



LYNN LAKE GOLD PROJECT

ENVIRONMENTAL ACT PROPOSAL REPORT

MAY 2020

MacLellan Site



ALAMOS GOLD INC.





ALAMOS GOLD INC.

**Lynn Lake Gold Project
Environment Act Proposal Report
– MacLellan Site**



Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Environment Act Proposal Form



Executive Summary

Alamos Gold Inc. (Alamos) is seeking an *Environment Act* Licence for the redevelopment of two historical gold mines near Lynn Lake, Manitoba. The Project consists of two primary deposit sites, which are both located near Lynn Lake, Manitoba: the 'Gordon' site and the 'MacLellan' site. Alamos intends to construct (redevelop), operate and eventually close/reclaim open pit gold mines at both these historical mine sites. The total mineralized material to be mined from the open pits at both sites is estimated to be approximately 26.1 Mt (17.5 Mt from the MacLellan site and 8.6 Mt from the Gordon site) with ore transported for processing at the MacLellan site.

This Environment Act Proposal (EAP) document presents the Environmental Assessment Report for the MacLellan site based on the Provincial Environment Act Proposal Report Guidelines pursuant to the provincial Environmental Assessment (EA) process under *The Environment Act* (Manitoba). This EAP documents the proposed facility operation at the MacLellan site, potential environmental effects, and implemented mitigation measures associated with operation. The EAP summary report is submitted as supporting information to the Environment Act Proposal Form for licensing consideration by Manitoba Conservation and Climate (MCC). A similar document has been prepared corresponding to the Gordon site development under separate cover. The assessment of both sites is documented in detail in the federally filed EIS (May 25, 2020) to the Impact Assessment Agency of Canada (IAAC) for the entire project.

Project residual effects were determined for 14 Valued Components (VCs) including: atmospheric environment, acoustic environment, groundwater, surface water, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, labour and economy, community services, infrastructure and well-being, land and resource use, heritage resources, current use of lands and resources for traditional purposes, human health, and Indigenous peoples. The federal EIS (Stantec 2020) contains detailed information on the assessment of these and other factors according to the Final Guidelines for the Preparation of an Environmental Impact Statement (EIS), dated November 2017 (CEAA 2017) and an extensive engagement program undertaken by Alamos. This EAP relies substantially on the information provided in the EIS (including the documentation of several years of engagement, field work and technical studies). The EIS has been provided to MCC for review and reference with key results summarized here to reduce redundancy and promote process efficiency.

Based on the results of the environmental assessment, including implementing the identified mitigation measures, the Project as planned is not likely to result in significant adverse residual environmental effects.

Engagement has been ongoing prior to and throughout the EA process, and will continue with agencies, local Indigenous communities, and stakeholders through the life of the Project. The Project will have both environmental and socio-economic benefits, economic development and job creation, and social benefits including potential local and regional Project-related employment, training programs, increased local and regional business revenue, tax revenue, capacity and capabilities, and potential for the supply of goods and services.

Acronyms and Abbreviations

AAQC	Ambient Air Quality Criteria
Alamos	Alamos Gold Inc.
amsl	above mean sea level
ARD	acid rock drainage
Ausenco	Ausenco Limited
CAAQS	Canadian Ambient Air Quality Standards
CAC	criteria air contaminants
CaCO ₃	calcium carbonate
Carlisle	Carlisle Goldfields Limited
CD Regulation	<i>Classes of Development Regulation</i>
CEAA 2012	<i>Canadian Environmental Assessment Act, 2012</i>
CEPA	<i>Canadian Environmental Protection Act, 1999</i>
CO	carbon monoxide
CO _{2e}	carbon dioxide equivalent
COPC	chemicals of potential concern
CR	concentration ratio
dBA	A-weighted decibels
dB	decibels
DFO	Fisheries and Oceans Canada
DIDO	drive-in-drive-out
dm ³	cubic decametres
DPM	diesel particulate matter
EA	environmental assessment
EAP	Environment Act Proposal
ECCC	Environment and Climate Change Canada



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EIS	environmental impact statement
FIFO	fly-in-fly-out
FTE	full time equivalent
g	gram(s)
GDP	gross domestic product
GHG	greenhouse gas
ha	hectares
HA	high annoyance
HCN	hydrogen cyanide
HQ	hazard quotient
IAA	<i>Impact Assessment Act</i>
IAAC	Impact Assessment Agency of Canada
ILCR	incremental lifetime cancer risk
km	kilometer(s)
km ²	square kilometre(s)
kV	kilovolt
kW	kilowatt
L	litre(s)
LAA	local assessment area
m	metre(s)
m ²	square metre(s)
m ³	cubic metre(s)
MBCA	<i>Migratory Birds Convention Act</i>
MCC	Manitoba Conservation and Climate
MDMER	Metal and Diamond Mining Effluent Regulations
ML	metal leaching
MRSA	mine rock storage area



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Mt	million tonne(s)
NO ₂	nitrogen dioxide
NRCan	Natural Resources Canada
oz	ounce(s)
PAG	potentially acid generating
PAH	polycyclic aromatic carbon
PDA	project development area
PM	particulate matter
PM ₁₀	respirable particulate matter with an aerodynamic diameter less than 10 µm
PM _{2.5}	fine particulate matter with an aerodynamic diameter less than 2.5 µm
POPC	pollutant of potential concern
PR	provincial road
Project, the	Lynn Lake Gold Project
Proponent, the	Alamos Gold Inc.
RAA	regional assessment area
Regulations, the	Regulations Designating Physical Activities
ROM	run of mine
ROW	right of way
s	second(s)
SAR	species at risk
SARA	<i>Species at Risk Act</i>
SO ₂	sulphur dioxide
SOCC	species of conservation concern
t	tonne(s)
TDG Act	<i>Transportation of Dangerous Goods Act, 1992</i>
TMF	tailings management facility
UTM	universal transverse Mercator



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VC	valued component
VOC	volatile organic compound
wad-CN	weak acid dissociable cyanide
WHO	World Health Organization



Introduction

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

The Lynn Lake Gold Project (the Project) is the proposed redevelopment of two historical shaft gold mines near Lynn Lake, Manitoba by Alamos Gold Inc. (Alamos; the Proponent). The Project consists of two primary deposit sites located near Lynn Lake, Manitoba: the ‘MacLellan’ site and the ‘Gordon’ site (Map 1-1). Alamos intends to construct (redevelop), operate and eventually close/reclaim open pit gold mines at both of these historical shaft mine sites. The total mineralized material to be mined from the open pits at both sites is estimated to be approximately 26.1 Mt (17.5 Mt from the MacLellan site and 8.6 Mt from the Gordon site).

Section 11(1) of *The Environment Act* requires a Proponent to file an Environment Act Proposal (EAP) in writing to the Director for Class 2 developments in Manitoba. The proposed Project is considered a Class 2 development under the Classes of Development Regulation (MR 164/88).

This document presents the Environment Act Proposal (EAP) Assessment Report for the MacLellan site based on the Provincial Environment Act Proposal Report Guidelines pursuant to the provincial EA process under *The Environment Act* (Manitoba). This EAP documents a summary of the proposed facility operation at the MacLellan site, potential environmental effects, and mitigation measures associated with operation. The EAP summary report is submitted as supporting information to the Environment Act Proposal Form for licensing consideration by Manitoba Conservation and Climate (MCC) and is based on the federally filed EIS document (May 25, 2020) to the Impact Assessment Agency of Canada (IAAC).

1.2 PROPONENT INFORMATION

Alamos is a Canadian-based intermediate gold producer with diversified production from three operating mines in North America: the Young-Davidson Mine in northern Ontario, Canada, and the Mulatos and El Chanate Mines in Sonora, Mexico. Alamos has a leading growth profile with exploration and development projects in Mexico, Turkey, Canada, and the United States.

Financial and planning decisions related to the development of the Project are the responsibility of Alamos. Alamos hired Stantec Consulting Ltd. to carry out the environmental assessment of the Project. Alamos maintains control over decisions related to the planning, design, implementation, construction, operation, and closure of the Project. This includes retaining the required staff, contractors, equipment, and other resources necessary to develop the Project, and providing management direction for Project phases.

The Alamos Board of Directors is responsible for providing governance and stewardship of the company and is required to act in the best interests of the company. The Board of Directors consists of ten directors whose responsibility is to supervise the management of the business and affairs of the Company. Alamos relies on its highly experienced senior management team that has many years of experience developing and operating mining projects in Canada and abroad.

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Alamos continually strives to preserve the long-term health and viability of the natural environment affected by Company projects and operations through investment in new initiatives to reduce the environmental footprint. Alamos' objective is to minimize its' operational environmental impacts and offset any impacts that cannot be fully mitigated or rehabilitated (Alamos Gold Inc. 2020).

The Proponent and main Project EA contact information is as follows:

Project Proponent:	Alamos Gold Inc. Address: Brookfield Place, 181 Bay Street, Suite 3910 P.O. Box #823, Toronto, ON M5J 2T3 Website: www.alamosgold.com
Proponent Chief Executive Officer:	John A. McCluskey President and Chief Executive Officer Address: Brookfield Place, 181 Bay Street, Suite 3910 P.O. Box #823, Toronto, ON M5J 2T3 Phone: (416) 368-9932 Email: jmc@alamosgold.com
Main Proponent Contact Regarding the Project:	Chris Bostwick VP, Technical Services Address: Brookfield Place, 181 Bay Street, Suite 3910 P.O. Box #823, Toronto, ON M5J 2T3 Phone: (416) 368-9932 Email: CBostwick@alamosgold.com
Main Proponent Contact Regarding Environmental Assessment:	Colin Webster VP, Sustainability and External Affairs Address: Brookfield Place, 181 Bay Street, Suite 3910 P.O. Box #823, Toronto, ON M5J 2T3 Phone: (416) 368-9932 Email: CWebster@alamosgold.com
Main Environmental Consultant Contact Regarding Environmental Assessment:	Karen Mathers, P.Ge. PMP Stantec Consulting Ltd., Project Manager Address: 500-311 Portage Avenue Winnipeg, MB R3B 2B9 Phone: (204) 489-5900 Email: Karen.Mathers@stantec.com

The 'Proponent Team' for this Project consists of independent third party consultants that have been engaged to assist Alamos throughout the EA process, including environmental planning, assessment, licensing, and permitting support from Stantec Consulting Ltd.; feasibility and design/engineering support from Ausenco Engineering Canada Inc. (Ausenco); geotechnical engineering support from Golder Associates; mine design support from Q'Pit Inc.; power supply support from BBA Engineering; economic modelling support from Price Waterhouse Cooper; accommodation assessment support for the Project from RePlan (an ERM Group Company); and Paraminerals Consulting, development of a 3D visualization of the Project throughout the life of the Project.



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1.3 LAND OWNERSHIP AND MINERAL RIGHTS

The MacLellan site has not been in operation since 1989. Since that time, ownership has changed over the years. In 2004, the property was purchased by Carlisle Goldfields Limited (Carlisle) and, through the acquisition of Carlisle in 2016, Alamos gained consolidated ownership of the mining claims, mineral leases, and a surface lease.

1.4 EXISTING LAND USE

The MacLellan site was formerly operated as an underground gold and silver mine, with a five-level shaft to a depth of 448 m and ramp access from the surface to 420 m below ground. The mine was operated by Maskwa Nickel Chrome Mines Limited, a subsidiary of Falconbridge Nickel Mines Limited, between 1986 and 1989 and produced approximately 144,000 oz of gold and 432,000 oz of silver through a 900- to 1,200-tonnes per day (t/day) milling operation. The mine operated under a licence that allowed for the discharge of mine water and sewage-plant effluent into polishing ponds and a marshy area adjacent to the Keewatin River. Ore was trucked to the Black Hawk Mining Inc. mill facility in Lynn Lake for processing.

The MacLellan site has been in a 'care and maintenance' phase since then, in anticipation of being reopened, with very little reclamation having been completed (Tetra Tech 2013). The present-day condition of the site is shown in the below aerial photograph. The site currently consists of a 4.6 km gravel access road, abandoned pole line, and infrastructure from the former underground mine, such as head frame, hoist house and shaft, access ramp, maintenance and other storage buildings, core shack and core racks, vent raise, and mine water settling ponds.

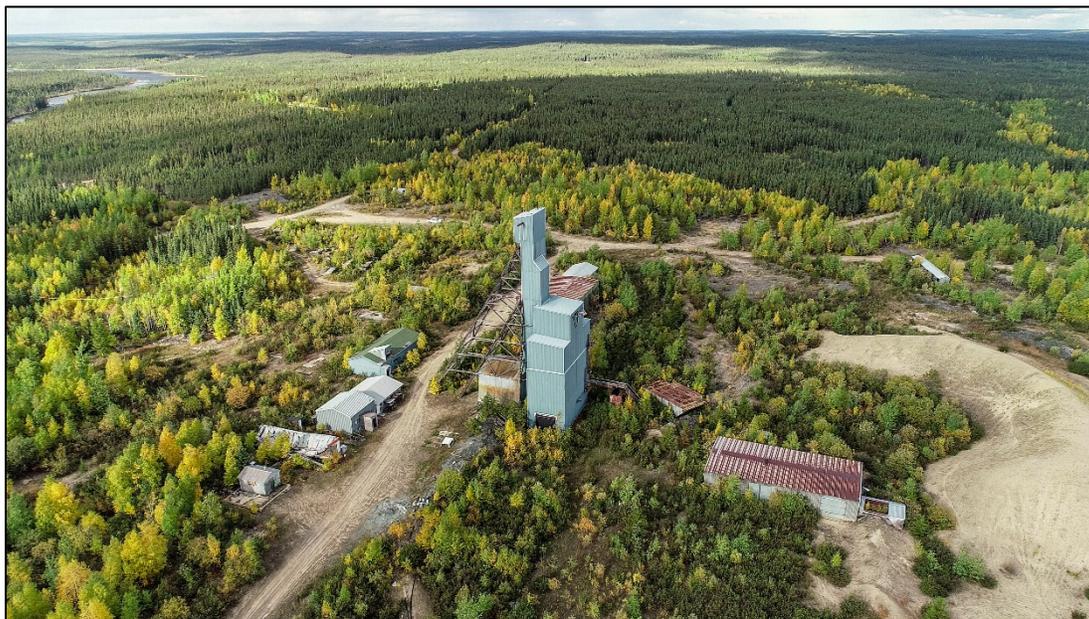


Photo 1 Aerial Photograph of MacLellan Site



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Existing land uses in and around the MacLellan site consist of Crown and municipal lands, including the northern urban portion of the Town of Lynn Lake, and remote cottage and recreational areas (e.g., Burge and Zed lakes provincial parks).

Land use designation of the MacLellan site and adjoining land is identified in the Town of Lynn Lake Development Plan By-law No. 1329-2009. The MacLellan site is located within the administrative boundary of the Town of Lynn Lake, which extends more than 10 km beyond the built up townsite (Map 1-1). Most of the land outside the built-up townsite is designated as “Limited Development” land use under the development plan (Map 1-2). The MacLellan site is also within a Community Interest Zone established for Marcel Colomb First Nation. Mineral exploration and development are encouraged in the “Limited Development” land use under the development plan. The “Limited Development” area comprises approximately 103,261 ha.

The townsite of Lynn Lake is also subject to the Town of Lynn Lake Zoning By-law No. 675. The townsite (i.e., built-up area) of Lynn Lake is divided into “Limited Development”, “Residential”, “Commercial and Public”, “Industrial”, and “Recreation and Open Space” land uses under the development plan (Map 1-2). Under the zoning by-law, land is zoned variously as “LD – Limited Development District”, “R1 – One-family Dwelling District”, “R2 – Two-family Dwelling District”, “R3 – Multiple-family Dwelling District”, “CG – General Commercial District”, “P – Public Open Space District”, and “M – Industrial District” (Map 1-3). These areas comprise approximately 213 ha of developed land.

1.5 PURPOSE OF THE PROJECT

The purpose of the Project is to develop the Lynn Lake gold deposits for the purpose of extracting gold (doré bullion) to process and sell.

A Project Feasibility Study was undertaken confirming the technical feasibility and economic viability of the Project. The Project is not feasible without the development of both the Gordon and MacLellan sites. No issues have been identified to date that are expected to materially affect the ability of Alamos to extract minerals from the Project.

1.6 REGULATORY FRAMEWORK

1.6.1 Environmental Assessment

The Project is subject to provincial and federal environmental regulatory requirements. The Final Environmental Impact Statement is intended to meet the requirements of *The Environment Act* (Manitoba) and the *Canadian Environmental Assessment Act, 2012*.

1.6.1.1 Provincial Requirements

Provincially, the *Classes of Development Regulation* (CD Regulation) under *The Environment Act* (Manitoba) identifies ‘Class 1’, ‘Class 2’ and ‘Class 3’ developments that must undergo a provincial EA and obtain a licence in accordance with the Act prior to construction, alteration, or operation. Section 3(5) of the CD Regulation classifies mines and milling facilities as Class 2 developments. The Project may also involve

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one or more water development and control activities that are considered Class 2 developments under section 3(9) of the CD Regulation, such as stream channel alterations that affect fish mobility and fish habitat. The Project is not expected to involve any of the water development activities listed as Class 3 development triggers under section 4(4) of the CD Regulation.

The Environmental Approvals Branch of Manitoba Conservation and Climate (MCC; formerly Manitoba Sustainable Development; MSD) has advised that it considers the proposed Project activities at the MacLellan and Gordon sites to constitute separate “developments” that will require separate licences under *The Environment Act* (Manitoba). The Environmental Approvals Branch will assess each site under separate EAP’s under the provincial EA process. Documentation related to the provincial environmental assessment process is available on the Environmental Approvals Branch website at:

https://www.gov.mb.ca/sd/permits_licenses_approvals/eal/index.html.

Other provincial agencies have potentially relevant mandates relative environmental aspects of the Project for the environmental assessment process. See Chapter 1, Section 1.4 of the federal EIS for a summary listing of potentially relevant key provincial legislation.

1.6.1.2 Federal Requirements

Under the Canadian Environmental Assessment Act (CEAA) 2012, federal EAs are possibly required for ‘designated projects’ consisting of one or more physical activities specified in the *Regulations Designating Physical Activities* (the Regulations). The Impact Assessment Agency of Canada (IAAC) is responsible for the administration of federal EAs for metal mines under CEAA 2012.

A Project Description Summary Document and Project Description Report were submitted to the Canadian Environmental Assessment Agency on June 22, 2017, and June 23, 2017, respectively. The Canadian Environmental Assessment Agency confirmed that a federal environmental assessment would be required and released the Environmental Impact Statement Guidelines on November 6, 2017 which specify the nature, scope and extent of the information required in the environmental impact statement. Documentation related to the federal environmental assessment is available on the Canadian Impact Assessment Registry Internet Site at: <https://www.ceaa.gc.ca/050/evaluations/document/exploration/80140?culture=en-CA>.

Other federal agencies are also providing specialized knowledge through the environmental assessment process. See Chapter 1 of the federal EIS for a summary listing of potentially relevant key federal legislation.

It is anticipated that readers of this EAP will reference the federal EIS that was filed with the IAAC for greater detail, as necessary.

1.6.2 Other Environmental Regulatory Requirements and Permits

In addition to the EA requirements described in Section 1.6.1, there are key provincial, federal, and municipal permits and approvals potentially required for the Project. These are listed in Tables 1-3 to Table 1-5 in Section 1.4.2 of Chapter 1 of the federal EIS.



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1.7 FUNDING

Alamos will provide funding for all undertakings related to the Project at the MacLellan site.



2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The MacLellan site is located 8 km (by vehicle) northeast of Lynn Lake (14U 380900E 6307500N). Lynn Lake is located approximately 820 km northwest of Winnipeg. The proposed preliminary site layout for the redeveloped MacLellan site is shown on Map 2-1.

The proposed Project infrastructure at the MacLellan site, excluding a portion of the MacLellan access road, will be located within the boundaries of mining claims and leasehold lands registered in the name of Carlisle Goldfields Limited, a wholly-owned subsidiary of Alamos (Map 2-2). Alamos has obtained road permits for the MacLellan access road, which grant exclusive rights for usage of this road to Alamos.

2.2 PROJECT COMPONENT OVERVIEW

The proposed mine operation at the MacLellan site is a conventional open pit with shovel and truck removal of the mine rock and ore produced during blasting. The key activities and components associated with the MacLellan mine site portion of the Project are as follows:

- Open pit – producing run-of-mine ore or raw/unprocessed ore.
- Ore, overburden, and mine rock stockpiles/storage areas – including raw ore from Gordon used as feedstock at the MacLellan site.
- Mill feed storage and crushing plant.
- Ore milling and processing plant.
- Tailings management facility (TMF).
- Sewage treatment and domestic waste handling.
- Utilities and infrastructure
 - Power supply line (66 kV) to the MacLellan site
 - Fuel/fuel storage and propane storage and distribution facilities
 - Potable and process water pipelines
 - Existing access roads and upgrades as required (including new bridge crossing of Keewatin River)

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- Proposed buildings and yards (security buildings, administration/small office, laboratory, plant control room, workshop, warehouse, truck shop, parking and laydown areas, lighting)
- Explosives storage (magazine) and explosives mixing plant.
- Water development and control
 - Water withdrawal from the Keewatin River
 - Water collection ditches, sumps, and/or small ponds to manage contact water at the site and seepage water from the TMF.
- Construction and permanent camp.

2.3 PROJECT PLANNING AND MANAGEMENT STRATEGIES

Environmental protection and management measures will be adopted to guide the planning, design, construction, operation, and decommissioning, reclamation, and closure of the Project.

2.3.1 Design Standards and Codes

The Project will:

- Adhere to regulated standards for air and water emissions, for handling, storage or disposal of solid wastes and hazardous materials, and for handling and storage of fuel.
- Adhere to regulated and/or industry design and management standards to address environmental risks such as seismicity, unusual weather events, flooding, and erosion.
- Project activities will be aligned with the International Cyanide Management Code.
- Follow the Canadian Dam Association Dam Safety Guidelines (CDA 2013, 2014) for design of containment structures for the TMF.

2.3.2 In-Design Mitigation

Initial design will incorporate mitigation measures to reduce Project-related interactions, including:

- Siting facilities to avoid sensitive areas such as watercourses, wetlands, important habitat types, areas of high archaeological potential, and areas of importance identified by Indigenous communities; and where unavoidable, the size and number of natural features that may be affected has been reduced (see Map 2-3).
- Siting facilities within, instead of across, watershed boundaries to reduce the number of potentially affected waterbodies (e.g., adjusting the location of the TMF).



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- Reducing the ‘footprint’ of Project facilities and activities, to the extent practical, to reduce the amount of disturbed land and disturbed water resources.

2.3.3 Environmental Protection, Mitigation and Management

Where avoidance of sensitive areas as described in Section 2.3.2 is not possible, mitigation measures will be developed in liaison with the applicable regulatory authorities and Indigenous communities. Environmental protection, mitigation, and management components include:

- Preparing an Environmental Protection Plan for construction activities that is included in, and enforced through, construction contracts.
- Preparing and implementing an Environmental Management Plan for ongoing monitoring and management of, for example, land and soil resources, water, air and water quality, noise and vibration, hazardous materials and waste, and occupational and community health and safety.
- Preparing and maintaining an Emergency Response Plan for the Project.
- Planning the mine for closure and having a Conceptual Closure Plan (federal EIS Chapter 23, Appendix 23B), including the provision of security to the provincial Crown for performance of rehabilitation work.
- Planning and financing activities to offset or compensate for unavoidable adverse effects on environmental resources such as aquatic habitats.
- Implementing a public, stakeholder and Indigenous engagement program. Alamos has commenced engagement activities, as summarized in the federal EIS Chapter 3. These efforts have been ongoing throughout Project planning and will continue through the permitting phase and implemented throughout construction, operation, and eventual decommissioning/closure with the objective of:
 - Addressing public, stakeholder, and Indigenous community concerns to the extent possible during the design, construction, operation, and closure of the Project.
 - Promoting local benefits, including employment and business opportunities, to the extent practical.

Further details on environmental protection, mitigation and management is provided in Section 8 of this report.

2.4 PROJECT ACTIVITIES AND COMPONENTS

The historical MacLellan site has been in a ‘care and maintenance’ phase since 1989 with very little reclamation having taken place. The site consists of a 4.6-km gravel access road, abandoned distribution pole line, and infrastructure from the former underground mine, such as a head frame, hoist house, shaft, access ramp, maintenance and other storage buildings, core shack and racks, vent raise, and mine water settling ponds (see Map 2-4). The underground workings are flooded with water.



Project Description

Alamos proposes to develop mine infrastructure at the MacLellan site, including an open pit, central ore milling and processing plant, associated infrastructure, ore and overburden stockpiles, a mine rock storage area (MRSA), and a tailings management facility (TMF). The existing 4.6 km access road will be used to access the site. Upgrades to the existing access road will be required, along with the addition of a second single lane steel bridge crossing of the Keewatin River (EIS Chapter 2, Section 2.3.2.3). With the proposed development of this site, the existing approx. 48 m tall head frame, hoist house and maintenance building will be demolished.

