surveillance Network Program required as a condition of a future Type A Water Licence issued for the Project, which will include:
	  ■ monitoring of groundwater inflow quantity and quality to the open pits and underground mining areas
	  ■ monitoring of groundwater levels to evaluate drawdown propagation from pumping
	  ■ monitoring of seepage quantity and quality from the waste rock storage areas
	The groundwater quality and quantity section of the Developer's Assessment Report will include a description of the specific objectives, monitoring techniques and general analysis procedures that will be used for the planned monitoring activities. Where applicable, links to adaptive management responses will be defined. The design of monitoring activities will also consider previously collected data and will incorporate ITK and information gathered through engagement with communities, where appropriate.

Supporting Annexes	Supporting documentation relevant to water quality is anticipated to include the following annexes which will be appended to the water quality section of the Developer's Assessment Report: ■ Groundwater Quantity and Quality Baseline Report ■ Groundwater Quantity and Quality Modelling Report Other information sources will be considered in the water quality assessment (see the "Information Sources" section above) but will not be appended to the water quality section of the Developer's Assessment Report.



LEGEND

- FORMER PINE POINT TOWN SITE
- BUSH ROAD
- CUTLINE
- DRAINAGE DITCH
- HISTORIC RAILBED
- HIGHWAY
- MINE ROAD
- TRANSMISSION LINE
- WATERCOURSE
- CUTBLOCK
- LOCAL STUDY AREA -
- WATERBODY

PINE POINT EXISTING MINING DISTURBANCE

- BACKFILLED PIT
- MINED PIT
- WASTE PILE

WATERSHEDS

- BIRCH CREEK
- BUFFALO RIVER
- BUFFALO RIVER AT HIGHWAY 5
- LITTLE BUFFALO RIVER
- LITTLE BUFFALO RIVER AT HWY 6
- PAULETTE CREEK
- PAULETTE CREEK AT HIGHWAY 6
- TWIN CREEK
- TWIN CREEK AT HIGHWAY 5

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REFERENCE(S)

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CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

TITLE
GROUNDWATER QUANTITY AND QUALITY, SURFACE WATER QUANTITY AND QUALITY, AND FISH AND FISH HABITAT LOCAL STUDY AREA

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-15
DESIGNED	JV
PREPARED	MM/PMT
REVIEWED	JV
APPROVED	JV

PROJECT NO.	CONTROL	REV.	FIGURE
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Freshwater Supply Line
Pine Point
Paulette Creek
Hanbury Creek
Twin Creek
Birch Creek
Snake Creek
Buffalo River
Sandy Lake
Nyarling River
6
5

LEGEND

- FORMER PINE POINT TOWN SITE
- BUSH ROAD
- CUTLINE
- DRAINAGE DITCH
- HISTORIC RAILBED
- HIGHWAY
- MINE ROAD
- TRANSMISSION LINE
- WATERCOURSE
- CUTBLOCK
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- WATERBODY

PINE POINT EXISTING MINING DISTURBANCE

- BACKFILLED PIT
- MINED PIT
- WASTE PILE

WATERSHEDS

- BIRCH CREEK
- BUFFALO RIVER
- BUFFALO RIVER AT HIGHWAY 5
- LITTLE BUFFALO RIVER
- LITTLE BUFFALO RIVER AT HWY 6
- PAULETTE CREEK
- PAULETTE CREEK AT HIGHWAY 6
- TWIN CREEK
- TWIN CREEK AT HIGHWAY 5

KEY MAP

0 5 10
1:325,000 KILOMETRES

REFERENCE(S)

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CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

TITLE
GROUNDWATER QUANTITY AND QUALITY, SURFACE WATER QUANTITY AND QUALITY, AND FISH AND FISH HABITAT REGIONAL STUDY AREA

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-15
DESIGNED	JV
PREPARED	MM/PMT
REVIEWED	JV
APPROVED	JV

PROJECT NO.	CONTROL	REV.	FIGURE
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4.2.1.3 SON-3: Impacts to Surface Water Quantity

A description of the assessment methods expected to be used in the Developer's Assessment Report for the surface water quantity component is provided in Table 4-9.

Table 4-9: Assessment Methods for Surface Water Quantity

Assessment Approach for SON-3: Impacts to Surface Water Quantity		
Information Sources	Information sources that will be used to support the surface water quantity assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Water Quantity Baseline Report ■ historical hydrometric data collected by the Water Survey of Canada ■ historical climate data available from various publicly available sources including Environment and Climate Change Canada ■ historical snowpack data available from the Government of the Northwest Territories (GNWT) annual snow surveys (GNWT-ENR 2020) ■ historical climate global re-analysis data from the European Centre for Medium-Range Weather Forecasts (ECMWF 2020) ■ historical remotely sensed snowpack data available from the European Space Agency (ESA 2019) ■ results of the effects assessments for groundwater quantity and quality ■ the site water balance ■ environmental management and monitoring plans, including framework or conceptual versions of the Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Waste Management Plan, Closure and Reclamation Plan, and Aquatic Effects Monitoring Program ■ territorial and federal legislation and guidance such as the NWT's *Mackenzie Valley Resource Management Act* and *Waters Act*	
Intermediate Components and Measurement Indicators	Intermediate Component(s)	Surface water quantity will be considered as an intermediate component in the Developer's Assessment Report. A rationale for the selection of surface water quantity as an intermediate component is provided in Section 2.0 and Table 2-2.
	Measurement Indicators	Measurement indicators for surface water quantity are defined in Section 4.1.2 and Table 4-2. As surface water quantity is an intermediate component, an assessment endpoint is not defined (Section 4.1.2).
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the surface water quantity assessment will include a local study area (LSA) and a broader regional study area (RSA) (Section 4.1.3): ■ The LSA includes all active mineral claims, existing bush roads, cutlines, historic railbed, waste rock piles, and backfilled and mined pits (Figure 4-3). The western and eastern boundaries of the LSA are defined by the western boundary of the Twin Creek watershed and the eastern boundary of the Paulette Creek watershed, respectively. The northern extent of the LSA includes a 10-m buffer north of the shoreline of Great Slave Lake and the outlets of the Twin Creek, Buffalo River, and Paulette Creek. The southern extent of the LSA includes Highway 6, connecting the western and eastern boundaries. It will align with the surface water quantity, water quality, and fish and fish habitat LSA. The LSA is anticipated to be large enough to capture direct and indirect effects on surface water flows and levels resulting from the Project. ■ The RSA includes the LSA plus Birch Creek, which is located 5 km to the west of the LSA (Figure 4-4). The RSA boundary extends 2 km into Great Slave Lake and provides broader context for characterizing baseline conditions and capturing the maximum potential effects from the Project. It will align with the RSA for groundwater quantity and quality and surface water quality.
	Temporal Boundaries	The temporal boundaries for the surface water quantity assessment will include the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. The assessment will also consider potential effects on surface water quantity during post-closure, where relevant. It is anticipated that quantitative modelling for the surface water quantity assessment will focus on one snapshot of construction activities, one snapshot of operation activities, one snapshot of closure and reclamation activities, and one snapshot for post-closure. Specific assessment snapshots will aim to capture the maximum effects of the Project within each Project phase and in post-closure. Specific assessment snapshots will be selected once additional Project design details become available. Quantitative modelling for each snapshot will be completed over a range of historical climate conditions to incorporate natural variations in climate.

Table 4-9: Assessment Methods for Surface Water Quantity

Assessment Approach for SON-3: Impacts to Surface Water Quantity		
Environmental Assessment Boundaries (cont'd)	Assessment Cases	■ The surface water quantity residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, if required, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the surface water quantity section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the surface water quantity assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the surface water quantity assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the surface water quantity assessment are anticipated to include: ■ observations of the timing and duration of historical drought periods including or photographs showing water levels ■ observations of the timing and duration of historical flooding including or photographs showing water levels ■ observations of changes in local water quantity conditions over time	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for surface water quantity will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of existing environment will incorporate historical and recent baseline sampling information regarding hydroclimate (e.g., rainfall, snowfall, evaporation), drainage patterns, water levels, and discharges. Additional information recommended to be collected for the surface water quantity component in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description. This will include information from four open-water hydrological field programs on Paulette Creek and Twin Creek and the Buffalo River planned in 2020. Further details are provided in Volume 3, Appendix C.	
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the surface water quantity component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for surface water quantity, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.	
Residual Effects Analysis	The residual effects analysis for the surface water quantity component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined primary in the pathway analysis (Volume 4). Four Project-environment interactions were determined to be primary for surface water quantity: ■ Project operation and footprint may alter site drainage and runoff and change local hydrology, which can affect drainage patterns and timing. ■ During closure, residual ground disturbance, cessation of site water management activities, and reconnection of drainages to the surface water environment may cause changes to local hydrology, which can affect drainage patterns and timing. ■ Physical changes to land cover and land surface can result in changes to local hydrological processes and water balance. ■ Development of open pits and underground mines and associated surface and groundwater changes can result in local increases or decreases in surface water quantity, which may change surface water flow regimes. In addition, one Project-environment interaction may be assessed as either primary or secondary depending on the outcome of environmental modelling work and confirmation of Project design details. In the event that this pathway is determined to be secondary in the pathway analysis, it will not be carried forward to the residual effects analysis. ■ Water supply requirements (potable and process) and water discharge for the Project may alter local hydrology and water balance.	

Table 4-9: Assessment Methods for Surface Water Quantity

Assessment Approach for SON-3: Impacts to Surface Water Quantity	
Residual Effects Analysis (cont'd)	Assessment methods that will be used to evaluate the potential residual environmental effects of these pathways on the surface water quantity intermediate component are described below. The core model framework is expected to be GoldSim (it is anticipated that the site water quality model may also be developed in GoldSim). The receiving environment surface water quantity model will integrate the hydrogeological quantity modelling and the mine site water balance. The model will be based on a Geographic Information System sub-watershed analysis and will consider rainfall and snowmelt runoff, lake storage and attenuation, lake evaporation, snow sublimation, as well as ice conditions at local lakes and streams, and mine site water management activities. The spatial domain of the receiving environment surface water quantity model will be the surface water quantity assessment LSA. Reference conditions in watercourses originating outside of the LSA will be estimated based on historical baseline data. The predicted changes to surface water quantity in the LSA calculated in the receiving environment surface water quantity model will be applied to historical baseline data for watercourses passing through the LSA in order to estimate conditions under the different Project phases. Simplified hydraulic models assuming uniform flow will be used to estimate changes in stream channel parameters resulting from changes in discharge. The receiving environment surface water quantity model predictions will be used as inputs to the surface water quality and fish and fish habitat components. Technically and economically feasible mitigation will be identified in coordination with the air quality, groundwater quantity and quality, surface water quality, and fish and fish habitat components.
Residual Effects Classification	The residual effects classification for the surface water quantity assessment will follow the methods defined in Section 4.1.9. Component-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. Due to the considerations noted in Section 4.1.9, a determination of significance will not be completed for surface water quantity, which will be considered as an intermediate component in the Developer's Assessment Report.
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the surface water quantity assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ water balance modelling inputs and results ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project ■ non-stationarity of climate data used as input for water balance modelling Prediction confidence and uncertainty with respect to groundwater quantity are also relevant to the surface water quantity assessment and will be considered in the surface water quantity section of the Developer's Assessment Report.
Monitoring and Follow-up	The surface water quantity section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring. Monitoring of surface water quantity will include the following elements: ■ an Aquatic Effects Monitoring Program, required as a condition of a future Type A Water Licence issued for the Project ■ a Surveillance Network Program required as a condition of a future Type A Water Licence issued for the Project Monitoring activities defined for the groundwater quantity and water quality components are also relevant to the surface water quantity component and will be considered in the surface water quantity section of the Developer's Assessment Report. Surface water quantity monitoring activities are often completed to support data needs for accompanying surface water quality monitoring. The surface water quantity section of the Developer's Assessment Report will include a summary description of the specific objectives, monitoring techniques, and general analysis procedures that will be used for the planned monitoring activities. Where applicable, links to adaptive management responses will be defined. The design of monitoring activities will also consider previously collected data and will incorporate ITK gathered through engagement with communities, where appropriate.
Supporting Annexes	Supporting documentation relevant to water quality is anticipated to include the following annexes which will be appended to the surface water quantity section of the Developer's Assessment Report: ■ Surface Water Quantity Baseline Report ■ Surface Water Quantity Modelling Report Other information sources will be considered in the surface water quantity assessment (see the "Information Sources" section above) but will not be appended to the surface water quantity section of the Developer's Assessment Report.

4.2.1.4 KLOI-1: Impacts to Water Quality

A description of the assessment methods expected to be used in the Developer's Assessment Report for the surface water quality component is provided in Table 4-10.

Table 4-10: Assessment Methods for Water Quality

Assessment Approach for KLOI-1: Impacts to Water Quality		
Information Sources	Information sources that will be used to support the water quality assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Water Quality Baseline Report ■ results of the effects assessments for groundwater quantity and quality, and surface water quantity, air quality, terrain and soils, and vegetation ■ environmental management and monitoring plans, including framework or conceptual versions of the Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Spill Contingency Plan, Waste Management Plan, Closure and Reclamation Plan, and Aquatic Effects Monitoring Program ■ territorial and federal legislation and guidance such as the NWT's *Mackenzie Valley Resource Management Act* and *Waters Act*, the Metal and Diamond Mining Effluent Regulations (MDMER), and federal Canadian Water and Sediment Quality Guidelines as per the Canadian Council of Ministers of the Environment	
Intermediate Components and Measurement Indicators	Intermediate Component(s)	Surface water quality will be considered as an intermediate component in the Developer's Assessment Report. A rationale for the selection of surface water quantity as an intermediate component is provided in Section 2.0 and Table 2-2.
	Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the water quality assessment are defined in Section 4.1.2 and Table 4-1. As surface water quantity is an intermediate component, an assessment endpoint is not defined (Section 4.1.2).
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the water quality assessment will include a local study area (LSA) and a broader regional study area (RSA; Section 4.1.3): ■ The LSA includes all active mineral claims, existing bush roads, cutlines, historic railbed, waste rock piles, and backfilled and mined pits (Figure 4-3). The western and eastern boundaries of the LSA are defined by the western boundary of the Twin Creek watershed and the eastern boundary of the Paulette Creek watershed, respectively. The northern extent of the LSA includes a 10-m buffer north of the shoreline of Great Slave Lake and the outlets of the Twin Creek, Buffalo River, and Paulette Creek. The southern extent of the LSA includes Highway 6, connecting the western and eastern boundaries. It will align with the surface water quantity, water quality, and fish and fish habitat LSA. The LSA is anticipated to be large enough to capture direct and indirect effects on water quality resulting from the Project. ■ The RSA includes the LSA plus Birch Creek, which is located 5 km to the west of the LSA (Figure 4-4). The RSA boundary extends 2 km into Great Slave Lake and provides broader context for characterizing baseline conditions and capturing the maximum potential effects from the Project. It will align with the RSA for groundwater quantity and quality and surface water quantity.
	Temporal Boundaries	The temporal boundaries for the water quality assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. Effects on water quality will be evaluated across all phases of the Project and will include consideration of potential changes in water quality during post-closure, where relevant. Each phase will be assessed, with water quality trends (for each major water quality constituent group) and the maximum predicted constituent concentration identified.
	Assessment Cases	■ The water quality residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, if required, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below ■ The determination of whether an RFD Case assessment will be included in the water quality section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the water quality assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	

Table 4-10: Assessment Methods for Water Quality

Assessment Approach for KLOI-1: Impacts to Water Quality	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the water quality assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the water quality assessment are anticipated to include the following information types and sources: ■ locations where drinking water is collected ■ observations of changes in local water quality conditions over time
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for water quality will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of existing environment will incorporate historical and recent baseline sampling information, including characterization of water quality and physical limnology of natural waterbodies and watercourses in the LSA and RSA. A summary of the available water quality and physical limnology data for the former pits on site will also be included in the existing environment description in the Developer's Assessment Report. Additional information recommended to be collected for the water quality component in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description. This will consist of collecting seasonal surface water quality data from waterbodies and watercourses that are expected to be affected by the Project as a result of surface water drainage, discharge of mine water, and aerial emissions deposition. Further details are provided in Volume 3, Appendix C.
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the water quality component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for water quality, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.
Residual Effects Analysis	The residual effects analysis for the water quality component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined primary in the pathway analysis (Volume 4). One Project-environment interaction was determined to be primary for water quality. Assessment methods that will be used to evaluate the potential residual environmental effects of this pathways on the water quality VC are described below. ■ Direct discharge of mine water, as well as surface runoff, groundwater inflow and seepage from the Project will cause changes to surface water quality in receiving and downstream aquatic environments. ▪ A water quality model will be developed, which will be integrated with the site water balance and receiving environment surface water quantity model and factor in the results of the hydrogeological modelling. The Project infrastructure, and waste and water management, will influence on-site and off-site (downstream) water quality from the development. Therefore, a predictive site-wide and receiving water quality numerical model will be constructed to project water quality that has the potential to drain/discharge from site water management facilities (e.g., for runoff and seepage from mine infrastructure such as mine rock and mineralized material storage facilities, water management ponds and operational discharges, open pits, other site surfaces) to the receiving environment during construction, operation, and closure and reclamation phases, and into post-closure. This modelling will be used to predict changes to water quality in the downstream receiving environment through all Project phases. ▪ The core model framework is expected to be GoldSim (integrated site, receiving environment, and pit lake models); it is anticipated that the surface water quantity model may also be developed in GoldSim. The water quality model will build on the water balance and integrate the hydrogeological quantity and quality modelling and geochemical load inputs. As required, other models may be used to supplement the site and receiving water quality models (e.g., pit lake model). ▪ Depending on the water balance and Water Management Plan developed to support the Developer's Assessment Report, other models may also be considered, such as Excel-based worksheets (high-level receiving environment model), CE-QUAL or WASP (hydrodynamic receiving environment and pit lake models), and CORMIX (receiving environment near-field discharge dispersion modelling). This determination will be identified following review of the Project Description and Water Management Plan for the Developer's Assessment Report to confirm the interactions between the Project and water quality. ▪ The modelling task requires the following information, at least at a conceptual level: • hydrogeological quantity and quality data, hydrological (bathymetry, site water balance, and receiving environment surface water quantity model) and geochemical source terms for each lithology • the Water Management Plan detailing the quantity and quality of proposed site discharges (e.g., mine water discharge [if necessary], sewage treatment plant) • all site-influencing factors (other Project components, runoff, diversions, covers, etc.) for construction, operation, and closure and reclamation phases, and into post-closure

Table 4-10: Assessment Methods for Water Quality

Assessment Approach for KLOI-1: Impacts to Water Quality	
Residual Effects Analysis (cont'd)	▪ Water quality will be modelled for all Project phases (i.e., construction through operation and closure and reclamation) and into post-closure through superimposing loading from mine-related inputs (e.g., runoff, seepage, discharges) on existing environment conditions and accounting for load accumulation, where appropriate. Water quality constituents will include each of the major water chemistry groups (e.g., major ions, nutrients, metals) and may include physico-chemical parameters such as dissolved oxygen. ▪ Model results will be provided as average monthly water quality (based on average climate year data) for all water quality constituents. The model will return predicted water quality of mine contact water at specified mine water management structures (as determined from a review of the Project Description), as well as downstream in the receiving environment. ▪ The focus of this assessment is expected to be on notable waterbodies (i.e., those with potential connectivity to fish-bearing waterbodies and watercourses) and the inshore bounds of Great Slave Lake during operation, and closure and reclamation. If the mine plan includes placement of tailings or mine contact water in open pits, the assessment may consider a subset (up to three) flooded pits that represent a range of anticipated closure conditions. The determination of the selected pits will be through a high-level water quality modelling exercise using Excel once the mine plan and an interim closure condition has been established. ▪ The water quality model predictions will be compared to baseline conditions and guidelines, which include protection of aquatic life, MDMER criteria, protection of water for wildlife consumption, and protection of source for drinking water, as applicable. ▪ Technically and economically feasible mitigation will be identified in coordination with the air quality, groundwater quantity and quality, surface water quantity, and fish and fish habitat components. Note that potential effects on Indigenous people from changes to water quality will be assessed in the traditional land and resource use (TLRU) section (see Section 4.2.2.3).
Residual Effects Classification	The residual effects classification completed for the water quality assessment will follow the methods defined in Section 4.1.9. VC-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. Due to the considerations noted in Section 4.1.9, a determination of significance will not be completed for surface water quality, which will be considered as an intermediate component in the Developer's Assessment Report.
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the water quality assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ▪ water balance modelling inputs and results ▪ water quality modelling inputs and results ▪ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project ▪ understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space ▪ knowledge of the effectiveness of mitigation and environmental design features for reducing or removing Project effects Prediction confidence and uncertainty with respect to air quality, groundwater quantity and quality and surface water quantity are also relevant to the water quality assessment and will be considered in the water quality section of the Developer's Assessment Report.
Monitoring and Follow-up	The water quality section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring. Monitoring of the aquatic receiving environment will include the following elements: ▪ an Aquatic Effects Monitoring Program, required as a condition of a future Type A Water Licence issued for the Project ▪ a Surveillance Network Program, required as a condition of a future Type A Water Licence issued for the Project ▪ mine water and water quality monitoring as required under MDMER ▪ construction monitoring, as appropriate (e.g., total suspended solids and turbidity monitoring during instream construction) Monitoring activities defined for the air quality, groundwater quantity and quality and surface water quantity components are also relevant to the water quality component and will be considered in the water quality section of the Developer's Assessment Report. The water quality section of the Developer's Assessment Report will include a description of the specific objectives, monitoring techniques and general analysis procedures that will be used for each monitoring type. Where applicable, links to adaptive management responses will be defined. The design of monitoring activities will also consider previously collected data and will incorporate ITK gathered through engagement with communities, where appropriate.