The key activities and components associated with the MacLellan site are described below.

2.4.1 Resource Extraction, Storage and Processing

2.4.1.1 Open Pit

The MacLellan resource will be developed as an open pit mine operation. During pre-production, 8.9 Mt of rock and overburden during pre-production will be removed and 405 kt of ore will be stockpiled. Remaining ore will be used to feed the mill for commissioning. The total quantity of material to be excavated from the MacLellan open pit during Project mine operation is approximately 266 Mt; this includes 26.9 Mt of ore.

The anticipated depth of the MacLellan open pit is approximately 450 m. The open pit will be developed in a series of benches based on the pit design parameters with drilling and blasting completed on each bench. The pit slopes will be designed based on industry standards and the results of site-specific geotechnical investigations. The proposed mine operation is a conventional open pit with shovel and truck removal of the mine rock and ore produced during blasting. Ramp widths will be designed to accommodate the deployed type and size of the mine equipment and vehicles.

MacLellan mining operation are expected to peak at a rate of 28.0 Mt/year (in Years 6 and 7). Ore will be stockpiled at the site and used as feedstock for the ore milling and processing plant. The peak stockpile at the MacLellan site will be 2.7 Mt. The ore stockpiles at the MacLellan site are planned to be active until the end of mine operation.

2.4.1.2 Mill Feed Storage Area and Crushing Plant

Run of Mine (ROM) ore from the open pit will be transported to a pad directly adjacent to the ore milling and processing plant for short-term storage prior to use as feedstock for the plant (see Map 2-1). A truck dump and crushing circuit is proposed to be located south of the ore milling and processing plant, accessed by the open pit road (Map 2-1). The crushing circuit will feed the ore milling and processing plant by a conveyor system. Potential dust emissions will be reduced through dust containment (e.g., enclosure) and collection systems.

2.4.1.3 Ore Milling and Processing Plant

A process flow diagram depiction for the ore processing is provided in Appendix 2A (EIS Chapter 2). The ore milling and processing plant is designed to process 7,500 t/day of ore, with a maximum potential process rate of 8,250 t/day. Ore will first be crushed in a two-stage crushing circuit comprising a primary jaw crusher,



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followed by a secondary cone crusher. Processing will continue with semi-autogenous grinding, then further grinding in a closed-circuit ball mill and cyclone circuit. The fine-ground product will then enter a pre-leach thickener feed box to be thickened from 33% to 50% solids. This will be in preparation for the downstream pre-aeration, leaching, and carbon-in-pulp (CIP) steps.

The cyanidation process for gold recovery will begin in the leach tank circuit, which will consist of four tanks in a series (Ausenco 2019). Each tank will be interconnected with launders to allow slurry to flow sequentially to each tank in the train, and each tank will be equipped with a dual-impeller mechanical agitator to provide uniform mixing of slurry, lime slurry, sodium cyanide, and oxygen. From the last tank in the leach circuit, the slurry will flow to the first CIP tank in the adsorption circuit, which will consist of six adsorption tanks in series.

Pulp will flow continuously from the first tank to the last, while carbon will be pumped counter current from the last tank to the first. The countercurrent process will be repeated until carbon, progressively loaded with gold, advances to the first CIP tank, where it will be washed and transferred to the acid wash column. The carbon will be acid-washed and residual acid on the carbon, if any, will be neutralized with both the acid and neutralization solutions being discharged to the tailings pump-box.

The washed and loaded carbon will then be transferred to the elution column (i.e., washing a compound with solvent), where it will be stripped of gold and silver using a sodium hydroxide and cyanide solution (approximately 3% each by volume). Stripped carbon will be fed into the carbon regeneration kiln feed hopper to be prepared for re-introduction to the CIP circuit.

Gold and silver will be recovered, smelted, and refined into gold doré bars ready for transport to a certified facility for further processing. The slurry from the last CIP tank will be sent to the cyanide detoxification circuit (Air/SO₂ oxidation process) for cyanide destruction prior to being discharged to the tailings pump-box and then to the TMF (EIS Chapter 2, Section 2.3.2.2).

To support the cyanidation process, sodium cyanide will be transported in 18 tonne isotainers to the processing plant. Approximately 82 tonnes will be consumed per month, requiring approximately 1 tanker delivery every 2-3 days (total 7-8 tankers/month).

Water demand at the ore milling and processing plant will be met with water removed from the historical underground workings, followed by reclaimed water from the TMF, to reduce the need for fresh surface water (EIS Chapter 2, Sections 2.3.2.2 and 2.8.2.1).

2.4.1.4 Ore, Overburden and Waste Rock Stockpiles/Storage Areas

The ore stockpile area planned for the MacLellan site will be approximately 115,500 m² in area (see Map 2-1), located south of the mill.

The MacLellan site will also contain stockpile areas for removed overburden and mine rock. The overburden stockpile area is proposed to be located to the west of the MRSA, while the MRSA is proposed to “wrap around” the south and east sides of the TMF (see Map 2-1). Table 2-1 provides the estimated maximum volumes of each material at the MacLellan site.



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Table 2-1 Approximate Quantity of Mine Materials for the MacLellan Site

Project Site	Ore Stockpile		Overburden		Mine Rock	
	Tonnage (Mt)	Total Volume (Mm ³)	Tonnage (Mt)	Volume (Mm ³)	Tonnage (Mt)	Total Volume (Mm ³)
MacLellan	2.7	1.2	8.2	4.8	230.9	102.6

Notes: Mine rock and ore stockpiled swelled densities assumed to be 2.25 t/m³. Overburden stockpile swelled density assumed to be 1.7 t/m³. Mine rock volumes based on a bulking factor of 1.3. Overburden volumes based on a bulking factor of 1.1.

Table 2-2 provides the general characteristics of each stockpile/storage area (i.e., surface area, height, and overall slope).

Table 2-2 General Characteristics of Each Stockpile/Storage Area

Stockpile	Maximum Surface Area (m ²)	Maximum Total Height (m)	Maximum Overall Slope (H:V)
Ore	115,500	30	1.33H:1V
Overburden	181,800	30	2.5H:1V
Mine Rock	3,561,300	45	2.5H:1V

Geochemical testing indicates that mine rock from the MacLellan site may contain up to 28% potentially acid generating (PAG) materials and shows a leaching potential for arsenic and other trace elements as discussed in detail in EIS Chapter 5 (Section 5.2.6). Blending of PAG and non-PAG material and/or dry and/or wet covers will be used to control acid rock drainage (ARD)/metal leaching (ML) from mine rock. Final required mitigation measures for mine rock will be determined during detailed engineering and outlined in the Environmental Management Plan. By contrast, ore stockpiles are not expected to generate ARD and have high leaching potentials for arsenic and cadmium. Overburden has a low risk of ARD/ML and is not expected to require special management or mitigation measures.

Seepage/runoff collection ditches will be constructed around the perimeter of each stockpile/storage area and directed to a series of sumps and/or small ponds at topographic lows. Water collected in the sumps and/or small ponds will be pumped to a site water management pond (the TMF collection pond) for management and/or treatment (if required) prior to discharge (see Map 2-1). Final required mitigation measures with respect to water quality will be determined through detailed engineering.

2.4.1.5 Transportation of Ore

Ore mined at the MacLellan site will remain on-site. Ore mined at the Gordon site will be transported to the MacLellan site for processing.



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2.4.2 Utilities and Infrastructure

2.4.2.1 Water Supply and Distribution System

Raw water is required at the MacLellan site for two purposes: 1) make-up water for ore processing during the first year of operation; and 2) fire and dust suppression, safety showers, truck washes, and the water treatment plant (for generation of potable water). This water will be withdrawn from the Keewatin River, located to the west of the MacLellan site (see Map 2-1). Make-up water requirements during the first year of operation are estimated to be 0.56 Mm³ or 312 m³/hour (Golder 2019; Ausenco 2019). Water for fire and dust suppression is included in this annual volume, as a portion corresponding to the two-hour retention time of the total live storage in a holding tank that will be located at the MacLellan site. Freshwater demands from the Keewatin River are estimated to be 350,400 m³ or 40 m³/hour after the first year. The potable water treatment plant will have a capacity of 92,000 L/day and will produce potable water for both the Gordon and MacLellan sites. The treated water is anticipated to be stored in an on-site tank for distribution to the buildings at the MacLellan site.

2.4.2.2 Power Distribution System

Power for the MacLellan site will be supplied by Manitoba Hydro Line 6. The Project will require upgrades to the existing power supply transmission line between Laurie River and Lynn Lake and Lynn Lake's Copper Street Station from 69 kV to 138 kV. A new 138 kV-34.5 kV substation (located approximately 1 km from the Copper Street Station) and a new 8 km 34.5 kV overhead distribution line into the MacLellan site will also be required to accommodate the Project (BBA 2019). The line is anticipated to be preferentially routed for most of the line length along existing linear disturbances such as trails and cut lines and the MacLellan access road (see Map 2-1). The line is anticipated to be a combination of standard single pole lines centred on a 20 m right-of-way, and standard H Frames with guy wires on a 40 m right-of-way. The line is anticipated to require two watercourse crossings.

It is anticipated that Manitoba Hydro will independently undertake the upgrade from Laurie River to Lynn Lake and at the Copper Street Station in Lynn Lake. Alamos will provide the new 138 kV-34.5 kV substation and 34.5 kV distribution line to the MacLellan site from Lynn Lake separately. The alignment, rights of way, and location of this distribution line and substation have not been determined at this time.

Alamos will not have the ability to direct or influence the construction/ upgrade of Manitoba Hydro's power distribution system (i.e., transmission line between Laurie River and Lynn Lake and Copper Street Station), which will be assessed, built, owned, and operated by Manitoba Hydro. This construction/upgrade is therefore excluded from the scope of the Project to be assessed.

The new Alamos substation will be double-ended (i.e., containing two switchboards in one assembly separated by a tie circuit breaker) with 100% redundancy in transformer capacity in the form of two 21/28 MVA oil filled type substation transformers (sized to carry the maximum power required by the MacLellan site; BBA 2019). Power distribution from the Alamos substation in Lynn Lake to, and at, the MacLellan site will be via 34.5 kV overhead lines, cable tray and underground conduits, with local outdoor type e-houses for transformers and load centres at each point of utilization.



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While the Alamos segment of power distribution system is within the scope of the EIS, the alignment, rights of way, and location of other elements of infrastructure are in the preliminary stages of planning and uncertain at this time. Detailed project planning will be undertaken in consideration of environmental constraints to avoid or reduce interactions with sensitive features such as watercourses and wetlands or known areas of habitat for rare species and archeological resources.

2.4.2.3 Fuel Storage and Distribution System

Tanker trucks will deliver diesel and gasoline fuels to the site on an as-needed basis for use by heavy equipment and Project vehicles. Propane will be considered for space heating. Fuels will be stored in approved above-ground storage tanks in the truck shop and fueling station west of the processing plant and will be equipped with secondary containment in accordance with provincial regulations and standards. Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements (e.g., the Storage and Handling of Petroleum Products and Allied Products Regulation under *The Dangerous Goods Handling and Transportation Act* of Manitoba). Stationary and distant mine equipment will be fueled with a fuel-dispensing truck.

2.4.2.4 Roads and Pipelines

The MacLellan site will be accessed via an existing access road off Provincial Road (PR) 391. The assessment of PR 391 is documented in the separate Gordon site EAP.

The existing 4.6-km MacLellan site access road and bridge will be used for service, construction, and operational vehicle access (see Map 2-1). A second single lane steel bridge crossing of the Keewatin River will be required to access the MacLellan site. Upgrades to the existing access road are anticipated to include removal and replacement of roadbed granular material and placement of new material and compacted granular. The existing side ditches will be cleared or reconstructed based on a suitable design.

Alamos will own and maintain internal site roads at the MacLellan site, which will allow movement of Project personnel, equipment, and materials on the site. Large haul truck traffic and other site vehicle traffic will be separated where appropriate. For example, large mine haul trucks being used at the site will have dedicated roads from the open pit to the various stockpiles and storage areas and to the central maintenance and shift changeover area.

Pipelines will be needed on-site to transport and dispose of contact water between various facilities, including the open pit, ore milling and processing plant, and TMF. The locations and dimensions of these pipelines will be confirmed as Project engineering is advanced.

To avoid repeated disturbance to the riverbank and stream bed, and on account of the differing raw water requirements (first year versus subsequent years), two pipelines (one 10-inch diameter and one 4-inch diameter) will be buried into the riverbank during the original intake construction to provide the raw water required from the Keewatin River to the MacLellan site.



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2.4.2.5 Buildings, Yards, and Parking Areas

Several buildings are proposed for the MacLellan site and will be amalgamated where possible without compromising Project requirements for efficiency, power, functionality, and safety. Security buildings will be erected to control access to the MacLellan site and associated facilities.

Parking areas will be developed to accommodate Project personnel, site visitors, and Project vehicles including road trucks and haul trucks. A central parking facility will be provided for personnel, contractors, and visitors. Separate parking areas will be provided for the mobile mine fleet and road haul trucks.

An administration office building at the site (a 25 m x 65 m single story building), will contain offices for site management staff, operating and maintenance, geology, engineering, and administration personnel (Ausenco 2019). It will contain conference rooms, washroom facilities, mine dry facilities, a meal room, filing rooms, and mine rescue, fire and first aid facilities.

The primary truck shop will be a 35 m x 63 m fabric building that will have bays to service open pit trucks and other surface equipment, as well as general maintenance facilities. It will be equipped with overhead cranes and will provide adequate space for the storage of tool cabinets and other items required for maintaining the mobile fleet. The truck shop will also support truck wash and fueling activities and provide personnel services and office facilities for daily management issues. Tire storage will also be provided in this area.

Assay and metallurgical laboratories and a plant control room will be built within the ore milling and processing plant complex. A warehouse (a 24 m x 15 m fabric building) will be used to store equipment parts and other material required throughout the life of the Project. A workshop will be located in the warehouse and will include an overhead crane and an office. The workshop, sized to accommodate electrical, instrumentation, welding, piping, fabrication, and machining activities (Ausenco 2019), will service the ore milling and processing plant.

Laydown areas will be required for the outdoor storage of equipment, maintenance, and construction equipment, as well as facilities for the construction and operation. Laydown areas will also include platforms for equipment erection.

Worker accommodations will be provided by a permanent camp facility at the site consisting of a 300-bed purchased camp plus a temporary 100-bed leased camp. The leased camp will be temporary and used during construction. The 300-bed permanent camp will be used during operation. Accommodations are proposed to be provided in 30 to 44 person dormitories and are single occupancy. Rooms will be approximately 6.5 m² with a mix of *en suite* or shared washrooms, and shared kitchen/dining, recreational, and laundry facilities (Ausenco 2019). Utilities (e.g., power, water, and wastewater) will be supplied by the Project and the camp will operate independently of the Town of Lynn Lake.



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2.4.2.6 Site Lighting and Security

General site lighting will be a combination of power line pole-mounted fixtures and building-mounted fixtures at the offices, shop, and other miscellaneous buildings (Ausenco 2019). Lighting will be designed to reduce spill-over light (i.e., unwanted outdoor light shining further than anticipated).

2.4.2.7 Explosives Storage

Emulsion explosives with non-electric detonators will be used and stored during mine operation at the MacLellan site. An explosives mixing plant and explosives magazine will be housed separately at a minimum prescribed distance away from the main mine operation. Explosives storage requirements will be determined in conjunction with the selected explosives supplier and will be established in accordance with the National Standard of Canada document number CAN/BNQ 2910-510 – *Explosives – Quantity Distances* (SCC and BNQ 2015), and the facility will be licensed under the *Explosives Act*.

2.4.2.8 Water Development and Control

No watercourse re-alignments are required, and no fish-bearing streams will be overlain with the MRSA, the TMF, or other associated mine infrastructure at the MacLellan site. As a result, no amendment to Schedule 2 of the Metal and Diamond Mining Effluent Regulations (MDMER) is anticipated. However, it is expected that a small pond ('East Pond') located south of the proposed open pit will drain as a result of development of the open pit (see Map 2-1).

Alamos will request a paragraph 34.4(2)(b) and 35(2)(b) *Fisheries Act* authorization from Fisheries and Oceans Canada (DFO) for the harmful alteration, disruption, or destruction of fish habitat that may occur as a result of Project activities, including in East Pond at the MacLellan site. Any *Fisheries Act* authorization will not be issued by DFO until after the Impact Assessment Agency of Canada (formerly Canadian Environmental Assessment Agency) decision on the Project. Details regarding other liquid discharges associated with Project operation are discussed in the federal EIS Chapter 2, Section 2.8.2.

Water management structures (i.e., diversion ditches) will be constructed to collect, divert, and release non-contact water to the environment.

Construction and operation of the underground water withdrawal pipelines to provide raw water for use at the MacLellan site (federal EIS Chapter 2, Section 2.3.2.3) is not anticipated to result in substantial changes to water level, flow, or pH in the Keewatin River. There may be a temporary increase in turbidity during pipeline construction; this will be mitigated through development and implementation of a Project-specific Erosion and Sediment Control Plan that includes consideration of in-water and shoreline activities associated with pipeline construction. The pipe will be constructed in accordance with the DFO *Freshwater Intake End of Pipe Fish Screen Guideline* (1995).



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2.4.3 Other Waste Storage and Management

2.4.3.1 Tailings Management Facility

The TMF is proposed to be located approximately 1.5 km from the ore milling and processing plant (see Map 2-1). The site was selected in consideration of technically and economically feasible alternatives, environmental constraints, the use of natural topography for containment, existing land tenure, the spatial footprint of the Project, and the benefits of having tailings contained in a single facility (federal EIS Chapter 2, Section 2.9.2). The final TMF site selection considered ECCC’s Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Environment Canada 2011).

Following discussions with DFO and ECCC in September 2016, the preliminary TMF design was revised to avoid the potential deposition of mine tailings into watercourses or waterbodies frequented by fish. The revised design of the TMF does not overlap spatially with any fish-bearing waters (see Map 2-1). The design of the TMF for the Project is based on the design criteria provided in Table 2-3.

Table 2-3 Tailings Management Facility (Ultimate Footprint) Design Basis

Item	Quantity	Units
Mineral Reserve	35	Mt
Tailings/Ore Ratio	1.0	-
Tailings Production	35	Mt
Design Mill Rate	7,500	t/day
Specific Gravity	3.0	-
Deposition Method	Spigot/End of Pipe	-
% Solids	47.7%	-
Average Void Ratio	1.0	-
Deposited Dry Density	1.5	t/m ³
Tailings Volume Requirement	23.1	Mm ³

The TMF will be constructed in three stages: Stage 1, Stage 2 and Ultimate. The volume of tailings progressively stored at each stage is 2.0 Mm³, 9.3 Mm³, and 23.1 Mm³, respectively. The TMF dams will be raised progressively to provide additional storage capacity. It is projected that three dam raises will be required during the 13-year operating period. The final two raises will be completed in back to back years.

The TMF dams will consist of a low permeability core constructed of suitable rockfill materials (i.e., clean, non-acid generating, relatively free draining) with internal bedding and filter zones, and upstream and downstream shells of granular material. Most of the dam materials are expected to be locally available from borrow sources. The dams will have an upstream slope of 3H:1V, a downstream slope of 2H:1V, and a crest width of 10 m. The starter dam crest elevation has been set at 362.5 m above mean sea level, with a dam height of 10 m and length of 4,150 m.



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Geochemical testing shows that approximately 57% of the tailings will be non-PAG. ARD from tailings is therefore not expected during operation. In the tailings pond, MDMER limits could be exceeded for cyanide, un-ionized ammonia, copper, and nickel during operation, but discharge to the environment from the pond is not expected based on the water balance model. Non-compliant discharges will not be allowed. Localized acidic conditions may develop in PAG tailings after closure. Under acidic conditions, MDMER limits for nickel and copper could be exceeded. The risk of ARD and ML from tailings will be managed at closure by placing covers to limit infiltration of precipitation and ingress of oxygen (EIS Chapter 23, Appendix 23B). The addition of a circuit for the removal of sulphides from the tailings with containment of produced concentrate will also be considered. Containment structures for the TMF will be designed in accordance with the Canadian Dam Association *Dam Safety Guidelines* (CDA 2013, 2014).

Based on available information regarding subsurface soils, it has been assumed that foundation seepage will be controlled via low permeability seepage cutoffs. A downstream seepage collection system, consisting of a series of sumps in combination with a buried weeping tile or rockfill finger drain system, will be installed during the starter dam construction to capture seepage at the toe of the dam and will be pumped back to the TMF collection pond. Water from the TMF pond will be directed to open pit at closure (EIS Chapter 23, Appendix 23B).

Rockfill and aggregate for construction will be sourced from non-acid generating (NAG) mine rock and from local quarries and borrow pits near the Project. These quarries and borrow pits will be determined as detailed design proceeds and evaluated for geotechnical and environmental suitability as detailed project planning and engineering proceeds.

2.4.3.2 Sewage Treatment Facility

The average sanitary wastewater flow rate will be approximately 60,000 L/d. A package treatment plant will be required with a discharge consisting of an outfall pipe and diffuser to the selected surface water receiver (likely the Keewatin River west of the MacLellan site). Effluent will be treated to meet applicable regulatory requirements (e.g., Wastewater Systems Effluent Regulations under the federal *Fisheries Act*) prior to discharge to the environment.

2.4.3.3 Domestic Solid Waste Handling Facility

Waste disposal will follow a Waste Management Plan for the Project, which will be developed in accordance with applicable regulations (e.g., *The Waste Reduction and Prevention Act* of Manitoba and the provincial Collection and Disposal of Wastes Regulation under *The Public Health Act*) and best practices. Solid waste will be collected and recycled to the extent practical. Where feasible, paper and cardboard will be recycled, waste steel will be sold as scrap, and wood and plastic will be salvaged and recycled. Non-hazardous domestic solid waste will be deposited at the landfill in Lynn Lake (approximately 4 km northeast of the community along PR 391) which has three to five years of space left and potentially another 20 years of capacity. A Waste Management Plan will be developed for the Project as there will be demand for landfill capacity for construction and non-hazardous domestic solid waste during operation. Alamos will liaise with planners in Lynn Lake regarding these needs and potential requirements for landfill expansion. Waste oils, fuels, and hazardous wastes (if any) will be safely handled and transported as recommended by the



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suppliers and/or manufacturers and in compliance with applicable federal, provincial, or municipal regulations (e.g., the Hazardous Waste Regulation under *The Dangerous Goods Handling and Transportation Act* of Manitoba, *Canadian Environmental Protection Act* and associated regulations, and the *Transportation of Dangerous Goods Act* and associated regulations).

2.5 ANCILLARY FACILITIES AND INFRASTRUCTURE

2.5.1 Manitoba Hydro Substation and Transmission Line

It is anticipated that Manitoba Hydro will independently undertake the from 69 kV to 138 kV power supply upgrade from Laurie River to Lynn Lake and at the Copper Street Station in Lynn Lake. The upgraded power distribution system from Laurie River to the Copper Street Station (including the upgrade of the Copper Street Station) is expected to be assessed, built, owned, and operated by Manitoba Hydro. This portion of the power distribution system will be entirely under the care and control of Manitoba Hydro and is therefore excluded from the scope of the Project to be assessed.

2.5.2 Borrow Sources

Borrow sources for construction are uncertain at this time and are therefore not included in the scope of the EIS. Preliminary investigation details on borrow sources for the Project are presented in Chapter 5 of the EIS. Detailed project planning to identify the location and scope of borrow pit operation will be undertaken in consideration of environmental constraints to avoid or reduce interactions with sensitive features such as watercourses and wetlands or known areas of habitat for rare species and archeological resources. It is assumed that quarries and other borrow sources owned and operated by third parties will be operated in accordance with permit requirements and best practices stipulated by the applicable regulatory authorities.

2.6 WORKFORCE

The total Project labour force, as well as full time equivalents (FTEs), expected to be on-site over a given time based on fly-in, fly-out rotations is 1,591 or 827 FTE on-site (for both sites). The total labour force and FTEs is based on pre-production peak, operation peak, and operation TMF lift. As described in EIS Chapter 2, Section 2.3.2.3, worker accommodations will be provided by first a temporary, then a permanent camp facility at the MacLellan site. It is anticipated that workers will be transported from the worker accommodations camp at the MacLellan site to the Gordon site via passenger vehicle (e.g., buses).

2.7 PROJECT SCHEDULE

The tentative Project schedule and approximate duration of the key Project phases are as follows:

- Construction (i.e., site preparation, physical construction/equipment installation, pre-production, and commissioning) will be scheduled following Project regulatory approval and is expected to take approximately two years to complete (Year -2, Year -1). Some limited pre-production may occur during this period. Project construction activities will be carried out concurrently at both the MacLellan and Gordon mine sites.



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- Operation (i.e., ore and mine rock extraction, processing, and waste management) is expected to start in 2023 and continue through the next 13 Years.
 - Mining operation is expected to commence on site in Year 1, following construction, and continue for the entire life of the Project.
 - The ore stockpiled during mine operation will be processed in the ore milling and processing plant located at the site during the Project.
- Decommissioning/closure will begin at the cessation of operation. Active closure is scheduled to begin in Year 14 at the MacLellan site. Active closure is expected to take approximately 5-6 years to complete and consists of the anticipated rehabilitation efforts that will be completed at the MacLellan site. Active closure will be followed by approximately 10 years of post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. Pit filling is expected to take 21 years at the MacLellan site under average conditions (EIS Chapter 9, Section 9.4.1). Permanent closure will occur when the site is stable, and monitoring is no longer required.

2.8 PROJECT PHASES

Working with Paraminerals Consulting, Alamos has developed a 3D visualization of what the Project will look like throughout the life of the Project. Visualizations for the MacLellan site are provided in the federal EIS in Chapter 2, Appendix 2B.

2.8.1 Construction

Construction (i.e., site preparation, physical construction and equipment installation, pre-production, and commissioning) will begin once all regulatory approvals and associated permits are in place and is expected to take approximately two years to complete. The timeframe to complete the required site preparation and surface infrastructure to start open pit activities is approximately nine months. Construction of the ore-milling and processing plant is expected to take two years. Ore will be stored in stockpiles until the facility is operational.

Construction will begin with clearing the areas for the Project components (i.e., ore milling, and processing plant, open pit, stockpiles, a portion of the TMF area, internal access roads, and ancillary facilities). Cleared merchantable timber will be sold, and any remaining cleared vegetation will be mulched and stored on-site for future use in active closure activities.

Water will be applied for dust suppression to haul roads and access roads and water management will be employed during the earthworks program to mitigate the potential environmental effects of fugitive dust on the surrounding area and mitigate surface erosion.

A 100-bed temporary construction camp will be established as part of the site preparation activities and will be located north of the ore milling and processing plant at the MacLellan site. The temporary camp will be used throughout the pre-production phase of the Project during which a permanent, 300-bed camp will also



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be established. The permanent camp will be used throughout operation of the Project (EIS Chapter 2, Section 2.7.3).

An access road connecting the site to PR 391 (i.e., upgrades to the existing 4.6-km access road and a bridge crossing of the Keewatin River at the MacLellan site) is proposed to be developed in conjunction with site preparation activities.

As clearing is completed, internal access roads, ore stockpiles, MRSAs, and the TMF surfaces will be prepared.

Starter dams for the TMF embankments at the MacLellan site will be constructed, and the embankments will be raised as storage requirements increase over the mine life. The ore stockpile and mine rock storage pad areas will be grubbed and graded to promote drainage control. The foundations will be prepared in accordance with environmental and engineering standards dependent upon the anticipated drainage chemistry, and drainage collection works will be installed.

An aggregate crusher and a concrete batch ready mix plant will be required on-site during construction. To meet future needs (e.g., road maintenance) for crushed aggregate, the portable crusher and concrete batch plant used during construction may remain on-site or be contracted out on a periodic basis. Raw materials used for crushing will be NAG mine rock from the open pit, if suitable, or materials from nearby approved pits or borrow areas.

Services, including the power supply, waste handling and fresh water supply systems, will be installed. The power supply will be provided into the MacLellan site by Manitoba Hydro and Alamos (EIS Chapter 2, Section 2.3.2.3).

Footings and foundations for buildings and structures associated with the ore milling and processing plant will be cast in place. Pre-packaged and field-erected ancillary facilities, including the buildings, fueling, tanks and processing equipment, will be delivered to the site and installed. Other equipment will be set up in their appropriate locations, and electrical and mechanical connections will be completed.

Removal of overburden for the open pit will occur in preparation for mining activities. Suitable overburden and excavated soil will be used on-site during construction with excess stored on-site for future use in active closure activities.

The amount and frequency of blasting required during the construction phase of the Project will be determined during detailed mine engineering.

The mechanical and electrical systems associated with the Project will be commissioned as construction is completed. Commissioning activities for the Project will include commissioning of the power distribution system and control, contact water collection systems, open pit dewatering system, tailings management water reclaim system, the ore milling and processing plant, and on-site fueling system. Following commissioning, the Project will start commercial operation.



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2.8.2 Operation

The operating life of the Project at the MacLellan site is estimated to be 13 years (excluding the pre-production period estimated at one to two years). As operation continues, the open pits will become progressively deeper, and related overburden, ore stockpiles, MRSAs, and the TMF, will increase in size. Solid and liquid wastes will be managed in compliance with applicable federal and provincial regulatory requirements (federal EIS Chapter 2, Sections 2.8.2 and 2.8.3). Ore from the Gordon site will be transported via highway trucks to the ore milling and processing plant at the MacLellan site for the first six years of operation. Based on a conservative haulage rate of 4,100 t/d, the Project is estimated to require seven truckloads per hour between the Gordon and MacLellan sites during this period.

The amount and frequency of blasting and drilling required during the operation phase of the Project will be determined during detailed mine engineering. Blasting is anticipated to occur two to three times per week, or approximately every third day, on average. Blasting is anticipated to be scheduled to coincide with shift change (i.e., approximately 7:00 pm). Ammonium nitrate and fuel oil emulsion is planned to be used for blasting at both sites. The ammonium nitrate and fuel oil emulsion will be manufactured at the site. Drilling is anticipated to occur 24 hours a day. Production drilling is anticipated to consist of 165 mm drill holes and pre-splitting. Void collapse and delineation drilling is anticipated to consist of 114 mm drill holes, both using down-the-hole hammers. Grade control drilling is anticipated to consist of 114 mm diameter drill holes using reverse circulation drilling.

2.8.3 Decommissioning/Closure

A Conceptual Closure Plan has been developed (EIS Chapter 23, Appendix 23B) and will be implemented in accordance with the *Mine Closure Regulation* under *The Mines and Minerals Act* of Manitoba and associated *General Closure Plan Guidelines* (MARD n.d.), to remove unneeded facilities and restore the MacLellan site following the completion of mining activities. The primary objective of reclamation and closure activities will be to establish physical, chemical, and biological stability of the site, and to meet desired end land functions and uses. The Conceptual Closure Plan will be updated throughout the Project lifetime as necessary to reflect the environmental requirements in place at the time of closure.

At the end of the operation phase of the Project, the main features will include the open pits, mill processing facilities, offices, storage areas, TMF, and MRSAs. Reclamation measures expected during decommissioning/closure for each of the main components are described in detail in federal EIS Chapter 23, Appendix 23B. Active closure activities will take place once mining has been completed (Year 14 at the MacLellan site). As outlined in federal EIS Chapter 2 (Section 2.6), active closure is anticipated to take 5-6 years to complete and will be followed by 10 years of post-closure monitoring and 21 years of pit filling (federal EIS Chapter 9, Section 9.4.1). Alamos will be responsible for monitoring and maintaining the integrity of the remaining structures. This responsibility will be outlined in the Closure Plan.

Alamos will surrender the lease and the site will be returned to the provincial Crown upon permanent closure once all fees, rents, royalties, and other liabilities applicable are paid. The site is expected to remain open indefinitely post closure for recreational activities such as hunting and trapping.

The main elements of decommissioning/active closure are:



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- Removal of buildings, equipment, and facilities (i.e., permanent structures) from the MacLellan site, together with aboveground concrete structures.
- Reclamation of mine access roads not needed for post-mining land access, with contouring to restore natural drainages and roadways revegetated.
- Recontouring of disturbed areas to blend in with surrounding topography and to re-establish natural drainage patterns.
- Removal of water management features that are no longer required, such as water treatment systems, ponds, and ditches. This will include: recontouring/spreading of pond berms; backfilling of ponds and ditches; and re-establishing natural drainage patterns.
- Management of site runoff from developed areas, including from the MRSAs and open pits, to meet federal and provincial regulatory requirements for downstream water quality.
- Implementation of public safety measures around the pits (e.g., re-sloping, fencing or rock berms).
- Allowing the open pits to fill with water to form pit lakes and directing the overflows to established drainages.
- Reclamation of MRSAs with suitable covers as needed, revegetation, and establishment of stable drainage conditions.
- Installation of a suitable cover and revegetation of the TMF and establishment of drainage to provide long-term erosion control.
- Revegetation of disturbed areas with plant species that are suitable for reclamation and the end land uses of the area. The goals of reclamation vegetation will be to: avoid erosion and sedimentation to protect aquatic resources; avoid invasive plant establishment; and re-establish a land use that is of value for wildlife and/or humans and mitigates the residual environmental effects of the Project on the environment.

2.9 EMISSIONS, DISCHARGES AND WASTES

2.9.1 Atmospheric Emissions

2.9.1.1 Air Contaminants

Air contaminant emissions during construction and operation will consist mainly of diesel combustion exhaust emissions from construction and mining equipment on-site, heavy-duty trucks transporting ore from the Gordon site to the MacLellan site (which is assessed and described in the Gordon EAP), and highway trucks delivering fuel, explosives and processing plant consumables, as well as fugitive dust emissions from construction and mining activities. The primary mining equipment will operate for 15 hours per day on average and the supporting equipment will operate for eight hours per day.



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The off-road equipment and vehicles consume diesel fuel and the resulting products of combustion are released to the atmosphere including oxides of nitrogen (NO_x), sulphur dioxide (SO₂), carbon monoxide (CO), hydrocarbons, diesel particulate matter (DPM), polycyclic aromatic hydrocarbons (PAHs) and metals. DPM is respirable particulate matter that has an aerodynamic diameter less than 10 µm (PM₁₀). It is assumed that 97% of DPM is PM_{2.5} or fine particulate matter that has an aerodynamic diameter less than 2.5 µm.

Fugitive dust emissions from drilling and blasting, surface disturbance activities, loading and unloading of material, truck traffic along haul roads and access roads, and wind erosion of exposed surfaces result in particulate matter (PM) emissions of various size ranges (e.g., TSP, PM₁₀ and PM_{2.5}) that can also be deposited to off-site ground and water surfaces (i.e., dustfall).

During operation, PM emissions will be released from dust collectors and wet scrubbers at the primary crusher, secondary crusher and the ore milling and processing plant gold room. The crushing plant conveyors and the fine ore stockpile are fully covered and therefore, fugitive dust emissions from these areas are not expected to be substantive.

Fugitive hydrogen cyanide (HCN) emissions may result from the leach and carbon-in-pulp (CIP) adsorption tanks in the ore milling and processing plant due to volatilization losses of sodium cyanide used in the leach and adsorption train, as well as from the TMF pond due to natural degradation and volatilization of a residual amount of cyanide contained in the tailings (a maximum of 10 mg/L, by design, of weak acid dissociable cyanide in wastewater discharged to the TMF) after cyanide detoxification.

Water will be applied to haul roads and access roads during construction and operation to mitigate the potential environmental effects of fugitive dust on surrounding properties. Chemical dust suppressants may be applied to haul roads on an as-needed basis during high wind conditions or if an increase of watering is determined ineffective or unfeasible at the time. Environmental effects of the Project on air quality will be considered and mitigated, where appropriate.

2.9.1.2 Greenhouse Gases

Project construction (estimated 24-month duration) will result in short-term greenhouse gas (GHG) emissions from the combustion of fuel in mobile construction equipment, stationary heaters, and power generators. GHGs will also be released from blasting activities and land-use changes (e.g., land clearing). The total annual construction emissions are estimated at approximately 80,617 tonnes of carbon dioxide equivalent (CO_{2e}) per year. Approximately 64,600 tonnes of CO_{2e} are estimated to be released during the worst-case year of construction from the MacLellan site (Q2 Year -2 to Q1 Year -1) (federal EIS Volume 5, Appendix A, Attachment F).

Project operation will result in GHG emissions from the combustion of fuel from transportation, in mobile and stationary equipment and releases from blasting activities. Assuming typical operation with the MacLellan mine operation powered using the existing Manitoba Hydro power grid (i.e., the available back-up diesel generation is not required) and the Gordon mine operation using on-site diesel-power generation, GHG emissions for the Project during operation are estimated to be 104,885 tonnes CO_{2e} per year.



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Approximately 68,000 tonnes of CO₂e are estimated to be released during the worst-case year of operation (Year 7) (federal EIS Volume 5, Appendix A, Attachment F).

2.9.1.3 Noise and Vibration

Noise and vibration will be generated during construction and will be typical of that associated with construction projects involving the movement of heavy mobile equipment such as haul trucks and stationary equipment such as power generators, compressors, and pumps.

Mining and surface crushing activities, including blasting of rock, and movement of material will be a source of noise and vibration throughout the Project operation phase. Stationary equipment such as crushers and mills will also generate noise and will be primarily used during the operation phase at the MacLellan site.

2.9.1.4 Light

Site lighting will be provided by a combination of power line pole-mounted fixtures and building-mounted fixtures at the offices, shop, and other miscellaneous buildings. Lighting will be designed to reduce spill-over light and will be typical of that associated with other industrial mine projects. Further information on light and visibility of the site from various viewpoints is provided in the Ambient Lighting Baseline Technical Data Report and Light Emissions Impact Assessment – Technical Modelling Report (federal EIS Volume 4, Appendix B; federal EIS Volume 5, Appendix G).

2.9.2 Liquid Discharges and Management

Multiple sources of liquid discharges during construction and operation will be managed on-site including, site runoff arising from precipitation; dewatering for foundation preparation; and dewatering of the existing open pits and underground workings. Liquid discharges at the MacLellan site can be classified as being either 'contact' or 'non-contact' water. Contact water is water, surface water or groundwater, that contacts mine workings or interacts with mine rock material. Contact water may also include dewatering associated with the Project. Non-contact water is water that does not contact mine workings and/or interact with mine rock material. The MacLellan site has been designed, as much as practical, to reduce the generation of contact water.

At closure, the water management related infrastructure will be sustained or re-configured to meet the requirements of the approved Closure Plan.

Contact Water

Collection ditches will be constructed around Project infrastructure to manage contact water. Water collected in the sumps and/or small ponds and during open pit dewatering will be pumped to water management ponds located at the site and discharged directly to the environment.

Seepage water associated with the TMF will be collected and pumped back to the TMF. Reclaim water from the TMF, underground workings dewatering water, and/or contact water from the water management facility will be used to meet ore milling and processing demand requirements. Tailings and excess water



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from the ore milling and processing plant will be piped to the TMF. Current modelling and engineering feasibility studies show that no discharge from the TMF will be required during normal operation (Ausenco 2019). If discharge is required, it will be treated to meet relevant federal and provincial regulatory requirements (e.g., the MDMER under the federal *Fisheries Act* and the *Manitoba Water Quality Standards, Objectives and Guidelines Regulation* under *The Water Protection Act* of Manitoba) prior to discharge to the environment, where applicable.

At the site's water management pond, water quality will be monitored. If necessary, the water will be treated to meet applicable federal and provincial regulatory requirements prior to discharge to the environment, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER. The water management pond has been sized in consideration of the retention time for the settling of suspended solids. Identification of the discharge locations for the MacLellan site will be confirmed during detailed engineering. Discharge from the site water management pond is anticipated to be to the Keewatin River.

Operational open pit dewatering will be carried out with in-pit pumps and/or using perimeter dewatering wells to intercept groundwater before it enters the pit.

Non-Contact Water

Where practical, collection ditches will be constructed to divert non-contact water around Project facilities to natural drainages. Consideration will be given to designing the channels to support fish habitat, where appropriate and practical. It will be determined during development of the Closure Plan whether the channels will remain or be re-configured following decommissioning/closure of the mine.

Sewage

Domestic sewage at the MacLellan site will be treated at the on-site sewage treatment facility. Effluent discharged from the facility will be treated to meet regulatory requirements.

2.9.3 Solid Wastes and Management

Solid wastes include domestic waste and waste oils, fuels, and hazardous wastes. Waste disposal will follow a Waste Management Plan for the Project, which will be developed in accordance with applicable regulations (e.g., *The Waste Reduction and Prevention Act* of Manitoba and the provincial Collection and Disposal of Wastes Regulation under *The Public Health Act*) and best practices.

Non-hazardous domestic solid waste will be deposited at the landfill in Lynn Lake which has three to five years of space left and potentially another 20 years of capacity.

Waste oils, fuels, and hazardous wastes (if any) will be safely handled and transported as recommended by the suppliers and/or manufacturers and in compliance with applicable federal, provincial, or municipal regulations.



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2.10 ALTERNATIVES

Consideration of alternatives is stipulated in the provincial environmental assessment process under The Environment Act Proposal Report Guidelines. The provincial Environment Act Proposal guidelines state that alternatives may consider one or more of the following: products to be provided, process technologies to be used, as well as feasibility and project siting.

2.10.1 Evaluation of Alternatives

The evaluation of alternatives for the MacLellan site focused on the following:

- Ore transportation
- Access to the Project site
- Location of key Project infrastructure
- Ore processing methods and technologies
- Fuel storage and distribution
- Power supply
- Water supply and wastewater management
- Water management and effluent discharge points
- Mine waste disposal and final effluent discharge methods
- Workforce accommodation and transportation

Each option for the alternatives identified is described and summarized for the MacLellan site. Further details on the alternatives analysis is provided in the federal EIS Chapter 2 (Section 2.9.3). The preferred alternative forms the basis for the Project to be assessed.



Engagement

3.0 ENGAGEMENT

3.1 REGULATORY ENGAGEMENT

The regulatory authorities that are expected to have an interest in the Project are identified in Table 3-1.

Table 3-1 Relevant Regulatory Authorities and Jurisdictions

Federal Government	Provincial Government	Municipal Government
<ul style="list-style-type: none"> • Canadian Environmental Assessment Agency (now IAAC) • Environment and Climate Change Canada • Fisheries and Oceans Canada • Health Canada • Natural Resources Canada • Indigenous Services Canada 	<ul style="list-style-type: none"> • Manitoba Growth, Enterprise, and Trade (now Manitoba Agriculture and Resource Development) • Manitoba Indigenous and Northern Relations • Historic Resources Branch of Manitoba Sport, Culture, and Heritage • Manitoba Sustainable Development (now MCC) • Workplace Safety and Health of Manitoba Finance 	<ul style="list-style-type: none"> • Town of Lynn Lake

Regulatory engagement activities undertaken to date by Alamos have included telephone calls, email communications, in-person meetings, and presentations. Key issues identified and discussed during the regulatory engagement activities undertaken to date have pertained to:

- The provincial requirement to obtain separate licenses under *The Environment Act* for the Gordon and MacLellan sites.
- The importance of redesigning the TMF to avoid interactions with waters frequented by fish (federal EIS Chapter 2).
- The importance of proactively engaging the local First Nation community and other potentially affected Indigenous communities (federal EIS Chapter 3).
- The importance of local economic benefits, including job opportunities and youth summer work experience (federal EIS Chapter 13).
- The importance of using town housing in Lynn Lake (federal EIS Chapter 14).
- The importance of fish and fish habitat offsetting requirements under the *Fisheries Act* (federal EIS Chapter 10).



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- The importance of caribou habitat, including discussions regarding the baseline studies, whether offsetting is required, and the potential effect on Critical Habitat (federal EIS Chapter 12).
- The regulator review of air quality and the planned approach to air dispersion modelling for the Atmospheric Environment (federal EIS Chapter 6).
- The identification of the potentially affected or interested Indigenous communities (federal EIS Chapter 3).
- The proper documentation of areas of heritage value at the mine sites prior to demolition (federal EIS Chapter 16).

Regulatory engagement with government will continue throughout the EA process and will remain ongoing (on an as-needed basis) for the duration of the Project. It is understood that there will also be several government-led engagement opportunities during the federal and provincial EA processes (e.g., public review and comment periods for EA-related documents).

As a responsible corporate citizen, Alamos is also committed to providing Project and corporate updates to interested government officials, as appropriate.

Further details on aspects of regulatory engagement (i.e., objectives and approach, identification of potentially relevant authorities/jurisdictions, engagement methods and results, ongoing and proposed engagement) can be found in the federal EIS Chapter 3 (Section 3.5).

3.2 STAKEHOLDER AND PUBLIC ENGAGEMENT

The following is a preliminary list of the types of non-regulatory and non-Indigenous stakeholders that have been identified as potentially having an interest in the Project:

- Business/economic stakeholders (e.g., local businesses, business associations, and industry groups).
- Development corporations.
- Local community members (e.g., residents and property owners).
- Local services (e.g., fire and police departments, hospitals).
- Non-governmental organizations.
- Research/academic organizations.

Alamos has conducted various stakeholder and community engagement activities with the groups identified above, including meetings, telephone interviews and presentations at career fairs. Additional stakeholders are expected to be identified as the Project progresses.

Six open house public meetings have been held to date: four were held in Lynn Lake for members of the local community including Marcel Colomb First Nation, one was held in Winnipeg, Manitoba for Marcel



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Colomb First Nation members residing in the city, and one was held in Nelson House for members of the local community including Nisichawayasihk Cree Nation. The open houses were advertised using posters, mail-outs, word of mouth, and social media. The events were informal drop-in style open houses. The events held on March 25, 2015, in Lynn Lake and March 26, 2015, in Winnipeg were attended by 42 individuals in total. The event held on February 3, 2020 in Nelson House was attended by 19 individuals. The events held on April 26, 2016, May 1, 2017, and February 4, 2020, in Lynn Lake were attended by 70, 53, and 46 people, respectively. At these events, the Proponent and Proponent Team distributed handouts and delivered a formal presentation to share Project information and solicit feedback/input. Attendees were invited to fill out questionnaires to provide feedback as well as any inquiries or issues that they wanted to raise.

In general, the questions, comments and concerns identified on the questionnaires completed at the open houses pertained to:

- Opportunities for employment and economic development in local communities.
- Opportunities for education/training, employment, and engagement specifically for members of Marcel Colomb First Nation.
- Opportunities for improved housing or other benefits specifically for local First Nations communities.
- Project infrastructure.
- The status and results of environmental baseline studies.
- Potential Project-related effects on water quantity and quality, soil quality, fish and fish habitat, wildlife, traplines, vegetation, human health, the local economy, local housing, community services and infrastructure, Marcel Colomb First Nation (on the Black Sturgeon Reserve), and the current use of lands and resources for traditional purposes by Indigenous peoples.
- Tailings containment.
- Site remediation.
- Potential accidental events.
- The importance of ongoing consultation and engagement.

The following topics were rated 'very important' in the opinions of more than 60% of the questionnaire respondents:

- Tailings and mine rock management.
- Wildlife and fish habitat.
- Employment.
- Groundwater and surface water.



Engagement

- Plants.
- Air quality.
- Contracts and business opportunities.
- Training and job skills.
- Community health.

Proponent-led stakeholder and community engagement will continue throughout the EA process and will remain ongoing (on an as-needed basis) for the duration of the Project. It is understood that there will also be several additional government-led engagement opportunities during the federal and provincial EA processes (e.g., public review and comment periods for EA-related documents).

Further details on aspects of stakeholder and public engagement (i.e., objectives and approach, identification of potentially affected and interested stakeholders, engagement methods and results, ongoing and proposed engagement) can be found in Chapter 3, Section 3.4 of the Final EIS.

3.3 ENGAGEMENT WITH INDIGENOUS PEOPLES

Based on 2016 census data (the latest census data available at the time this document was prepared), Indigenous people account for approximately 18% of the total population of Manitoba, which includes approximately 223,310 First Nations, Métis, and Inuit people (Statistics Canada 2017a).

Based on current understanding of traditional lands located in proximity to, and/or downstream or downwind from, Project activities and components, the following seven Indigenous nations have been identified by the CEA Agency (now IAAC) as expected to be “most affected” by the Project:

- Marcel Colomb First Nation
- Mathias Colomb Cree Nation
- Nisichawayasihk Cree Nation
- O-Pipon-Na-Piwin Cree Nation
- Manitoba Metis Federation
- Peter Ballantyne Cree Nation
- Barren Lands First Nation

The IAAC also identified additional Indigenous nations that may also be affected by the Project, but “to a lesser degree”. These communities include:

- Métis Nation – Saskatchewan Northern Region 1
- Métis Nation – Saskatchewan Eastern Region 1



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- Hatchet Lake First Nation
- Northlands Denesuline First Nation
- Sayisi Dene First Nation

Engagement has been ongoing prior to and throughout the EA process, and will continue through the life of the Project. Alamos has been engaging with Indigenous nations in the Project area to introduce the Project, receive feedback, and document potential issues and concerns. The 12 identified Indigenous nations have been contacted to discuss the potential effects of the Project on their community. Alamos has used several engagement methods to present the Project information, facilitate discussion, and solicit feedback on the Project from Indigenous nations. These engagement methods were selected based on responses to initial communications with Indigenous nations on how they would like to be engaged on the Project and include: information packages, community meetings, meetings with leadership, follow-up phone calls, e-mails, and text messages, traditional land and resource use studies, committee and liaison positions, site tours, fieldwork opportunities and cultural awareness activities. Information provided herein is current to May 22, 2020. Information or feedback provided through engagement after May 22, 2020 will be shared with regulators in supplemental filings to the Environmental Impact Statement in January 2021. Alamos will continue, throughout the life of the mine to incorporate information shared from Indigenous communities and groups wherever appropriate, including changes to outcomes of mitigation and monitoring.