Table 4-10: Assessment Methods for Water Quality

Assessment Approach for KLOI-1: Impacts to Water Quality	
Supporting Annexes	Supporting documentation relevant to water quality is anticipated to include the following annexes which will be appended to the water quality section of the Developer's Assessment Report: ■ Water Quality Baseline Report ■ Water Quality Modelling Report Other information sources will be considered in the water quality assessment (see the "Information Sources" section above) but will not be appended to the water quality section of the Developer's Assessment Report.

4.2.1.5 SON-4: Impacts to Fish and Fish Habitat

A description of the assessment methods expected to be used in the Developer's Assessment Report for the fish and fish habitat component is provided in Table 4-11.

Table 4-11: Assessment Methods for Fish and Fish Habitat

Assessment Approach for SON-4: Impacts to Fish and Fish Habitat		
Information Sources	Information sources that will be used to support the fish and fish habitat assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Fish and Fish Habitat Baseline Report ■ results of the effects assessments for air quality, groundwater quantity and quality, surface water quantity, and water quality ■ environmental management and monitoring plans, including framework or conceptual versions of the Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Spill Contingency Plan, Waste Management Plan, Closure and Reclamation Plan, and Aquatic Effects Monitoring Program ■ territorial and federal legislation and guidance such as the federal *Fisheries Act*, the NWT's *Wildlife Act*, the federal *Species-at-Risk Act*, and Committee on the Status of Endangered Wildlife in Canada	
Valued Components, Assessment Endpoints, and Measurement Indicators	Valued Components (VCs)	The VCs recommended to be used in the fish and fish habitat assessment, and a rationale for their selection, are provided in Section 2.0 and Table 2-1. VCs have been grouped by fish community (e.g., Twin Creek fish community, Great Slave Lake fish community). In grouping VCs by community, each waterbody or watercourse is recognized as supporting different fish species and habitats. Furthermore, each fish community is also affected by different Project activities.
	Assessment Endpoints and Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the fish and fish habitat assessment are defined in Section 4.1.2 and Table 4-1.
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the fish and fish habitat assessment will include a local study area (LSA) and a broader regional study area (RSA; Section 4.1.3): ■ The LSA includes all active mineral claims, existing bush roads, cutlines, historic railbed, waste rock piles, and backfilled and mined pits (Figure 4-3). The western and eastern boundaries of the LSA are defined by the western boundary of the Twin Creek watershed and the eastern boundary of the Paulette Creek watershed, respectively. The northern extent of the LSA includes a 10-m buffer north of the shoreline of Great Slave Lake and the outlets of the Twin Creek, Buffalo River, and Paulette Creek. The southern extent of the LSA includes Highway 6, connecting the western and eastern boundaries. It will align with the surface water quantity, water quality, and fish and fish habitat LSA. The LSA is anticipated to be large enough to capture direct and indirect effects on fish and fish habitat resulting from the Project. ■ The RSA for fish and fish habitat includes the LSA plus Birch Creek, which is located 5 km to the west of the LSA (Figure 4-4). The RSA boundary extends 2 km into Great Slave Lake and provides broader context for characterizing baseline conditions and capturing the maximum potential effects from the Project, and considers Fisheries and Oceans Canada (DFO) management areas (Day et al. 2012) as appropriate. It is also expected to align with the RSA for surface water quantity and quality; however, in the Developer's Assessment Report, there may be a consideration for extending the RSA farther upstream into individual watersheds based on movement of resident fish in the watershed.

Table 4-11: Assessment Methods for Fish and Fish Habitat

Assessment Approach for SON-4: Impacts to Fish and Fish Habitat		
Environmental Assessment Boundaries (cont'd)	Temporal Boundaries	The temporal boundaries for the fish and fish habitat assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. The assessment will also consider potential effects on fish and fish habitat during post-closure, where relevant. For some pathways of effects, residual effects on fish and fish habitat VCs will evaluated across all phases of the Project, but not necessarily for each specific phase. Where applicable, residual effects may also be assessed in terms of specific temporal snapshots of the Project defined by intermediate components (e.g., surface water quantity and water quality) that may have a linkage to potential effects on fish and fish habitat VCs.
	Assessment Cases	■ The fish and fish habitat residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case, and possibly, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the fish and fish habitat section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the fish and fish assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the fish and fish habitat assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the fish and fish habitat assessment are anticipated to include the following information types and sources: ■ fish species harvested for subsistence, cultural, or commercial purposes and their perceived value ■ locations where fish are harvested ■ fishing methods used to capture fish ■ fish species local distribution and abundance ■ fish species behaviour and habitat conditions ■ known spawning locations and timing ■ observations of changes in fish populations over time	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for fish and fish habitat will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of existing environment will incorporate historical and recent baseline sampling information, including characterization of physical limnology, fish habitat conditions, benthic invertebrate communities, plankton communities, and fish populations in waterbodies and watercourses in the LSA and RSA. Additional information recommended to be collected for the fish and fish component in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description. The additional work planned in waterbodies and watercourses in the LSA will consist of assessing fish habitat (e.g., habitat types, bed substrate, cover for fish), sampling to determine the presence/absence of fish, and a scoping-level evaluation of connectivity of pits or diversions to fish-bearing habitats. Further details are provided in Volume 3, Appendix C.	
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the fish and fish habitat component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for fish and fish habitat, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.	

Table 4-11: Assessment Methods for Fish and Fish Habitat

Assessment Approach for SON-4: Impacts to Fish and Fish Habitat	

Residual Effects Analysis	The residual effects analysis for the fish and fish habitat component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4).
	Assessment methods are provided for three Project-environment interactions that may be assessed as either primary or secondary pathways in the fish and fish habitat assessment, depending on the outcomes of environmental modelling work, confirmation of Project design details, and the results of the effects assessments completed for groundwater quantity and quality, surface water quantity, and water quality. In the event that these pathways are ultimately determined to be secondary in the pathway analysis, they will not be carried forward to the residual effects analysis. However, assessment methods have been provided to account for the possibility that these interactions may ultimately be determined to be primary.
	■ Altered site drainage and runoff from facilities may change local hydrology and affect fish habitat quantity and quality (e.g., in Twin Creek, Paulette Creek).
	  ▪ A qualitative evaluation will be completed for these two pathways that considers the quantitative outcome of the surface water quantity model and the water quantity assessment. Changes to fish habitat quality and quantity will be assessed based on predicted changes to variables such as water levels, water depths, and wetted/channel widths.
	■ Direct discharge of mine water, as well as surface runoff, groundwater inflow, and seepage from the Project, will cause changes to downstream surface water quality, which can alter fish habitat quality and affect the survival and reproduction of fish.
	  ▪ A qualitative evaluation will be completed that considers the outcome of the quantitative water quality model predictions. The water quality predictions for key parameters (e.g., nutrients, metals, ions) will be compared to guidelines (i.e., Canadian Council of Ministers of the Environment guidelines for the protection of aquatic life) to predict effects on fish community VCs potentially affected by the changes in water quality. Predicted changes in water quality will also be used to qualitatively assess changes to fish habitat (e.g., changes to habitat quality or changes to food availability from changes to water quality).

Residual Effects Analysis (cont'd)	■ Project footprint will result in a direct loss or alteration of fish habitat, which may affect habitat quantity, quality, and connectivity and fish distribution. ▪ A quantitative assessment will be completed of potential changes to total area of habitat present and calculated as an absolute (i.e., area) of loss or alteration, as appropriate. The calculation will be based on the likely presence of each VC (e.g., Twin Creek fish community) at a particular location, the width of the waterbody or the area of the structure, and the area of disturbance under the Project footprint (e.g., road crossing structure or water intake). This assessment will also consider the need for a conceptual Fisheries Offsetting Plan for the Project to offset the losses to fish habitat (i.e., harmful alteration, disruption or destruction of fish habitat as per the *Fisheries Act*). Technically and economically feasible mitigation will be identified in coordination with the air quality, groundwater quantity and quality, surface water quantity, and surface water quality components. Note that potential effects on Indigenous and other people from changes to fish availability (e.g., traditional and commercial harvest) will be assessed in the traditional land resource use (TLRU) and non-traditional land and resource use (NTLRU) sections, respectively (see Section 4.2.2.3 and Section 4.2.2.4).
Residual Effects Classification and Determination of Significance	The residual effects classification completed for the fish and fish habitat assessment will follow the methods defined in Section 4.1.9. VC specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. A determination of significance will be completed for the fish and fish habitat VC according the methods described in Section 4.1.9.
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the fish and fish habitat assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ water quantity modelling inputs and results ■ water quality modelling inputs and results ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project ■ understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space ■ knowledge of the effectiveness of mitigation and environmental design features for reducing or removing Project effects Prediction confidence and uncertainty with respect to groundwater quantity and quality, surface water quantity, and water quality are also relevant to the fish and fish habitat assessment and will be considered in the fish and fish habitat section of the Developer's Assessment Report.

Table 4-11: Assessment Methods for Fish and Fish Habitat

Assessment Approach for SON-4: Impacts to Fish and Fish Habitat	
Monitoring and Follow-up	The fish and fish habitat section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring. Monitoring of the aquatic receiving environment will include the following elements: ■ an Aquatic Effects Monitoring Program, required as a condition of a future Type A Water Licence issued for the Project ■ an Environmental Effects Monitoring study required under the Metal Mining and Diamond Effluent Regulations ■ an evaluation of the effectiveness of fish habitat offsetting measures developed for the Project (if development of a Fisheries Offsetting Plan is required) ■ construction monitoring, as appropriate (e.g., total suspended solids and turbidity monitoring during instream construction) Monitoring activities defined for the groundwater quantity and quality, surface water quantity, and water quality components are also relevant to the fish and fish habitat component and will be considered in the fish and fish habitat section of the Developer's Assessment Report. The fish and fish habitat section of the Developer's Assessment Report will include a description of the specific objectives, monitoring techniques, and general analysis procedures that will be used for each monitoring type. Where applicable, links to adaptive management responses will be defined. The design of monitoring activities will also consider previously collected data and will incorporate ITK and information gathered through engagement with communities, where appropriate.
Supporting Annexes	Supporting documentation relevant to the fish and fish habitat assessment is anticipated to include the following annexes which will be appended to the fish and fish habitat section of the Developer's Assessment Report: ■ Fish and Fish Habitat Baseline Report ■ Conceptual Fisheries Offsetting Plan (if required) Other information sources will be considered in the fish and fish habitat assessment (see the "Information Sources" section above) but will not be appended to the fish and fish habitat section of the Developer's Assessment Report.

4.2.1.6 SON-5: Impacts to Terrain and Soils

A description of the assessment methods expected to be used in the Developer's Assessment Report for the terrain and soils component is provided in Table 4-12.

Table 4-12: Assessment Methods for Terrain and Soils

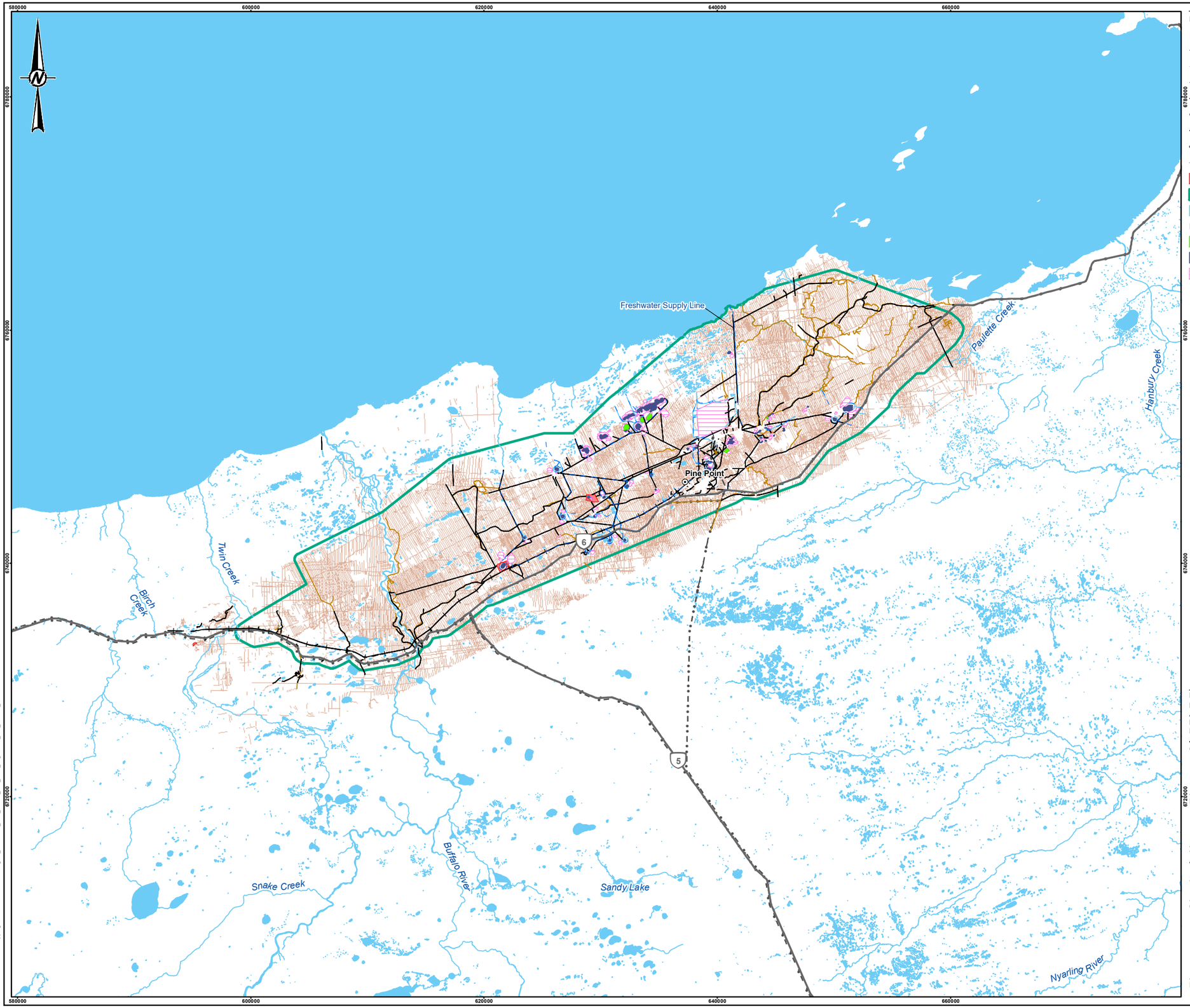
Assessment Approach for SON-5: Impacts to Terrain and Soils		
Information Sources	Information sources that will be used to support the terrain and soils assessment scoping are anticipated to include those listed in Section 4.1.1. and the following sources: ■ the Terrain and Soils Baseline Report ■ results of the effects assessments for air quality, groundwater quantity and quality, surface water quantity, water quality, and vegetation ■ environmental management and monitoring plans, including framework or conceptual versions of the Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Spill Contingency Plan, Waste Management Plan, and Closure and Reclamation Plan	
Intermediate Components and Measurement Indicators	Intermediate Component(s)	Terrain and soils will be considered as an intermediate component in the Developer's Assessment Report. A rationale for the selection of terrain and soils as an intermediate component is provided in Section 2.0 and Table 2-2.
	Measurement Indicators	Measurement indicators for terrain and soils are defined in Section 4.1.2 and Table 4-2. As terrain and soils is an intermediate component, an assessment endpoint is not defined (Section 4.1.2).
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the terrain and soils assessment will include a local study area (LSA) and a broader regional study area (RSA): ■ The LSA for terrain and soils is equivalent to vegetation and wildlife (including caribou) and will include the anticipated maximum extent of the Project footprint plus a 500 m buffer (771 km^2). All active mineral claims, existing bush roads, cutlines, historic railbed, waste rock piles, and backfilled and mined pits are included in the LSA. Other anticipated new and existing features for the Project contained within the LSA include access roads, laydown areas, and overburden stockpiles. The LSA is expected to capture the combined potential direct and indirect (e.g., dust deposition) effects from the Project on terrain and soils and provides local context for assessing effects (Figure 4-5).

Table 4-12: Assessment Methods for Terrain and Soils

Assessment Approach for SON-5: Impacts to Terrain and Soils		
		■ The RSA was defined for terrain and soils, vegetation, and small-ranging wildlife VCs to provide broader context for interpreting the local effects of the Project and covers approximately 1,851 km^2 (Figure 4-6). The RSA includes the LSA and is similar to the RSA for groundwater, hydrology, and surface water quality due to the ecological relationships among aquatic and soil and vegetation ecosystems, and wildlife habitats (e.g., wetland structure and function) (Figure 4-4). The RSA includes Birch Creek watershed and is bounded by the southern shore of Great Slave Lake. The RSA provides broader context for characterizing baseline conditions such as the presence of previous and existing developments, and natural disturbances (e.g., wildfire). The Project is predicted to have no measurable ecological effects on terrain and soils beyond the LSA.
	Temporal Boundaries	The temporal boundaries for the terrain and soils assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. The assessment will also consider potential effects on terrain and soils during post-closure, where relevant. For some pathways of effects, residual effects will be evaluated across all phases of the Project, but not necessarily for each specific phase. Where applicable, residual effects may also be assessed in terms of specific temporal snapshots of the Project defined by intermediate components (e.g., air quality) that may have a linkage to potential effects on terrain and soils.
	Assessment Cases	■ The terrain and soils residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, possibly, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the terrain and soils section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the terrain and soils assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the terrain and soils assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the terrain and soils assessment are anticipated to include the following information types and sources: ■ land conservation ■ terrain features ■ slope stability ■ permafrost	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for terrain and soils will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of existing environment will incorporate historical and recent baseline sampling information including but not limited to surficial material, characterization of soils, landscape description, and permafrost presence. Additional information recommended to be collected for the terrain and soils component in the baseline study plan for the Project (Volume 3, Appendix C) will also be included in the existing environment description. Further baseline studies were conducted in summer 2020. This will occur in conjunction with the vegetation discipline. Data related to Ecological Land Classification, terrain, and soils will be collected at each target site. Further details are provided in Volume 3, Appendix C.	
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the terrain and soils component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for terrain and soils, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.	
Residual Effects Analysis	The residual effects analysis for the terrain and soils component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). One Project-environment interaction was determined to be a primary pathway for the terrain and soils component. Assessment methods that will be used to evaluate the potential residual environmental effects of this pathway on water quality VCs are described below: ■ Alteration of soil and terrain conditions (e.g., quantity, quality, and distribution) may adversely affect soil productivity and the types of ecosystems that can be reclaimed on the landscape. ▪ Distribution of terrain and soil types will be mapped using up to date aerial photography and LiDAR, and supported by the Ecological Landscape Classification (ELC) developed for the vegetation assessment. This	

Table 4-12: Assessment Methods for Terrain and Soils

Assessment Approach for SON-5: Impacts to Terrain and Soils	
	map will be used to determine the amount and distribution of soil types in the Base Case and the amount of soil removed or altered/disturbed by the Project (Application Case), and RFD Case (if applicable). Soil productivity (quality) will be inferred from the classification of soil types, and associated suitability for reclamation. The assessment will be supported by scientific literature. Technically and economically feasible mitigation will be identified in coordination with the air quality, vegetation, and wildlife components.
Residual Effects Classification	The residual effects classification completed for the terrain and soils assessment will follow the methods defined in Section 4.1.9. Component-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, duration, and geographic extent, duration, reversibility, frequency, and probability of occurrence. Due to the considerations noted in Section 4.1.9, a determination of significance will not be completed for terrain and soils, which will be considered as an intermediate component in the Developer's Assessment Report.
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the terrain and soils assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ air emissions modelling inputs and results ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project ■ understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space ■ knowledge of the effectiveness of mitigation and environmental design features for reducing or removing Project effects Prediction confidence and uncertainty with respect to surface water quantity and water quality are also relevant to the terrain and soils assessment and will be considered in the terrain and soils section of the Developer's Assessment Report.
Monitoring and Follow-up	The Developer's Assessment Report will not include monitoring programs directly for the terrain and soils discipline. The effectiveness of environmental design features and mitigation measures related to the Project will be measured and monitored through other disciplines. Monitoring activities defined for the air quality, groundwater quantity and quality, surface water quantity, and vegetation components are relevant to the terrain and soils component and will be considered in the terrain and soils section of the Developer's Assessment Report.
Supporting Annexes	Supporting documentation relevant to the terrain and soils assessment is anticipated to include the following annex which will be appended to the terrain and soils section of the Developer's Assessment Report: ■ Terrain and Soils Baseline Report Other information sources will be considered in the terrain and soils assessment (see the "Information Sources" section above) but will not be appended to the terrain and soils section of the Developer's Assessment Report.