Further details on aspects of engagement with Indigenous communities (i.e., objectives and approach, identification of potentially interested Indigenous communities, engagement methods and results, ongoing and proposed engagement) can be found in Chapter 3, Section 3.3 of the Final EIS.



4.0 ENVIRONMENTAL SETTING

4.1 OVERVIEW

The Project, located in North Central Manitoba, is approximately 322 km northwest of Thompson via PR 391, 1,085 km northwest of Winnipeg, and 100 km east of Kinoosao, Saskatchewan (Map 1-1). The Project is in a remote, sparsely populated, and rugged region of the Boreal Shield Ecozone.

Primary resource uses in the region include mining activities and limited forestry. Hunting, trapping, water-oriented recreation, including sport fishing, and other forms of tourism are important activities. There are two communities near the Project: the Town of Lynn Lake and Marcel Colomb First Nation (on Black Sturgeon Reserve). These communities are connected by PR 391, which runs southeast from Lynn Lake to the Town of Leaf Rapids and the City of Thompson.

The area supports peat-covered hummocky glacial deposits underlain by an expanse of Precambrian bedrock. Bedrock in the region is typically covered by 2 to 4 m of overburden. The terrain consists of mostly hilly, till-veneered bedrock, with intervening low areas of organic terrain. The terrain ranges from level to moderately sloping, with most slopes ranging from 0 to 15%. Surficial geology of the Lynn Lake area consists primarily of till. The till deposits are generally thin, range from 1 to 3 m in thickness, and are generally found overlying bedrock. The texture of the till found in the Lynn Lake area is generally sandy and contains a large proportion of debris derived from crystalline shield lithologies. Glaciolacustrine deposits comprise nearshore sand and gravel as well as massive to laminated sand, silt and clay that accumulated in the deeper areas of glacial Lake Agassiz. Permafrost is typically found in 10% to 50% of the land in the Lynn Lake area (Heginbottom et al. 1995). When present, the permafrost generally has low to moderate ice content.

Soils in the region are composed of mineral soils, which are dominant on sandy, acidic till, with organic soils typical in bogs and peat plateaus, and widespread discontinuous permafrost (Smith et. al. 1998). Soil thickness is variable and ranges from 0 metres, in areas of exposed bedrock to more than 2 metres; however, depth to bedrock is commonly 0.3 to 2 metres below the surface. Within the Churchill River Upland Ecoregion, Dystric Brunisols are the dominant soils on sandy acidic till, while Gray Luvisols are dominant on well to imperfectly drained clay deposits (Smith et al.1998). Across the Project area, soils include Brunisolic, Cryosolic and Organic soil orders. Brunisols occupy the largest proportion of the Project area, followed by Cryosols then Organic soils. At the MacLellan site, the most extensive soils within terrestrial areas belong to the Hat Lake and Wuskwatim soil units, which represent 34% and 32% of this area, respectively.

Contiguous tracts of boreal forest span the area with jack pine (*Pinus banksiana*) common in well-drained areas, and black spruce (*Picea mariana*) and tamarack (*Larix laricina*) species abundant in wetter areas.

The area is home to diverse wildlife species such as beaver (*Castor canadensis*), moose (*Alces alces*), black bear (*Ursus americanus*), American marten (*Martes americana*), and a variety of migratory bird species. Numerous wetlands, lakes, rivers, and streams are found throughout the area due to impermeable



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bedrock and poorly drained soils in peat filled depressions. These waterbodies are a part of the Churchill River Watershed that drains into the Hudson Bay to the east (Smith et. al. 1998). The Project lies within four subwatersheds of the broader Granville Lake Watershed: Hughes River, Lower Keewatin River, Lower Lynn River, and Cockeram Lake. Around the MacLellan site, water flows south into the Keewatin River and southeast through Cockeram Lake and Sickle Lake before discharging into Granville Lake on the Churchill River, upstream of Southern Indian Lake. Surface water around the Gordon site drains southward into the Hughes River, via Farley, Swede and Ellystan lakes, which in turn discharge into Barrington River and Southern Indian Lake on the Churchill River. Fish inhabiting the area include northern pike (*Esox lucius*), walleye (*Sander vitreus*), lake whitefish (*Coregonus clupeaformis*), and brook stickleback (*Culaea inconstans*).

Readers looking for further details on the biophysical environment (i.e., climate, air quality and greenhouse gas emissions, ambient sound and light, physiography, geology and soils, geochemistry, surface water and groundwater resources, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, and species of conservation of concern/species at risk) are directed to the federal EIS Chapter 5. Readers looking for further details on the socio-economic environment (i.e., socio-economic context, labour and economy, education, health care, emergency and social services, transportation and utilities, land and resource use, historical land and resource use, current use of lands and resources for traditional purposes, and heritage resources) are also directed to the federal EIS Chapter 5.



5.0 ENVIRONMENTAL ASSESSMENT APPROACH

5.1 OVERVIEW

The assessment of environmental effects focuses on valued components (VCs), which are the elements of the environment that could be affected by the Project and are of importance or interest to regulators, Indigenous communities and other potentially affected members of the public or interested parties.

The following VCs have been assessed as part of the EIS:

- Atmospheric Environment
- Noise and Vibration
- Groundwater
- Surface Water
- Fish and Fish Habitat
- Vegetation and Wetlands
- Wildlife and Wildlife Habitat
- Labour and Economy
- Community Services, Infrastructure and Wellbeing
- Land and Resource Use
- Heritage Resources
- Current Use of Lands and Resources for Traditional Purposes
- Human Health
- Indigenous Peoples

The environmental assessment approach incorporates the following key considerations:

- Identifying the activities and components of the Project.
- Predicting and evaluating potential changes to the environment and the likely effects on identified valued components (VCs).
- Proposing measures to mitigate adverse environmental effects.



Environmental Assessment Approach

- Determining remaining residual effects and whether residual adverse effects are significant after the implementation of mitigation measures.
- Development of follow-up and monitoring programs to verify both the accuracy of the effects assessment and the effectiveness of mitigation measures.

Integral to the EA process was the consideration and incorporation of knowledge from the local community and from Indigenous nations, where available.

For further details on the environmental assessment scope and methods, readers are directed to the federal EIS Chapter 4.

5.2 ASSESSMENT BOUNDARIES

5.2.1 Spatial Boundaries

Spatial and temporal boundaries are identified for the assessment and assist in quantifying effects. Spatial boundaries for the assessment were selected based on the geographic extent over which Project activities and their effects on VCs are likely to occur, as well as other ecological, technical, and social considerations. Three geographic areas were defined for VC assessment purposes – the Project Development Area (PDA), Local Assessment Area (LAA) and Regional Assessment Area (RAA).

- The PDA encompasses the immediate area in which Project activities and components occur plus a 30-m buffer and is the anticipated area of direct physical disturbance associated with the construction and operation of the Project (i.e., the Project footprint; see Map 2-1).
- The LAA encompasses the area in which Project-related environmental effects (direct or indirect) can be predicted or measured for assessment. The LAA, which is specific to each VC, encompasses the PDA and is selected in consideration of the geographic extent of effects.
- The RAA is the area established for context for the determination of significance of project-specific effects. The RAA encompasses both the PDA and LAA and is VC-specific.

5.2.2 Temporal Boundaries

Temporal boundaries for the assessment address the potential effects during the Project's construction, operation, and decommissioning/closure phases over relevant timescales. The temporal boundaries for the Project are the same as the Project schedule described in Section 2.7, above.



6.0 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

6.1 ATMOSPHERIC ENVIRONMENT

6.1.1 Existing Environment

Three distinct subcomponents were described to characterize the atmospheric environment baseline conditions: climate and meteorology, ambient air quality and greenhouse gases (GHGs).

The Project is in a region characterized by short, cool summers and long, cold winters. Long-term climate data indicates that the mean annual air temperature is -3.2°C . The coldest monthly average temperature is -24°C (January) and the highest monthly average temperature is 16°C (July). The total annual precipitation is 478 mm, with 318 mm falling as rain, and the remainder as snow.

Existing air quality reflects the remote location of the Project and the current lack of industrial activities in the area. Existing dust levels are low and attributed to traffic on unpaved roads and other human activities such as the use of wood stoves and open fires. The average $\text{PM}_{2.5}$ and PM_{10} concentrations at the MacLellan site in 2016 were $2.9\ \mu\text{g}/\text{m}^3$ and $4.6\ \mu\text{g}/\text{m}^3$, representing baseline concentrations in the LAA. The overall average dustfall measured in 2016 was $0.33\ \text{mg}/\text{dm}^2/\text{day}$, representing the baseline dustfall in the LAA. Representative baseline concentrations of nitrogen dioxide (NO_2), carbon monoxide (CO) and sulphur dioxide (SO_2) were based on analysis of ambient air monitoring data from the Fort Smith continuous monitoring station in the Northwest Territories. Baseline ambient concentrations of hydrogen cyanide (HCN), metals, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) are assumed negligible because of the remote location of the Project and the absence of industrial activities in the LAA. Overall, the existing air quality in the LAA can be characterized as very good.

6.1.2 Environmental Effects

6.1.2.1 Change to the Environment

The potential environmental effects of the Project on the atmospheric environment, prior to mitigation, include:

- change in air quality
- change in GHGs

Emissions of air contaminants and GHGs to the atmospheric environment may result in a change in air quality or a change in atmospheric GHGs.

Emissions during construction and pre-production at the MacLellan site are associated with the operation of the off-road construction and mining equipment, and movement of construction material for the



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construction of the major components of the Project such as internal haul roads, stockpile pads, ore milling and processing plant infrastructure and the TMF. Emissions during operation at the MacLellan site are associated with diesel combustion exhaust from the mining equipment, fugitive dust emissions generated from mining activities and wind erosion, fugitive dust emissions from the mill feed storage area and crushing plant, emissions from the ore milling and processing plant and the TMF.

Construction, operation, and closure activities will result in GHG releases from the combustion of diesel fuel, consumption of purchased electricity, detonation of explosives and land clearing.

The effects of the environment on the Project with respect to the potential effects of climate and extreme weather is discussed in the federal EIS Chapter 21.

6.1.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on air quality and GHG emissions at the MacLellan site:

- Enclosure of the mill feed storage area and crushing plant conveyors and the fine ore stockpile to reduce fugitive dust emissions. Particulate emissions from the enclosed conveyors and fine ore stockpile are assumed negligible.
- Use of dust collection/control systems (e.g., baghouse) at the primary crusher and the processing plant gold room to reduce PM emissions. Use of a wet scrubber at the secondary crusher. The dust collection efficiencies of the dust collectors and wet scrubber are considered in the calculation for PM emissions.
- Optimization of haul roads and infrastructure to reduce transportation and haul distances.
- Optimization of the TMF to reduce the area of exposed dry surfaces to reduce the potential for windblown dust emissions.
- Enclosed leaching and adsorption processes at the ore milling and processing plant to reduce fugitive HCN emissions due to volatilization losses.
- Limited concentration of weak acid dissociable (WAD)-cyanide (after cyanide detoxification) in water discharge to the TMF to 10 mg/L to reduce fugitive HCN emissions from the TMF pond.
- Engines and exhaust systems will be properly maintained to keep construction and mining equipment in good working condition.
- The concentration of sulphur in diesel fuel shall not exceed 15 mg/kg, as per the Sulphur in Diesel Fuel Regulations (ECCC 2002) that came into effect in 2006 for on-road vehicles and in 2010 for off-road equipment. This sulphur concentration is used in the emissions quantification for the Project.
- Haul trucks and vehicle idling times will be reduced to the extent possible.
- Cold starts will be limited to the extent possible.



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- On-site haul roads and access roads will be maintained in good condition, with regular inspections to monitor loose dust on the roads to reduce dust “track out” onto public roads.
- During dry periods, water will be applied to haul roads and access roads to reduce dust emissions. The application of water will be limited to non-freezing temperatures to avoid icing that can present a safety hazard. Watering is most effective immediately after application, and repeated watering several times a day might be required, depending on surface and meteorological conditions. A 75% control efficiency due to watering is applied to the quantified PM emissions from haul roads and access roads for the Project based on the Western Regional Air Partnership Fugitive Dust Handbook (WRAP 2006).
- Chemical dust suppressants will be applied to haul roads as an alternative option to watering. While chemical dust suppressants can be more effective at controlling fugitive dust than watering, they are also more expensive and can have adverse effects. Therefore, chemical dust suppression will be applied on an as-needed basis during high wind conditions or if measured ambient PM concentrations are in exceedance of the Manitoba Ambient Air Quality Criteria and if an increase of watering is determined ineffective or unfeasible at the time. Examples of suppressants include chlorides, petroleum products, liquid polymer emulsions, and agglomerating chemicals. These suppressants, if required, will be applied, as per the manufacturer’s recommendations, to preclude unintended environmental effects.
- Haul truck speed on the on-site haul roads will be limited to 35 km/h (loaded) and 40 km/h (empty). Vehicle speed on the access roads will be limited to 40 km/h.
- Track-out of material to PR 391 will be reduced by dust sweeping and truck wheel washing stations prior to entering onto PR 391.
- Surfaces of topsoil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces.

6.1.2.3 Residual Effects

Project construction and operation will result in the release of contaminants that will change ambient air quality. The air quality assessment focuses on Project operation because the operation phase has the greatest potential for adverse effects to air quality. The quantities of air contaminants released during the worst-case year of construction (Q2 Year -2 to Q1 Year -1 for the MacLellan site) are substantively less than the worst-case year of operation (Year 7 for the MacLellan site). The quantities of air contaminants released during decommissioning/closure are typically much less than construction and operation, are short-term in duration during active reclamation, and can be managed to negligible or acceptable levels through the application of standard operating procedures and best management practices. Therefore, the effects on air quality in the construction and decommissioning/closure phases will be less than during operation.

Maximum ambient concentrations and dustfall for the substances of interest are predicted for ore haul on PR 391 (Year 2) and the worst-case year of operation at the MacLellan site (Year 7). For the MacLellan site, the model results indicate that the maximum predicted 1-hour average NO₂ concentrations and 24-hour average TSP and PM₁₀ concentrations are greater than the respective AAQC. The maximum predicted 1-



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hour average NO₂ concentration is greater than the CAAQS. For the other gaseous and particulate criteria air contaminants, dustfall and metals, the maximum predicted values are less than the applicable AAQC.

During the construction phase, construction and mining equipment exhausts, blasting using an ammonium nitrate fuel oil emulsion and land clearing are anticipated sources of GHG emissions. These GHG emissions consist primarily of carbon dioxide (CO₂), with smaller amounts of methane and N₂O. Approximately 64.6 kt CO₂e are estimated to be released during the worst-case year of construction at the MacLellan site, and are conservatively estimated to contribute to approximately 0.30% and 0.009% to annual provincial and national GHG emission totals, respectively.

During the operation phase, GHG emission sources include emissions from heavy off-road equipment, on-highway trucks and vehicles, the stationary generator, and blasting. The MacLellan site operation is estimated to produce 68.3 kt CO₂e during the worst-case year, contributing approximately 0.32% and 0.009% annually to the provincial and national GHG emission totals.

Significance of Residual Effects

With planned mitigation and environmental protection measures, the residual environmental effects on air quality and GHGs are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.2 NOISE AND VIBRATION

6.2.1 Existing Environment

6.2.1.1 Noise

Noise levels in the RAA varied, with lowest levels in remote areas and highest levels in residential communities. Dominant noise sources in remote areas of the RAA (e.g., First Nation trapping areas and fishing camps) are wildlife, birds, insects, occasional aircraft flyovers, vegetation rustling, and wind noise. Noise levels were similar between day and night, with daytime summer levels averaging 34.3 dBA and nighttime levels averaging 33.4 dBA. Rural recreational areas like the lake-shore environments of Burge Lake were slightly higher, with summer daytime noise levels averaging 40.6 dBA and nighttime 35.2 dBA. Noise sources contributing to these levels were from residents' activities, local traffic, watersport and recreational activities, occasional aircraft flyovers, vegetation rustling, wildlife, insects, and water ripple noise. Nighttime noise consisted of occasional wildlife calling and dawn bird chorus during sunrise.

Similar noise levels were found within the Black Sturgeon Reserve (Marcel Colomb First Nation). Average summer noise levels in this sparsely populated area was 39.4 dBA during the day and 37.9 dBA at night. Sounds were attributed to residential and recreational activities during the daytime and earlier part of the nighttime period (due to longer daylight hours), and occasional dog barking, wildlife calling, and dawn bird chorus during sunrise.

Baseline sound levels at receptors located in the community of Lynn Lake were based on levels advised in Health Canada Noise Guidance (Health Canada 2017) for quiet rural communities (i.e., population density



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of 28 per square km). The Health Canada quiet rural community baseline daytime sound level is 45 dBA and nighttime level 35 dBA. This actual baseline sound level is likely to be higher because the population density at Lynn Lake is more than 28 per square km; however, the quieter baseline sound level is considered a more conservative approach.

6.2.1.2 Vibration

In contrast to audible noise, the background environmental ground-borne vibration levels in an outdoor rural area without local human activities is typically below the threshold of human perception (65 vibration velocity in decibel scale; FTA 2018). The typical threshold of human perception of ground vibration is 0.5 millimeters per second peak particle velocity (ISEE 2011); however, the perceptibility threshold varies from person to person. In rural and remote areas, vibration effects are uncommon.

6.2.2 Environmental Effects

6.2.2.1 Change to the Environment

The potential environmental effects of the Project on the acoustic environment, prior to mitigation, include:

- change in noise levels
- change in vibration levels

During construction, noise emissions from activities such as site preparation, utility and infrastructure development, and processing facility construction will result in a change in noise levels. During operation, noise emitted from the processing facility and mobile equipment (i.e., haul trucks) will result in a change in noise levels. In the decommissioning/closure phase, noise emissions from excavation and reclamation activities will result in a change in noise levels.

In the construction phase, activities such as site preparation, utility and infrastructure development, and processing facility construction will result in a change in vibration levels. Project construction activities such as earthworks, piling, and drilling were considered to cause potential vibration effects. During the operation phase, blasting activities at the site will result in ground-borne vibration and air overpressure. The vibration effects from ground vibration and air overpressure on human receptors were considered. In the decommissioning/closure phase, excavation and reclamation activities will result in a change in vibration levels.

6.2.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on noise and vibration levels during construction and operation:

- Where possible, large stationary machinery (i.e., crushers) will be located inside buildings.
- Fully enclosed conveyor between buildings in processing plant.



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- Large transportation trucks will be used to reduce the number of trips.
- Mobile equipment will have exhaust mufflers.
- Work camp building walls and roof will include noise-insulated panels.
- Work camp building will include air conditioning system such that double pane windows and insulated doors can be closed during the summer season.
- Reduce heavy fleet idling when not operating, where practical.

Vibration mitigation for blasting will be achieved by blast design related to quantities of explosives, blast hole locations and time delays between blasts. The mitigation measures are summarized as follows:

- Highest explosive per time delay that do not exceed 207.9 kg.
- Only one hole/delay will be fired in the blast.
- Minimum time delay between holes in blasts will not be less than 8 milliseconds (ms).

6.2.2.3 Residual Effects

High annoyance (HA) is a measure used to estimate a community response to noise levels. Health Canada uses the change in %HA as an appropriate indicator of noise-induced human health effects. Project-related changes in %HA at receptors are predicted to be below the 6.5% target for the construction phase and therefore in compliance with the Health Canada Noise Guidance (Health Canada 2017).

Similarly, low frequency noise effects are not expected at receptors because the predicted sound levels are below the Health Canada Noise Guidance targets (Health Canada 2017).

During construction, daytime and nighttime outdoor noise levels at the temporary work camp are predicted to be 56.7 dBA. To reduce noise effects on workers, temporary work camp buildings will be designed in a manner that reduces noise by 30 dB when windows are closed. Based on a building transmission loss of 30 dB, the Project-related construction noise level inside the temporary work camp is predicted to be 26.7 dBA, which is below the target for sleep disturbance (i.e., 30 dBA; World Health Organization 1999). As a result, no noise-related sleep disturbances of workers are predicted from the Project construction during the daytime and nighttime period.

The closest receptors to potential construction activities at the MacLellan site are located far enough away (i.e., over 1 km) that structural damage due to construction equipment (e.g., pile driver, compactor) vibration is unlikely. The blasting plan will consider distance to receptors and will size the charges to avoid exceeding regulatory targets at receptors (i.e., 120 dBL).



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Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on noise levels and vibration levels are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.3 GROUNDWATER

6.3.1 Existing Environment

Groundwater flow in the Project area is strongly influenced by topography, which results in flow from high areas to low areas. Measured groundwater levels vary from 314 to 326 m above mean sea level. Recharge is associated with topographic high areas and discharges to surface water features within the topographic low areas. At the MacLellan site, overall, the regional groundwater flow within the overburden is to the south, southeast across the MacLellan site LAA/RAA.

Overall groundwater quality in the Project area meets the *Manitoba Provincial Water Quality Guidelines* for drinking water (MWS 2011) and the *Canadian Drinking Water Quality Guidelines* (Health Canada 2019) except for iron and manganese. Concentrations of these parameters are typically elevated in groundwater within northern areas in Manitoba and are reflective of the natural mineralization and geochemical processes in the area. In areas of historical mine activities there was no clear difference in shallow groundwater quality between areas associated with historical mine operation and background areas with respect to drinking water guidelines. Seepage from historical MRSAs had concentrations of sulphate, arsenic, iron, and manganese that exceeded the drinking water guidelines. There are no known groundwater users located within the LAA/RAA for the MacLellan site.

Background groundwater quality also meets the more stringent provincial and federal guidelines for the protection of freshwater aquatic life except fluoride and phosphorous. Within the historical mine operational areas, groundwater quality exceeds these guidelines for fluoride, phosphorous, and iron. Seepage from historical MRSAs had concentrations of arsenic, cadmium, copper, iron, phosphorous, and zinc above the provincial and federal guidelines for the protection of freshwater aquatic life.

6.3.2 Environmental Effects

6.3.2.1 Change to the Environment

The potential environmental effects of the Project on groundwater, prior to mitigation, include:

- change in groundwater quantity and/or flow
- change in groundwater quality

At the MacLellan site, the primary Project effect on groundwater quantity and/or flow during construction is related to dewatering of the historical underground workings and starter pit and local dewatering for the installation of utilities and buildings and dam foundations for the TMF as well as from changes to infiltration



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rates resulting from the construction of roads and mine components. During operation, effects are related to the lowering of water levels through continued dewatering of the open pit and mounding of the water table through continued operation of the TMF. Dewatering of the historical underground workings and open pit and local dewatering for the installation of utilities and buildings and dam foundations for the TMF have the potential to change groundwater levels and flow patterns and subsequently the mass loading of parameters from groundwater to surface water at the MacLellan site. Water pumped from the open pit will be collected and pumped to a collection pond and/or the TMF. Pumped water may be sent to the process plant and used for mill processing prior to being sent to the TMF with tailings. Groundwater recharge from the MRSA and TMF have the potential to affect groundwater and surface water quality where groundwater discharges to lakes and wetlands.

Following completion of operation, dewatering of the open pits will cease, and the open pits will fill with water. As the open pits fill, groundwater levels will slowly recover, and the groundwater flow patterns will return to near baseline conditions. At the MacLellan site, closure of water management facilities will result in the removal of contact water collection systems that may result in groundwater originating from the MRSA and TMF discharging to the natural environment.

6.3.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on groundwater quality and quantity:

- Limit construction footprint (i.e., PDA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the PDA.
- Use standard management practices throughout the Project, including drainage control and excavation and open pit dewatering.
- Use standard construction methods, such as seepage cutoff collars, where trenches extend below the water table to mitigate preferential flow paths.
- Design MRSAs to increase the amount of runoff and reduce the amount of infiltration through the MRSAs, thereby reducing the recharge and loading to groundwater.
- Install contact water and seepage collection ditches around the perimeter of the MRSA and TMF to mitigate the migration of seepage from mine infrastructure.
- Install contact water collection ditches around the overburden storage area, ore stockpile, MRSA, and TMF to collect toe seepage and groundwater recharge from these Project components.
- The seepage collection is an integral component of the MRSA and TMF design at the MacLellan site and therefore included in the effects assessment as mitigation.
- Refilling open pit at closure to return groundwater levels to baseline conditions.



6.3.2.3 Residual Effects

During the construction phase, changes to groundwater infiltration are considered to have a minor effect on groundwater resources. Residual effects from temporary dewatering and contact water collection are anticipated to be low, as the groundwater pumping will be short-term on an as-needed basis. The residual effects from dewatering of the starter pit, historical underground workings, and the initial operation of the TMF at the MacLellan site will be most notable during the construction and operation phases. In the area of the MacLellan starter pit, groundwater levels are predicted to be lowered by approximately 1 m or more within 200 m of the pits. Groundwater discharge to the Keewatin River is anticipated to increase from baseline conditions due to mounding of the water table associated with the TMF. Changes to the groundwater discharge rates for remaining lakes and watercourses are expected to be relatively small (generally less than 86 m³/d) compared to baseline conditions.

At the MacLellan site, dewatering of the open pit will lower the water table by up to 1 m that extends over an area of approximately 800 m south of the open pit, increasing to more than 10 m within 600 m of the open pit. There are no known groundwater users located within the LAA/RAA and therefore, no water supply wells or groundwater takings that supply potable water within the extent of drawdown. The rate of groundwater discharge to Payne Lake, Minton Lake, Lake 2 (near MacLellan site), and Lake 3 (near MacLellan site) increases from baseline conditions to the end of operation due to mounding of the water table in the vicinity of the TMF. The rate of groundwater recharge from watercourse Kee3-B2-A1 (watercourse from East Pond to Tributary of Keewatin River) increases at the end of operation compared to baseline conditions due to dewatering of the open pit. For the remaining watercourses and lakes, the changes to groundwater discharge are relatively small (generally less than 84 m³/d) compared to the baseline conditions.

Following completion of operation, dewatering of the open pit will cease and water levels will begin to rise within the open pit to a maximum water elevation of 330 m above mean sea level at the MacLellan site, which reflects the local groundwater table at closure. The water table is predicted to return to near baseline conditions, except at the MacLellan site where the TMF is predicted to result in mounding of the water table. The rates of groundwater discharge to surface water are predicted to return to near baseline rates once the open pit is full and a pit lake has formed except for Payne Lake, Lake 3, Kee3-B2-A1, and Kee3-Pay1 (watercourse connecting Payne Lake and Keewatin River). Groundwater discharge to Payne Lake, Lake 3, Kee3-B2-A1, and Kee3-Pay1 increases in closure compared to baseline conditions due to mounding of the water table associated with the TMF.

Residual effects on groundwater quality are predicted as a result of recharge through the historical MRSAs and new MRSAs with elevated concentrations of parameters above background. Dewatering of the open pit will influence groundwater flow patterns during construction and operation and redirect groundwater recharge originating from the historical MRSAs to the open pit where it will be pumped to a settling pond prior to discharge to the environment. During dewatering of the open pit treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment. During construction, recharge originating from the historical MRSAs are predicted to be redirected from surface water receivers to the open pit. During operation and closure, groundwater recharge from the MRSAs and TMF is predicted to be elevated above the drinking water guidelines for nitrate+nitrite, total cyanide, sulphate, aluminum,



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antimony, arsenic, manganese, sodium, and/or uranium. The predicted groundwater flow pathway of seepage from the MRSAs and TMF is mainly confined to the PDA with a small portion extending into the LAA until the seepage originating from the MRSAs and TMF discharges to surface water. The main surface water receivers of seepage from the MRSAs and/or TMF are the Keewatin River and Minton Lake. The effects assessment for groundwater quality was conservative in that attenuation of groundwater quality along the groundwater flow path from the source to the receptor was not considered. Further information on groundwater and seepage effects from the MRSAs and TMF can be found in the federal EIS Chapter 8 and in the Hydrogeology Assessment: MacLellan Site – Technical Modelling Report (federal EIS Volume 5, Appendix G). No groundwater supply wells are known to be located within the flow pathways of seepage from the MRSAs and TMF.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on groundwater quantity and quality are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.4 SURFACE WATER

6.4.1 Existing Environment

Most of the lakes within and near the study area are shallow (<4 m deep) and do not thermally stratify during the summer. Background water quality generally reflects geochemistry of the Precambrian Shield. Lakes and streams are typically low in dissolved ions (<80 mg/L total dissolved solids), soft (hardness <75 mg/L as calcium carbonate (CaCO₃)), and neutral to slightly acidic. Parameters such as total phosphorus, aluminum, chromium, and iron are naturally elevated (or low in the case of pH) and occasionally do not meet applicable guidelines. Flooding within the region can be triggered by extreme precipitation, rapid snow melt, ice jams, and beaver activity, with peak flows generally occurring during the spring freshet. Beaver activity is extensive within the MacLellan LAA and can produce high water levels in both streams and lakes.

The LAA at the MacLellan site is characterized by larger lakes and rivers than at the Gordon site. Cockeram Lake is the largest lake by surface area in the LAA at the MacLellan site with a surface area of approximately 21 km². Surface water flow in the MacLellan site PDA is north to south towards Cockeram River. The Keewatin River flows north to south within the LAA and drains the western part of the PDA, Dot Lake, Payne Lake, and small tributaries. The Cockeram River flows north to south within the LAA and drains the eastern portion of the PDA, Lobster Lake, Minton Lake, and several unnamed lakes. Water flows from the Keewatin River and the Cockeram River into Cockeram Lake. Run-off from the MacLellan site enters the Keewatin River via a stream that drains a small pond (East Pond) to the south and several smaller tributaries that drain to the west. East Pond was the main water collection area for the previous MacLellan Mine. Baseline data collection results indicate that historical mining activities at the MacLellan site have affected and continue to affect water quality in the East Pond. Despite these elevated concentrations in the East Pond, drainage from the MacLellan site does not have a measurable effect on water quality in the Keewatin River; water quality parameter concentrations were similar upstream and downstream of the MacLellan site. This



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is likely due to the relatively small volume of water draining the MacLellan site in comparison to the volume of the Keewatin River.

The former East Tailings Management Area (ETMA) is located immediately east of the Town of Lynn Lake and adjacent to Lynn River and Eldon Lake. Lynn River drains into the Keewatin River downstream of the MacLellan site. The ETMA stored tailings for three now-closed copper, gold and nickel mines that operated between 1953 and 1975. Elevated concentrations of aluminum, copper, nickel, cadmium, cobalt, and zinc were observed in waterbodies downstream of the ETMA (i.e., Eldon Lake, Lynn River, Keewatin River, and Cockeram Lake). These metals showed a general downward concentration gradient as a function of distance from the. This spatial concentration gradient, which is evident between Eldon Lake and Sickie Lake, suggests that the ETMA continues to influence water quality in Eldon Lake, Lynn River, the Keewatin River, Cockeram Lake, and potentially Sickie Lake (which is also downstream of the former Burnt Timber Mine near Shortie Lake). There is no apparent remaining influence of the ETMA or the Burnt Timber Mine on water quality as far downstream as Granville Lake.

6.4.2 Environmental Effects

6.4.2.1 Change to the Environment

The potential environmental effects of the Project on surface water, prior to mitigation, include:

- change in surface water quantity
- change in surface water quality

At the MacLellan site, surface water quantity and/or flow could be affected by the following physical activities during construction: site preparation; construction of mine components and water management facilities; construction of utilities, infrastructure, and other facilities; and construction of water development and control including dewatering of pit and underground workings. The TMF will be used to store and recycle water for ore processing. Water from dewatering activities, including dewatering of the existing mine shaft, will be pumped and stored in the TMF. At the MacLellan site, construction, and operation of the fresh-water intake in the Keewatin River is not anticipated to result in substantial changes to water quantity; however, water development and control activities will alter surface water quantity.

At the MacLellan site, changes to water quality during construction are attributed to discharge of mine effluent from the collection pond to the Keewatin River.

During operation, effects on surface water quantity and flow will be from the temporary changes in flows to downstream waterbodies as a result of continued dewatering and the use of interceptor wells for groundwater management, and from temporary and permanent changes in watershed area due to construction within the PDA. At the MacLellan site, rock, overburden, and ore stockpiles will capture infiltrated water and store as pore-water, which will decrease inputs to groundwater and hydraulically connected surface waterbodies, including East Pond and its outlet. Water management will affect surface water quantity through the collection, storage, and recycling of contact water, the diversion of non-contact



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water, and the use of fresh water from the Keewatin River. At the MacLellan site, contact water will be managed so that no discharge from the TMF is anticipated to occur under average climate conditions.

At the MacLellan site, changes to water quality during operation may result from discharge of mine effluent from the collection pond to Keewatin River and groundwater seepage from the TMF and MRSA to unnamed Keewatin River tributaries draining East Pond and Payne Lake, and to Minton Lake.

During decommissioning, active closure, and post-closure at the MacLellan Site, surface water quantity and/or flow will be affected by the removal of Project infrastructure, rehabilitation and reclamation of infrastructure land, re-establishment of drainage patterns to the extent feasible, and the filling of the open pit. Removal of Project infrastructure and reclamation of land will decrease runoff while increasing infiltration and evapotranspiration. Once mining is completed and dewatering is terminated, the open pit will begin to fill from groundwater inflow, direct precipitation, surface water runoff, and water from the TMF. This will affect groundwater levels and gradients, which will result in positive changes to natural surface water quantity and/or flow in adjacent surface water features, possibly including the Keewatin River, East Pond, and the East Pond outlet. At the MacLellan site, changes in water quality may result from the overflow from the open pit to the unnamed Keewatin River tributary (KEE3-B1) during the decommissioning, reclamation, and closure phase.

6.4.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on surface water quantity and flow:

- Limiting construction footprint and disturbed areas (i.e., PDA) to the extent practicable.
- Grading perimeter and access roads of open pits to divert runoff away from the open pits to reduce contact water.
- Maintaining access roads by periodically regrading and ditching to improve water flow.
- Maintaining existing drainage patterns with the use of culverts. Inspection of culverts periodically to remove accumulated material and debris to avoid erosion, flooding, habitat damage, property damage, and mobilization of sediment.
- Collecting runoff and groundwater seepage from underground/open pit dewatering, overburden and ore stockpiles, TMF and MRSAs.
- Designing for collection, storage, and reuse of contact water (runoff and seepage), only discharging excess water after reuse and treatment, as necessary.
- Balancing timing of recycling from sources to relieve storage pressures on contact water collection ponds.



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- Constructing and using perimeter runoff and contact water collection ditches to collect overland flow and toe seepage, intercept shallow groundwater flow, and divert non-contact water away from the Project components.
- Pumping excess water to collection ponds as needed.
- Designing contact water collection ditches to convey the 1:25-year storm event and with positive gradients to limit standing water and maintain positive flow.
- Designing contact-water collection ponds with active water storage that considers ice thickness during winter.
- Configuring pond inlet and outlet structures to reduce inlet velocity and scour and meet sedimentation requirements.
- Designing and operating the TMF with no discharge to the environment during operation through reclaiming and recycling surplus water from the TMF to meet mill demand during operation.
- Refilling open pit at closure to return groundwater levels to baseline conditions.
- Implementing Project-specific environmental management and monitoring programs including a Surface Water Monitoring and Management Plan, Groundwater Monitoring Plan, Erosion and Sediment Control Plan, Beaver Dam and Beaver Activity Management Plan, and development of Emergency Response and Spill Prevention and Contingency Plans for implementation in the event of an accident or malfunction.

Additional mitigation measures to avoid or reduce potential effects on surface water quality, beyond those already described to avoid or reduce potential effects on surface water quantity, at the MacLellan site are:

- Design of water management facilities to collect and treat (as required) surplus contact water such that effluent meets applicable federal and provincial regulatory requirements, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER (amended), prior to discharge to the environment.
- Designing the TMF with two cells to allow progressive development during operation to reduce fresh-water requirements.
- Operating the TMF as a non-discharging facility during operation through decommissioning and reclamation.
- Recycling water between the TMF and the processing facility to the maximum extent possible during operation to reduce fresh-water make-up requirements.
- Implementing passive treatment options (e.g., controlled pit stratification, fertilizer amendment, flow segregation) in the open pit should monitoring show that pit water quality is not suitable for release to the environment during the approximately 20 years anticipated to fill the open pit with contact water at the conclusion of mine operation.



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- Using a closed circuit for cyanide use and cyanide destruction in the processing plant (via Air/SO₂ oxidation and precipitation of metals) prior to release to the TMF.
- Constructing groundwater cut-off ditches to reduce groundwater seepage from the TMF reaching Minton Lake.
- Treating domestic waste in an average 60,000 L/day sewage treatment plant so that it meets “Wastewater Systems Effluent Regulations” under the *Fisheries Act* prior to discharge to the Keewatin River via a pipeline and diffuser.

6.4.2.3 Residual Effects

Surface Water Quantity

At the MacLellan site, discharge in the unnamed Keewatin River tributary KEE3-B1 (QM04) is predicted to result in a decrease in mean annual flow of 64%; this change in flow is persistent through the operation and early years of the decommissioning, reclamation, and active closure phases of the Project.

During construction at the MacLellan site, mean annual flow at the outlet of Minton Lake (QM07) is predicted to decrease by 19% from the baseline conditions. This change in streamflow at the Minton Lake outlet is generally persistent through subsequent phases of the Project. The change is primarily related to in the loss of catchment area and subsequent runoff due to the Project infrastructure. During closure at the MacLellan site, a decrease in mean annual discharge of 56% is predicted for KEE3-B1 increasing from 0.035 m³/s to 0.070 m³/s (99% increase) once the open pit is filled. Once the open pit is filled, the increased catchment area of KEE3-B1 will cause the long-term increase in streamflow. Routing the outflow from the pit lake was done to address concerns expressed by Fisheries and Oceans Canada (see EIS Chapter 10).

Change in ice regime at the MacLellan site is expected to be limited in extent to small streams.

Surface Water Quality

Water quality of each potential source of discharge to the receiving environment at the MacLellan site is predicted to be below the short-term applicable water quality guidelines and below Schedule 4 effluent limits of the MDMER for the Expected Case and Upper Case scenarios (with the exception of ammonia exceeding the upper case at the MacLellan site). At the MacLellan site, total aluminum, arsenic, cadmium, copper, dissolved cadmium, and fluoride were identified as POPCs. All POPCs occur in the post-closure phase and maximum concentrations associated with the identification of these POPCs consistently occur at assessment node KEE3-B1 (i.e., the unnamed tributary to Keewatin River that will directly receive overflow from the flooded pit). For the MacLellan site, the maximum:

- Total aluminum concentrations are expected to be 0.20 mg/L which is approximately two times the long-term applicable guidelines and 29 times modelled expected baseline.
- Total arsenic concentrations are expected to be 0.203 mg/L which is approximately 4.5 times the long-term applicable guidelines and 21 times modelled expected baseline.



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- Total copper concentrations are expected to be 0.0059 mg/L, approximately 1.5 times higher than the long-term applicable guideline and 17 times the modelled expected baseline.
- Total and dissolved cadmium concentrations are expected to be 0.0025 mg/L, approximately 8 times higher than the long-term applicable guideline (total cadmium) and 6 times the applicable guideline (dissolved) and over 490 times the modelled upper baseline.
- Total fluoride concentrations are expected to be 0.21 mg/L, approximately 1.7 times higher than the long-term applicable guideline and 4.7 times the modelled expected baseline.

Significance of Residual Effects

The Project will result in changes to surface water quantity within the MacLellan site LAA. Project-induced changes to surface water quantity have the potential to cause adverse effects to fish through changes in fish habitat. The Project will result in changes to surface water quality within the MacLellan site LAA. Project-induced changes to surface water quality have the potential to cause adverse effects to fish and other aquatic biota exposed to elevated concentrations of the identified POPCs.

With mitigation and environmental protection measures, the residual environmental effects on surface water quantity and quality are predicted to be not significant as the predicted changes are not expected to exceed a 30% relative change from existing conditions in lake levels and streamflows and are not expected to result in community (i.e., species composition and relative abundance) or population-level effects (i.e., survival, growth, or reproduction) to fish and aquatic life. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.5 FISH AND FISH HABITAT

6.5.1 Existing Environment

Most of the lakes near the MacLellan site are shallow (less than 4 m deep) and do not stratify during the summer. Background surface water quality generally reflects geochemistry of the Precambrian Shield. Lakes and streams are typically low in dissolved ions, soft, and neutral to slightly acidic in pH. Some parameters (e.g., dissolved oxygen, pH, total phosphorus, aluminum, chromium, and iron) are naturally elevated and occasionally do not meet water quality guidelines. Common large-bodied species include northern pike, walleye, lake whitefish (*Coregonus clupeaformis*), white sucker (*Catostomus commersoni*), yellow perch (*Perca flavescens*), and burbot (*Lota lota*). Common small-bodied fish species include emerald shiner (*Notropis atherinoides*), spottail shiner (*Notropis hudsonius*), brook stickleback and slimy sculpin (*Cottus cognatus*). Northern pike, walleye and lake whitefish are the most commonly angled fish in the area. One aquatic species at risk, the western Hudson Bay populations of lake sturgeon (*Acipenser fulvescens*), is reported to be present in the Keewatin River. No other species at risk are expected within the LAA. Lake sturgeon is classified as “endangered” by the Committee on the Status of Endangered Wildlife in Canada.

Lakes at the MacLellan site are generally shallow (average depths <3 m) except for East Pond, Macrophytes are abundant in all lakes within the LAA at the MacLellan site and were the dominant or co-dominant cover type in the littoral zone of most lakes. Most of the lakes within the LAA at the MacLellan



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site provide spawning, rearing, and overwintering habitat for large-bodied and small-bodied fish species. Except for the Keewatin and Cockeram rivers. Streams at the MacLellan site are generally small (<5 m wide and <1 m deep) with low gradients (<1%), fine silt and organic substrates, and numerous beaver dams. Cover types include aquatic and overhanging vegetation, debris, and boulders.

A total of 17 fish species are known to occur in the lakes and streams near the Project. Small-bodied fish species are most prevalent in streams and small, shallow lakes including: brook stickleback, ninespine stickleback (*Pungitius pungitius*), log perch (*Percina caprodes*), trout perch (*Percopsis omiscomaycus*), emerald shiner, spottail shiner, longnose dace (*Rhinichthys cataractae*), lake chub (*Couesius plumbeus*), and slimy sculpin. Large-bodied fish species are more prevalent in larger, deeper lakes and include northern pike, walleye, yellow perch, lake whitefish, burbot, cisco (*Coregonus artedii*), white sucker, and longnose sucker (*Catostomus catostomus*). Larger lakes, such as Cockeram Lake, typically support a greater diversity of fish and fish habitat than smaller lakes in the Project area. Northern pike are the most widespread large-bodied species in the lakes of the Project area, while brook stickleback are the most widespread small-bodied species in the lakes and streams. Northern pike and brook stickleback were the most widely distributed fish species in the lakes at the MacLellan site. Measured levels of metals in fish tissue were generally low and below guideline concentrations for protection of aquatic life and human consumption. Sediments at the sample sites in the LAA at the MacLellan site were composed largely of silt and clay with metal concentrations generally below guidelines. Several sediment quality guideline exceedances were observed at the sample sites at the MacLellan site, indicating that the former ETMA, located immediately east of the Town of Lynn Lake and adjacent to the Lynn River and Eldon Lake, has resulted in elevated metal concentrations in the sediments of lakes and streams downstream from historic mining activities.

6.5.2 Environmental Effects

6.5.2.1 Change to the Environment

The potential environmental effects of the Project on fish and fish habitat prior to mitigation, include:

- change in fish habitat
- change in fish health, growth, or survival

During the construction phase, changes in fish and fish habitat will result from alteration of surface water flows from changes to watershed boundaries through project infrastructure such as the sumps, ponds, and drainage ditches. Changes to physical habitat will also occur in the MacLellan site LAA due to new road crossing infrastructure and the new intake structure in the Keewatin River. During the operation phase, changes to fish and fish habitat will result from alterations in surface flows from changes in the groundwater table with the presence of the open pits and from the operation of project infrastructure such as drainage ditches, sumps, and water withdrawals. These alterations are expected to impact hydraulically connected waterbodies (i.e., East Pond and the East Pond outlet, located south of the open pit at the MacLellan site, and the Keewatin River). During the decommissioning/closure phase, fish and fish habitat changes will result from alteration of surface flows as groundwater fills the open pit, affecting the water table and releasing water to the Keewatin River via a new trench.



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At the MacLellan site, changes to fish health, growth and survival will result from the release of sediment, from dewatering of the existing underground mine workings during the construction phase, and from discharge of contact water during construction and operation. Additional effects on fish health, growth and survival will result from the discharge of effluent from the wastewater treatment plant, from seepage of the TMF during operation, closure, and post-closure, and from overflow from the open pit to the Keewatin River tributary at the end of the decommissioning/closure phase.

6.5.2.2 Mitigation Measures

Most of the mitigation measures to reduce Project-related effects on fish habitat are related to avoidance measures and to the mitigation measures proposed to reduce Project-related effects on surface water quantity (Section 6.4.2.2, above). Additional mitigation measures relating to availability of habitat area are:

- Sizing new culverts to convey the 1:100-year flood and using open-bottom structures where practical to maintain fish habitat values and fish passage.
- New road crossings will be sized and installed following Manitoba Infrastructure guidelines (DFO and MNR 1996).
- Designing open pit outlets so they are impassable to fish, to discourage fish from colonizing open pits in post-closure.

Mitigation measures to avoid or reduce the Project-related changes in fish habitat, including those potentially due to changes in groundwater and surface flows, at the MacLellan site are:

- Restricting water withdrawal rates from the Keewatin River to <10% of instantaneous discharge at all times.
- Collecting and conveying non-contact water to the collection pond for discharge to the Keewatin River during operation.
- Designing the TMF with two cells to allow progressive development during operation to reduce water management requirements.
- Recycling water between the processing facility and the TMF to reduce fresh-water requirements from the Keewatin River during operation.
- Implementing soil covers and vegetation to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity at closure.
- Directing water from the TMF and MRSA to the open pit during closure to reduce the filling period.

Additional mitigation measures to reduce potential effects of the Project to fish habitat, including standard mitigation measures identified in DFO's "Measures to Protect Fish and Fish Habitat" (DFO 2019), are:

- Limit disturbance areas around waterbodies to maintain existing riparian vegetation and promote recovery of riparian vegetation by marking buffer zones around sensitive habitats and work areas; using

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existing access routes; reducing soil compaction by using weight-distributing materials under machinery.

- Maintain fish passage by avoiding obstructing watercourses or otherwise interfering with fish movement.

Most of the mitigation measures to reduce Project-related effects on fish health, growth, or survival are the same as those proposed to reduce Project-related effects on surface water quality (Section 6.4.2.2).

Mitigation measures to reduce potential effects of changes in surface water quality on fish health, growth, or survival at both sites are:

- Grading perimeter and access roads to divert runoff away from the open pit and fish-bearing waterbodies.
- Maintaining access roads by periodically regrading and ditching to improve water flow and reduce erosion.
- Using dust suppression measures (Section 6.1.2.2) for exposed ground areas within the PDA during dry periods as necessary to reduce dust deposition to surface waters.
- Constructing non-contact water ditches upslope of overburden stockpiles, MRSAs, ore stockpiles, mine infrastructure and the TMF to reduce contact water volumes.
- Constructing contact water collection ditches around the MRSAs, overburden stockpiles, and ore stockpiles to convey the 1:25-year storm event to collection ponds.
- Constructing contact water collection ponds to contain (without discharge) run-off from a 1:100-year storm event with active storage that considers maximum ice thickness in winter.
- Designing collection pond inlets and outlets to reduce water velocities, scour (erosion of sediment) and pond stratification potential (chemical or thermal).
- Maintaining culverts in access road crossings to remove accumulated material and debris to reduce erosion, flooding, and sediment mobilization.
- Implementing sediment and erosion control measures during construction to limit the release of total suspended solid (TSS) and turbidity in lakes and streams.
- Implementing Project-specific environmental management and monitoring programs including:
 - Surface Water Monitoring and Management Plan (federal EIS Chapter 23, Section 23.5.5).
 - Groundwater Monitoring Plan (federal EIS Chapter 23, Section 23.5.4).
 - Explosives Management Plan (federal EIS Chapter 23, Section 23.5.10).
 - Erosion and Sediment Control Plan (federal EIS Chapter 23, Section 23.5.13).



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- Wildlife Monitoring and Management Plan (federal EIS Chapter 23, Section 23.5.14).
- Emergency Response and Spill Prevention and Contingency Plans (federal EIS Chapter 23, Section 23.5.1), which will include the measures listed in Measures to Protect Fish and Fish Habitat (DFO 2019).
- Implementing soil covers and vegetation to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity at closure.
- Filling the open pit at closure with contact water to reduce the duration of pit wall exposure and to return groundwater levels to baseline conditions.