LEGEND

- FORMER PINE POINT TOWN SITE
- BUSH ROAD
- CUTLINE
- DRAINAGE DITCH
- HISTORIC RAILBED
- HIGHWAY
- MINE ROAD
- TRANSMISSION LINE
- WATERCOURSE
- CUTBLOCK
- LOCAL STUDY AREA - TERRESTRIAL
- WATERBODY

PINE POINT EXISTING MINING DISTURBANCE

- BACKFILLED PIT
- MINED PIT
- WASTE PILE

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PROJECTION: UTM ZONE 11N DATUM: NAD83

CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

TITLE
TERRAIN AND SOILS, VEGETATION, AND WILDLIFE LOCAL STUDY AREA

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-15
DESIGNED	JV
PREPARED	MM/PMT
REVIEWED	JV
APPROVED	JV

PROJECT NO. 19125747 CONTROL REV. 0 FIGURE 4-5

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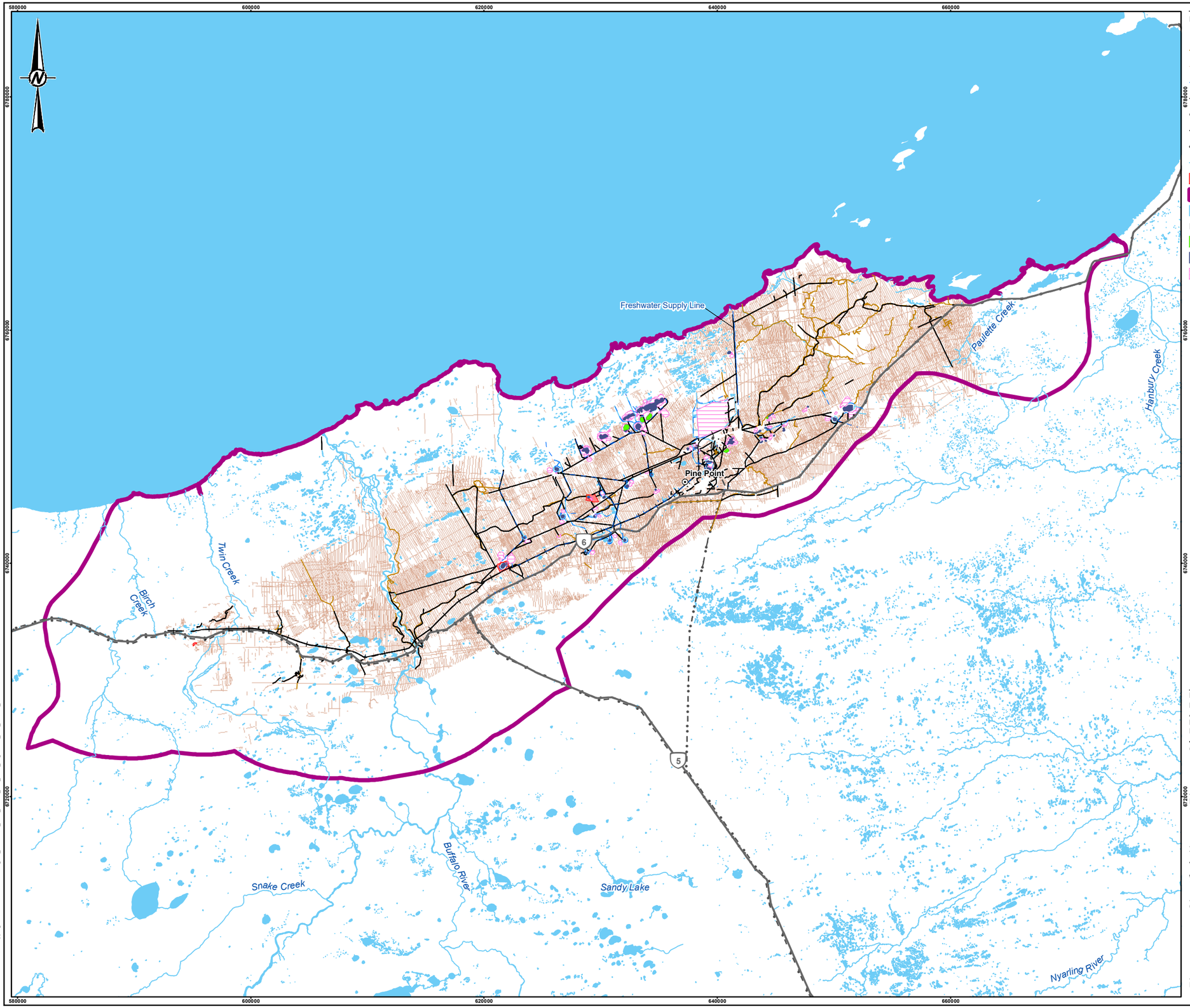

LEGEND

- FORMER PINE POINT TOWN SITE
- BUSH ROAD
- CUTLINE
- DRAINAGE DITCH
- HISTORIC RAILBED
- HIGHWAY
- MINE ROAD
- TRANSMISSION LINE
- WATERCOURSE
- CUTBLOCK
- REGIONAL STUDY AREA - TERRESTRIAL
- WATERBODY

PINE POINT EXISTING MINING DISTURBANCE

- BACKFILLED PIT
- MINED PIT
- WASTE PILE

0 5 10

1:325,000 KILOMETRES

REFERENCE(S)

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PROJECTION: UTM ZONE 11N DATUM: NAD83

CLIENT

PINE POINT MINING LTD.

PROJECT

PINE POINT PROJECT

TITLE

TERRAIN AND SOILS, VEGETATION, AND SMALL-RANGING WILDLIFE REGIONAL STUDY AREA

CONSULTANT

GOLDER

YYYY-MM-DD	2020-12-15
DESIGNED	JV
PREPARED	MM/PMT
REVIEWED	JV
APPROVED	JV

PROJECT NO.	CONTROL	REV.	FIGURE
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4.2.1.7 SON-6: Impacts to Vegetation

A description of the assessment methods expected to be used in the Developer's Assessment Report for the vegetation component is provided in Table 4-13.

Table 4-13: Assessment Methods for Vegetation

Assessment Approach for SON-6: Impacts to Vegetation		
Information Sources	Information sources that will be used to support the vegetation assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Vegetation Baseline Report ■ results of the effects assessments for groundwater quantity and quality, surface water quantity, water quality, and air quality ■ environmental management and monitoring plans, including framework or conceptual versions of the Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Spill Contingency Plan, Waste Management Plan, Closure and Reclamation Plan, and Wildlife Protection Plan	
Valued Components, Assessment Endpoints, and Measurement Indicators	Valued Components (VCs)	The VCs to be used in the vegetation assessment include upland, wetland, and riparian ecosystems. A rationale for the selection of vegetation VCs is provided in Section 2.0 and Table 2-1.
	Assessment Endpoints and Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the vegetation assessment are defined in Section 4.1.2 and Table 4-1.
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the vegetation assessment will include a local study area (LSA) and a broader regional study area (RSA): ■ The LSA for vegetation is equivalent to terrain and soils and will include the anticipated maximum extent of the Project footprint plus a 500 m buffer (771 km^2). All active mineral claims, existing bush roads, cutlines, historic railbed, waste rock piles, and backfilled and mined pits are included in the LSA. Other anticipated new and existing features for the Project contained within the LSA include access roads, laydown areas, and overburden stockpiles. The LSA is expected to capture the combined potential direct and indirect (e.g., dust deposition) effects from the Project on terrain and soils and provides local context for assessing effects (Figure 4-5). ■ The RSA was defined for terrain and soils, vegetation, and small-ranging wildlife VCs to provide broader context for interpreting the local effects of the Project and covers approximately 1,851 km^2 (Figure 4-6). The RSA includes the LSA and is similar to the RSA for groundwater, hydrology, and surface water quality due to the ecological relationships among aquatic and soil and vegetation ecosystems, and wildlife habitats (e.g., wetland structure and function) (Figure 4-4). The RSA includes Birch Creek watershed and is bounded by the southern shore of Great Slave Lake. In addition to existing human developments the RSA also includes disturbances from wildfires. ■ The RSA is expected to be at a scale suitable for assessing the significance of effects on upland, wetland, and riparian ecosystem VCs distributed inside the RSA, but probably also extend beyond its boundaries. The RSA is considered large enough to provide an ecologically relevant and confident assessment of the direct and indirect effects on vegetation VCs from the Project, and the cumulative effects from the Project and previous, existing, and reasonably foreseeable developments, and natural factors.
	Temporal Boundaries	The temporal boundaries for the vegetation assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. The assessment will also consider potential effects on vegetation during post-closure, where relevant. For some pathways of effects, residual effects will be evaluated across all phases of the Project, but not necessarily for each specific phase. Where applicable, residual effects may also be assessed in terms of specific temporal snapshots of the Project defined by intermediate components (e.g., air quality) that may have a linkage to potential effects on vegetation.
	Assessment Cases	■ The vegetation residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, possibly, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the vegetation section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.

Table 4-13: Assessment Methods for Vegetation

Assessment Approach for SON-6: Impacts to Vegetation	
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the vegetation assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the vegetation assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the vegetation assessment are anticipated to include the following information types and sources: ■ traditional use species and communities ■ known locations of traditional use species
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for vegetation will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of existing environment will incorporate historical and recent baseline sampling information regarding plant species and species of conservation concern, ecoregions and protected areas, and ecosite phases in the LSA and RSA, which supports the development of the Ecological Landscape Classification (ELC) for the study areas. Additional information identified to be collected for the vegetation component in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description. Further baseline studies were conducted in summer 2020. These studies will be completed in conjunction with the soils discipline. Data related to the ELC and rare/invasive plants will be collected at sampling sites.
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the vegetation component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for vegetation, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.

Residual Effects Analysis	The residual effects analysis for the vegetation component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). Two Project-environment interactions were determined to be primary for vegetation. Assessment methods that will be used to evaluate the potential residual environmental effects of these pathways on the vegetation VCs (upland, wetland, and riparian ecosystems) are described below.
	■ direct loss, alteration, and fragmentation of upland, wetland, and riparian ecosystems from the Project footprint
	■ alteration of final terrain and soil conditions, and/or plant species composition could change the types of ecosystems that can be reclaimed on the landscape, and adversely affect vegetation ecosystem availability, distribution, and condition
	  ▪ Availability and distribution of upland, wetland, and riparian ecosystems in the LSA and RSA will be estimated from the ELC. Fire and human disturbance data from government sources will also be incorporated as landcover layers in the ELC. The ELC will be used to determine changes in the availability (quantitatively) and distribution (qualitatively) of vegetation VCs from the Base Case to the Application Case, and the RFD Case (if applicable).
	  ▪ Changes in the condition of upland, wetland, and riparian ecosystems will be assessed qualitatively through the results of the analysis of loss and fragmentation of vegetation ecosystems, and predicted changes in light and moisture regimes and potential for invasive plants, and the associated effects on community composition and listed and traditional use plant species. The analysis will be supported by scientific literature, and information gathered from ITK and community engagement, where available.
	Technically and economically feasible mitigation will be identified in coordination with the air quality, terrain and soils, and wildlife components.
	Note that potential effects on Indigenous people from changes in vegetation ecosystems (e.g., traditional use plants) will be assessed in the TLRU section (see Section 4.2.2.2).

Residual Effects Classification and Determination of Significance	The residual effects classification completed for vegetation assessment will follow the methods defined in Section 4.1.9. Component-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. A determination of significance will be completed for the vegetation communities (upland, wetland, riparian) and populations VC according the methods described in Section 4.1.9.
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the vegetation assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ air emissions modelling inputs and results ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project ■ understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space ■ knowledge of the effectiveness of mitigation and environmental design features for reducing or removing Project effects Prediction confidence and uncertainty with respect to air quality and terrain and soils are also relevant to the vegetation assessment and will be considered in the vegetation section of the Developer's Assessment Report.

Table 4-13: Assessment Methods for Vegetation

Assessment Approach for SON-6: Impacts to Vegetation	
Monitoring and Follow-up	The vegetation section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring. Monitoring for vegetation will include the following elements: ■ Confirmation of habitat losses as a part of the annual Wildlife Protection Plan. Once the Project is constructed, the Project footprint will be delineated to determine the actual extent of the physical footprint and associated loss of vegetation communities (habitat) for comparison with that predicted in the Developer's Assessment Report. ■ Monitoring of vegetation as a component of progressive reclamation under the Closure and Reclamation Plan. Lessons learned will be applied to the reclamation of the Project components. ■ Surveys for non-native invasive plant species following construction. The vegetation section of the Developer's Assessment Report will include a description of the specific objectives, monitoring techniques, and general analysis procedures that will be used for each monitoring type. Where applicable, links to adaptive management responses will be defined. The design of monitoring activities will also consider previously collected data and will incorporate ITK and information gathered through engagement with communities, where appropriate.
Supporting Annexes	Supporting documentation relevant to the vegetation assessment is anticipated to include the following annexes which will be appended to the vegetation section of the Developer's Assessment Report: ■ Vegetation Baseline Report Other information sources will be considered in the vegetation assessment (see the "Information Sources" section above) but will not be appended to the vegetation section of the Developer's Assessment Report.

4.2.1.8 KLOI-2 Impacts to Caribou

A description of the assessment methods expected to be used in the Developer's Assessment Report for caribou is provided in Table 4-14.

Table 4-14: Assessment Methods for Caribou

Assessment Approach for KLOI-2: Impacts to Caribou		
Information Sources	Information sources that will be used to support the caribou assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Wildlife Baseline Report ■ results of the effects assessments for groundwater quantity and quality, surface water quantity, water quality, air quality, terrain and soils, vegetation, and wildlife ■ environmental management and monitoring plans, including framework or conceptual versions of the Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Spill Contingency Plan, Waste Management Plan, Closure and Reclamation Plan, and Wildlife Protection Plan ■ the NWT boreal caribou recovery strategy (Conference of Management Authorities 2017) ■ territorial and federal legislation and guidance such as the NWT's *Wildlife Act*, the federal *Species at Risk Act*, the Committee on the Status of Endangered Wildlife in Canada, and the Environment and Climate Change Canada (ECCC) threshold for undisturbed woodland caribou habitat as key requirement of ECCC's critical habitat identification (i.e., 65% undisturbed habitat; ECCC 2018).	
Valued Components, Assessment Endpoints, and Measurement Indicators	Valued Components (VCs)	The VC recommended to be used in the caribou assessment is woodland caribou (boreal population). A rationale for the selection of caribou as the VC is provided in Section 2.0 and Table 2-1.
	Assessment Endpoints and Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the caribou assessment are defined in Section 4.1.2 and Table 4-1.

Table 4-14: Assessment Methods for Caribou

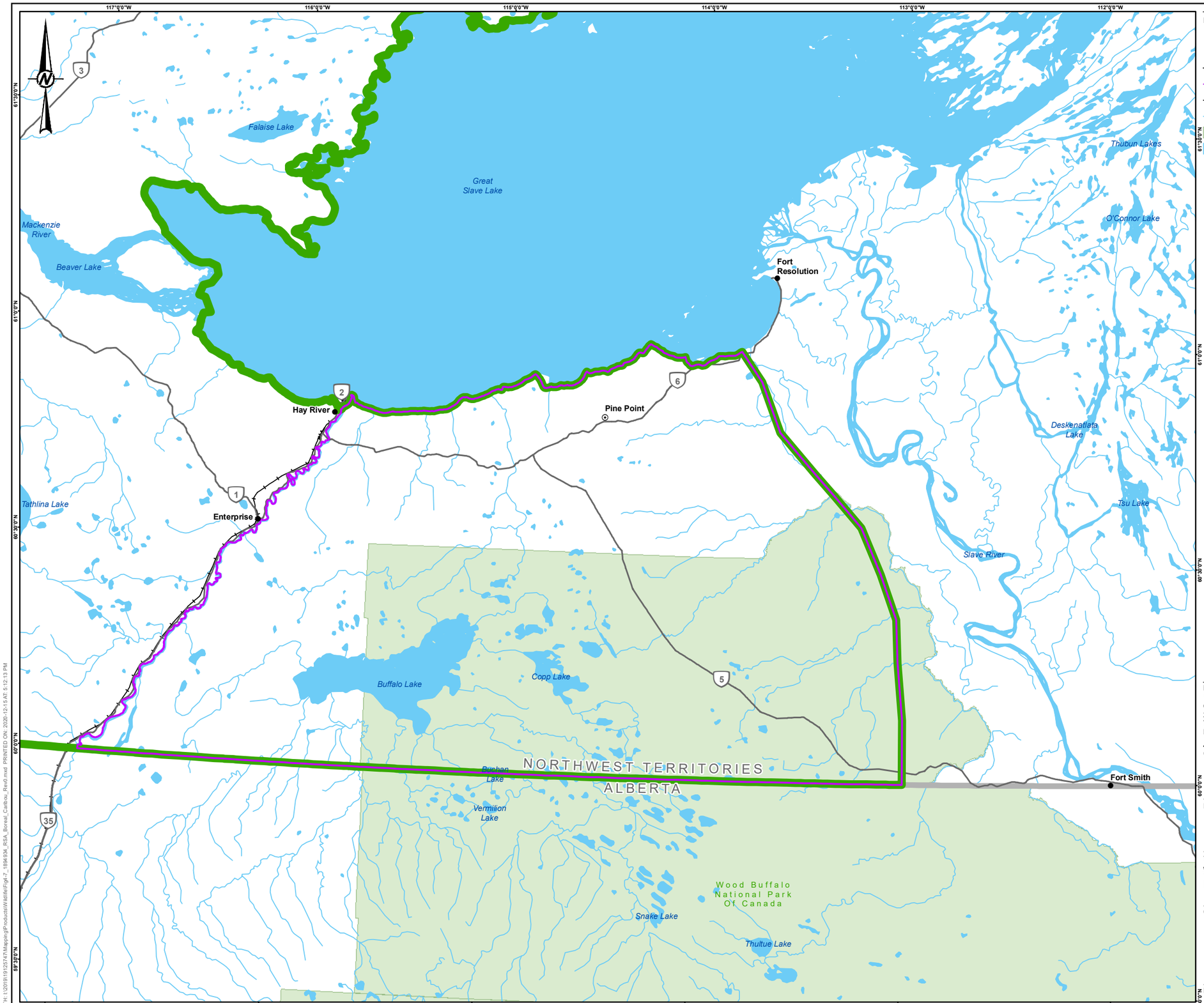
Assessment Approach for KLOI-2: Impacts to Caribou		
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the caribou assessment will include a local study area (LSA), regional study area (RSA) and the NT1 Boreal Caribou Range (Section 4.1.3): ■ The LSA for caribou is equivalent to terrain and soils, vegetation, and other wildlife and will include the anticipated maximum extent of the Project footprint plus a 500 m buffer (77,145 ha). All active mineral claims, existing bush roads, cutlines, historic railbed, waste rock piles, and backfilled and mined pits are included in the LSA (Figure 4-5). Other anticipated new and existing features for the Project contained within the LSA include access roads, laydown areas, and overburden stockpiles. The LSA is expected to capture the combined potential direct and indirect effects from the Project on caribou and provides local context for assessing effects. The 500 m buffer is expected to be large enough to capture sensory disturbance effects from noise, lights, smells, and human activity (ECCC 2018). Two additional spatial boundaries are used for the assessment of woodland caribou to provide a fuller understanding of the magnitude, geographic extent, duration, and context of predicted effects from habitat alterations due to the Project, and previous, existing and future developments. ■ The RSA is defined as the portion of the Southern NWT Range (GNWT 2019) east of the community of Hay River to the western boundary of NT1 Boreal Caribou Range, and bounded to the north by the shoreline of Great Slave Lake and to the south by the Northwest Territories-Alberta border (1,722,100 ha) (Figure 4-6). The area provides a biologically relevant scale to assess Project-related and cumulative changes on caribou and caribou habitat in context of existing conditions in this portion of the Southern NWT Range. Predator-prey interactions and effects on caribou are also expected to be relevant at this spatial scale. A qualitative assessment of the Southern NWT Range will also be completed to provide relevant ecological context for predicted incremental and cumulative effects from the Project and previous, existing, and reasonably foreseeable developments on caribou. ■ The NT1 Boreal Caribou Range (24,398,791 ha) is used to assess habitat loss at a scale to support information on the status of critical habitat (65% undisturbed habitat or not more than 35% disturbed habitat) at the population scale (ECCC 2018) (Figure 4-7). The NT1 Boreal Caribou Range is the scale for determining the significance of effects from the Project on caribou and will consider the analyses at the scales of the RSA and Southern NWT Range.
	Temporal Boundaries	The temporal boundaries for the caribou assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. For some pathways of effects, residual effects on caribou will be evaluated across all phases of the Project, but not necessarily for each specific phase. The assessment will also consider potential effects on caribou during post-closure, where relevant.
Environmental Assessment Boundaries (cont'd)	Assessment Cases	■ The caribou residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, possibly a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" methods descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the caribou section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the caribou assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the caribou assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the caribou assessment are anticipated to include the following information types and sources: ■ locations where caribou are harvested ■ caribou local distribution and abundance ■ caribou behaviour and habitat conditions ■ observations of changes in caribou population abundance and distribution over time	