Mitigation measures to reduce potential effects of changes in surface water quality on fish health, growth, or survival that are specific to the MacLellan site are:

- Constructing contact water collection ditches around the TMF to convey the 1:25-year storm event to the collection pond.
- Pumping water from the existing underground works to the TMF for storage and eventual use in the processing facility.
- Designing the TMF with two cells to allow progressive development during operation to reduce water management requirements.
- Operating the TMF as a non-discharging facility during operation through reclaiming TMF water for use in the ore processing mill.
- Recycling water between the TMF and the mill to the maximum extent possible during operation to reduce fresh-water make-up requirements.
- Using a closed circuit for cyanide use and cyanide destruction in the processing plant (via Air/SO₂ oxidation and precipitation of metals) prior to release to the TMF.
- Constructing groundwater cut-off ditches to reduce the volume of groundwater seepage from the TMF entering Minton Lake during post-closure.
- Treating domestic waste in an average 60,000 L/day sewage treatment plant so that it meets “Wastewater Systems Effluent Regulations” under the *Fisheries Act* prior to discharge to the Keewatin River via a pipeline and diffuser.
- Implementing soil covers and vegetation to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity at closure.
- Implementing passive treatment options (e.g., controlled pit stratification, amendment, flow segregation) in the open pit if required, should monitoring show that pit water quality is not suitable for release to the environment during the timeframe anticipated to fill the open pit with water at the conclusion of operation.



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Additional mitigation measures to reduce potential effects of the Project to the health, growth, or survival of fish and aquatic biota are:

- Requiring heavy machinery working near water to be kept in good working condition, to be re-fueled no closer than 50 m from any waterbody or watercourse, and to be filled with biodegradable hydraulic fluids.
- Identifying and flagging riparian zones within which heavy machinery is prohibited from entering.
- Limiting in-water works to outside of the northern Manitoba Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat (DFO 2020b) as practical.
- Isolating in-water work areas and conducting fish rescues, including East Pond at the MacLellan site, and other locations where instream construction will be required.
- Implementing runoff, erosion, and sediment control measures to reduce the amount of water available to become sediment laden, the amount of sediment that is mobilized through erosion, and the amount of sediment that is conveyed to waterbodies. Additional details are available in Erosion and Sediment Control Plan as described in the federal EIS (Chapter 23, Section 23.5.13). The final plan will include the measures listed in the Measures to Protect Fish and Fish Habitat (DFO 2019).
- Monitoring the effectiveness of construction management plan mitigation measures during construction activities near water, including total suspended solids and/or turbidity and comparing measured values to MWQSOG (MWS 2011) and CCME guidelines (CCME 2002).
- Installing screens on the water intakes that are sized using DFO's "Interim Code of Practice: End of Pipe Fish Protection Screens for Small Water Intakes in Freshwater" (DFO 2020a). The screens will be sized based on the weakest swimming fish species in the Keewatin River (burbot, an anguilliform swimming species) and Farley Lake (white sucker and yellow perch, two subcarangiform swimming fish species).
- Restricting water withdrawal rates to <10% of the instantaneous discharge of the Keewatin River at all times.
- Limiting the size, timing, and setback distances of blasting charges to avoid percussive injuries to fish or damage to incubating eggs. Blasting protocols tailored to the MacLellan site and its fish species assemblages will be developed during Project permitting, using guidance outlined in the "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky 1998).
- Establishing and enforcing a worker code-of-conduct for employees brought into work at the LLGP that would limit potential over-fishing of lakes, stream, and rivers in the Project area (e.g., restricting fishing in lakes or streams of a specific size, those used by local Indigenous communities for subsistence or traditional purposes, or determined to contain already depressed populations by Manitoba Conservation and Climate).



6.5.2.3 Residual Effects

The main adverse residual environmental effect on fish habitat is direct losses of fish habitat and changes to water quality affecting fish health and survival. For effects to fish habitat, with the development of the Fish Habitat Offsetting Plan as described in the federal EIS (Chapter 23, Section 23.5.15), no net loss to habitat is expected. For effects to fish health and survival, modelling was used to predict water quality at various nodes in lakes and streams at the MacLellan site and are summarized below.

For the MacLellan site, the following POPCs were identified for the “expected case”: total aluminum, total arsenic, total and dissolved cadmium, total copper, and total fluoride. Using site-specific baseline data for dissolved organic carbon, hardness, and pH from the small Keewatin River tributary (KEE3-B1), the maximum predicted concentrations of total aluminum were found to be approximately five times lower than the US EPA (2018) total aluminum long-term guideline. Total arsenic concentrations were predicted to be higher than applicable guidelines in two months during post closure; otherwise concentrations are predicted to be well below guidelines levels (<0.02 mg/L). For cadmium, water quality modelling results indicated that predicted total and dissolved cadmium guideline exceedances were predicted to occur during post-closure. Alamos will monitor water quality in the open pit as it fills with water and amend water quality in the open pit, if necessary, prior to its discharge to the small Keewatin River tributary. For copper, water quality modelling results indicated that while total copper concentrations are predicted to exceed the long-term total copper CEQG during post-closure, the occurrences are rare, the magnitude of exceedance is low, and the CEQG is likely over-conservative based on the relationship between copper toxicity and water hardness. For fluoride, water quality modelling results indicated that the maximum predicted fluoride concentration in the small Keewatin River tributary is 0.21 mg/L, which is below this fluoride toxicity benchmark.

Alamos will request a Fisheries Act Authorization from DFO for the “harmful alteration, disruption or destruction” of fish habitat that will occur with the East Pond at the MacLellan site.

Significance of Residual Effects

With planned mitigation and environmental protection measures, the residual environmental effects on fish and fish habitat are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.6 VEGETATION AND WETLANDS

6.6.1 Existing Environment

The RAA is located within the Boreal Shield Ecozone, Churchill River Upland Ecoregion, Reindeer Lake Ecodistrict, which is dominated by black spruce dominated uplands and permafrost and non-permafrost wooded bogs and patterned fens (Smith et al. 1998). Almost half of the LAA is upland (6,992 ha, 46%), much of the other half is wetland (6,452 ha, 42%), with the remaining areas classified as water (1,353 ha, 9%) and anthropogenic (484 ha, 3%). Conifer-dominated forests are the most common forest type occurring throughout the LAA and RAA, with most being dense, followed by open and sparse. Mixedwood forests were also present in the LAA and RAA but were much less common. Wildfires have occurred within the



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RAA and are a natural disturbance on the landscape that result in a mosaic of various successional stages within habitat patches.

Field surveys documented 200 plant species within the Project area. A total of 19 species of conservation concern (SOCC) have been documented in the Churchill River Upland Ecoregion; however, no federally protected plant species listed under *Species at Risk Act* grow in the habitat types found in the RAA. Occurrences of provincially ranked SOCC were recorded in the RAA including Lake Quillwort (*Isoetes lacustris*), small water-lily (*Nymphaea tetragona*), Northern woodsia (*Woodsia alpine*), Shrubby willow (*Salix arbusculoides*), and Boreal locoweed (*Oxytropis borealis*); however, no SOCC were found to occur within the PDA.

All the species of interest to Indigenous communities were recorded in the RAA and are common species in Manitoba with the exception of small water lily and shrubby willow. Commonly occurring species (average >20% cover) include various species of birch, jack pine, moss, and spruce. Less commonly occurring species observed include Mooseberry (*Viburnum edule*), Red raspberry (*Rubus idaeus*), and Wild strawberry (*Fragaria virginiana*) (1 observation each).

6.6.2 Environmental Effects

6.6.2.1 Change to the Environment

The potential environmental effects of the Project on vegetation and wetlands prior to mitigation, include:

- change in landscape diversity
- change in plant community diversity
- change in plant species diversity
- change in wetland function

During construction, changes to vegetation and wetlands will occur during site preparation, water development and control, and through emissions, discharges, and wastes at the MacLellan site. During operation, effects to vegetation and wetlands are not anticipated, except from water management and emissions, discharges, and wastes at the site since no additional clearing is anticipated in this phase. Decommissioning of the mine site will occur within existing disturbance and will not result in greater fragmentation, and thus not negatively interact with vegetation and wetlands. Reclamation at the MacLellan site may positively affect landscape, community and species diversity and wetland functions by reclaiming to native upland or native wetland state in some areas.



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6.6.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on vegetation and wetlands at the MacLellan site:

- Native areas disturbed by the Project will be covered and reseeded using a native upland seed mix for rehabilitation and to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity at closure.
- Equipment will arrive at Project site clean and free of soil and vegetative debris. Equipment will be inspected and, if deemed to be in appropriate condition, will be approved for use and identified with a suitable marker or tag. Equipment that does not arrive at the Project site in appropriate condition will not be allowed on the construction footprint until it has been cleaned, re-inspected and deemed suitable for use.
- Sensitive areas, such as wetlands, will be buffered by 30 m and clearly marked prior to clearing.
- Silt fencing will be installed and maintained to reduce entry of deleterious substances to wetlands or waterbodies as described in the federal EIS (Chapter 23).
- Vegetation clearing will occur during dry and frozen conditions, when possible.
- A protective layer such as matting or biodegradable geotextile and clay ramps or other approved materials will be used between wetland root/seed bed and construction equipment if ground conditions are encountered that create potential for rutting, admixing or compaction.
- A native seed mix will be used to assist in reducing invasive plant species spread and establishment as well as for erosion control on exposed soils.
- Topsoil and subsoil piles will be monitored for invasive plant species growth during construction and corrective measures (e.g., spraying, mowing, hand-pulling) will be implemented to avoid growth and establishment.
- Certified No. 1 seed will be used to reseed areas, unless Certified No. 1 seed is not available for selected reclamation species (i.e., native species).
- Unless a certificate of weed analysis can be provided, construction material sources used for supplies of sand, gravel, rock, straw, and mulch will be visually inspected to determine whether they are free of invasive species propagules to the extent possible. If sources are suspected as having invasive species propagules, they will be sampled, and lab analyzed to determine whether they meet the requirements of the responsible regulatory agency prior to obtaining or transporting material to the Project site. If sampling cannot be completed, post construction monitoring for invasive species will be completed.
- If pesticide use is required, a permit will be obtained under *The Environment Act* (Manitoba).
- Known occurrences of SOCC will be avoided. If avoidance of plant SOCC is not possible, seed collection or transplant of the plant will be considered.



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- Broad-spraying herbicide within 30 m of plant species or ecological communities of conservation concern, wetlands or waterbodies will not be conducted. Spot spraying, wicking, mowing, or hand picking are acceptable measures for control of regulated weeds in these areas.
- Dust suppression, as described in Section 6.1.2.2 above will be applied.
- Sediment fencing and/or other appropriate measures will be used to prevent erosion and siltation into adjacent wetlands as described in the federal EIS (Chapter 23).
- Grading will be directed away from wetlands, where possible.
- The removal of vegetation in wetlands will be reduced to the extent possible.
- Ground level cutting/mowing/mulching of wetland vegetation instead of grubbing, will be conducted where possible.
- Grading within wetland boundaries will be reduced unless required for site specific purposes.
- Cross drainage will be maintained to allow water to move freely from one side of the road to the other in areas of permanent or temporary access roads.
- Frost packing, snow, ice, geotextile swamp mats or access mat will be used for access through wet areas.

6.6.2.3 Residual Effects

For residual effects on landscape diversity at the MacLellan site, it was determined that some vegetation patches will be totally lost during construction and operation; however, with the reclamation of the site, the result is a low magnitude, positive change in the RAA for the long-term.

For residual effects on community diversity, the Project will result in a loss of 370.9 ha of wetland plant communities, and an addition of 576.3 ha of reclaimed upland and 61.8 ha of water in the LAA of the MacLellan site. Change in plant community diversity will largely occur once during the construction and operation; however, indirect effects to plant communities from dust deposition will occur continuously, resulting in overall adverse effects to community diversity during construction that will last through operation.

For residual effects on species diversity, construction and operation at the MacLellan site are not anticipated to directly affect known plant SOCC occurrences; however, SOCC and plants of interest to Indigenous communities may be indirectly adversely affected by drawdown from dewatering of the open pit and dust deposition.

For residual effects on wetland function, construction is expected to result in a direct wetland loss of 370.9 ha at the MacLellan site. Groundwater drawdown during construction and operation at the MacLellan site may alter the class, plant species composition and decomposition rates of wetlands. Dewatering may also result in the thawing of permafrost within the LAA of the MacLellan site, reducing carbon sequestration. The



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results overall indicate a direct and indirect reduction to wetland function; however, loss of a type of wetland function is not expected in the RAA.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on vegetation and wetlands are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.7 WILDLIFE AND WILDLIFE HABITAT

6.7.1 Existing Environment

The Project is located in the Boreal Shield Ecozone, Churchill River Upland Ecoregion, and Reindeer Lake Ecodistrict (Smith et al. 1998), which is characterized by coniferous boreal forest and poorly drained peatlands, underlain with glacial deposits and Precambrian bedrock.

Baseline data indicates the Project area is home to American marten, American red squirrel (*Tamiasciurus hudsonicus*), beaver, black bear, Canadian lynx (*Lynx canadensis*), fisher (*Martes pennant*), grey wolf (*Canis lupus*), mink (*Neovison vison*), moose, red fox (*Vulpes Vulpes*), river otter (*Lontra canadensis*), snowshoe hare (*Lepus americanus*), weasel (*Mustela erminea*), wolverine (*Gulo gulo*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), little brown myotis (*Myotis lucifugus*), and various small rodents (e.g., voles).

Results of field studies and background data collection indicate that 33 mammal species potentially occur in the RAA, 20 of which were observed during field studies, including woodland caribou. A total of 101 wildlife species were observed during baseline surveys: 20 mammals, 79 birds, two amphibians. Focal mammalian species include boreal woodland caribou (*Rangifer tarandus caribou*), moose, gray wolf, black bear, and American marten. The Project does not overlap the modern range of barren-ground caribou (*Rangifer tarandus groenlandicus*).

One hundred and ninety-eight bird species have the potential to breed in the Project area (MB BBA 2019): 62 waterbirds, four upland gamebirds, 18 raptors, and 114 songbirds. Common birds observed during baseline studies were mallard (*Anas platyrhynchos*), ring-necked duck (*Aythya collaris*), Canada goose (*Branta canadensis*), common loon (*Gavia immer*), swamp sparrow (*Melospiza georgiana*), ruby-crowned kinglet (*Regulus calendula*), Tennessee warbler (*Oreothlypis peregrina*), dark-eyed junco (*Junco hyemalis*), and yellow-rumped warbler (*Setophaga coronate*).

Two amphibian species were detected during baseline field surveys and are known to breed within the RAA: wood frog (*Lithobates sylvaticus*) and boreal chorus frog (*Pseudacris maculate*). The boreal habitats within the RAA support a diverse insect community, including beetles, moths, and spiders, mayflies, and dragonflies.

The RAA overlaps the current or historical ranges of 14 species at risk (SAR), including four mammals (little brown myotis, northern myotis (*Myotis septentrionalis*), wolverine, woodland caribou); eight birds (horned



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grebe (*Podiceps auratus*), yellow rail (*Coturnicops noveboracensis*), short-eared owl (*Asio flammeus*), common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus cooperi*), bank swallow (*Riparia riparia*), barn swallow (*Hirundo rustica*), and rusty blackbird (*Euphagus carolinus*); one amphibian (northern leopard frog (*Lithobates pipiens*)), and one insect (yellow-banded bumble bee (*Bombus terricola*)) (Government of Canada 2019). The RAA also overlaps the current ranges of three SOCC including two birds (trumpeter swan (*Cygnus buccinator*) and evening grosbeak (*Coccothraustes vespertinus*)), and one insect (transverse lady beetle (*Coccinella transversoguttata*)) (Government of Canada 2019). Field observations of SAR and SOCC during project specific baseline studies included little brown myotis, wolverine, common nighthawk, olive-sided flycatcher, barn swallow, and woodland caribou. The Project is located in the Province of Manitoba's woodland caribou Kamuchawie Management Unit, and woodland caribou are reported to typically occur more than 80 km southwest of the RAA (pers. comm. 2015). The Project (MacLellan site) also overlaps the Manitoba North Range (MB9), an area delineated as potentially containing critical habitat for woodland caribou; however, habitat within the RAA contains a relatively high degree of disturbance (i.e., Town of Lynn Lake, MacLellan site, fires within 40 years) and currently provides limited suitable habitat for woodland caribou.

Wildlife habitat in the RAA is a mosaic of terrestrial and wetland habitats intersected by extensive stream and lake systems that is relatively undisturbed. Some wildlife species may be more sensitive to Project-related environmental effects and some species also warrant additional regulatory concern, such as SAR. Mortality risk in the RAA is primarily attributable to traffic-related mortality, hunting and trapping activities, and predation while wildlife health in the RAA is related largely to water quality and ambient air quality.

6.7.2 Environmental Effects

6.7.2.1 Change to the Environment

The potential environmental effects of the Project on wildlife and wildlife habitat prior to mitigation, include:

- change in wildlife habitat
- change in wildlife mortality risk
- change in wildlife health

During the construction phase, effects on wildlife and wildlife habitat are related primarily to site preparation activities causing habitat loss, habitat disturbance, sensory disturbance and health effects from emissions, discharges, and wastes, and mortality risks related to vehicle transportation. Construction related emissions, discharges, and wastes are not anticipated to be at levels that would be lethal to wildlife or that would affect wildlife mortality risk.

During the operation and the decommissioning/closure phases, it is anticipated that activities and infrastructure will be located on cleared, disturbed land and that no wildlife will be present, resulting in no additional effects on wildlife habitat. Emissions, discharges, and wastes during these phases is also anticipated to be the primary pathway of effects on wildlife health and wildlife habitat; however, exposures to wildlife are not anticipated to be at levels that would be lethal; therefore, no changes are anticipated to



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wildlife mortality risk during these phases. Traffic-related mortality along PR 391 is included in the assessment for the Gordon site.

6.7.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on wildlife and wildlife habitat at the MacLellan site:

- Design for limitation of construction footprint (i.e., PDA) to the extent possible.
- Design for use of down-lighting, a technique of directing night lighting downward, to reduce light effects on wildlife adjacent to the PDA.
- Design for maintenance of a 30 m naturally vegetated buffer around wetlands, waterbodies, and watercourses.
- Design for restriction of unauthorized access to habitat adjacent to the PDA.
- Design for provision of low areas in the ploughed snowbanks of access and on-site roads, where practical, to facilitate wildlife movements across and out of road corridors.
- Design for scheduling vegetation clearing and site preparation activities outside the breeding period for migratory birds (Zone C7; May 7 to August 7; ECCC 2019). If activities that could result in risk of harm cannot be avoided, Alamos will develop and implement a Project-specific Wildlife Monitoring and Management Plan that outlines how risk of harm will be managed in accordance with ECCC guidance (federal EIS Chapter 23). This plan would be developed in liaison with ECCC and federal agencies.
- Flag environmentally sensitive areas (e.g., seeps and springs, mineral licks, dens, roosts, stick nests, hibernacula) prior to clearing and construction, and evaluation of the features for additional mitigation measures (e.g., setbacks).
- Retain actual or potential habitat trees where safe and technically feasible to do so. If removal is required, removal activities will be scheduled, to the extent practical, outside the core maternity roosting season for bats (May 1 to August 31; Fenton and Barclay 1980; Barclay 1982, 1984) and breeding season for birds (Zone C7; May 7 to August 7; ECCC 2019). If habitat tree removal or general tree clearing is required during the maternity roosting period, a qualified biologist will review the trees to make a determination on occupancy before removal. This measure will also reduce the risk to other species that use trees for denning or shelter (e.g., American marten).
- Maintain vegetation cover along the boundaries of high activity areas (e.g., access roads) to reduce sensory (noise and visual) disturbance.
- Report the discovery of nests or other animal dwellings (e.g., lodges, dens) to Alamos, and appropriate action or follow-up will be guided by the Wildlife Monitoring and Management Plan (federal EIS Chapter 23). Report to the Wildlife and Fisheries Branch of DARD for direction on follow-up actions in necessary.



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- Demolish existing buildings and infrastructure outside of the nesting window for birds (Zone C7; May 7 to August 7; ECCC 2019) and the maternity roosting period for bats (May 1 to August 31; Fenton and Barclay 1980; Barclay 1982, 1984) as per the Wildlife Monitoring and Management Plan.

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on wildlife and mortality at the MacLellan site:

- Design for scheduling vegetation clearing and site preparation activities outside the breeding period for migratory birds (Zone C7; May 7 to August 7; ECCC 2019). If activities that could result in risk of harm cannot be avoided, Alamos will develop and implement a Project-specific Wildlife Monitoring and Management Plan that outlines how risk of harm will be managed in accordance with ECCC guidance (federal EIS Chapter 23). This plan would be developed in liaison with ECCC.
- Flag environmentally sensitive areas (e.g., amphibian breeding ponds, dens, roosts, stick nests, hibernacula) prior to clearing and construction, and evaluation of the features for additional mitigation measures (e.g., setbacks).
- Report the discovery of nests or other animal dwellings (e.g., lodges, dens) to Alamos, and appropriate action or follow-up will be guided by the Wildlife Monitoring and Management Plan (federal EIS Chapter 23, Section 23.5.15). Report to the Wildlife and Fisheries Branch of DARD for direction on follow-up actions, as necessary.
- Retain actual or potential habitat trees where safe and technically feasible to do so. If removal is required, removal activities will be scheduled, to the extent practical, outside the core maternity roosting season for bats (May 1 to August 31; Fenton and Barclay 1980; Barclay 1982, 1984) and breeding season for birds (Zone C7; May 7 to August 7; ECCC 2019). If habitat tree removal or general tree clearing is required during the maternity roosting period, a qualified biologist will review the trees to make a determination on occupancy before removal. This measure will also reduce the risk to other species that use trees for denning or shelter (e.g., American marten).
- Implement road safety measures such as speed limits and signage to reduce the chance for wildlife collisions both on site and between sites.
- Report wildlife encounters and problem wildlife concerns or sightings to Alamos and appropriate action or follow-up will be guided by the Wildlife Monitoring and Management Plan.
- Follow best management practices for general site housekeeping to reduce wildlife attraction (e.g. food and chemical storage, prompt removal of roadkill).
- Include wildlife awareness training during site orientation to reduce the risk of human-wildlife conflict.
- Control site access by resource users during post-closure.
- Demolish existing buildings and infrastructure outside of the nesting window for birds (Zone C7; May 7 to August 7; ECCC 2019) and the maternity roosting period for bats (May 1 to August 31; Fenton and



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Barclay 1980; Barclay 1982, 1984) as per the Wildlife Monitoring and Management Plan (federal EIS Chapter 23).

- Maintain cyanide concentrations below guidelines. Project activities will be aligned with the standards of practice set out in the International Cyanide Management Code.
- Manage vegetation around collection ponds and the TMF to deter wildlife and consider additional mitigation measures (e.g., fencing, netting, bird/bat deterrents) if monitoring identifies concerns regarding wildlife use of these areas.

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on wildlife health at the MacLellan site:

- Project infrastructure and facilities designed to avoid sensitive areas (e.g., watercourses, important habitat types) to the extent possible, within watershed boundaries, and PDA reduced to the extent practical.
- Design and maintenance for control of fugitive dust emissions from roads, material handling, and storage areas/stockpiles and from equipment emissions as described in the federal EIS (Chapter 5, Section 6.4.1.3).
- Design for administrative controls, including a no idling policy to reduce emissions from vehicles and mobile equipment.
- Design for adherence to applicable Transport Canada emission requirements for new mobile equipment on site.
- Design for use of perimeter berms and runoff and contact-water collection ditches as described in the federal EIS (Chapter 9, Section 9.4.1.3 and Chapter 8, Section 8.4.3.2).
- Design for fuel storage in approved above ground storage tanks equipped with secondary containment systems in accordance with federal and provincial regulation and standards.
- Design of sewage treatment plant and water management facilities to treat effluent to levels that will meet applicable federal and provincial guidelines of toxicity.
- Dispose and handle waste oils, fuels, and hazardous waste as recommended by the suppliers and/or manufacturers in compliance with federal, provincial, and municipal regulations.
- Bird deterrents, if required, to keep migratory birds from using collection pond during construction and operation and/or the open pit during closure.
- Design for enclosure of mill feed storage area and use of wet scrubbers (or equivalent) as described in the federal EIS (Chapter 6, Section 6.4.1.3).
- Design of water management facilities to collect and treat (as required) surplus contact water and design for cyanide detoxification as described in the federal EIS (Chapter 9, Section 9.4.2.3).



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- Manage vegetation around collection ponds and the TMF and consider additional mitigation measures (e.g., fencing, netting, bird/bat deterrents) if monitoring identifies concerns regarding wildlife use of these areas.
- Bird deterrents, if required, to keep migratory birds from using the TMF and contact ponds during construction and operation and/or the open pit during closure.

6.7.2.3 Residual Effects

Wildlife Habitat

Residual effects on wildlife habitat during the construction phase are related to the direct loss or alteration of habitat within the LAA. Species that occupy disturbed and rocky habitats, such as common nighthawk, are most likely to be affected by the alteration of developed land, whereas birds, furbearers and moose are most likely to be affected following the loss of the terrestrial and wetland habitats. An indirect loss or alteration of wildlife habitat is also expected through sensory disturbance, edge effects, and altered wetland function that can result in habitat avoidance and reduced habitat effectiveness for wildlife, including migratory birds, SAR and SOCC, moose, and furbearers, in areas adjacent to the PDA.

During the operation phase, residual effects on wildlife habitat are related to the indirect loss or alteration of wildlife habitat through sensory disturbance resulting in habitat avoidance and reduced habitat effectiveness for wildlife in areas adjacent to the PDA, as described above during the construction phase. Chronic sensory disturbance during mining operation will terminate following completion of operation phase. Increased traffic volumes associated with the Project may increase the existing level of indirect effects to wildlife (i.e., avoidance) along PR 391, but effects are not expected to extend far beyond the PDA. The effects to wildlife resulting from sensory disturbance are expected to be similar to those described above during the construction phase. Wildlife occupying the LAA are already subject to some degree of altered habitat effectiveness and it is expected that sensory disturbance from the Project will temporarily increase the degree of altered habitat effectiveness causing some wildlife species to potentially avoid the portions of the LAA or relocate to undisturbed areas.

During the decommissioning/closure phase, potential Project-related environmental effects for a change in habitat, both direct and indirect, are largely positive, with the exception of the removal of mine infrastructure which may adversely affect species such as barn swallow that rely on anthropogenic structures for nesting. There will be a long-term benefit to wildlife and wildlife habitat compared to baseline conditions following reclamation and closure of the MacLellan site.

With the implementation of the proposed mitigation measures, the overall effect on wildlife habitat is anticipated to be low in the construction and operation phases, resulting in a <10% and <5% change in wildlife habitat and SAR and SOCC habitat in the LAA, respectively.

Wildlife Mortality Risk

Residual effects on wildlife mortality are largely related to site preparation activities during the construction phase, including vegetation clearing and earthworks. During construction, there is potential for increased



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mortality risk to small mammals and amphibians due to their limited mobility, risks to overwintering amphibians and mammals, as well as increased risk of vehicle-related wildlife mortality.

During operation, effects to wildlife mortality risk are largely related transportation of ore to on-site stockpiles and to the mill and other Project-related traffic. Increased mortality risk due to traffic is anticipated to be short-term. An increase in mortality risk is also possible where the trapping of problem beavers at water control structures is required, potential increase in drowning at the TMF at the MacLellan site, potential for bird collisions with towers and guy wires, and human-wildlife conflicts from animals attracted to wastes generated at the site (e.g., bears).

During the decommissioning/closure phase of the Project, activities are expected to have similar residual effects as those described above for the construction phase. The closure phase and post-closure activities are expected to have more enduring effects, primarily as it relates to the indirect mortality of wildlife resulting from increased access by predators to the site such as wolves and humans to gain access to prey species. Given that the Project will not result in increased linear features or create new access to sites, residual incremental effects are deemed to be low.

SAR and SOCC are not uniquely susceptible to a change in mortality risk during all project phases in comparison to other species.

Wildlife Health

Residual effects on wildlife health during the construction phase are associated with air emissions (i.e., combustion products, rock dust) from Project activities (e.g., vehicular traffic). With the implementation of the proposed mitigation measures, the residual effect on wildlife health resulting from fugitive dust escaping into the environment is expected to be low. During operation, residual effects on wildlife health are expected to increase with the increase in air emissions produced during operation activities. Air emissions will be continuous through operation and some heavy metals contained in rock dust are known to be persistent in the environment, and potentially toxic to wildlife. With the implementation of mitigation measures (e.g., dust control), the residual effects of operation of the Project on wildlife health at the site is expected to be low. Similar effects are anticipated with the addition of the milling and processing of ore during operation and the TMF which may create additional residual effects on wildlife health. These additional effects during the operation phase are associated with water management ponds, chemical contamination of the environment from the TMF, and an increase in air emissions (i.e., rock dust) from the mill and processing plant. Based on results from the ecological risk assessment, the overall residual effect on wildlife health is anticipated to be negligible to low at the site.

During decommissioning/closure, residual effects on wildlife are expected to be similar to those described above during the construction and operation phase. SAR and SOCC and migratory birds are not uniquely susceptible to a change in wildlife health during the project phases in comparison to other species.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on wildlife and wildlife habitat are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.



6.8 LABOUR AND ECONOMY

6.8.1 Existing Environment

The Town of Lynn Lake, Manitoba, and the community of Marcel Colomb First Nation (on Black Sturgeon Reserve, Manitoba), represent all populated Census Subdivisions within 30-km of the MacLellan site and are included in the LAA. The RAA encompasses other Census Subdivisions within 100 km of the MacLellan site including the Town of Leaf Rapids and the community of Granville Lake. The population of Lynn Lake was recorded to be 490 in 2016 with an Indigenous population of approximately 48% (Statistics Canada 2017a). The town of Leaf Rapids has an estimated population of 580 (Statistics Canada 2017a). The City of Thompson serves as regional hub for approximately 72,000 people (Northern Region of Manitoba). Four First Nations exist within the RAA including Marcel Colomb First Nation (Black Sturgeon Reserve), Mathias Colomb Cree Nation (Granville Lake), O-Pipon-Na-Piwin Cree Nation (South Indian Lake Indian Settlement) and Peter Ballantyne Cree Nation (Kinoosao).

The economies in the area have historically been based on mining as the primary industry. Currently, the economy within the LAA is heavily reliant on government funding with some fishing and hunting tourism. Businesses in the Town of Lynn Lake include accommodations, grocery, and gas and several small businesses. Public facilities such a school and hospital also exist in the LAA.

Gross domestic product (GDP) in the LAA was estimated to be approximately \$26 million in 2016. Labor force was estimated at approximately 175 persons in Lynn Lake in 2016 with an Indigenous labor force of approximately 40%. Employment in Lynn Lake was largely in educational services, healthcare and social assistance, and transportation and warehousing. Within the RAA, employment was found to be greatest in mining, quarrying, and oil and gas extraction, followed by health care and social assistance, and educational services. Employment in the LAA was greatest in education, law and social, community and government service occupations, followed by business, finance and administration occupations, all of which were female dominated. Employment in trades, transport and equipment operations were also prevalent, with males accounting for the entirety of this employment occupation. Occupational employment in the RAA was greatest in sales and service, followed by trades, transport and equipment operation and occupations in education, law and social, community and government services. Industry and occupational employment trends were similar in the LAA and RAA when looking at total population and the Indigenous population.

In Lynn Lake, approximately 46.4% of the total population has completed post-secondary education compared to 28.6% of the town's Indigenous population. The median annual income was \$31,250 for the Town of Lynn Lake, with the median income of the town's Indigenous population at \$25,605. Average hourly wages for positions likely required for the Project in positions such as forestry, oil and gas, mining, technical services, and construction range from approximately \$28.33 to \$33.92.

6.8.2 Environmental Effects

6.8.2.1 Change to the Environment

The potential environmental effects of the Project on labour and economy prior to mitigation, include:



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- change in regional labour force
- change in regional business
- change in regional economy

Demand for labour and regional expenditures are the primary pathways through which the Project may affect labour and economy. Project demand for labour has the potential to both beneficially and adversely affect local and regional labour forces. Beneficial effects include increases in local employment (direct, indirect, and induced) during all phases. Adverse effects primarily relate to decreased demand for labour as the Project transitions from operation into and through decommissioning/closure, resulting in loss of direct employment. Project spending has potential to both beneficially and adversely affect local and regional businesses. Beneficial effects include increases in business revenue. Potential adverse effects of Project spending on regional businesses primarily relate to increased demand for local labour, goods, and services, which can lead to labour scarcity and increased labour costs. Project spending will result in overall increased economic activity (i.e., GDP) in the LAA and RAA. The Project will also pay property taxes, or provide grants in lieu, to the municipality of Lynn Lake and contribute to provincial and federal government revenues through taxation on labour, goods and services.

6.8.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce adverse Project-related effects and to enhance beneficial effects on labour and economy, to the extent possible:

- Inform residents and Indigenous communities of job and procurement opportunities during all Project phases and implement a policy of local hire where priority is given to the workers from the LAA, followed by other parts of the RAA, other parts of Manitoba, and other parts of Canada.
- Post job qualifications in advance and identify available training programs and providers so that local and Indigenous residents can acquire the necessary skills and qualify for potential Project-related employment.
- Identify potential shortages of workers with specific skill requirements, and work with training and education facilities, Indigenous communities, and local communities to increase opportunities for local community members to obtain training required for Project participation.
- Require workers (not inclusive of summer students) 19 years and younger to have completed grade 12 or have an appropriate equivalency to prevent young people from leaving school prematurely.
- Workforce education to encourage healthy lifestyle choices, sensitivity training and strict enforcement of Alamos' health and safety policies.
- Develop work packages that consider the capacity and capabilities of local and regional businesses and plan for working with local and Indigenous-owned businesses to enhance their potential for successfully bidding on Project contracts regarding the supply of goods and services.



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- Post Project purchasing requirements in advance so that local and regional businesses can position themselves to effectively compete to supply goods and services needed for Project construction and operation.
- Design for completion of timber removal in accordance with *The Forest Act* of Manitoba.
- Work with local communities to develop training programs (e.g., contract opportunities) oriented to Project operational needs.

6.8.2.3 Residual Effects

Labour Force

Residual effects on local and regional labor force relates to direct employment. It is estimated that an annual average direct workforce of 406 full-time equivalents (FTE) will be required over the two-year construction period, a 412 FTE workforce over the 13-year operational period, and an annual 90 FTE workforce during decommissioning/closure. Five percent of direct Project employment is estimated to be sourced from the LAA and the remaining 95% of labour demand satisfied using a fly-in/fly-out (FIFO) or drive-in/drive-out (DIDO) workforce recruited from other parts of the RAA and Manitoba. With the implementation of mitigation and management measures, and in consideration of local employment estimates, the Project is expected to result in positive, low magnitude effects on direct employment within the LAA and RAA. The loss of employment at the closure of the Project is a known effect and will be anticipated by Project workers. Mitigating the magnitude of this loss of employment is the gained labour income, skills and experience workers realize while employed with the Project; therefore, the loss of employment following closure of the Project is anticipated to be low. With the implementation of mitigation and management measures, Project residual effects on the local and regional labour force are expected to be positive in direction but low in magnitude during construction and operation.

Businesses

Residual effects on local and regional businesses relates to indirect and induced employment. Alamos estimates that over the life of the Project \$493.1 million in capital expenditure and \$1.9 billion in operational spending (PwC 2020a, 2020b) will occur within Manitoba. The degree to which local businesses will benefit from Project contracting and supply opportunities, and therefore result in indirect employment, depends on several factors, including their size, capability, and capacity to accommodate Project requirements. It is believed that local businesses in the LAA are likely positioned to respond to small- to medium-sized service and supply contracts and highly likely that a greater percentage of Project expenditures on goods and services will occur within other parts of the RAA. In both cases (LAA and RAA), indirect employment effects are anticipated to be positive in direction but low in magnitude.

Based on induced employment estimates for the Northern Region, residual effects on induced employment were determined to be a 9.0% increase (over baseline conditions) in the number of employed persons within the Lynn Lake area during construction, a 13.5% increase during operation, and a 1.9% increase during decommissioning/closure.



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Wages paid to the Project's direct workforce are predicted to show a measurable variance from existing conditions in Lynn Lake; therefore, the Project has the potential to contribute to upward pressure on wages though increased competition for labour within the LAA and RAA. To manage the Project's contribution to upward pressure on wages, Alamos will pay its direct workforce wages that are consistent with Manitoba's mining industry. Combined with the small anticipated size of the Project's local direct workforce, adverse effects on local and regional businesses in terms of upward pressure on wages and associated increased difficulty to recruit or retain workers is expected to be low.

Local and Regional Economies

Residual effects on local and regional economy relates to GDP and municipal taxes. Alamos estimates that direct Project contributions to Provincial GDP will total a net present value (5% discount rate) of \$664 million over the life of the Project, composed of \$637 million in direct effects, \$6 million in indirect effects and \$21 million in induced effects. The Project is expected to have a moderate magnitude positive effect on the GDP of the LAA and RAA. As the Project transitions from operation and into and through decommissioning/closure Project contributions to the GDP of the LAA and RAA will cease. Property taxes payable by the Project are inherently beneficial to the municipal government of Lynn Lake. The Project is therefore expected to result in a positive residual effect on municipal government revenues.

Significance of Residual Effects

With mitigation and environmental protection measures, the adverse residual environmental effects on labour and economy are predicted to be not significant. Positive effects on labour force, businesses and local and regional economies are also anticipated. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.9 COMMUNITY SERVICES, INFRASTRUCTURE, AND WELL-BEING

6.9.1 Existing Environment

The existing environment for community services, infrastructure, and wellbeing was characterized by analysis of housing and temporary accommodations (including campgrounds), education, recreation, health care, social, and emergency services, transportation, utilities, community wellbeing index scores and self-reported health characteristics.

The results indicated that in 2016, the Town of Lynn Lake had 263 private dwellings of which 176 were occupied by usual residents (Statistics Canada, 2017a). Most housing is at least forty years old and in poor condition or unlivable in 2016. In 2016, there were 272 private dwellings in Leaf Rapids, 67% of them occupied by usual residents (Statistics Canada 2017b). Marcel Colomb First Nation has 14 housing units on the Black Sturgeon Reserve. Overcrowding is an issue within this community, with an average occupancy of 14 people per unit. Construction on an additional 14 and 8 housing units began in 2018 and 2019, respectively, but has not yet been completed (pers. comm. 2019). Temporary accommodations in the LAA include two hotels in Lynn Lake, and a lodge and bed and breakfast in Leaf Rapids. In the RAA, temporary accommodations include lodges, camps, campgrounds, and 15 hotels, motels, and bed-and-



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breakfasts with more than 600 rooms in the City of Thompson (City of Thompson 2018; Travel in Manitoba 2020).

In the LAA and RAA, education services are provided through Frontier School Division, Area 1, except for the City of Thompson, with services provided by the Mystery Lake School Division. West Lynn Heights School, in Lynn Lake, serves the Town of Lynn Lake and Marcel Colomb First Nation. In 2018, West Lynn Heights School had an enrollment of 179, the Leaf Rapids Education Centre, had a total enrolment of 175, and the Oscar Blackburn school in South Indian Lake had an enrollment of 261. There are seven schools in the City of Thompson with a total enrolment of 3,163 students in 2018. The University College of the North, located in Thompson, is the only college in the RAA and it has over 500 students annually (City of Thompson 2018).

Municipal recreation facilities in the LAA include the Jim MacLellan Arena in Lynn Lake, which is used for activities such as curling, skating, and hockey, basketball, and volleyball. A fitness centre opened at the arena in November 2019. There is also an unsupervised beach, public libraries, a gymnasium, theatre, nine-hole golf course, outdoor sports fields, and a youth center in the LAA. In the RAA, The City of Thompson has a range of municipal recreational facilities and trails as well as facilities serving the broader region, such as the Vale Regional Community Centre.

The LAA is located within the service delivery area for the Northern Regional Health Authority. The Lynn Lake Hospital is the only hospital in the LAA. It is a 19-bed (including eight long-term care beds) facility with a 24-hour emergency room, a lab and X-ray. Leaf Rapids Health Centre runs a physician-staffed clinic that is open on weekdays and a nurse-run emergency room. In the RAA, the Thompson General Hospital is the largest hospital in northern Manitoba and provides 71 acute care beds, including a 10-inpatient bed, acute-care adult psychiatric unit. In Lynn Lake, social services programs include a hostel, employment counseling, parenting skills training, childcare, youth drop-in center, and social development programs. Social services in the Town of Leaf Rapids include a healthy baby program, public health education and youth support. More extensive social services are available in the City of Thompson. In 2017, the Hope North Recovery Centre opened to provide mental health and addictions services for area youth in crisis (Darbyson 2017). The Lynn Lake RCMP detachment provides police services to the Town of Lynn Lake and Marcel Colomb First Nation. The Town of Leaf Rapids and the community of South Indian Lake have their own RCMP detachments. Volunteer fire services operate in the LAA and both Lynn Lake and Leaf Rapids have 24-hour emergency medical services with one ambulance in each community. In the RAA, emergency services are provided by Thompson Fire & Emergency Services, which provide fire protection and emergency medical service to the city and surrounding area.

The MacLellan site is connected to the Town of Lynn Lake by Provincial Road (PR) 391 and the MacLellan site access road, an all-weather gravel road. Provincial roads are maintained by Manitoba Infrastructure Region 5. The Town of Lynn Lake is accessible only by PR 391, which connects the Town of Lynn Lake and Marcel Colomb First Nation with the Town of Leaf Rapids and the City of Thompson. Other transportation includes the Lynn Lake airport servicing the LAA and the Thompson Airport servicing the RAA.

Water and wastewater services in the LAA include curbside garbage pick-up for residents and businesses in the Town of Lynn Lake and Marcel Colomb First Nation, which is disposed of at the Lynn Lake Waste



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Disposal Site. Water in the Town of Lynn Lake comes from West Lynn Lake. The water treatment plant (Level 3) and distribution network (Level 1) are operated by the Town. Water and wastewater services are generally exclusive to the community. Wastewater facilities consist of a gravity-fed collection system (Level 1) with three lift stations and a lagoon. Marcel Colomb First Nation operates its own water treatment plant and sewage lagoon on the Black Sturgeon Reserve. In the RAA, the Thompson waste disposal ground services the City of Thompson, the Local Government District of Mystery Lake, the Wuskwatim Generating Station, the Keeyask Generating Station, and the Paint Lake Provincial Park. The City of Thompson operates two wastewater treatment facilities.

The Community Wellbeing Index measures socio-economic wellbeing for individual communities across Canada based on census subdivisions used in Statistics Canada Census. The index is comprised of four components (education, labour force, income, and housing) which are combined to create a single wellbeing score ranging from a low of 0 to a high of 100 (federal EIS Chapter 14). Within the LAA, the Community Wellbeing Index score (based on education, labor, income, and housing) for the Town of Lynn Lake was 74 in 2016. The 2016 scores for the Town of Leaf Rapids and South Indian Lake were 68 and 44, respectively. The City of Thompson's Community Wellbeing Index score was 76. Low education and income scores are common to all three RAA communities. In terms of comparison, the highest 2016 index score in Manitoba was 89, seen in Headingley. Further explanation of the Community Wellbeing Index can be found in the federal EIS Chapter 14.

Health characteristics in the LAA were analyzed based on data from rural and Indigenous populations. Results include: statistically greater percentage of females than males reporting very good or excellent levels of perceived health and perceived mental health; statistically greater percentage of the population with an obese body mass index, who are occasional or daily smokers, and who engage in heavy drinking; and statistically greater percentage of females than males reporting that they are satisfied or very satisfied with life.

6.9.2 Environmental Effects

6.9.2.1 Change to the Environment

The potential environmental effects of the Project on community services, infrastructure, and wellbeing prior to mitigation, include:

- change in housing and temporary accommodations
- change in local services and infrastructure
- change in transportation services and infrastructure
- change in community wellbeing

Potential changes to community services and infrastructure will result from an in-migration of Project workers to the LAA as a result of the Project, therefore increasing demand on existing services and infrastructure, including health, emergency, education, recreation, and utilities. In the LAA, the population has been decreasing due to mine closures and, as a result, community services and infrastructure have



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been scaled back. Most facilities are at least 40 years old and in need of repair, upgrading or replacement. It is assumed that workers' families will not relocate to Lynn Lake and that most workers will operate on a FIFO or DIDO rotation.

During construction and operation, a temporary increase in population in the LAA is expected as a result of the Project, which has potential to place additional demands on local availability of housing, accommodations, with workers primarily accommodated at a work camp at the MacLellan site. Most of the physical Project activities, with the exception of wastes and emissions, movement of trucks, equipment, supplies and personnel within the LAA, and utilities, infrastructure and other facilities at the MacLellan site, will not affect community services and infrastructure; however, demands on local policing and other social service providers may increase if Project-related income is spent on illicit activities. An increased demand is also expected for healthcare and emergency services by temporary Project workers, and/or related to accidents or malfunctions of the Project activities during these phases. The construction and operation activities will also affect transportation services and infrastructure through the creation of additional traffic in the LAA and RAA.

During decommissioning/closure, there will be a reduction in effects on community services and infrastructure as a result of a reduction in demand on them as workers move away due to diminishing employment. Potential changes in community wellbeing will result from a change in employment and income and change in population associated with each phase of the Project and its activities.

6.9.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on community services, infrastructure, and wellbeing:

- Implementation of a worker housing strategy.
- Work camp at the MacLellan site to accommodate workers during construction and operation.
- During construction, first aid facilities will be supplied by the Engineering, Procurement, and Construction Management contractor. First-aid personnel will provide transport to Lynn Lake hospital when required. During operation, first aid facilities will be supplied by a dedicated first aid/mine rescue office in each of the site administration offices. Site security personnel will be trained as Emergency Medical Service first responders, and when required, provide transfer to Lynn Lake hospital.
- Power, water, and wastewater treatment will be provided by Alamos and will not rely on resources within the Town of Lynn Lake.
- Development of a Waste Management Plan because there will be a Project demand for landfill capacity for construction and non-hazardous domestic solid waste. Alamos will liaise with planners in Lynn Lake regarding these needs and potential requirements for landfill expansion.
- Mandatory safety orientations for new employees.



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- Control of access to the PDA using a security gate and guard house, and by employing on-site security staff.
- Site security services to help limit demands on the local police system.
- Careful control of flammable material (such as fuels and explosives) on-site.
- Training of Project personnel in fuel handling, equipment maintenance, and fire prevention and response measures.
- Implementation of work schedules for Project workers (e.g., 12 hours per day, seven days per week) that deter FIFO/DIDO workers from spending time off shift in local communities and accessing community recreation services and facilities outside of working hours.
- Scheduling of alternating work shifts so that all workers do not arrive in and leave the area at the same time will limit Project-related demands on both traffic and air services and infrastructure.
- Liaise with local emergency providers so that roles and responsibilities are understood, and that the necessary resources required to respond are in place.
- Maintenance of fire prevention and suppression systems on site, including water supplies, sprinklers, fire extinguishers and other firefighting equipment.
- Workforce education to encourage healthy lifestyle choices, sensitivity training and strict enforcement of Alamos' health and safety policies. For example, sensitivity training would raise the level of awareness about the potential effects that workers can have on the community and their families through drug and alcohol use or other social concerns.
- Access to Employee Assistance Program for Project personnel, and requirement for pre-employment physicals.
- Development of cooperative protocols with responsible agencies to deal with access of Project personnel to emergency and other medical services.
- Development and implementation of Project-specific environmental management plans and monitoring programs.
- Development and implementation of Project-specific Emergency Response and Spill Prevention and Contingency Plans will reduce the likelihood and severity of accidents and potential fires.
- Upgrading and resurfacing the existing access roads to the MacLellan site.
- Implement standard construction procedures, including traffic control, to reduce traffic delays during construction. The procedures will be developed during ongoing planning and engineering design to address traffic staging to reduce delays.
- Providing bussing services between the temporary camp and Gordon site.



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- Encouraging carpooling among locally resident construction and operation workers.
- Scheduling arrivals/departures of employee traffic to occur earlier than the existing observed a.m. peak hour for local traffic and later than the existing observed p.m. peak hour if needed.

6.9.2.3 Residual Effects

Housing and Temporary Accommodations

With the implementation of a Project accommodations strategy, including a work camp during construction and operation, residual effects on housing and temporary accommodation are expected to be negligible.

Local Services and Infrastructure

With the construction of the work camp, the presence of non-local workers during construction and operation is not anticipated to place additional demands on power, water, and wastewater services and infrastructure. Power for the MacLellan site will be supplied by Manitoba Hydro via infrastructure built by Alamos. Potable water will be provided by treating filtered fresh water through a vendor-supplied potable water treatment plant. The sewage from the MacLellan site buildings will be collected for processing at the MacLellan sewage treatment plant. Waste disposal will follow a Waste Management Plan for the Project with solid waste collected and if practical, recycled. Alamos will provide emergency response services sufficient in size and capability to respond to emergency situations at the mine and Project-related demands on education and recreation will be supplied by the work camp. With the application of mitigation and management measures, the residual adverse effects on the capacity of local services and infrastructure during all Project phases are predicted to be low.

Transportation Services and Infrastructure

Residual effects on transportation and infrastructure are largely related to the increased use of roadways in the LAA and RAA during the construction, operation, and decommissioning/closure phases. At least one 6-km section of PR 391 will likely require resurfacing. With the implementation of mitigation measures, the residual adverse effect of the Project on transportation services and infrastructure is predicted to be low.