Table 4-14: Assessment Methods for Caribou

Assessment Approach for KLOI-2: Impacts to Caribou	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for caribou will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of the existing environment will incorporate historical and recent baseline sampling information, including characterization of habitat conditions for caribou in the LSA and RSA. Habitat characterization likely will be completed using the habitat suitability model that was developed for the Project in 2018 (Golder 2018). Incorporation of ITK and community input is expected to support the characterization of existing conditions. The existing baseline information related to caribou is considered adequate to complete the effects assessment. No additional site-specific surveys are anticipated to be collected for caribou (Volume 3, Appendix C).
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the caribou component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for caribou, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.
Residual Effects Analysis	The residual effects analysis for caribou will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). Four Project-environment interactions were determined to be primary for caribou. Assessment methods that will be used to evaluate the potential residual environmental effects of these pathways on caribou are described below. ■ Direct removal/alteration and fragmentation of vegetation ecosystems (i.e., caribou habitat) can affect caribou abundance and distribution. ■ Alteration of final terrain and soil conditions, and/or plant species composition, could change the types of ecosystems that can be reclaimed on the landscape, and adversely affect caribou habitat availability and distribution, and survival and reproduction. ▪ Availability and distribution of suitable habitat for caribou in the RSA will be estimated and mapped using the habitat suitability model developed by Golder (2018). Data used to develop the model include Landsat satellite data and the Earth Observation for Sustainable Development of Forests (EOSD) forest cover map imagery data for the Northwest Territories (provided courtesy of the Department of Environment and Natural Resources, Government of the Northwest Territories [GNWT-ENR]). The model also used ECCC data describing fire and development disturbance through 2015. Fire and human development disturbance since 2015 were added using the NWT Fire and Inventory of Landscape Change (acquired from the GNWT-ENR Cumulative Impact Monitoring Program website) datasets to maximize the amount of disturbance in the LSA and RSA. Development disturbance polygons, points, and linear features included a 500 m buffer, as per standard methods for assessment of caribou habitat (Environment Canada 2012; Golder 2018). ▪ The habitat model for the RSA will be used to determine changes in the availability (quantitatively) and distribution (qualitatively) of caribou habitat from the Base Case to the Application Case, and the RFD Case (if applicable). The analysis for the RFD Case may be quantitative and/or qualitative depending on the level of information available for RFDs.
Residual Effects Analysis (cont'd)	▪ Incremental and cumulative changes in existing caribou habitat and disturbance from the Project and other developments at the scale of the Southern NWT Range (GNWT 2019) will be calculated and qualitatively assessed to provide relevant ecological context for predicted effects from the Project on caribou in this region of the NT1 Boreal Caribou Range. ▪ At the scale of the NT1 Boreal Caribou Range, the incremental contribution from the Project to the loss of critical caribou habitat and associated increase in human (and total) disturbance relative to existing conditions will be calculated. ■ Sensory disturbance can alter caribou movement and behaviour and adversely affect functional habitat availability and caribou abundance and distribution. ▪ Effects from sensory disturbance on caribou will be captured quantitatively under the habitat availability and distribution assessment, as the 500 m buffer around human disturbance, which is used to calculate caribou habitat loss, also includes effects from sensory disturbance and perceived predation risk. ▪ Additional qualitative analyses on caribou abundance, distribution, and survival and reproduction will be completed using scientific literature, government reports, and other publicly available information that characterizes effects from sensory disturbance on woodland caribou. ■ Increased access for predators (e.g., wolf and black bear) and prey may increase predation risk and decrease caribou survival and reproduction. ▪ Changes in predator access will be assessed qualitatively through the results of the analysis of loss and fragmentation of suitable caribou habitat, and supported by scientific literature. In addition, a quantitative comparison of existing trails and roads with linear features developed for the Project (and RFDs, if applicable) will be used to qualitatively assess changes in predator access on effects on caribou survival and reproduction. Assessment methods are also provided for one Project-environment interaction that may be assessed as either a primary or secondary pathway on caribou, depending on feedback from communities and other people on the

Table 4-14: Assessment Methods for Caribou

Assessment Approach for KLOI-2: Impacts to Caribou	
	Developer's Assessment Proposal. In the event that this pathway is determined to be secondary in the pathway analysis, it will not be carried forward to the residual effects analysis. ■ Changes in public access to hunting/trapping areas and increased density of people (i.e., Project staff and contractors) in the area may increase harvesting of caribou and affect abundance. ■ A quantitative comparison of existing trails and roads with linear features developed for the Project (and RFDs, if applicable) will be used to qualitatively assess changes in public access on effects on caribou survival and reproduction. Information from ITK and communities on current harvest areas and levels of caribou would provide valuable support for the assessment of this pathway. Technically and economically feasible mitigation will be identified in coordination with the air quality, terrain and soils, vegetation, and wildlife components. Note that potential effects on Indigenous people from changes to caribou availability (e.g., traditional harvest) will be assessed in the traditional land and resource use (TLRU) section (see Section 4.2.2.3).
Residual Effects Classification and Determination of Significance	The residual effects classification completed for the caribou assessment will follow the methods defined in Section 4.1.9. Caribou-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. A determination of significance will be completed for the caribou VC according the methods described in Section 4.1.9.
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the caribou assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project ■ understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space ■ knowledge of the effectiveness of mitigation and environmental design features for reducing or removing Project effects Prediction confidence and uncertainty with respect to air quality, water quality, and vegetation, are also relevant to the caribou assessment and will be considered in the caribou section of the Developer's Assessment Report.
Monitoring and Follow-up	The caribou section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance and follow-up monitoring. Monitoring of caribou will occur as a component of the Wildlife Protection Plan developed for the Project, and include the following elements: ■ wildlife sightings monitoring, which will consist of reporting of caribou sightings/activity by all staff ■ pre-clearing monitoring, which will consist of pre-clearing surveys to detect caribou ahead of clearing activities ■ wildlife incident reporting, which will consist of reporting of caribou incidents (e.g., caribou injury or mortality) by all staff Monitoring activities defined for air quality, water quality, and vegetation are also relevant to caribou and will be considered in the caribou section of the Developer's Assessment Report. The caribou section of the Developer's Assessment Report will include a description of the specific objectives, monitoring techniques, and general analysis procedures that will be used for each monitoring type. Where applicable, links to adaptive management responses will be defined. The design of monitoring activities will also consider previously collected data and will incorporate ITK and information gathered through engagement with communities, where appropriate.
Supporting Annexes	Supporting documentation relevant to the caribou assessment is anticipated to include the following annex which will be appended to the Developer's Assessment Report and referenced, as appropriate, in the caribou section of the Developer's Assessment Report: ■ Caribou Habitat Suitability Index Model Methods Other information sources will be considered in the caribou assessment (see the "Information Sources" section above) but will not be appended to the caribou section of the Developer's Assessment Report. The caribou baseline will be included in the Wildlife Baseline Report (Section 4.2.1.9).



LEGEND

- FORMER PINE POINT TOWN SITE
- POPULATED PLACE
- ALL-SEASON ROAD
- WINTER ROAD
- RAILWAY
- WATERCOURSE
- PARK/PROTECTED AREA
- WATERBODY
- NT1 BOREAL CARIBOU RANGE
- REGIONAL STUDY AREA – WOODLAND CARIBOU, WOOD BISON, WOLF, AND WOLVERINE

0 20 40
1:1,000,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. PARKS AND PROTECTED AREAS OBTAINED FROM CONSERVATION AREAS REPORTING AND TRACKING SYSTEM (CARTS), CANADIAN COUNCIL ON ECOLOGICAL AREAS, 2017.

PROJECTION: ALBERS CONIC EQUAL AREA

CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

TITLE
WOODLAND CARIBOU AND OTHER WIDE-RANGING WILDLIFE REGIONAL STUDY AREA

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-15
DESIGNED	DC
PREPARED	PMT
REVIEWED	JV
APPROVED	JV

PROJECT NO.	PHASE	REV.	FIGURE
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4.2.1.9 SON-7: Impacts to Wildlife

A description of the assessment methods expected to be used in the Developer's Assessment Report for the wildlife component is provided in Table 4-15.

Table 4-15: Assessment Methods for Wildlife

Assessment Approach for SON-7: Impacts to Wildlife		
Information Sources	Information sources that will be used to support the wildlife assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Wildlife Baseline Report ■ results of the effects assessments for groundwater quantity and quality, surface water quantity, water quality, air quality, terrain and soils, vegetation, and caribou ■ environmental management and monitoring plans, including framework of conceptual version of the Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Spill Contingency Plan, Waste Management Plan, Closure and Reclamation Plan, and Wildlife Protection Plan ■ territorial and federal legislation and guidance such as the NWT's *Wildlife Act*, the federal *Species at Risk Act*, the federal *Migratory Birds Convention Act*, and Committee on the Status of Endangered Wildlife in Canada.	
Valued Components, Assessment Endpoints, and Measurement Indicators	Valued Components (VCs)	The potential VCs for the wildlife assessment are listed in Section 2.0 and Table 2-1 Characterization of the existing environment and a pathway analysis are completed for all VCs listed in Table 2-1 to identify the primary pathways from the Project that may result in significant effects on wildlife VCs. However, not all potential wildlife VCs listed in Table 2-1 need to be assessed comprehensively in the Residual Effects Analysis, Residual Effects Classification and Significance Determination, and Prediction Confidence and Uncertainty sections of the Developer's Assessment Report. At a fine-filter level, wildlife VCs were selected for comprehensive assessment (including RFD Case, where applicable) to focus the assessment on the primary areas of concern with respect to the Project. In cases where effects would be similar for multiple wildlife species, only one species was selected as a VC for comprehensive assessment to minimize ecological and assessment redundancy. For example, the baseline and assessment for olive-sided flycatcher indicates similar habitat and potential Project and cumulative effects for other listed bird species, such as bank swallow, barn swallow, and common nighthawk because they have similar diets (i.e., aerial insectivores). Similarly, the baseline and assessment for yellow rail indicates similar habitat and potential Project and cumulative effects for horned grebe, red-necked phalarope other wetland-dependent species (e.g., northern leopard frog [not detected during baseline surveys]). At a coarser level, ecological and assessment redundancy is completed through the assessment of upland, wetland, and riparian ecosystems, and overall biodiversity, in the vegetation SON (Section 4.2.1.7). Assessing and managing biodiversity at the vegetation ecosystems level means that large numbers of biodiversity elements are addressed together. For example, wildlife guilds dependent on mature forests (e.g., caribou, wolverine, bats) that may contain very old live trees, standing dead trees, and coarse woody debris will be captured by the ecosystem level assessment. Similarly, analysis of the availability, distribution, and function of wetland and riparian ecosystems provides an assessment of amphibians, semi aquatic birds, and mammals, and potential movement corridors connecting habitats across the landscape. The coarse and fine filter assessments compliment and interact with one another, with each assessment providing context for the other. Combined, the coarse and fine filter assessments provide a holistic assessment of the potential effects of the Project on biodiversity. The following is a list of wildlife VCs selected for comprehensive assessment in the Developer's Assessment Report: ■ wood bison ■ wolverine ■ gray wolf ■ little brown myotis ■ olive-sided flycatcher ■ common nighthawk ■ evening grosbeak ■ yellow rail ■ rusty blackbird ■ whooping crane The inclusion of whooping crane in the comprehensive assessment was based on a recommendation from Parks Canada as it is a key indicator of Wood Buffalo National Park. A screening level assessment will be completed for all other wildlife VCs listed in Table 2-1, which includes characterization of existing conditions, pathway analysis, and tabulation of the classification of predicted Project residual effects and determination of significance. The screening tabulation of residual effects classification and determination of significance will be provided in an appendix to the wildlife SON in the Developer's Assessment Report.

Table 4-15: Assessment Methods for Wildlife

Assessment Approach for SON-7: Impacts to Wildlife		
Valued Components, Assessment Endpoints, and Measurement Indicators (cont'd)	Assessment Endpoints and Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the wildlife assessment are defined in Section 4.1.2 and Table 2-2.
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the wildlife assessment will include a local study area (LSA) and two VC-specific regional study areas (RSAs; Section 4.1.3): ■ The LSA for wildlife is equivalent to terrain and soils and vegetation and will include the anticipated maximum extent of the Project footprint plus a 500 m buffer (77,145 ha). All active mineral claims, existing bush roads, cutlines, historic railbed, waste rock piles, and backfilled and mined pits are included in the LSA. Other anticipated new and existing features for the Project contained within the LSA include access roads, laydown areas, and overburden stockpiles. The LSA is expected to capture the combined potential direct and indirect (e.g., dust deposition, noise, changes in surface water quality) effects from the Project on wildlife and provides local context for assessing effects (Figure 4-5). ■ The RSA for small-ranging wildlife VCs (e.g., migratory birds, bats, amphibians, and bumble bees) was designed to provide broader context for interpreting the local effects of the Project and covers approximately 185,148 ha (Figure 4-6). The RSA includes the LSA and is similar to the RSA for groundwater, hydrology, surface water quality, soils and vegetation due to the ecological relationships among aquatic and soil and vegetation ecosystems, and wildlife habitats (e.g., wetland structure and function). The RSA includes Birch Creek watershed and is bounded by the southern shore of Great Slave Lake. In addition to existing human developments the RSA also includes disturbances from wildfires. ■ The area is expected to be at a scale suitable for assessing the significance of effects on wildlife VCs with small daily and seasonal ranges distributed inside the RSA, but probably also extend beyond its boundaries. The RSA is considered large enough to provide an ecologically relevant and confident assessment of the direct and indirect effects on wildlife VCs from the Project, and the cumulative effects from the Project and previous, existing, and reasonably foreseeable developments, and natural factors. ■ For more wide-ranging wildlife VCs (e.g., wood bison, wolverine, gray wolf) the RSA defined for caribou will be used to provide broader context for interpreting the local effects of the Project (Section 4.2.1.8). The RSA is defined as the portion of the Southern NWT Range (GNWT 2019) east of the community of Hay River to the western boundary of NT1 Boreal Caribou Range, and bounded to the north by the shoreline of Great Slave Lake and to the south by the Northwest Territories-Alberta border (1,722,100 ha) (Figure 4-7). The area is expected to capture a large enough portion of populations to make ecologically relevant predictions about the incremental and cumulative effects from the Project and other developments on all VCs that are likely to be distributed inside but may also extend outside the RSA. Predator-prey interactions are also expected to be relevant at this spatial scale.
	Temporal Boundaries	The temporal boundaries for the wildlife assessment will focus the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. The assessment will also consider potential effects on wildlife during post-closure, where relevant. For some pathways of effects, residual effects on wildlife VCs will be evaluated across all phases of the Project, but not necessarily for each specific phase.
	Assessment Cases	■ The wildlife residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, possibly, a Reasonably Foreseeable Development (RFD) Case. The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the “Existing Environment” and “Residual Effects Analysis” descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the wildlife section will be made during preparation of the Developer’s Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual reasonably RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the wildlife assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	

Table 4-15: Assessment Methods for Wildlife

Assessment Approach for SON-7: Impacts to Wildlife	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the wildlife assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the wildlife assessment are anticipated to include the following information types and sources: ■ wildlife species harvested for subsistence, cultural, or commercial purposes and their perceived value ■ locations where wildlife are harvested ■ wildlife species local distribution and abundance ■ wildlife species behaviour and habitat conditions ■ observations of changes in wildlife population abundance and distribution over time
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for wildlife will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of the existing environment will incorporate historical and recent baseline sampling information, including characterization of wildlife habitat conditions in the LSA and RSA. Habitat characterization could be completed using habitat suitability models that were developed for the Project in 2018 (Golder 2018). Incorporation of ITK and community input is expected to support the characterization of existing conditions. The existing baseline information related to wildlife is considered adequate to complete the effects assessment. No additional site-specific surveys are anticipated to be collected for the wildlife component (Volume 3, Appendix C).
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the wildlife component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for wildlife, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.

Residual Effects Analysis	The residual effects analysis for the wildlife component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). Three Project-environment interactions were determined to be primary for wildlife. Assessment methods that will be used to evaluate the potential residual environmental effects of these pathways on wildlife VCs are described below.
	■ Direct removal/alteration and fragmentation of vegetation ecosystems (i.e., wildlife habitat) can affect wildlife abundance and distribution.
	■ Alteration of final terrain and soil conditions, and/or plant species composition could change the types of ecosystems that can be reclaimed on the landscape, and adversely affect wildlife habitat availability and distribution, and survival and reproduction.
	  ■ For small- and wide-ranging wildlife VCs, availability and distribution of suitable habitats in each applicable RSA (see Spatial Boundaries) will be estimated and mapped using habitat suitability models (Golder 2018). Data used to develop the models include Landsat satellite data and the Earth Observation for Sustainable Development of Forests (EOSD) forest cover map imagery data (NRCAN and GNWT 2017) for the Northwest Territories (provided courtesy of the Department of Environment and Natural Resources, Government of the Northwest Territories [GNWT-ENR]). Fire data (from 1965 to present) are also applied as a separate layer to identify age of burns and incorporated into the habitat models. Human disturbance data (e.g., forest cut blocks, communities, powerlines, roads, and trails) were obtained from government sources and applied to the models as a separate layer.
	  ■ The habitat models for the RSAs will be used to determine changes in the availability (quantitatively) and distribution (qualitatively) of habitat for wildlife VCs from the Base Case to the Application Case, and the RFD Case (if applicable). The analysis for the RFD Case may be quantitative and/or qualitative depending on the level of information available for RFDs.
	■ Sensory disturbance can alter wildlife movement and behaviour and adversely affect wildlife habitat availability and animal abundance and distribution.
	  ■ Effects from sensory disturbance will be determined qualitatively using scientific literature, government reports, and other publicly available information that details effects from sensory disturbance on wildlife VCs.
	Technically and economically feasible mitigation will be identified in coordination with the air quality, terrain and soils, and vegetation components.
	Note that potential effects on Indigenous and other people from changes to wildlife availability (e.g., traditional hunting, outfitting) will be assessed in the TLRU and NTLRU sections, respectively (see Section 4.2.2.3 and Section 4.2.2.4).

Residual Effects Classification and Determination of Significance	The residual effects classification completed for the wildlife assessment will follow the methods defined in Section 4.1.9. Wildlife-specific definitions will be developed for the residual effects classification criteria of direction, magnitude, geographic extent, duration, reversibility, frequency, and probability of occurrence. A determination of significance will be completed for the wildlife VCs according the methods described in Section 4.1.9.

Table 4-15: Assessment Methods for Wildlife

Assessment Approach for SON-7: Impacts to Wildlife	
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the wildlife assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project ■ understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space ■ knowledge of the effectiveness of mitigation and environmental design features for reducing or removing Project effects Prediction confidence and uncertainty with respect to air quality, water quality, and vegetation are also relevant to the wildlife assessment and will be considered in the wildlife section of the Developer's Assessment Report.
Monitoring and Follow-up	The wildlife section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring. Monitoring of wildlife will occur as a component of the Wildlife Protection Plan developed for the Project, and will include the following elements: ■ wildlife sightings monitoring, which will consist of reporting of wildlife sightings/activity by all staff ■ wildlife surveillance monitoring, which will consist of systematic surveys of the accommodations camp and waste management areas to document wildlife activity ■ bird nesting and bat roosting monitoring, which will consist of non-intrusive pre-clearing surveys to detect bird nesting activity and potential bat maternity roosts, should vegetation clearing be required during the bat maternity roosting period or the migratory bird nesting period (1 May 1 to 15 August) ■ pre-clearing monitoring, which will consist of pre-clearing surveys to detect large mammals and raptor nests ahead of clearing activities ■ wildlife incident reporting, which will consist of reporting of wildlife incidents (e.g., wildlife injury or mortality, wildlife-caused damage to property) by all staff Monitoring activities defined for air quality, water quality, and vegetation are also relevant to wildlife and will be considered in the wildlife section of the Developer's Assessment Report. The wildlife section of the Developer's Assessment Report will include a description of the specific objectives, monitoring techniques and general analysis procedures that will be used for each monitoring type. Where applicable, links to adaptive management responses will be defined. The design of monitoring activities will also consider previously collected data and will incorporate ITK and information gathered through engagement with communities, where appropriate.
Supporting Annexes	Supporting documentation relevant to the wildlife assessment is anticipated to include the following annexes which will be appended to the Developer's Assessment Report: ■ Screening Level Assessment for Wildlife Valued Components ■ Wildlife Baseline Report ■ Habitat Suitability Index Model Methods ■ Residual Effects Classification and Significance Determination for Screening Level Valued Components Other information sources will be considered in the wildlife assessment (see the "Information Sources" section above) but will not be appended to the wildlife section of the Developer's Assessment Report. Caribou will be included in the Wildlife Baseline Report.

4.2.2 Human Environment

4.2.2.1 SON-8: Impacts to Heritage Resources

Heritage resources is identified in Table 2-1 as a proposed VC to be included in the Developer's Assessment Report. A description of the assessment methods expected to be used in the Developer's Assessment Report for heritage resources is provided in Table 4-16.

Table 4-16: Assessment Methods for Heritage Resources

Assessment Approach for SON-8: Impacts to Heritage Resources		
Information Sources	Information sources that will be used to support the heritage resources assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Heritage Resources Baseline Report ■ results of the effects assessments for groundwater quantity and quality, surface water quantity, water quality, and air quality ■ environmental management and monitoring plans, including framework or conceptual versions of the following: Water Management Plan, Tailings and Waste Rock Management Plan, Erosion and Sediment Control Plan, Spill Contingency Plan, Waste Management Plan, and Closure and Reclamation Plan ■ other Archaeological Impact Assessment and Archaeological Overview Assessment reports prepared for Pine Point Mining Limited ■ territorial and federal legislation and guidance such as the *Northwest Territories Archaeological Sites Act*, *Northwest Territories Archaeological Sites Regulations*, *Mackenzie Valley Resource Management Act*, *Mackenzie Valley Land Use Regulations*	
Valued Components, Assessment Endpoints, and Measurement Indicators	Valued Components (VCs)	The VCs recommended to be used in the heritage resources assessment are defined in Section 2.0 and Table 2-1.
	Assessment Endpoints and Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the heritage resources assessment are defined in Section 4.1.2 and Table 4-1.
Environmental Assessment Boundaries	Spatial Boundaries	The spatial boundaries considered in the heritage resources assessment will include a local study area (LSA) and a broader regional study area (RSA; Section 4.1.3): ■ The LSA is recommended to include the Project footprint or areas of direct ground disturbance that could affect heritage resources. ■ The RSA is recommended to be an area extending from Hay River in the west to Slave River in the east, and the shore of Great Slave lake in the North to the Alberta border in the south. This will provide context for documented heritage resources in the LSA.
	Temporal Boundaries	The temporal boundaries for the heritage resources assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. For some pathways of effects, the residual effects of the heritage resources VC will be evaluated across all phases of the Project, but not necessarily for each specific phase.
	Assessment Cases	■ The heritage resources residual effects analysis will consist of two assessment cases, which will include a Base Case and an Application Case (Section 4.1.3). The methods that will be used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ A Reasonably Foreseeable Development Case will not be included, as disturbance to heritage resource sites are spatially localized events that will not result in the negative effect on the condition of other archaeological sites in the region. Therefore, cumulative effects are not anticipated.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the heritage resources assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the heritage resources assessment are defined in Section 4.1.5. Specific types of ITK that may be used in the heritage resources assessment are anticipated to include the following information types and sources: ■ location of known heritage resource sites (e.g., observed artifacts or features) ■ locations of traditional use sites that could contain archaeological sites (e.g., campsites, cabins, fishing, or hunting locations)	

Table 4-16: Assessment Methods for Heritage Resources

Assessment Approach for SON-8: Impacts to Heritage Resources	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for heritage resources will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of the existing environment will incorporate historical and recent baseline sampling information. Additional information recommended to be collected for heritage resources in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description. Further baseline studies were carried out in summer 2020 in areas of the Project footprint outside of previously disturbed areas. Heritage field studies will be carried out in high potential areas to identify presence of archeological sites. The description the existing environment for the heritage resources component will include characterization of each site (size, density, age, cultural affiliation, level of disturbance) within the LSA.
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the heritage resources component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for heritage resources, along with the associated residual effects categorization (i.e., no pathway, secondary or primary) and proposed mitigation measures, is provided in Volume 4.
Residual Effects Analysis	As indicated in Volume 4, there are no primary pathways identified for heritage resources; hence, a residual effects analysis will not be completed for the heritage resources component.
Residual Effects Classification and Determination of Significance	As there are no primary pathways identified for heritage resources, a residual effects classification and significance determination will not be completed for the heritage resources component.
Prediction Confidence and Uncertainty	Prediction confidence and uncertainty will be evaluated according to the general methods defined in Section 4.1.10. Key sources of uncertainty that are relevant to the heritage resources assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ adequacy of baseline data for understanding current conditions and future changes unrelated to the Project ■ understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space ■ knowledge of the effectiveness of mitigation and environmental design features for reducing or removing Project effects
Monitoring and Follow-up	The heritage resources section of the Developer's Assessment Report will include a description of the monitoring activities proposed to address the uncertainties associated with effect predictions and the performance of environmental design features and mitigation related to the Project. In the NWT, the Prince of Wales Northern Heritage Centre manages the permitting process to protect archaeological resources, including types of studies, and the need for mitigation and/or monitoring, where appropriate. As described in Section 4.1.11, the description of monitoring activities will include consideration of both compliance monitoring and follow-up monitoring. Monitoring and management for the heritage resources component will include the following elements: ■ A heritage resources management plan to be developed prior to Project construction that describes procedures to follow in the event unanticipated (chance find) heritage resources are encountered during construction, operation, or closure. ■ An education program for mine staff and contractors to enable identification of heritage resources and provides general guidelines for the appropriate response to the inadvertent discovery of known or suspected archaeological sites
Supporting Annexes	Supporting documentation relevant to the heritage resources assessment is anticipated to include the following annex which will be appended to the heritage resources section of the Developer's Assessment Report: ■ Heritage Resources Baseline Report Other information sources will be considered in the heritage resources assessment (see the "Information Sources" section above) but will not be appended to the heritage resources section of the Developer's Assessment Report.

4.2.2.2 KLOI-3: Impacts to Traditional Land and Resource Use

A description of the assessment methods expected to be used in the Developer's Assessment Report for the TLRU component is provided in Table 4-17.

Table 4-17: Assessment Methods for Traditional Land and Resource Use

Assessment Approach for KLOI-3: Impacts to Traditional Land and Resource Use		
Information Sources	Indigenous Traditional Knowledge (ITK) regarding the lands and waters used by the Indigenous peoples potentially affected by the Project will be integral in developing the traditional land and resource use (TLRU) baseline and effects assessment. Information sources that will be used to scope the TLRU assessment are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the TLRU Baseline Report ■ publicly available literature regarding TLRU in the region, and around the Project (e.g., academic publications, previous ITK studies completed in relation to the Pine Point Pilot Project), and validated by the communities ■ TLRU information provided through Project consultation and engagement ■ TLRU use information and ITK obtained through forthcoming Project-specific studies ■ inputs from the effects assessments for air quality, noise, climate, water quality, fish and fish habitat, vegetation, caribou, and wildlife	
Valued Components, Assessment Endpoints, and Measurement Indicators	Valued Components (VCs)	The VCs recommended to be used in the TLRU assessment include: traditional hunting and trapping, traditional fishing, traditional plant harvesting, and use of culturally important sites and areas. A rationale for the selection of these VCs is provided in Section 2.0 and Table 2-1.
	Assessment Endpoints and Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the TLRU assessment are defined in Section 4.1.2 and Table 4-1.
Environmental Assessment Boundaries	Spatial Boundaries	The Project is within the traditional territories of the Deninu Kue First Nation, K'atl'odeeche First Nation, and Northwest Territory Métis Nation. The Deninu Kųę First Nation is in close proximity to the Project, and has to date been the most engaged. The Hay River Métis Council and the Fort Resolution Métis Council were initially engaged separately; however, more recently, engagement has been through the Northwest Territory Métis Nation. Project-induced effects on the TLRU of these groups will be largely assessed within the study areas defined for potentially affected resources. Therefore, the study areas for hunting and trapping and traditional plant harvesting activities correspond with those of the terrestrial disciplines (Table 4-12, Table 4-15, Figure 4-5 through Figure 4-7) and the study areas for fishing and water use correspond with those of the aquatic disciplines(Table 4-8, Table 4-11, Figure 4-3 and Figure 4-4). Consideration is also given to the noise study area when discussing effects on the experience of Indigenous land users (Table 4-6). When assessing effects on travel, access, and the use of the land for cultural and spiritual practices, the TLRU assessment does not rely on defined spatial boundaries. The TLRU study areas and issues will be refined in collaboration with affected Indigenous groups.
	Temporal Boundaries	The temporal boundaries for the TLRU assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, closure and reclamation. The assessment will also consider potential effects on TLRU during post-closure, where relevant. For some pathways of effects, residual effects on TLRU VCs will be evaluated across all phases of the Project, but not necessarily for each specific phase.
	Assessment Cases	■ The TLRU residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, possibly, a Reasonably Foreseeable Development (RFD) Case. The methods used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the TLRU section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual reasonably RFDs.
Input from Engagement	TLRU information, ITK, and concerns raised during the Indigenous engagement process undertaken for the Project (Volume 2) will be incorporated into the TLRU assessment according to the methods defined in Section 4.1.4. Specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	

Table 4-17: Assessment Methods for Traditional Land and Resource Use

Assessment Approach for KLOI-3: Impacts to Traditional Land and Resource Use	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the TLRU assessment are defined in Section 4.1.5. Specific types of ITK that may be identified for inclusion in the TLRU assessment are anticipated to include: ■ traditionally important resources (e.g., wildlife, fish, medicinal plants) ■ country foods and food security ■ patterns of traditional land use ■ the cultural value of resources, places, and landscapes ■ cultural, spiritual, and ceremonial sites ■ the interaction between the wage and traditional economy ■ travel routes, including trails and water-based access routes ■ subsistence and harvesting activities ■ ecological knowledge of wildlife, vegetation, fish, water, and climate
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for TLRU will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. The description of the existing environment will incorporate information regarding current TLRU of communities obtained through desktop literature review, feedback provided during engagement and through consultation with communities, following ITK protocols. The existing environment will also be informed by Project-specific ITK studies developed by the communities, or on behalf of the communities. The existing environment for land and resource use will include a description of harvesting activities and their importance to potentially affected communities, harvest species, levels, and importance to the traditional economy, places of cultural and spiritual value, and access to land use areas. Additional information recommended to be collected for TLRU component in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description. This will include information from a desktop literature review and future engagement activities. Further details are provided in Volume 3, Appendix C.
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the TLRU component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for TLRU, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.
Residual Effects Analysis	The TLRU residual effects analysis will consist of a qualitative assessment, supported by quantitative analysis where possible, and will discuss the disturbance affecting traditional land use areas, changes in the availability of traditionally important resources (e.g., wildlife, fish and vegetation), changes in physical access, and the potential for sensory disturbances (i.e., noise, odour and visual effects) to affect Indigenous land users. The TLRU effects assessment will therefore incorporate the results of other relevant environmental disciplines when discussing effects on resources and the potential for sensory disturbance to affect Indigenous land users. In addition to the tangible values (e.g., wildlife species or traditional plants) associated with the use of lands and resources by Indigenous groups, the TLRU effects assessment will also discuss intangible values (e.g., changes to sense of place within the larger cultural landscape, and opportunities to transfer cultural values and knowledge to future generations) associated with TLRU. The TLRU results of Indigenous engagement will also be relied upon in determining potential and residual effects on TLRU. The residual effects analysis for the TLRU component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). Assessment methods that will be used to evaluate the potential residual environmental effects of these pathways on TLRU VCs are described below. Several Project-environment interactions have been determined to be secondary or primary, depending on the outcome of the analyses of biological components and feedback from communities. In the event that these pathways are determined to be secondary in the pathway analysis, they will not be carried forward to the residual effects analysis: ■ changes in the abundance and distribution of wildlife, and the availability of wildlife for traditional hunting and trapping ■ changes in the abundance and distribution of fish, and the availability of fish for traditional fishing ■ changes in water quality, and the availability of water for drinking ■ changes in the abundance and distribution of vegetation, and the availability of plants for traditional harvesting ■ To determine changes in resource availability, the TLRU assessment will incorporate the results of the wildlife assessment, fish and fish habitat assessment, vegetation assessment, and water quality assessments.

Table 4-17: Assessment Methods for Traditional Land and Resource Use

Assessment Approach for KLOI-3: Impacts to Traditional Land and Resource Use	

Residual Effects Analysis (cont'd)	Other Project-environment interactions were determined to primary (Volume 4):
	■ the direct disturbance to, or loss of, traditional use areas, including hunting and trapping, fishing, plant harvesting, and culturally important sites and areas (e.g., habitation, spiritual sites, or trails)
	  ▪ Land disturbance from the Project will be calculated for traditional use areas identified by Indigenous communities, including areas used for hunting, trapping, fishing, plant harvesting, or culturally important sites, to identify the change in available land use areas between Base Case, Assessment Case, and RFD Case.
	■ sensory disturbances (e.g., noise, light, odour, and visual disturbance) can affect the experience of Indigenous land users
	  ▪ A qualitative assessment will be conducted, incorporating the results of engagement with Indigenous communities and the level of concern expressed, supported by a quantitative analysis from the noise and air quality assessments
	■ changes in intangible values, including sense of place within the cultural landscape, and reduced ability to transfer knowledge to future generations
	  ▪ A qualitative assessment will be conducted, incorporating the results of engagement with Indigenous communities and the level of concern expressed. Changes in intangible values will be considered holistically with other measurable parameters for each VC.
	■ changes in social and economic factors can affect participation in traditional activities (e.g., either positively or negatively) and changes in cultural values and practices
	  ▪ A qualitative assessment will be conducted, incorporating the results of engagement with Indigenous communities and the level of concern expressed, and the results of the socio-economic assessment.

Residual Effects Classification and Determination of Significance	The residual effect classification criteria for TLRU will generally be consistent with those presented in Section 4.1.9 and Section 4.2.2.3, with the exception of geographic extent. When assessing Project effects on TLRU, a local geographic extent will be assigned to effects within the associated local study area (LSA) of the resource affected. Similarly, a regional geographic extent will be assigned to effects within the associated regional study area (RSA) of the resource affected. For example, traditional plant harvesting will be assessed within the vegetation LSA. Beyond regional effects are those that extend outside of the RSAs for environmental resources used for traditional harvesting purposes. A determination of significance will be completed for the TLRU VCs according to the methods described in Section 4.1.9 and those described further in the socio-economic assessment methods (Section 4.2.2.3). In determining the significance of the Project's effects on TLRU, the level of concern expressed by communities and ITK collected in association with the Project will be included alongside scientific analyses and inference.
Prediction Confidence and Uncertainty	Key sources of uncertainty that are relevant to the TLRU assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ Many of the effects on TLRU rely upon the assessments completed for other disciplines; therefore, limits in prediction confidence and uncertainties identified in those assessments may also be relevant to the assessment on Indigenous TLRU. ■ For TLRU, there are no established thresholds or standards for most measurement indicators. Although it may be possible to set thresholds for purposes of an EA, it often cannot be demonstrated that there is any consensus on a specific threshold value where an effect on TLRU occurs or what such a threshold means in terms of significance of an effect. As a result, professional judgment is often used in reaching conclusions on significance for effects on TLRU. ■ The effects on TLRU may not lend themselves to the assignment of criteria or determination of significance except in terms of potential, thus introducing a larger element of uncertainty into the TLRU assessment. There generally is the expectation that an effect brought forward for assessment will in fact occur, at least to some degree. However, it is difficult to predict, for example, whether some effects will be positive, negative, or both, who will be affected, and in what ways. ■ The approach taken for the TLRU assessment is to assess Project-related effects on the TLRU of Indigenous communities. As a result, there is uncertainty regarding human variability in the degree to which predicted effects will affect individual members. For example, not all individuals might be affected to the same degree by sensory disturbances (e.g., noise or air quality). To reduce the uncertainty regarding human variability in response to predicted effects, the TLRU assessment typically takes a conservative approach and assumes that predicted Project effects will affect the community as a whole and the future sustainability of TLRU. ■ ITK and the results of Indigenous engagement will be key in determining the effects of the Project on TLRU. The extent to which ITK and engagement results are accessible during the assessment process will influence prediction confidence and certainty in the Developer's Assessment Report.

Table 4-17: Assessment Methods for Traditional Land and Resource Use

Assessment Approach for KLOI-3: Impacts to Traditional Land and Resource Use	
Monitoring and Follow-up	Monitoring and follow up activities that are relevant to the TLRU component, and that will be addressed in the Developer's Assessment Report, are anticipated to include consideration of the following: ■ An education program for mine staff and contractors on the protection of identified Indigenous cultural sites, ongoing engagement with Indigenous communities on the effectiveness of mitigation measures, the results of environmental monitoring programs, and opportunities for community members to be involved in monitoring programs Monitoring activities defined for air quality, noise, water quality, fish and fish habitat, vegetation, wildlife, and caribou are also relevant to TLRU and will be considered in the TLRU section of the Developer's Assessment Report. These programs will incorporate ITK and information gathered through engagement with communities, where appropriate.
Supporting Annexes	Supporting documentation relevant to the TLRU assessment is anticipated to include the following annexes which will be appended to the TLRU section of the Developer's Assessment Report: ■ the TLRU Baseline Report It is anticipated that Project-specific ITK reports containing TLRU information will be produced in collaboration with Indigenous communities tiered as being the most affected by the Project. Such reports are the property of the communities providing ITK and may or may not be approved for submission as supporting documents to the Developer's Assessment Report by the Indigenous communities. If approved for submission, the ITK reports will be annexed to the Developer's Assessment Report and referenced, as appropriate, in the TLRU section. Other information sources will be considered in the TLRU assessment (see the "Information Sources" section above) but will not be appended to the TLRU section of the Developer's Assessment Report.

4.2.2.3 KLOI-4: Impacts to Social and Economic Conditions

A description of the assessment methods expected to be used in the Developer's Assessment Report for the socio-economic assessment is provided in Table 4-18.

Table 4-18: Assessment Methods for Socio-economic Assessment

Assessment Approach for KLOI-4: Impacts to Social and Economic Conditions		
Information Sources	Information sources that will be used to support the socio-economic assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the Socio-economic Baseline Report ■ the MVEIRB's *Socio-Economic Impact Assessment Guidelines* (MVEIRB 2007) ■ publicly available sources, including statistical databases (e.g., GNWT Bureau of Statistics; Statistics Canada), government publications (e.g., GNWT Health and Social Services; GNWT Industry, Trade and Investment), and other relevant literature regarding social and economic conditions in communities ■ specific economic information sourced from the PPML NI 43-101 (preliminary economic assessment) and internal PPML resources (used in economic modelling) ■ the conceptual Socio-economic Management Plan, developed as part of the Project, including a list of commitments ■ the Engagement and Collaboration Plan, developed as part of the Project, and updated as the EA process unfolds ■ information gathered through telephone interviews, key informant interviews in communities, and meetings with government and service providers with a mandate to monitor and manage social and economic conditions in communities, and the territory more broadly ■ guidance on engagement from the Land and Water Boards of the Mackenzie Valley (LWBMV 2018a,b)	
Valued Components, Assessment Endpoints, and Measurement Indicators	Valued Components (VCs)	The VCs recommended to be used in the socio-economic assessment, and a rationale for their selection, are provided in Section 2.0 and Table 2-1.
	Assessment Endpoints and Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the socio-economic assessment are defined in Section 4.1.2 and Table 4-1.

Table 4-18: Assessment Methods for Socio-economic Assessment

Assessment Approach for KLOI-4: Impacts to Social and Economic Conditions		
Environmental Assessment Boundaries	Spatial Boundaries	The assessment of social and economic effects is not spatially bounded by a square, rectangle, or polygon but is instead focused on those communities and jurisdictions most affected by the Project. The Project is within the South Slave Region, and the traditional territories of the Deninu Kue First Nation, K'atl'odeeche First Nation, and Northwest Territory Métis Nation. The Deninu Kų́ę First Nation is in close proximity to the Project, and has to date been the most engaged. The Hay River Métis Council and the Fort Resolution Métis Council were initially engaged separately; however, more recently, engagement has been through the Northwest Territory Métis Nation. The socio-economic local study area communities (Figure 4-8) include: **Communities Prioritized by PPML for Involvement and Closest to the Project** ■ Fort Resolution (South Slave community, Deninu Kų́ę First Nation, Northwest Territory Métis Nation [Fort Resolution Métis Council]) ■ Hay River Dene 1 (K'atl'odeeche First Nation) ■ Hay River (South Slave community, Northwest Territory Métis Nation [Hay River Métis Council Government]) **Other Communities for Inclusion** ■ Enterprise (South Slave community) ■ Fort Providence (South Slave community) ■ Fort Smith (South Slave community, Northwest Territory Métis Nation [Fort Smith Métis Council]) ■ Kakisa (South Slave community) ■ Dettah (Akaitcho Dene [Yellowknives Dene First Nation]) ■ Łutsel K'e (Akaitcho Dene [Łutsel K'e Dene First Nation]) ■ Yellowknife (major population, economic and service hub) Data collection and presentation of baseline information for these communities will be tiered depending on their propensity to experience socio-economic effects. For example, the communities of Hay River and Fort Resolution would be more expected to experience population-driven effects given their proximity to the Project and the potential for in-migration, while the communities of Fort Providence, Łutsel K'e, and Fort Smith are farther away and less likely to attract relocating jobseekers. The socio-economic regional study area is the NWT. Regional-level effects are largely related to economic effects such as Project-driven contributions to territorial Gross Domestic Product (GDP), labour force conditions, government revenues, industry and commercial activity, and population change.
	Temporal Boundaries	The temporal boundaries for the socio-economic assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. Post-closure will be considered in tandem with the closure and reclamation phase for socio-economic effects assessment and will consider the long-term implications of closure in the future development context known at the time of assessment. For some pathways of effects, residual effects on social and economic VCs will be evaluated across all phases of the Project, but not necessarily for each specific phase.
	Assessment Cases	The socio-economic assessment is inherently cumulative in nature and does not consider the Project's effects in isolation. This is done because communities and economies are not affected by individual developments in a vacuum; rather, it is the cumulative interaction of developments in a region that combines to affect social and economic conditions in communities. When describing conditions and trends beyond present day, the socio-economic effects assessment considers all reasonably foreseeable projects in conjunction with current conditions. While some projects may have been announced, or are in the planning process, they are not necessarily considered to be reasonably included in predictions of future conditions from an economic standpoint. Rather, only projects with proven economics (e.g., funding, approvals) and a strong likelihood of proceeding are considered in the interest of providing a meaningful projection of future social and economic conditions. The economic components of the socio-economic residual effects analysis will consist of up to three assessment cases, as generally defined in Section 4.1.3: a Base Case, an Application

Table 4-18: Assessment Methods for Socio-economic Assessment

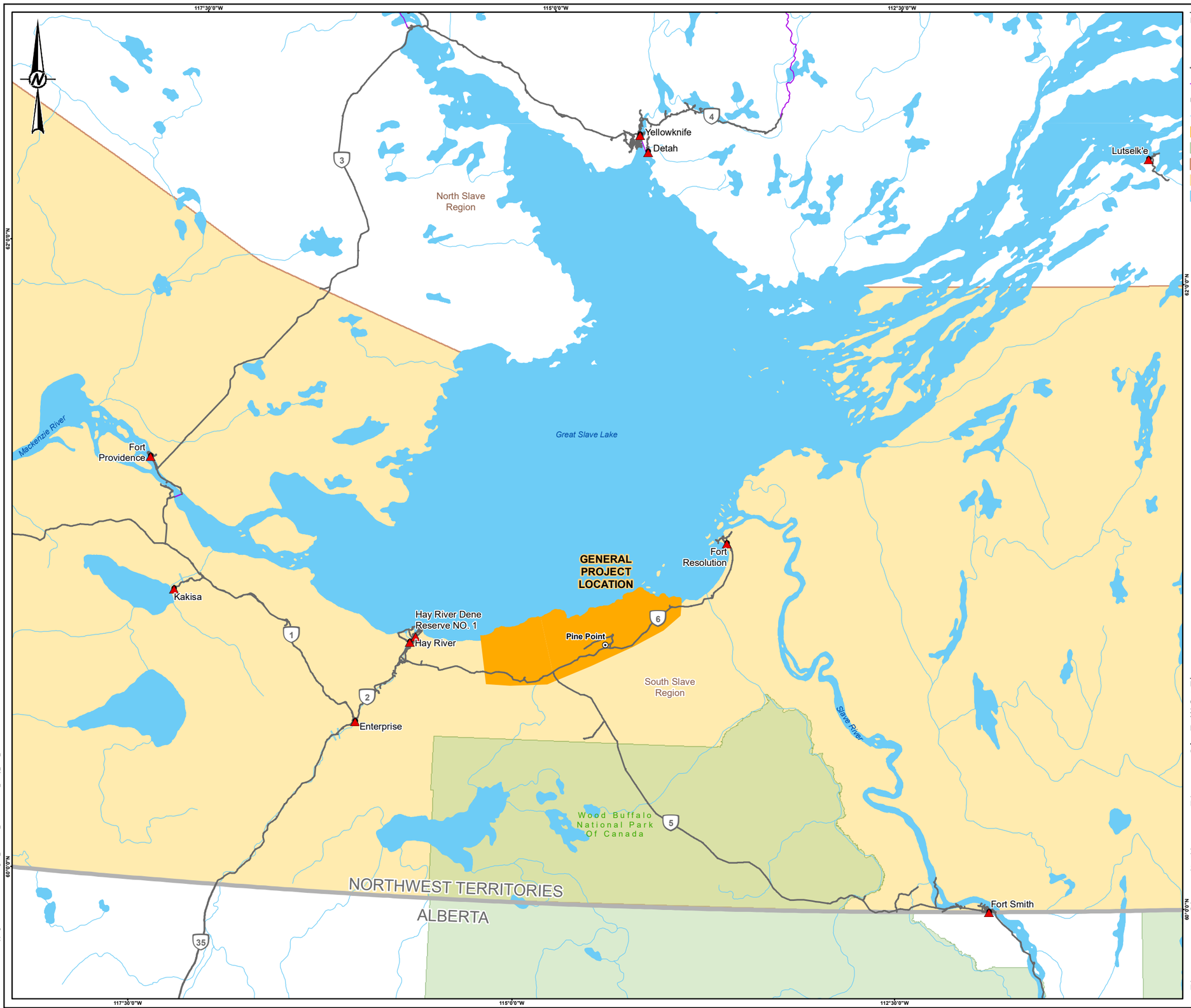
Assessment Approach for KLOI-4: Impacts to Social and Economic Conditions		
		Case and, possibly, a Reasonably Foreseeable Development (RFD) Case. The RFD case considers future projects that have overlapping economic influences with the Project. Attempting to predict future social conditions in communities without the Project is not likely to yield accurate or meaningful results against which to compare the Project's incremental impacts. Rather, the assessment of the Project's ability to influence social conditions in communities is based on current conditions and on feedback from communities. The "Base Case" for the social components of the assessment is, therefore, consistent with the baseline at the time of writing, and reflects the present priorities of communities. Cumulative effects from the Project and RFDs on social conditions are considered qualitatively.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the socio-economic assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the socio-economic assessment are defined in Section 4.1.5. Specific types of ITK that may be identified for inclusion in the socio-economic assessment are anticipated to include: ■ language and cultural retention ■ mobility ■ interaction between the wage and traditional economies ■ traditional economic activities ■ family and community roles ■ indicators of wellbeing ■ volunteerism ■ vulnerability ■ food security and nutrition	
Existing Environment	The description of existing environment provided in the Developer's Assessment Report for socio-economic VCs will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. It is anticipated that much of the desktop information presented in Volume 3 will require updating given the tendency for socio-economic data to become out of date rapidly. Further, gaps in data have been identified and will require additional data collection to prepare an adequate socio-economic baseline. The description of the existing environment will incorporate current information regarding conditions in communities obtained through interviews with key informants able to speak to socio-economic conditions in their community. The socio-economic baseline program will be discussed with communities through preliminary engagement as described in Volume 2 and may be subject to an Aurora Research Licence permit, if appropriate. This will include information regarding population demography, labour market, economic activity, service provision, infrastructure and housing capacity, and health and wellbeing. Additional information recommended to be collected for the socio-economic component in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description. This will include information from a desktop literature review and future engagement activities. Further details are provided in Volume 3, Appendix C.	
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the socio-economic component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for the socio-economic component, along with the associated residual effects categorization (i.e., no pathway, secondary or primary) and proposed mitigation measures, is provided in Volume 4.	
Residual Effects Analysis	A Project will affect people and communities in different ways, depending on their proximity to the Project, their relationship with the area of the Project and on the degree to which they participate in the Project. While benefits are usually expected (e.g., employment, business development, incomes), they may not be realized by all individuals, families, and communities. Further, some people may experience adverse effects from the Project. Mitigation can attempt to address adverse Project effects and benefit enhancement measures can seek to maximize Project benefits for a wider group of people; however, the extent to which mitigations and enhancements are effective is not always apparent or measurable. The approach to the socio-economic effects analysis is therefore qualitative and nuanced. In coming to conclusions, including describing potential and residual effects, there is necessarily a high dependence on engagement results and comparable experiences. The Project's territorial economic and population effects will be assessed quantitatively using economic Input-Output modelling. The Project's potential employment effects will also be assessed quantitatively using projected workforce requirements relative to labour market conditions in communities and the territory, and in consideration of qualitative factors such as barriers to employment. A qualitative assessment will be conducted for the remaining socio-economic pathways identified in Volume 4, incorporating the results of engagement with Indigenous communities and the level of concern expressed. Only primary pathways as identified in Volume 4 will be carried forward to the residual effects analysis. In determining residual Project effects, the socio-economic assessment considers: ■ baseline conditions in communities potentially affected by the Project, with attention paid to differing contexts based on intersectional identity factors (e.g., gender, Indigeneity, age, or vulnerability)	

Table 4-18: Assessment Methods for Socio-economic Assessment

Assessment Approach for KLOI-4: Impacts to Social and Economic Conditions	
	■ the Project design or execution elements potentially interacting with socio-economic VCs and indicators (e.g., employment, rotations, contracting requirements, transportation, and worker housing) ■ the Project's economic inputs (e.g., workforce estimates, capital and operational expenditures are used in economic Input-Output models used to predict macroeconomic territorial population effects) ■ the concerns and aspirations raised by potentially affected parties through engagement, consultation, and other means of input (e.g., the socio-economic baseline study, ITK studies) ■ the results of applicable monitoring outcomes for communities in comparable contexts where mining development has contributed to socio-economic effects ■ Project-specific mitigation and benefit enhancement measures developed either to be in line with standard practice, or in response to input from potentially affected parties. Where the Project is determined to have residual effects on aspects of the socio-economic environment, this is described further in terms of who is likely to experience what effects and to what extent, taking into consideration the concerns expressed by potentially affected parties, the capacity of systems (e.g., healthcare, protective and emergency services, housing) and identity factor characteristics of the population, as appropriate. Residual effects criteria area assigned to classify and prioritize effects, as described below. The MVEIRB's *Socio-Economic Impact Assessment Guidelines* (2007) will be incorporated into the residual effects analysis process.
Residual Effects Classification and Determination of Significance	When determining the consequence of socio-economic effects, local and national geographic extents are weighted equally. This is done because the type of social effects addressed are either focused effects on a local population, or more broadly relevant but smaller effects in national capitals or other regions. Further, a key goal of the effects assessment is to identify benefits to communities mostly affected by the Project. The socio-economic residual effects assessment considers both positive and negative effects. Magnitude is assigned based on the potential for the effect to change a socio-economic feature, and the manageability of the effect. Most socio-economic effects occur continuously throughout the life of the Project (e.g., demand for labour, procurement, social effects associated with rotational employment), and are not reversible with the conclusion of a Project phase (e.g., adverse social effects that may develop in communities do not go away when employment incomes are removed). Where applicable, the definitions for these criteria described in Section 4.1.9 will be applied to the socio-economic assessment. Residual effects criteria are used to describe the Project's social and economic effects; however, in determining the significance of an effect on communities and other groups of people, the socio-economic effects assessment relies on the expected effect on the quality of life of those affected. The magnitude of the effect is often weighted heavily in the determination of significance and is influenced by the level of concern expressed by affected groups.
Prediction Confidence and Uncertainty	There is inherent uncertainty in assessing the significance of some socio-economic effects given the reliance of effect realization on the responses of individuals, families, and communities to effect stimuli, mitigation, and benefit enhancement measures. Forces outside the control of a single Project can further this uncertainty by undermining the effectiveness of mitigation and benefit enhancement measures. Many socio-economic effects may not lend themselves to the assignment of criteria or determination of significance except in terms of potential, thus introducing a larger element of uncertainty into socio-economic effects assessment. There generally is the expectation that an effect brought forward for assessment will in fact occur, at least to some degree. However, it is difficult, and in some cases not possible, to predict whether an effect will be positive, negative or both, and in what ways for whom. For example, Project employment incomes will be beneficial to those accessing employment opportunities and their families (positive effect); however, for vulnerable segments of society (e.g., women, children in single parent homes, the elderly), these opportunities may not be accessible, and not influence their quality of life (neutral effect). Where these employment incomes are concentrated in only a portion of households, this can create inequality (negative effect). The significance of the effect of Project-paid incomes is, therefore, nuanced. Confidence in the assessment of the significance of the Project's socio-economic effects necessarily depends on: ■ the perceptions and values of affected people and their leadership, as made evident through engagement ■ the adequacy of baseline data for understanding current conditions ■ the status of project planning and design features, including economic modelling inputs ■ knowledge of the effectiveness of mitigation in reducing or removing adverse effects, and of benefit enhancement measures ■ lessons learned from other experiences Confidence in the prediction of whether an effect is significant or not is often high, regardless of all the uncertainties in describing the detail of that effect. This may at times seem to be a contradiction. For example, effects on GDP and labour income are only an approximation based on Input-Output modelling. Even in the event of large errors in the approximation, however, the Project`s effects on GDP and labour income will necessarily be significant. Confidence in the results of the socio-economic effects assessment is enhanced through discussion with communities regarding what their past experience with development has been, and what their concerns are in relation to new development. Further, discussing mitigation and benefit enhancement measures with communities increased the confidence in the efficacy of such measures to meet the goals of the community.

Table 4-18: Assessment Methods for Socio-economic Assessment

Assessment Approach for KLOI-4: Impacts to Social and Economic Conditions	
Monitoring and Follow-up	The Socio-economic Management Plan will provide a full discussion of PPML's monitoring measures; a conceptual version will be submitted with the Developer's Assessment Report. PPML will collaborate with the government to track socio-economic trends in the region and in communities, and will track, internally, appropriate indicators within the purview of a developer as defined by the forthcoming Socio-economic Agreement between PPML and the GNWT. PPML will monitor direct employment and incomes by Indigenous identity, gender, and point of origin. Workforce training, educational initiatives, and community contributions will also be monitored, and reported on in the annual socio-economic monitoring report for the Project submitted in response to the Socio-economic Agreement. Efforts to support and encourage traditional pursuits will be similarly tracked and reported on. It has been recommended that employee and family use of the Project's Employee and Family Assistance Program, on-site medical services, Elder counselling, and other mental and physical health-related programming be monitored and evaluated.
Supporting Annexes	Supporting documentation relevant to socio-economics is anticipated to include the following annexes which will be appended to the socio-economics section of the Developer's Assessment Report: ■ the Socio-economic Baseline Report Other information sources will be considered in the socio-economic assessment (see the "Information Sources" section above) but will not be appended to the socio-economic section of the Developer's Assessment Report.



LEGEND

- FORMER PINE POINT TOWN SITE
- SOCIO-ECONOMIC STUDY AREA COMMUNITY
- ALL-SEASON ROAD
- WINTER ROAD
- TERRITORIAL/PROVINCIAL BOUNDARY
- WATERCOURSE
- GENERAL PROJECT LOCATION
- PARK / PROTECTED AREA
- REGIONAL BOUNDARY
- SOUTH SLAVE REGION
- WATERBODY

0 25 50
1:1,375,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. PARKS AND PROTECTED AREAS OBTAINED FROM CONSERVATION AREAS REPORTING AND TRACKING SYSTEM (CARTS), CANADIAN COUNCIL ON ECOLOGICAL AREAS, 2017.

PROJECTION: ALBERS CONIC EQUAL AREA

CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

TITLE
SOCIO-ECONOMIC LOCAL STUDY AREA COMMUNITIES

CONSULTANT
GOLDER

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DESIGNED	JO
PREPARED	MM
REVIEWED	JV
APPROVED	JV

PROJECT NO. 19125747 | PHASE | REV. 0 | FIGURE 4-8

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4.2.2.4 SON-10: Impacts to Non-traditional Land and Resource Use

A description of the assessment methods expected to be used in the Developer's Assessment Report for the NTLRU assessment is provided in Table 4-19.

Table 4-19: Assessment Methods for the Non-traditional Land and Resource Use Assessment

Assessment Approach for SON-10: Impacts to Non-traditional Land and Resource Use		
Information Sources	Information sources that will be used to support the non-traditional land and resource use (NTLRU) assessment scoping are anticipated to include the relevant sources listed in Section 4.1.1 and the following: ■ the NTLRU Baseline Report. ■ publicly available sources, including statistical databases (e.g., GNWT Bureau of Statistics;), government publications (e.g., GNWT Industry, Trade and Investment), and other relevant literature regarding NTLRU activities in the local study area (LSA) and regional study area (RSA). ■ the Engagement and Collaboration Plan, developed as part of the Project, and updated as the EA process unfolds ■ information gathered through telephone interviews and key informant interviews in communities ■ guidance on engagement from the Land and Water Boards of the Mackenzie Valley (LWBMV 2018a,b)	
Valued Components, Assessment Endpoints, and Measurement Indicators	Valued Components (VCs)	The VCs recommended to be used in the NTLRU assessment, and a rationale for their selection, are provided in Section 2.0 and Table 2-1.
	Assessment Endpoints and Measurement Indicators	The assessment endpoints and measurement indicators recommended to be used in the NTLRU assessment are defined in Section 4.1.2 and Table 4-1.
Environmental Assessment Boundaries	Spatial Boundaries	NTLRU is linked to anthropogenic use of the land and resources for non-traditional activities. The resources hunted, fished, or harvested in the area of the Project effects, as well as the level of use in the vicinity of the Project, are considered. It is also linked to the ability of a Project to affect the visual and acoustic environments, insofar as a Project can create visual and auditory disturbances that interfere with tourism and other land use activities. Therefore, the study areas for NTLRU correspond to those of the noise, water quality, fish and fish habitat, vegetation, caribou, and wildlife components (Table 4-6 and Table 4-8 through Table 4-15; Figure 4-3 through Figure 4-7). Where there is variation between the study areas for these disciplines, the NTLRU baseline will discuss land and resource use at a scale appropriate to the specific discipline. Other industrial activity (e.g., resource extraction, power generation) is discussed at the regional scale where the Project has the potential to interact with these activities.
	Temporal Boundaries	The temporal boundaries for the NTLRU assessment will focus on the Project phases defined in Section 4.1.3: construction, operation, and closure and reclamation. The assessment will also consider potential effects on NTLRU during post-closure, where relevant. For some pathways of effects, residual effects on NTLRU VCs will be evaluated across all phases of the Project, but not necessarily for each specific phase.
	Assessment Cases	■ The NTLRU residual effects analysis will consist of up to three assessment cases, as defined in Section 4.1.3: a Base Case, an Application Case and, possibly, a Reasonably Foreseeable Development (RFD) Case. The methods used to assess the Base Case and the Application Case are defined in Section 4.1.3 and in the "Existing Environment" and "Residual Effects Analysis" descriptions provided below. ■ The determination of whether an RFD Case assessment will be included in the NTLRU section will be made during preparation of the Developer's Assessment Report, based on the methods outlined in Section 4.1.3. If an RFD Case is required, it is anticipated that the assessment will be qualitative and conceptual, and that the approach taken will depend upon the level of information available for individual RFDs.
Input from Engagement	Information and concerns raised during the engagement process undertaken for the Project (Volume 2) will be incorporated into the NTLRU assessment according to the methods defined in Section 4.1.4; specific issues raised will be documented in the assessment and a description of how the issue was addressed will be provided.	
Incorporation of Indigenous Traditional Knowledge (ITK)	The general methods that will be used to integrate local and ITK into the NTLRU assessment are defined in Section 4.1.5. Specific types of ITK that may be identified for inclusion in the NTLRU assessment are anticipated to include information about resources that may be accessed for NTLRU activities, such as outfitted hunting, angling, or commercial fishing.	

Table 4-19: Assessment Methods for the Non-traditional Land and Resource Use Assessment

Assessment Approach for SON-10: Impacts to Non-traditional Land and Resource Use	
Existing Environment	The description of the existing environment provided in the Developer's Assessment Report for NTLRU will follow the general methods outlined in Section 4.1.6 and will expand on the information provided in Volume 3. Gaps in data have been identified in the desktop data and will require additional data collection to prepare an NTLRU baseline. The description of the existing environment will incorporate current information regarding conditions obtained through interviews with key informants able to speak to NTLRU in the study areas. Additional information recommended to be collected for the NTLRU component in the baseline study plan for the Project (Volume 3, Appendix C) will be included in the existing environment description. This will include information from a desktop literature review and future engagement activities. Further details are provided in Volume 3, Appendix C.
Project Interactions and Mitigations	Identification of Project interactions and mitigations for the NTLRU component will follow the general methods outlined in Section 4.1.7. A description of the anticipated Project-environment interactions identified for NTLRU, along with the associated residual effects categorization (i.e., no pathway, secondary, or primary) and proposed mitigation measures, is provided in Volume 4.
Residual Effects Analysis	The residual effects analysis for the NTLRU component will follow the general methods outlined in Section 4.1.8 and will focus on the Project-environment interactions that are determined to be primary in the pathway analysis (Volume 4). One Project-environment interaction was determined to be primary for NTLRU: ■ Sensory disturbances can influence outfitted and recreational hunting and angling, camping, or lodge experiences in the vicinity of the Project. The approach to the NTLRU residual effects analysis will be generally consistent with those used in the socio-economic assessment (Section 4.2.2.3) and will employ the MVEIRB's *Socio-economic Impact Assessment Guidelines* (2007). In addition, one Project-environment interaction may be assessed as either primary or secondary depending on the outcome of the analysis for biological components. In the event that this pathway is determined to be secondary in the pathway analysis, it will not be carried forward to the residual effects analysis. ■ Project footprint and activities may lead to changes in the abundance and distribution of fish, vegetation ecosystems, and wildlife and the availability or suitability of resources for outfitted and recreational hunting and angling, camping, or lodge experiences. When discussing residual effects on resource-based activities (e.g., hunting, trapping, fishing), the NTLRU assessment considers the results of associated EAs (e.g., wildlife, fish and fish habitat).
Residual Effects Classification and Determination of Significance	The residual effect classification criteria for NTLRU are generally consistent with those presented in Section 4.1.9 and Section 4.2.2.3, with the exception of geographic extent. When assessing Project effects on NTLRU, a local geographic extent is assigned to effects within the associated LSA of the resource affected. Similarly, a regional geographic extent is assigned to effects within the associated RSA of the resource affected. For example, outfitted hunting is assessed within the wildlife LSA. Beyond regional effects are those that extend outside of the RSAs for environmental resources used economically or for recreation. A determination of significance will be completed for the NTLRU VCs according the methods described in Section 4.1.10 and those described further in the socio-economic assessment methods (Section 4.2.2.3).
Predictions Confidence and Uncertainty	Key sources of uncertainty that are relevant to the NTLRU assessment, and that will be addressed in the Developer's Assessment Report, are anticipated to include the consideration of the following elements: ■ Many of the effects on NTLRU rely upon the assessments completed for other disciplines; therefore, limits in prediction confidence and uncertainties identified in those assessments may also be relevant to the assessment on NTLRU. ■ For NTLRU, there are no established thresholds or standards for most measurement indicators. Although it may be possible to set thresholds for purposes of an EA, it often cannot be demonstrated that there is any consensus on a specific threshold value where an effect on NTLRU occurs or what such a threshold means in terms of significance of an effect. As a result, professional judgment is often used in reaching conclusions on significance for effects on NTLRU. ■ The effects on NTLRU may not lend themselves to the assignment of criteria or determination of significance except in terms of potential, thus introducing a larger element of uncertainty into the NTLRU assessment. There generally is the expectation that an effect brought forward for assessment will in fact occur, at least to some degree. However, it is difficult to predict, for example, whether some effects will be positive, negative or both, and in what ways.
Monitoring and Follow-up	The Socio-economic Management Plan will provide a full discussion of the PPML monitoring measures. PPML will collaborate with the government to track socio-economic trends in the region and in communities, and will track, internally, appropriate indicators within the purview of a developer as defined by the forthcoming Socio-economic Agreement between PPML and the GNWT. This may include NTLRU.
Supporting Annexes	Supporting documentation relevant to NTLRU is anticipated to include the following annexes which will be appended to the NTLRU section of the Developer's Assessment Report: ■ the NTLRU Baseline Report Other information sources will be considered in the NTLRU assessment (see the "Information Sources" section above) but will not be appended to the NTLRU section of the Developer's Assessment Report.

4.3 Effects of Extreme Events

4.3.1 Effects of the Environment on the Project

Section 4.3 of the EA Initiation Guidelines suggests that the potential effects of the physical environment on the Project be considered in the EA Initiation Package for the Project. Potential pathways of effects of the environment on the Project will be addressed in Effects of the Environment on the Project section of the Developer's Assessment Report. Environmental effects with a reasonable probability of occurring in and around the Project footprint during the various phases of the mine life will be considered, as informed through historical and baseline information for the region, experience with similar projects, and comments received from Indigenous communities, regulators, and other people interested in the Project.

Potential pathways of effects of the environment on the Project will be identified based on additional Project details, which will be included in the Project Description for the Developer's Assessment Report and are anticipated to include the following:

- climate change
- changes in permafrost
- extreme precipitation, including seasonal flooding and spring thaw patterns
- external natural events (e.g., wildfires, ice jams)
- seismic events

Environmental changes or events can have effects on the performance or stability of engineered structures or periods of operation. For example, climate change over the life of the Project could potentially result in shifts in weather conditions (e.g., temperature, precipitation levels) and/or the frequency of extreme weather events (e.g., floods, drought). These changes could potentially increase the risk of environmental effects on Project infrastructure, including any engineered structures.

For each identified pathway, potential effects will be considered, along with relevant Project design and mitigation. The likelihood of occurrence will be discussed. Monitoring or management plans, and the adaptive management framework, relevant to the effect pathways will also be identified.

4.3.2 Accidents and Malfunctions

Accidents and malfunctions are unplanned events caused by industrial or natural hazards, such as structural or operation failures, floods, and seismic events. Section 4.3 of the EA Initiation Guidelines suggests that accidents and malfunctions be considered in the EA Initiation Package for the Project. This section provides a summary of the approach that will be used in the Developer's Assessment Report to assess effects from potential accidents and malfunctions on biophysical and socio-economic components. Potential effects from natural hazards are addressed under effects of the environment on the Project in Section 4.3.1. Only accidents and malfunctions that have a reasonable probability of occurring during construction, operation, and closure and reclamation phases will be considered in the Developer's Assessment Report. Potential accidents and malfunctions for mining developments generally include, as an example:

- small to large fuel spills
- slope failures
- failure of tailings management infrastructure

- failure of turbidity control systems
- pipeline ruptures
- erosion of roads connecting to water management / Project components
- failure of pumps or overflow of sumps

The relevant accidents and malfunctions will be identified based on additional Project details, which will be included in the Project Description to be included with the Developer's Assessment Report. The risk of potential accidents or malfunctions will be identified sources, including any internal risk assessments, government guidelines, experience with other similar projects, and comments received from Indigenous communities, regulators, and other people interested in the Project. Medical and similar emergencies, while important, are unlikely to have an environmental effect and will be addressed through the company's emergency response strategy.

Where applicable, accidents and malfunctions will be considered in the relevant sections for the biophysical and socio-economic intermediate and valued components. For example, accidents and malfunctions related to small-scale spills are included in the pathway analysis tables (Volume 4); however, larger accidents and malfunctions that are not part of regular Project operations are addressed mainly in the Accidents and Malfunctions section in the Developer's Assessment Report.

5.0 PROPOSED STRUCTURE FOR THE DEVELOPER'S ASSESSMENT REPORT

An overview of the structure anticipated to be used for the Developer's Assessment Report is provided in Table 5-1. It is proposed that the Developer's Assessment Report will be organized into four volumes, as follows:

- Volume I will consist of an introduction and overview of the scope of the assessment; documentation of community, regulatory, and public engagement completed for the Project; and information related to how ITK will be collected and incorporated into the biophysical and socioeconomic effects assessments. Volume I will also include the Project Description, summary of Project alternatives, and information on the EA methods that will be used in the Developer's Assessment Report.
- Volume II will consist of an effects assessment for the biophysical environment, which includes the following EA components: air quality, noise, and climate; groundwater quantity and quality; surface water quantity; water quality; fish and fish habitat; terrain and soils; vegetation; caribou; and wildlife.
- Volume III will consist of an effects assessment for the human environment, which includes the following EA components: heritage resources, TLRU, socio-economics, and NTLRU.
- Volume IV will consist of supporting sections, which will include an assessment of potential effects of the environment on the Project and an assessment of potential effects from accidents and malfunctions. Volume IV will also include an environmental and socio-economic management and monitoring framework for the Project.

Table 5-1: Document Map for the Developer's Assessment Report

Volume I **Pine Point Project**	Plain Language Summary 1.0 Introduction and Overview 2.0 Community, Regulatory, and Public Engagement 3.0 Indigenous Traditional Knowledge 4.0 Project Description and Alternatives 5.0 Environmental Assessment Approach	Annex 1A: Terms of Reference Annex 1B: Table of Concordance Annex 2A: Engagement Records	
Volume II **Biophysical Environment Effects Assessment**	6.0 Air Quality, Noise, and Climate SON-1: Impacts to Air Quality, Noise, and Climate 7.0 Groundwater Quantity and Quality SON-2: Impacts to Groundwater Quantity and Quality 8.0 Surface Water Quantity SON-3: Impacts to Surface Water Quantity 9.0 Water Quality KLOI-1: Impacts to Water Quality 10.0 Fish and Fish Habitat SON-4: Impacts to Fish and Fish Habitat 11.0 Terrain and Soils SON-5: Impacts to Terrain and Soils 12.0 Vegetation SON-6: Impacts to Vegetation 13.0 Caribou KLOI-2: Impacts to Caribou 14.0 Wildlife SON-7: Impacts to Wildlife	Annex 6A: Air Quality, Noise, and Climate Baseline Report Annex 6B: Air Quality Modelling Report Annex 6C: Air Quality Emissions Report Annex 6D: Air Quality Meteorology Report Annex 6E: Noise and Vibration Modelling Results Annex 7A: Groundwater Quantity and Quality Baseline Report Annex 7B: Groundwater Quantity and Quality Modelling Report Annex 8A: Surface Water Quantity Baseline Report Annex 8B: Surface Water Quality Modelling Report Annex 9A: Water Quality Baseline Report Annex 9B: Water Quality Modelling Report Annex 10A: Fish and Fish Habitat Baseline Report Annex 10B: Conceptual Fisheries Offsetting Plan (if required) Annex 11A: Terrain and Soils Baseline Report Annex 12A: Vegetation Baseline Report Annex 13A: Caribou Habitat Suitability Index Model Methods and Figures Annex 14A: Screening Level Assessment for Wildlife Valued Components Annex 14B: Wildlife Baseline Report Annex 14C: Wildlife Habitat Suitability Index Model Methods and Figures Annex 14D: Residual Effects Classification and Significance Determination for Screening Level Valued Components	
Volume III **Human Environment Effects Assessment**	15.0 Heritage Resources SON-8: Impacts to Heritage Resources 16.0 Traditional Land and Resource Use KLOI-3: Impacts to Traditional Land and Resources 17.0 Socio-economics KLOI-4: Impacts to Social and Economic Conditions 18.0 Non-traditional Land and Resource Use SON-10: Impacts to Non-traditional Land and Resource Use	Annex 15A: Heritage Resource Baseline Report Annex 16A: Traditional Land and Resource Baseline Report Annex 16B: Indigenous Traditional Knowledge Reports (if approved by communities) Annex 17A: Socio-economic Baseline Report Annex 18A: Non-traditional Land and Resource Use Baseline Report	
Volume IV **Supporting Sections**	19.0 Effects of Extreme Events 20.0 Management and Monitoring Framework for the Biophysical and Human Environments	Annex 20A: Conceptual Spill Contingency Plan Annex 20B: Conceptual Waste Management Plan Annex 20C: Conceptual Erosion and Sediment Control Plan Annex 20D: Conceptual Tailings and Waste Rock Management Plan Annex 20E: Conceptual Water Management Plan Annex 20F: Conceptual Closure and Reclamation Plan	Annex 20G: Conceptual Air Quality Mitigation and Monitoring Plan (if required) Annex 20H: Conceptual Aquatic Effects Monitoring Program Annex 20I: Conceptual Wildlife Protection Plan Annex 20J: Conceptual Socio-economic Management Plan Annex 20K: Conceptual Engagement and Collaboration Plan

Note: The structure recommended in this document map is conceptual. Naming and numbering of sections and annexes will be finalized in the Developer's Assessment Report.
SON = Subject of Note; KLOI = Key Line of Inquiry

6.0 REFERENCES

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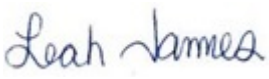

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APPENDIX A

Additional Screening Information for No Pathways

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ Wind-borne emissions of concentrate from haul trucks can affect air quality.	▪ Concentrate will be covered during transportation to rail yards.	No pathway	▪ Standard mitigation for the avoidance of wind-borne emissions ▪ Shown to be effective at other operations ▪ Mitigation expected to be 100% effective resulting in no measurable change to the atmospheric environment ▪ Therefore, no linkage to effects expected
▪ Seepage from waste rock deposition areas can cause changes in groundwater quality. ▪ Seepage from waste rock deposition areas can cause changes in groundwater quality and soil chemistry, which can affect the condition of upland, wetland, and riparian ecosystems. ▪ Seepage from waste rock deposition areas can cause changes in groundwater quality and soil chemistry, which can affect vegetation and caribou and other wildlife habitat availability and distribution.	▪ Mineralized material and waste rock will be stored in a contained area. Waste rock will be disposed of onto constructed waste rock storage facilities, or where possible, into historical open pits. ▪ Potential acid generating material (PAG) will be segregated from non-potential acid generating (non-PAG) material. ▪ Seepage will be monitored and managed, if necessary, as described in the Tailings and Waste Rock Management Plan ▪ The Water Management Plan and Tailings and Waste Rock Management Plan will be implemented, including adaptive management, if required. ▪ The Closure and Reclamation Plan will be implemented.	Secondary or No Pathway	▪ Standard mitigation for waste rock and seepage management ▪ Effective at other mines in the NWT and Canada ▪ Geochemical analyses show limited PAG on site ▪ Standard management practices will be employed as per management plans ▪ Mitigation expected to be 100% effective resulting in no measurable changes to groundwater quality ▪ Therefore, no linkage to effects expected ▪ Considered “no pathway” and screened out unless further information becomes available during the development of the Developer’s Assessment Report (DAR), in which case, it may be considered as a secondary pathway in the DAR
▪ Cross-drainage structures for site roads may alter watercourse hydraulics and geomorphology, which may affect local drainage and a risk of blocking flow. ▪ Cross-drainage structures for site roads may alter watercourse hydraulics and geomorphology, which may affect local drainage and alter surface water and sediment quality.	▪ Roads will be designed to the minimum possible width and follow best practices for design speeds and expected vehicle traffic. ▪ The road alignment will minimize stream crossings and alterations to existing drainage patterns. ▪ Cross-drainage structures will be designed to limit the area disturbed within waterbodies and watercourses and crossings will be located to avoid sensitive habitats, where possible. ▪ Culverts will be sized to convey flows under design conditions. ▪ Water crossing structures will be constructed and installed in a manner that protects the banks from erosion and maintains surface water flows. ▪ Culverts will be regularly inspected and maintained to prevent blockages from forming and causing ponding or backwater effects, including snow removal at inlets and outlets prior to freshet.	No pathway	▪ Standard mitigation for placement of cross-drainages structures, such as culverts ▪ Best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Standard management practices will be employed as per management plans ▪ Mitigation expected to be 100% effective resulting in no measurable changes to hydrology and geomorphology ▪ Therefore, no linkage to effects expected
▪ Discharge of treated domestic wastewater and sewage may cause a change in surface water quality in receiving and downstream aquatic environments. ▪ Discharge of treated domestic wastewater and sewage may cause a change in surface water quality, which can alter fish habitat quality and affect the survival and reproduction of fish. ▪ Discharge of treated domestic wastewater and sewage may cause a change in surface water quality, which can affect the condition of upland, wetland, and riparian ecosystems. ▪ Discharge of treated domestic wastewater and sewage may cause a change in surface water quality, which can affect vegetation and caribou and other wildlife habitat availability and distribution.	▪ Treated domestic effluent will be discharged to the septic field or may be discharged to a waterbody if it meets effluent criteria. ▪ The Water Management Plan and Waste Management Plan will be implemented.	No pathway or Secondary	▪ Best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Standard management practices will be employed as per management plans ▪ Design and mitigation expected to be 100% effective at preventing adverse changes to surface water quality ▪ Therefore, no linkage to effects expected ▪ Considered “no pathway” and screened out unless further information becomes available during the development of DAR, in which case, it may be considered as a secondary pathway in the DAR

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ Changes to local hydrology from surface disturbances during construction may alter fish habitat quantity and quality and affect habitat connectivity and fish distribution.	▪ The Project disturbance footprint will be limited to the extent practical, and where possible and practical, infrastructure will be built on previously disturbed sites. ▪ Areas of vegetation clearing and soil disturbance will be limited to the immediate area of the future activity at that location. ▪ Roads will be designed to the minimum possible width and follow best practices for design speeds and expected vehicle traffic. ▪ Clearing equipment will be used that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shoes and brush) where feasible. ▪ Steepness and length of slopes of disturbed areas and stockpiled soils will be limited. ▪ Where possible, work will be avoided in sensitive areas during the time-of-year when erosion is more likely (e.g., spring freshet). ▪ Routine inspection and maintenance of containment and conveyance structures (i.e., roadside ditches and culverts) will be conducted to limit the risk of road wash-out or sediment release to the environment. ▪ Culverts will be sized to convey flows under design conditions. ▪ Water crossing structures will be constructed and installed in a manner that protects the banks from erosion and maintains surface water flows. ▪ Where possible, a 30 metre (m) buffer will be established between Project components/infrastructure and permanent waterbodies and watercourses. ▪ Progressive reclamation and revegetation will be implemented for areas disturbed by the Project that are no longer required. ▪ The Closure and Reclamation Plan will be implemented.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to local hydrology and fish habitat quantity, quality, and connectivity ▪ Therefore, no linkage to effects expected
▪ The area of turbulence around the diffuser may affect fish habitat quantity and quality and fish distribution.	▪ If required, the pumped mine water discharge will be directed through a properly designed diffuser to minimize effects from changes in velocity. ▪ The diffuser will be located to avoid sensitive fish habitat (e.g., shoals, spawning areas). ▪ Direct discharge flow rates will be developed and maintained to address erosion concerns. ▪ The diffuser discharge ports will be located above the lakebed to minimize erosion.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to fish habitat quality and quantity ▪ Therefore, no linkage to effects expected
▪ The use of explosives near fish-bearing water may cause injury or mortality to fish.	▪ Blasting operations will follow the Fisheries and Oceans Canada (DFO) *Measures to Protect Fish Habitat* and *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky 1998) for setback distances from fish bearing waterbodies. ▪ Blasting will occur on land during the open pit and underground mine development, where no water or fish are present. Blasting will not occur in a water body.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Setback will meet DFO's guidance ▪ Effective at other developments throughout Canada ▪ Therefore, no linkage to effects expected

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ Instream construction activities may alter fish habitat quality and affect the survival of fish.	▪ Where possible, instream construction in areas of potential spawning habitat will take place outside the spawning period for fish valued components. Construction activities will be scheduled to avoid work during DFO's *Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat* (DFO 2013). ▪ Water crossing structures and water intakes will be constructed and installed in a manner that protects the banks from erosion and maintains the flows in the water body and follows permits or authorizations issued for the Project from the appropriate regulatory agencies and DFO's *Measures to Protect Fish and Fish Habitat*. ▪ Instream construction will be completed in isolation of flowing water (i.e., use of isolation methods for the installation of instream developments where surface water exists at the time of construction). ▪ For isolations/diversions, 100% downstream flow will be maintained. Pump intakes should not disturb the bed. Water diversion hoses will be screened as per DFO's *Freshwater Intake End-of-Pipe Fish Screen Guidelines* (DFO 2015) and the interim code of practice (DFO 2020). ▪ A qualified aquatics professional will be retained to complete or oversee the fish rescue from within the exclusion area(s). Salvaged fish will be relocated from work isolation areas to adjacent sections of tributaries, outside the work location. Fish handling time will be kept to a minimum, and appropriate, non-lethal sampling methods will be used during the fish rescue (e.g., backpack electrofishing, minnow trapping).	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Will meet DFO's guidance ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to fish habitat quality ▪ Therefore, no linkage to effects expected
▪ Changes to public access to fishing areas and increased density of people (i.e., Project staff and contractors) in the area could affect fish abundance.	▪ Existing roads and trails will be used where possible. ▪ To reduce risks to public health and safety, access will be restricted by installing gates and fencing on private roads. ▪ A "No hunting and fishing" policy will be implemented on the Project site that applies to staff and contractors.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Will meet DFO's guidance ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes in public access relative to existing conditions ▪ Therefore, no linkage to effects expected
▪ Activities may affect terrain through an increase in potential slope instability and/or failures.	▪ The Water Management Plan will be implemented. ▪ The Erosion and Sediment Control Plan will be implemented. ▪ Routine inspection and maintenance of containment and conveyance structures (i.e., roadside ditches and culverts) will be conducted to limit the risk of road wash-out or sediment release to the environment. ▪ Areas of vegetation clearing and soil disturbance will be limited to the immediate area of the future activity at that location. ▪ Progressive reclamation and revegetation will be implemented for areas disturbed by the Project that are no longer required.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to slope instability and/or failures ▪ Therefore, no linkage to effects expected
▪ Soil transport and stockpiling can increase erosion potential and change soil quality.	▪ The Erosion and Sediment Control Plan will be implemented. ▪ If soils are prone to wind erosion, areas will be tackifed, covered, seeded, and/or water will be applied during periods of high erosion potential (e.g., summer and fall). ▪ Organics and upper soil material will be salvaged to the extent practical for future use in reclamation. ▪ Soil salvage stockpiles will be constructed in such a way as to reduce changes to quality, erosion, and loss (e.g., slumping).	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable change in erosion potential ▪ Therefore, no linkage to effects expected

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ Soil disturbance can alter soil temperature and lead to changes in permafrost depth or prevalence.	▪ The Project disturbance footprint will be limited to the extent practical, and where possible and practical, infrastructure will be built on previously disturbed sites. ▪ Areas of vegetation clearing and soil disturbance will be limited to the immediate area of the future activity at that location. ▪ A pipe bench will be constructed to accommodate the pipelines, which will follow existing and proposed road alignments to the extent practical to minimize the Project footprint. ▪ Roads will be designed to the minimum possible width and follow best practices for design speeds and expected vehicle traffic. ▪ Clearing equipment will be used that minimizes surface disturbance, soil compaction and topsoil loss (e.g., equipment with low ground pressure tracks or tires, blade shoes, and brush) where feasible.	No pathway or Secondary	▪ Standard mitigation and best management practices will be implemented ▪ Permafrost is limited at the site ▪ Effective at other developments throughout Canada ▪ Standard management practices will be employed as per management plans ▪ Mitigation expected to be 100% effective resulting in no measurable change in soil temperature ▪ Therefore, no linkage to effects expected ▪ Considered “no pathway” and screened out unless further information becomes available during the development of DAR, in which case, it may be considered as a secondary pathway in the DAR
▪ Changes in groundwater quality from open pits, underground mines, and tailings can affect soil quality. ▪ Changes in groundwater quality from open pits, underground mines, and tailings can alter soil chemistry and affect the condition of upland, wetland, and riparian ecosystems. ▪ Changes in groundwater quality from open pits, underground mines, and tailings can alter soil chemistry and affect vegetation and caribou and other wildlife habitat availability and distribution.	▪ The Water Management Plan and Tailings and Waste Rock Management Plan will be implemented that include adaptive management, if required. ▪ Tailings generated from the process plant will be pumped to and stored in the tailings disposal areas, which will be designed to minimize potential environmental effects by using pre-existing open pits. ▪ Studies will be undertaken to evaluate the suitability of multiple locations as tailings disposal sites and to select locations that will avoid and minimize risk of potential environmental effects. ▪ The Closure and Reclamation Plan will be implemented.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable change in groundwater quality ▪ Therefore, no linkage to effects expected
▪ Changes in site surface water runoff can affect soils and the availability, distribution, and condition of upland, wetland, and riparian ecosystems.	▪ The Project disturbance footprint will be limited to the extent practical, and where possible and practical, infrastructure will be built on previously disturbed sites. ▪ Areas of vegetation clearing and soil disturbance will be limited to the immediate area of the future activity at that location. ▪ Roads will be designed to the minimum possible width and follow best practices for design speeds and expected vehicle traffic. ▪ The road alignment will minimize stream crossings and alterations to existing drainage patterns. ▪ Work will be avoided in sensitive areas during the time-of-year when erosion is more likely (e.g., spring freshet). ▪ Steepness and length of slopes of disturbed areas and stockpiled soils will be limited. ▪ The Water Management Plan, Tailings and Waste Rock Management Plan, and Erosion and Sediment Control Plan will be implemented, and includes that applies adaptive management, if required. ▪ Process water will be recirculated and water from tailings disposal areas will be recovered for recycling. ▪ Process water for start-up may be pumped from historical open pits if the water has suitable quality and quantity, or if not, from Great Slave Lake. ▪ Routine inspection and maintenance of containment and conveyance structures (i.e., roadside ditches and culverts) will be conducted to limit the risk of road wash-out or sediment release to the environment. ▪ Culverts will be sized to convey flows under design conditions. ▪ Water crossing structures will be constructed and installed in a manner that protects the banks from erosion and maintains surface water flows. ▪ A 30 m buffer will be established between Project components/infrastructure and permanent waterbodies and watercourses. ▪ Progressive reclamation and revegetation will be implemented for areas disturbed by the Project that are no longer required. ▪ The Closure and Reclamation Plan will be implemented.	No pathway or Secondary	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable change in surface water runoff ▪ Therefore, no linkage to effects expected ▪ Considered “no pathway” and screened out unless further information becomes available during the development of DAR, in which case, it may be considered as a secondary pathway in the DAR

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ Changes in surface water quality from contact with surface facilities and additional infrastructure could adversely affect soil chemistry and the condition of upland, wetland and riparian ecosystems. ▪ Changes in surface water quality from contact with surface facilities and additional infrastructure could affect soil chemistry and vegetation, and caribou and other wildlife habitat availability and distribution.	▪ The Water Management Plan and Tailings and Waste Rock Management Plan will be implemented and includes adaptive management, if required. ▪ Progressive reclamation and revegetation will be implemented for areas disturbed by the Project that are no longer required. ▪ The Closure and Reclamation Plan will be implemented.	No pathway or Secondary	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable change in surface water quality ▪ Therefore, no linkage to effects expected ▪ Considered “no pathway” and screened out unless further information becomes available during the development of DAR, in which case, it may be considered as a secondary pathway in the DAR
▪ Direct discharge of mine water, as well as surface runoff, groundwater inflow and seepage from the Project will cause changes to surface water quality, which can adversely affect the condition of upland, wetland, riparian ecosystems.	▪ The Project disturbance footprint will be limited to the extent practical, and where possible and practical, infrastructure will be built on previously disturbed sites. ▪ Areas of vegetation clearing and soil disturbance will be limited to the immediate area of the future activity at that location. ▪ Roads will be designed to the minimum possible width and follow best practices for design speeds and expected vehicle traffic. ▪ The road alignment will minimize stream crossings and alterations to existing drainage patterns. ▪ The Water Management Plan and Tailings and Waste Rock Management Plan will be implemented, including adaptive management, if required. ▪ Water that interacts with the site footprint, waste rock, and tailings management areas will be captured and managed. ▪ Studies will be undertaken to evaluate the potential use of re-injection wells as an alternative method to dispose of underground saline water that will infiltrate open pits and underground mines. ▪ If required, the mine water discharge will meet all regulatory guidelines including Effluent Quality Criteria defined in a future Type A Water Licence and the Canadian Metal and Diamond Mining Effluent Regulations – Schedule 4 limits. ▪ Depending on the location, the pumped mine water discharge to a receiving water body (river or lake system) may be directed through a properly designed diffuser system to rapidly attenuate the discharge, as appropriate ▪ Discharge water will be regularly sampled and monitored, enabling adaptive management actions if necessary. ▪ An Aquatic Effects Monitoring Program (AEMP) and Surveillance Network Program (SNP) will be developed and implemented to monitor effects of the mine on the aquatic receiving environment. Adaptive management actions as per an aquatic response framework within the AEMP will be enabled if necessary. ▪ Mineralized material and waste rock will be stored in a contained area. Waste rock will be disposed of onto constructed waste rock storage facilities, or where possible, into historical open pits. ▪ Tailings generated from the process plan will be pumped to and stored in the tailings disposal areas, which will be designed to minimize potential environmental effects by using pre-existing open pits. ▪ A blasting management plan will be developed and implemented.	No pathway or Secondary	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable change to surface water quality ▪ Therefore, no linkage to effects expected ▪ Considered “no pathway” and screened out unless further information becomes available during the development of DAR, in which case, it may be considered as a secondary pathway in the DAR

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ Changes in surface water levels, flows and drainage areas can increase soil erosion and sedimentation along waterbodies and watercourses and affect the availability, distribution, and condition of upland, wetland, and riparian ecosystems. ▪ Changes in surface water levels and flows can alter waterbodies and watercourses and affect the availability, distribution, and condition of upland, wetland, and riparian ecosystems. ▪ Changes in surface water levels, flows and drainage areas can affect soils and vegetation, and caribou and other wildlife habitat availability and distribution.	▪ The Project disturbance footprint will be limited to the extent practical, and where possible and practical, infrastructure will be built on previously disturbed sites. ▪ Areas of vegetation clearing and soil disturbance will be limited to the immediate area of the future activity at that location. ▪ Roads will be designed to the minimum possible width and follow best practices for design speeds and expected vehicle traffic. ▪ The road alignment will minimize stream crossings and alterations to existing drainage patterns. ▪ Work will be avoided in sensitive areas during the time-of-year when erosion is more likely (e.g., spring freshet). ▪ Steepness and length of slopes of disturbed areas and stockpiled soils will be limited. ▪ The Water Management Plan, Tailings and Waste Rock Management Plan, and Erosion and Sediment Control Plan will be implemented, and including the application of adaptive management, if required. ▪ Process water will be recirculated and water from tailings disposal areas will be recovered for recycling. ▪ Process water for start-up may be pumped from historical open pits if the water has suitable quality and quantity, or if not, from Great Slave Lake. ▪ Routine inspection and maintenance of containment and conveyance structures (i.e., roadside ditches and culverts) will be conducted to limit the risk of road wash-out or sediment release to the environment. ▪ Culverts will be sized to convey flows under design conditions. ▪ Water crossing structures will be constructed and installed in a manner that protects the banks from erosion and maintains surface water flows. ▪ A 30 m buffer will be established between Project components/infrastructure and permanent waterbodies and watercourses. ▪ Progressive reclamation and revegetation will be implemented for areas disturbed by the Project that are no longer required. ▪ The Closure and Reclamation Plan will be implemented.	No pathway or Secondary	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to surface water levels and flows ▪ Therefore, no linkage to effects expected ▪ Considered “no pathway” and screened out unless further information becomes available during the development of DAR, in which case, it may be considered as a secondary pathway in the DAR
▪ Blasting and associated fly rock may result in injury or mortality to caribou and other wildlife.	▪ A blasting management plan will be developed and implemented. ▪ Blasting activities will be limited to the daytime periods, where possible. ▪ Blasting activities will follow a regular schedule, where possible, and site-wide notice will be given prior to each blast. ▪ A survey of the blast area will be completed prior to the blast and caribou will be deterred from areas of risk. ▪ Wildlife will be deterred from areas of risk. ▪ Blasting operations will follow DFO’s *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky 1998) for setback distances from fish bearing waterbodies, which is likely to reduce the risk to waterbirds.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to wildlife survival and reproduction ▪ Therefore, no linkage to effects expected
▪ Attraction of wildlife to the Project (e.g., food waste, sewage, petroleum-based products, salt, explosive powder) may increase human-wildlife interactions and alter predator-prey relationships, or result in direct removal/mortality of problem wildlife resulting in an affect to wildlife abundance.	▪ The Wildlife Protection Plan will be implemented. ▪ Littering and feeding of wildlife will be prohibited. ▪ The Waste Management Plan will be implemented ▪ Domestic (e.g., food) waste will be incinerated regularly. ▪ Industrial (e.g., used oil and lubricants) waste will be collected and incinerated and/or transported off site for recycling or disposal at a licensed disposal facility. ▪ Wastes will be stored in wildlife proof containers. ▪ Work sites will be maintained and materials (e.g., cables, wires, fencing) will be properly stored so as not to entangle caribou or other wildlife.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to wildlife survival and reproduction ▪ Therefore, no linkage to effects expected

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ The Project could induce in-migration to the NWT from southern communities.	▪ Local labour in local study area (LSA) communities will be prioritized for employment and local businesses for contracting opportunities. ▪ Communities will be prioritized for hiring through Impact benefit Agreements (IBAs) or other agreements. ▪ Other Northern labour will be included as a second priority for hiring after local labour from LSA communities. ▪ Yellowknife will be maintained as a pick-up point community to provide a transportation hub for other Northern workers coming from the North Slave Region. ▪ Communication will occur with other mining operators in the NWT to understand their closure schedules, and opportunities for workforce transition to the Project where possible and following prioritization of local labour from LSA communities . ▪ A worker accommodation camp will be maintained as travelling from the site after a shift is a safety concern. This removes the need for relocation to the NWT to access Project employment in the event that southern workers are required to supplement Northern labour.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout the North ▪ Mitigation and Project workforce management approach expected to be largely effective resulting in no meaningful changes to in-migration ▪ Therefore, no linkage to effects expected
▪ Project-induced in-migration to the NWT from southern communities could increase consumer prices and result in inflation of consumer goods.	▪ Local labour in LSA communities will be prioritized for employment and local businesses for contracting opportunities. ▪ Communities will be prioritized for hiring through IBAs or other agreements. ▪ Other Northern labour will be included as a second priority for hiring after local labour from LSA communities. ▪ Yellowknife will be maintained as a pick-up point community to provide a transportation hub for other Northern workers coming from the North Slave Region. ▪ Communication will occur with other mining operators in the NWT to understand their closure schedules, and opportunities for workforce transition to the Project where possible and following prioritization of local labour from LSA communities. ▪ A worker accommodation camp will be maintained as travelling from the site after a shift is a safety concern. This removes the need for relocation to the NWT to access Project employment in the event that southern workers are required to supplement Northern labour.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout the North ▪ Mitigation and Project workforce management approach expected to be largely effective resulting in no meaningful changes to consumer prices and inflation ▪ Therefore, no linkage to effects expected
▪ Project workforce housing requirements could increase demand on the rental housing market in Yellowknife, Hay River and Fort Resolution.	▪ Workers, including those from outside the NWT, will be housed in full-service construction and operations camps.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Mitigation and Project workforce management approach expected to be largely effective resulting in no meaningful changes to the rental housing market ▪ Therefore, no linkage to effects expected
▪ The Project's out-of-area workforce could increase demand for health, social, and protective services.	▪ A first responder medical station will be provided at the accommodation camp facilities to meet workers' medical needs while at site, to limit the demand for governmental health facilities for work related injuries. ▪ Pre-employment medical exams will be conducted in hometown. ▪ First aid training will be provided. ▪ Driver training will be provided and a driver code of conduct will be enforced, to control speeds and encourage considerate driving. ▪ Zero tolerance policies will be in place regarding the use of drugs and alcohol while on shift or in transit. ▪ A worker code of conduct will be developed and enforced. ▪ Access to an Employee and Family Assistance Program (EFAP) will be provided such that private fee for service organizations are used and the public or non-profit sector does not see an increase in demand. ▪ A worker accommodation camp will be maintained as travelling from the site after a shift is a safety concern.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Mitigation and Project workforce management approach expected to be largely effective resulting in no meaningful changes to the demand for health, social, and protective services ▪ Therefore, no linkage to effects expected

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ The Project's use of air and water transportation for materials, goods, and out-of-area workers during construction and operations will place additional demand on air and shipping transportation services.	▪ Liaison will occur with air and shipping service providers to ensure capacity is available to move goods, equipment, and personnel. ▪ Service agreements will be established with providers in advance, and make them aware of shipping and air transportation requirements.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation and service agreements expected to be largely effective resulting in no changes in the demand for air and shipping transportation services that would exceed supply ▪ Therefore, no linkage to effects expected
▪ Project construction and operations will generate demand for power and place pressure on the power supply system.	▪ Arrangements will be made with NWT Power to provide services to some extent in a manner that does not jeopardize the electricity security for other users. ▪ Diesel generators will be used as required to offset surplus and emergency demand for electricity extra to that provided by the NWT Power grid.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation and service agreements expected to be largely effective resulting in no changes in the demand for power supply that would exceed supply ▪ Therefore, no linkage to effects expected
▪ The Project will generate solid waste requiring disposal, thereby potentially affecting capacity of waste management services infrastructure.	▪ The Waste Management Plan will be implemented. ▪ Waste management agreements will be established with service providers capable of handling solid and hazardous waste. ▪ Inert waste may be disposed in an onsite landfill. ▪ Organic waste from the camp may be incinerated on site.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Standard management practices will be employed as per management plans ▪ Mitigation and service agreements expected to be largely effective resulting in no changes in the demand for waste management services that would exceed supply ▪ Therefore, no linkage to effects expected
▪ Project-induced in-migration to Yellowknife, Hay River and Fort Resolution could increase demand for waste management infrastructure beyond capacity.	▪ Local labour in LSA communities will be prioritized for employment and local businesses for contracting opportunities. ▪ Communities will be prioritized for hiring through IBAs or other agreements. ▪ Hiring priorities will be communicated to LSA communities. ▪ Other Northern labour will be included as a second priority for hiring after local labour from LSA communities. ▪ Yellowknife will be maintained as a pick-up point community to provide a transportation hub for other Northern workers coming from the North Slave Region. ▪ Communication will occur with other mining operators in the NWT to understand their closure schedules, and opportunities for workforce transition to the Project where possible and following prioritization of local labour from LSA communities. ▪ A worker accommodation camp will be maintained as travelling from the site after a shift is a safety concern. This removes the need for relocation to the NWT to access Project employment in the event that southern workers are required to supplement Northern labour.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation and Project workforce management approach expected to be largely effective resulting in no changes to the demand for waste management infrastructure that would exceed supply ▪ Therefore, no linkage to effects expected
▪ Project will increase demand for potable water and wastewater treatment and disposal.	▪ Water will be drawn from an appropriate potable source. ▪ Wastewater management agreements will be established with service providers capable of effectively collecting, transporting, and treating wastewater.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Standard management practices will be employed as per management plans ▪ Mitigation and service agreements expected to be largely effective resulting in no changes in the demand for potable water and wastewater treatment and disposal services that would exceed supply ▪ Therefore, no linkage to effects expected

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ Releases of criteria air contaminants from a wildfire started by Project activities can alter air quality and greenhouse gas emissions and affect climate.	▪ A Wildfire Prevention and Preparedness Plan will be developed and implemented. ▪ All heavy equipment and fueling sites will be equipped with approved and fully charged fire extinguishers. ▪ Firefighting training will be provided to on-site personnel (as deemed appropriate). ▪ No smoking will be allowed at equipment fuelling stations or outside of designated areas at all times. ▪ Safety management systems (e.g., hot work permits) will be in place. ▪ Firebreaks and vegetation management (e.g., removal of understory fuel loads) will be implemented as required.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable change to atmospheric environment ▪ Therefore, no linkage to effects expected
▪ Chemical or hazardous materials spills on site and during transport offsite may enter groundwater and affect groundwater quality. ▪ Chemical or hazardous materials spills on site and during transport offsite may adversely affect surface water quality in the local aquatic receiving environment. ▪ Chemical or hazardous materials spills on site and during transport offsite can alter fish habitat quantity and quality and affect the survival and reproduction of fish. ▪ Chemical or hazardous materials spills on site and during transport offsite may adversely affect soil quality. ▪ Chemical or hazardous materials spills on site and during transport offsite may adversely affect upland, wetland, and riparian ecosystems. ▪ Chemical or hazardous materials spills on site or during transport offsite can affect soil, vegetation, and caribou and other wildlife habitat availability and survival and reproduction of individual animals. ▪ Chemical or hazardous materials spills on site or during transport offsite can affect actual or perceive changes in water, fish, plants, and wildlife, which could affect participation in traditional activities and the consumption of traditional foods. ▪ Chemical or hazardous materials spills on site or during transport offsite can influence water, fish, and wildlife, which could affect availability or suitability of resources for outfitted and recreational hunting and fishing.	▪ The Spill Contingency Plan and Waste Management Plan will be implemented. ▪ Standard best management practices for general activities with regards to use, handling, and storage of deleterious substances will be followed. ▪ Hazardous waste will be stored in appropriate containers that will be located in a lined bermed containment pad, which will provide secondary containment of spills. ▪ No fuels, oils, or other hazardous substances will be stored within 150 m of groundwater springs or areas of upwelling, unless otherwise authorized. ▪ No equipment maintenance or refuelling will be conducted within 150 m of groundwater springs or areas of upwelling, unless otherwise authorized. ▪ No fuels, oils, or other hazardous substances will be stored within 150 m of waterbodies. ▪ No equipment maintenance or refuelling will be conducted within 150 m of waterbodies. ▪ The tailings transport pipeline will have drainage points and spill containment areas located along the route. ▪ Regular maintenance of vehicles and equipment will be conducted. ▪ Spill kits will be available at various locations throughout the site and will be maintained in good working order. ▪ Hazardous waste will be transported to a licensed hazardous waste receiving facility for disposal. ▪ Fuel and hazardous materials will be transported in approved containers in licensed vehicles. ▪ If a major spill occurs, the cleanup, treatment, and disposal of the contaminated waste and soil will be handled and disposed of using approved methods. ▪ Speed limits will be enforced. ▪ The Spill Contingency Plan and Waste Management Plan will be implemented and will consider DFO's *Measures to Protect Fish Habitat* ▪ Ongoing consultation and communication of the results of monitoring plans and programs will occur with Indigenous communities. ▪ Ongoing consultation with Indigenous communities will occur on the implementation of appropriate mitigation measures and their effectiveness.	No Pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to the aquatic and terrestrial environments ▪ Therefore, no linkage to effects expected
▪ Flow over emergency spillways of water containment structures during extreme flood events may alter local hydrology, drainage and/or stream characteristics. ▪ Flow over emergency spillways of water containment structures during extreme flood events may adversely affect surface water quality. ▪ Flow over emergency spillways of water containment structures during extreme flood events may adversely alter surface water quality and affect fish habitat quantity and quality and the survival and reproduction of fish.	▪ Overflow spillways and downstream conveyance structures will be designed to be stable and maintain function, and provide sufficient erosion protection during a design flood. ▪ Routine inspections will be completed and the storm water management system will be maintained.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in no measurable changes to surface water quantity and quality ▪ Therefore, no linkage to effects expected

Table A-1: Additional Screening Information for No Pathways

Effects Pathway	Environmental Design Features and Mitigation	Pathway Assessment	Rationale and Comments
▪ A wildfire started by Project activities may adversely affect surface water quality. ▪ A wildfire started by Project activities may adversely alter surface water quality and affect fish habitat quantity and quality and the survival and reproduction of fish. ▪ A wildfire started by Project activities may adversely affect soil quality and distribution. ▪ A wildfire started by Project activities may adversely affect upland, wetland, and riparian ecosystems. ▪ A wildfire started by Project activities may result in loss of wildlife and wildlife habitat. ▪ A wildfire started by Project activities may result in loss of traditional land use. ▪ A wildfire started by Project activities may result in loss of non-traditional land and resource use.	▪ A Wildfire Prevention and Preparedness Plan will be developed and implemented. ▪ All heavy equipment and fuelling sites will be equipped with approved and fully charged fire extinguishers. ▪ Firefighting training will be provided to on-site personnel (as deemed appropriate). ▪ No smoking will be allowed at equipment fuelling stations or outside of designated areas at all times. ▪ Safety management systems (e.g., hot work permits) will be implemented. ▪ Firebreaks and vegetation management (e.g., removal of understory fuel loads) will be implemented.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting no measurable changes to the aquatic and terrestrial environments ▪ Therefore, no linkage to effects expected
▪ Failure of storm water management features (culverts, roadside ditches) following a severe rainfall event can influence surface water levels, flows and drainage areas, which can affect soil quality and distribution. ▪ Failure of storm water management features (culverts, roadside ditches) following a severe rainfall event can influence surface water levels, flows and drainage areas, which can affect upland, wetland, and riparian ecosystems. ▪ Failure of storm water management features (culverts, roadside ditches) following a severe rainfall event can influence surface water levels, flows and drainage areas, which can affect caribou and other wildlife habitat availability and distribution. ▪ Failure of storm water management features (culverts, roadside ditches) following a severe rainfall event can influence surface water levels, flows and drainage areas, which can affect ecological services (e.g., water quality, fish, wildlife) and traditional land and resource use. ▪ Failure of storm water management features (culverts, roadside ditches) following a severe rainfall event can influence surface water levels, flows and drainage areas, which can affect ecological services (e.g., water quality, fish, wildlife) and non-traditional land and resource use	▪ Storm water features will be designed to carry/contain a suitable return rainfall event as well as provide sufficient erosion protection during those events. ▪ Routine inspections and maintenance of storm water management system will be conducted.	No pathway	▪ Standard mitigation and best management practices will be implemented ▪ Effective at other developments throughout Canada ▪ Mitigation expected to be 100% effective resulting in measurable change to surface water flows and levels ▪ Therefore, no linkage to effects expected

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