Community Wellbeing

Given the LAA's declining population and low level of unemployment, it is assumed that 95% of direct labour will be recruited from outside the LAA. Residual effects on community wellbeing are largely related to labor force, income, education, and housing, assessed by the Community Wellbeing Index. The Project is anticipated to result in negligible changes in existing conditions related to housing and is not anticipated to have a measurable positive or adverse effect on education; therefore, Project residual effects on wellbeing within the LAA are predicted to be positive and conservatively characterized as low. Project workforce during the construction and operation phases could result in a 10% increase in the LAA's population. Because this demographic profile of workers differs from that of the LAA, FIFO/DIDO workers are expected to change the demographic profile of the LAA which, in the extreme case could lead to adverse interactions between usual residents and workers, increased crime and reliance on negative coping mechanisms. In



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consideration of mitigation measures, population-related residual effects on social cohesion are conservatively assumed to be adverse in direction and moderate.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on community services, infrastructure, and wellbeing are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.10 LAND AND RESOURCE USE

6.10.1 Existing Environment

Land use types within the township of Lynn Lake include residential and commercial service and retail developments. There are no parks or protected areas within the PDA or LAA. Within the RAA, most of the land outside the built-up township is designated as “Limited Development” land use under the development plan where mineral exploration and development are encouraged. The RAA is mainly unoccupied provincial Crown land in the Thompson Community and Regional Planning Area of northwest Manitoba which includes provincial parks, subdivisions, and various land use permits (e.g. camps, lodges, cabins). Federal Crown land within the RAA includes First Nations Reserves and Treaty Land Entitlement land. There are two provincial parks within the RAA: Burge Lake Provincial Park (10 ha) and Zed Lake Provincial Park (14 ha). There are no other conservation areas or ecological reserves within the RAA. However, the RAA encompasses the provincial Kamuchawie Caribou Management Unit and the federal Woodland Caribou Manitoba North Range (MB9), where animals from the Manitoba North Range herd were observed during field studies. There are no other wildlife management areas within the RAA.

There are two campgrounds in the RAA, at Burge Lake and Zed Lake provincial parks. Recreational land use activities within the RAA include sport fishing, hiking, camping, snowmobiling, cross-country skiing, snowshoeing, and ice fishing. Resource use in the RAA includes hunting and outfitting. The Town of Lynn Lake promotes outdoor recreation opportunities during all seasons. Common activities include ice fishing, snowmobiling, ice-skating, cross-country skiing, snowshoeing, tobogganing, dog-sled racing, wildlife viewing, canoeing, kayaking, and recreational hunting.

Resource use in the general Lynn Lake area is characterized by activities such as hunting, fishing, trapping, mining, and limited forestry. Common big game species found in the RAA include moose, black bear, and gray wolf. Upland game birds hunted include grouse, ptarmigan, and migratory game birds. Grey Owl Outfitters holds a black bear allocation area that overlaps with a small portion of the LAA and the PDA for the MacLellan site. The RAA falls within the Pukatawagan and Southern Indian Lake Registered Traplines with a total of 20 registered traplines, all of which have had trapper permits. There are no commercial fish waterbodies overlapped by the PDA. There are portions of two listed commercial fish lakes (Cockeram and Cartwright lakes) within the LAA and there are 17 commercial fish waterbodies in the RAA. Watercourses in the RAA and LAA support a recreational sport fishery. There are no sport fish lakes within the PDA for the MacLellan site.



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Mineral exploration activity in the Lynn Lake area and surrounding region has focused on copper, lead, zinc, gold, silver, nickel, and cobalt. The PDA and LAA have historically been subject to mining development and currently, the MacLellan site is under care and maintenance with recent activity of new claims being staked in this area (as of the fall of 2019). The Project LAA also encompasses one quarry withdrawal area. Productive forest land is scattered throughout the RAA. The productive forest land in the PDA represents a very small area of the total productive forest land in the LAA and RAA (ranging from 6.3% to 0.2% respectively).

6.10.2 Environmental Effects

6.10.2.1 Change to the Environment

The potential environmental effects of the Project on land and resource use prior to mitigation, include:

- change in land use
- change in recreation
- change in resource use

Changes to land use as a result of the Project includes consideration of compatibility with land use plan designations and zoning, the potential to degrade land and cause disturbance and nuisance effects (e.g., construction noise, dust, disruption to access), restriction of access, and visibility of project components from Project clearing and construction activities within the PDA. Decommissioning/closure activities have the potential to disrupt land use but may ultimately result in the restoration of access and land use.

Changes to recreation as a result of the Project include direct loss of, or loss of access to, recreation areas. During construction, activities may reduce the available land base for various recreational activities, affect changes in accessing recreational areas within the PDA, and may also affect recreation through sensory disturbance (i.e., noise, visual aesthetics). Population increase associated with the construction phase can also increase competition for resources. During operation of the Project, the presence of structures could affect recreational use and visual aesthetic values; however, the Project will likely only be visible to receptor sites in the immediate vicinity. Other Project effects on recreation include access restrictions to recreational use areas, and noise effects. During decommissioning/closure, recreation activities may be disrupted or intruded on through sensory disturbance from rehabilitation activities, but decommissioning may ultimately restore access.

Changes to resource use as a result of the Project may occur during construction and operation through the direct loss of, or access to, local resource use areas as well as disruption to resource activities. Disturbance effects on resource use considers the reduction in wildlife harvesting success as result of sensory disturbance (e.g., noise, visual), increased pressure on the resource (e.g., hunting, trapping, and fishing) and direct effects on those wildlife species. The presence of workers during construction could also result in an increase in competition for species harvested by hunters and trappers and anglers. The Project also has is the potential to affect productive forest land. Decommissioning/closure activities can also disrupt



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or intrude on local resource use activities, but decommissioning may ultimately restore access and availability of resources.

6.10.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on land and resource use at the MacLellan site:

- Signage will be installed around the perimeter of the PDA to alert local land and resource users of the presence of the Project and its facilities.
- Project lighting will be limited to that which is necessary for safe and efficient Project activities. Directional lighting will be used to limit the transmission of light outside of the PDA. Portable lighting equipment will be positioned to limit visibility at nearby receptors, to the extent feasible.
- Noise mitigation measures will be selected and installed as described in Section 6.2.2.2.
- Workers will be prohibited from bringing firearms and fishing gear to the sites while working to limit competition for wildlife and fish species of value to resource users.
- Alamos will post warning signs on the access roads and distribution line ROW to discourage unauthorized access and snowmobiling due to safety concerns.
- Alamos will implement traffic control measures which may include gating approaches to Project access roads, placing large boulders and/or gated fencing to restrict public access to the PDA.
- Alamos will engage local land and resource users (e.g., recreational harvesters) and the Town of Lynn Lake to address, to the extent possible, issues related to the removal and inaccessibility of lands and resources within the PDA at Project sites, and with local boaters to address navigation issues as well as access and safety issues related to navigation along watercourses affected by the Project, including engagement regarding the need to provide marked portages to circumvent obstructions.
- Desired end land and resource uses will be considered in the preparation of the conceptual Closure Plan as part of Project rehabilitation.
- The Project footprint will be limited to the extent possible (i.e., PDA) including site clearing and disturbance associated access routes and distribution line ROW.
- Existing access roads and trails will be used to the extent possible.
- Work schedules will be implemented for Project construction workers (subject to FIFO employment) to deter workers from hunting locally outside of working hours during a shift.
- Alamos will communicate the schedule of Project activities throughout the construction, operation, and decommissioning/closure phases to potentially affected local resource users and MCC Regional Officials.



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- Alamos will engage with local resource users (hunters, outfitters, trappers, anglers) and MCC Regional Officials to address to the extent possible the potential conflict, disturbance, or access restrictions to hunting, trapping, and fishing areas in the PDA, and availability of wildlife and fish resources.
- Timber removal will be completed in accordance with *The Forest Act* (Manitoba).
- Merchantable timber may be salvaged and used, if feasible, to enhance carbon storage, or it will be made available to local communities for fuelwood.

6.10.2.3 Residual Effects

Land Use

Given the small areas of provincial land that are affected by the MacLellan site PDA (938 ha within the LAA) and approximately 10 ha of land for the distribution line ROW, residual effects on land use are predicted to be low. Some access restrictions are anticipated to be in place for the period of construction; however, with the implementation of the mitigation measures, the residual effects are anticipated to be low. The Project's overall presence will also result in some visual disturbance and will be long-term in duration (i.e., from reclamation of stockpiles). During decommissioning/closure activities, no new interactions with designated lands, including those associated with access, are anticipated.

Recreation

During construction, residual effects on recreation will primarily occur in the PDA where access will be restricted, resulting in a shift of recreational users to other areas of the LAA. The land within the PDA is not considered "prime" recreational land, given that it is a former mine site and there are alternative lands within the LAA available for recreational use. The continued use of the Keewatin River as a recreational canoe route is not expected to be affected by the Project. Low frequency noise effects are not expected at receptors because the predicted sound levels are below the Health Canada targets; however, recreational activities may be disturbed by other noise during construction. This disruption is expected to be short-term and irregular in frequency. The presence of mine workers is predicted to result in increased demand for outdoor recreation within the LAA. Residual effects described for the construction phase will continue throughout operation consisting of ongoing noise, and restriction in use of access roads. The addition of the presence of the ore stockpile, overburden stockpile, and the MRSA and other Project infrastructure may result in some visual disturbance to recreational users. However, modelled analyses suggest that mine infrastructure and stockpile/storage areas would barely be visible or marginally so. Decommissioning/closure activities may cause disruption (e.g., through sensory and/or nuisance effects) but may ultimately restore access for recreational activities.

With the implementation of mitigation measures, residual effects from the Project on recreation are anticipated to be low in magnitude for each Project phase.

Resource Use

During construction, Project clearing and construction activities will lead to a loss of area for resource harvesting in the PDA. Project construction may also result in temporary sensory disturbance (e.g.,



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construction noise, visual) and nuisance effects (e.g., traffic) displacing big game or furbearers and reducing harvesting success rates in the LAA for hunting and trapping. These disturbances may also affect the experience quality for hunters/outfitters and trappers and could cause habitat avoidance and/or a change in habitat use around the site, decreasing interest in guide outfitting services in a certain area. Predicted sound level of short-term construction activities (e.g., pile driving at a bridge crossing) will be below the Health Canada noise level target. There are currently no commercially fished waterbodies within the PDA or LAA and increased competition for hunting and fishing resources that are of interest will be mitigated through the prohibition of hunting/fishing gear for workers at the sites. The Project will result in a decline in net merchantable timber in the RAA and LAA.

During operation, sensory and visual disturbance effects described for the construction phase are expected to continue as a result of Project activities. Project components may be barely or marginally visible from certain vantage points. The noise assessment results for the operation phase indicate that nighttime equivalent sound levels from the Project will be below applicable thresholds.

During Project decommissioning/closure, no new residual effects on areas or access for hunting, outfitting, trapping, and fishing are expected. The decommissioning/closure phase is also expected to result in less pressure on resources, as some areas may become accessible again for commercial harvest activities.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on land and resource use are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.11 HERITAGE RESOURCES

6.11.1 Existing Environment

A heritage resources impact assessment for the Project was conducted at the MacLellan site in August 2015. There are 10 recorded sites within the MacLellan site PDA. Sites were intact except for one which was a historic building that was in the initial stages of collapse. Three of the MacLellan recorded sites, all from the Historic Period, were concluded to be camp sites. Artifacts observed included a folding stove, a steel washtub, and several tin cans and bottles (Evans 2012). Other sites were found to likely be related to early mineral exploration camps, temporary habitation sites, or storage buildings. For the RAA (covering a relatively large area owing to the historical and precontact mobility of Indigenous peoples), records indicated that ancestors of the Swampy Cree, Rock Cree, Dene, and Métis lived and harvested resources throughout the RAA for the past 200 years (Provincial Archives of Manitoba, n.d.). Marcel Colomb First Nation participants stated that the MacLellan site PDA was used on a limited basis. There are 781 heritage resource sites recorded in the RAA, most of which date to the Precontact Period.



6.11.2 Environmental Effects

6.11.2.1 Change to the Environment

During construction and operation, changes to heritage resources could result from removal of vegetation, causing soil movement and displacing shallowly buried artifacts. Grading and compaction of the site during construction could also potentially disturb or destroy heritage resources. During operation, heritage resources could be disturbed through brushing of previously undisturbed areas, subsoil removal and regrading of access roads, soil removal for Project infrastructure, grading, and compaction.

There are no potential effects pathways for Project decommissioning/closure at the MacLellan site as heritage resources concerns will have been addressed during construction or operation, and decommissioning/closure will not result in ground disturbance to areas not previously disturbed during the Project.

6.11.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid Project-related effects on heritage resources:

- Implementation of the Heritage and Cultural Resources Protection Plan when heritage or cultural resources, or objects thought to be heritage or cultural objects, are exposed.
- Protective barriers placed around heritage resource sites that are inadvertently found during construction so that the area can be protected while work proceeds.
- Evaluation by a professional archaeologist of PDA changes or added development components.
- Education of construction contractors for the appropriate protocols if heritage or cultural resources, or objects thought to be heritage or cultural resources, are discovered.
- Controlled surface collection or salvage excavation of discovered heritage resource sites, or a portion thereof, that cannot be avoided.
- Construction monitoring by a professional archaeologist in areas that are heritage sensitive such as sites identified as being culturally sensitive by Indigenous engagement.
- Education of construction contractors for the appropriate protocol if heritage or cultural resources, or objects thought to be heritage or cultural resources, are discovered.
- As-found recording of site HfMf-7, a shed related to historical mining activity.

6.11.2.3 Residual Effects

None of the Project components currently interact with known heritage resources; therefore, there is a low potential for a change to the number of heritage resource sites because of the Project. The archaeological sites recorded within the MacLellan site PDA are outside of the areas proposed for development. Baseline



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information from Indigenous nation members indicate that there are no known burial sites; cultural landscapes; sacred, ceremonial, or culturally important places, objects, or things; nor is there archaeological potential and/or artifact places at the site. Therefore, there are no anticipated residual effects on heritage resources.

Significance of Residual Effects

There are no anticipated residual effects on heritage resources at the MacLellan site; therefore, there is no significant adverse residual effect. Results of the assessment are presented in Appendix A; Table A-1.

6.12 CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES

6.12.1 Existing Environment

Information provided herein is current to May 22, 2020. Indigenous nations who have expressed traditional interests in the RAA include Marcel Colomb First Nation, Mathias Colomb Cree Nation/Granville Lake Community, Peter Ballantyne Cree Nation, Manitoba Metis Federation, and the Métis Nation – Saskatchewan Eastern Region 1. Indigenous nations who have indicated through engagement they do not undertake traditional practices in the RAA include O-Pipon-Na-Piwin Cree Nation, Nisichawayasihk Cree Nation, Barren Lands First Nation, Hatchet Lake First Nation, Northlands Denesuline First Nation, Sayisi Dene First Nation and the Métis Nation – Saskatchewan Northern Region 1. The results of the information gathering process indicated that current use for traditional purposes occurs in the PDA, LAA, and RAA. A summary of traditional land and resource use for each community is presented in the federal EIS (Volume 2, Section 7.2.13).

6.12.2 Environmental Effects

6.12.2.1 Change to the Environment

The potential environmental effects of the Project on traditional land and resource use prior to mitigation, include:

- changes to availability of traditionally used resources
- changes in access to traditionally used resources or areas
- changes to current use sites or areas
- changes to experience of current use and cultural values associated with traditionally used resources.

Availability of resources currently used for traditional purposes can be affected by a change in the landscape that removes habitat for species relied upon for traditional use, or by a change in mortality or health of these species in such a way that their numbers are affected.



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During the construction phase, habitat will be lost in the PDA. During site preparation, direct and indirect loss of habitat will result from vegetation clearing, dewatering, and sensory disturbances that can fragment habitats and reduce ecological function. Noise from construction activities may also disturb wildlife and contribute to avoidance of the area by traditional harvesters. Changes to mortality risk can also affect availability of traditional resources through increased vehicular traffic, human-wildlife interactions, effects on predator-prey interactions and indirectly on health of harvested species by soil compaction or dust on plants.

During the operation phase, transportation within the LAA is the primary activity with potential to cause wildlife mortality and change the availability of traditionally harvested resources. The presence of utilities, site infrastructure, facilities, and fluctuating water levels may also increase wildlife mortality, or alter wildlife habitat. Noise, light, and vibration is also expected to be a primary pathway that could potentially change the availability of traditional resources through wildlife avoidance.

During the decommissioning/closure phase, the Project is anticipated to increase availability of traditional resources through a lessening in sensory disturbances, vehicular collisions, and reclamation of habitat.

Access to resources currently used for traditional purposes can be affected by restrictions to access of lands. During construction, access to sites may be restricted for safety reasons. During operation, changes to access may also result from operation of utilities, infrastructure, and other facilities. During the decommissioning/closure phase, access is anticipated to improve compared with active mining.

During construction, changes in traditional cultural and spiritual sites and areas can be affected directly through the physical removal of the resource itself by land clearing and infrastructure development, or indirectly through sensory disturbances, noise, light, and other emissions. During operation, sensory disturbance as well as the physical presence of utilities, site infrastructure, and facilities or water management activities may disturb a site or render a site or area inaccessible. During the decommissioning/closure phase, the level of sensory disturbance due to wastes and emissions activities will be reduced in comparison to operation, with a return to baseline conditions during post-closure.

Changes to the environment resulting from the Project that have the potential to affect cultural values associated with traditional land and resource use include changes in access or sensory disturbances such as noise, light, and dust that may directly or indirectly interfere with cultural transmission by shared experience of traditional practices.

6.12.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on traditional land and resource use. Mitigation measures that are relevant to availability of traditionally harvested resources at the MacLellan site will include the following:

- Wetland buffering, silt fencing, and timing of vegetation clearing as described in Section 6.6.2.2 will reduce habitat loss or loss of traditionally important species.



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- Dust suppression, as described in Section 6.1.2.2 will reduce sensory disturbance, effects to habitat or traditionally harvested species.
- Erosion and sediment control measures during construction and timing works outside of sensitive periods will reduce alteration or loss of fish habitat.
- Workers will be prohibited from bringing firearms and fishing gear to the sites while working to limit competition for wildlife and fish species as described in Section 6.10.2.2.
- Mitigation as described in Section 6.10.2.2 will reduce effects on traditionally important fish species and habitat.
- Offsetting lost habitat area where harmful alteration, disruption, or destruction of fish habitat will occur as described in the federal EIS (Chapter 23, Section 23.5.15).
- Relevant mitigation for groundwater as described in Section 6.3.2.2 to reduce effects on traditionally important species and resources.
- Relevant mitigation for wildlife and wildlife habitat as described in Section 6.7.2.2 to reduce effects on traditionally important species and resources.
- Relevant actions in the Wildlife Monitoring and Management Plan as described in the federal EIS (Chapter 23, Section 23.5.15) to reduce effects on traditionally important species and resources.

Mitigation measures specific to the removal of the existing infrastructure at the MacLellan site includes the following:

- Surface Water Monitoring and Management Plan as described in the federal EIS (Chapter 23, Section 23.5.5).
- Relevant mitigations as described in Section 6.7.2.2. to mitigate effects on wildlife habitat.

Mitigation measures that are relevant to changes in access to resources currently used for traditional purposes will include the following:

- Site access by traditional harvesters will be controlled during post-closure as per the Closure Plan described in the federal EIS (Chapter 23, Section 23.5.18). Alamos' ongoing engagement may result in developing alternative access to resource harvesting areas.
- Existing access roads and trails will be used to the extent possible; access routes will be developed in compliance with provisions of *The Crown Lands Act* and *The Mines and Minerals Act*.

Mitigation measures that are relevant to changes in cultural and spiritual sites will include the following:

- Although no known cultural and spiritual sites or areas are in the PDA, Alamos' ongoing engagement program will facilitate development of mitigation measures if these are reported or discovered during construction and operation phases.



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- Design for limitation of Project footprint (i.e., PDA) to the extent possible.
- Design for use of down-lighting, a technique of directing night lighting downward, to reduce light effects adjacent to the PDA.
- Buffers around wetlands, waterbodies, and watercourses as described Section 6.6.2.2 will be maintained to reduce effects to cultural and spiritual sites or areas.
- Design for restriction of unauthorized access adjacent to the PDA.
- Maintain vegetation cover along the boundaries of high activity areas (e.g., access roads) to reduce sensory (noise and visual) disturbance.
- The Heritage and Cultural Resources Protection Plan as described in the federal EIS (Chapter 23, Section 23.5.11) will be implemented when previously unidentified heritage or cultural resources, or objects thought to be heritage or cultural objects, are exposed. Additional mitigation measures for heritage resources are addressed in Section 6.11.2.2.
- Controlled surface collection or salvage excavation as addressed in Section 6.11.2.2 will be implemented for any discovered heritage resource sites, or a portion thereof, that cannot be avoided.

6.12.2.3 Residual Effects

The residual effects on availability of lands and resources for traditional use during the construction phase is largely related to site preparation. Site preparation will require removal of habitat in the PDA. Once cleared, the PDA will provide no suitable wildlife habitat, except for a few species that prefer developed sites. Site preparation and water development will also negatively affect fishing, hunting, and trapping activities that currently occur. The residual effect of construction traffic on wildlife mortality is expected to be minor in the LAA. Overall, the residual effects on change in resource availability during the construction phase of the Project is low. During operation, wildlife will avoid the PDA and LAA due to continuous disturbance caused by emissions such as noise, light, and traffic throughout the duration of operation. Increased dust and POPCs could affect vegetation and fish distribution and health. Residual effects on mortality risk during this phase due to trapping of nuisance animals, conflicts with infrastructure, and vehicle collisions, is limited in area and numbers of individuals, and not expected to have population level effects. Decommissioning/closure activities are expected to reverse the residual effects to resource availability and therefore are generally positive compared with active mining.

The residual effects on access to lands and resources for traditional use are related to clearing of natural vegetation or earthworks activities during construction and operation. This will remove one travelway from use within the MacLellan PDA, altering patterns of access to travel routes harvesting areas in the LAA. Overall, the residual effect on change in access during the construction and operation of the Project is low. Residual effects on access in the closure phase are anticipated to be positive compared with active mining with access ultimately being restored to some areas.

The residual effects on cultural and spiritual sites are largely related to site preparation activities and sensory disturbance. The Project will require the disturbance of landscape in the PDA. No traditional or



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cultural sites or areas are known to exist within the PDA; however, some sites may experience sensory disturbances due to light, dust, and noise. These sites may also experience effects due to the removal of visual buffers. Overall, the residual effect is low.

The experience of Indigenous peoples on the land, cultural identity, opportunities for intergenerational knowledge transmission, and spiritual connections represent intangible values, which are largely subjective and conditional, reflecting beliefs, perceptions, values, and qualitative experience. As such, for changes to the environment that affect cultural values or importance associated with traditional land and resource use, it is not possible to establish meaningful and applicable measurable parameters or assess these values to current assessment conventions. Therefore, potential effects on cultural values have not been subject to an effects assessment using the same methodology. Rather, when an Indigenous nation has identified a related concern, the subjective and experiential components of current use that cannot be measured are considered qualitatively. Residual effects on cultural values using this assessment methodology include transmission of cultural practices and teachings between generations, the sacredness of lands and waters as a whole, changes to experiences on the land, and a responsibility to protect and care for the land.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on traditional land and resource use are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.13 HUMAN HEALTH

6.13.1 Existing Environment

Existing conditions for human health are characterized by the calculated Baseline Case concentration ratios (CRs), hazard quotients (HQs), and incremental lifetime cancer risks (ILCRs) of contaminants currently existing in the environment. The CR applies to non-cancer health risks associated with the inhalation of criteria air contaminants (CAC) such as NO₂, SO₂, and PM_{2.5}. The HQ applies to non-cancer health risks associated with ingestion exposures of metals in drinking water and food. The ILCR applies to carcinogenic health risks associated with exposure to carcinogenic chemicals of potential concern (COPC).

Exposure pathways include direct contact with soil (ingestion and dermal contact), ingestion of wild meat, fish, plants and surface water and inhalation (air emissions) of contaminants. At the MacLellan site, baseline CRs for NO₂, SO₂ and PM_{2.5} were below the benchmark CR of 1.0, representing a negligible human health risk. The Baseline Case HQs for metal exposures through ingestion were generally below the risk acceptability benchmark of 0.2, with some exceedances for methylmercury, primarily due to consumption of fish, and manganese and thallium, primarily due to consumption of wild meat, traditional plants and/or backyard garden produce. Baseline Case CRs could not be calculated for inhalation risk associated with diesel particulate matter (DPM), hydrogen cyanide (HCN), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and metals because air concentration data were not available in this remote region.



6.13.2 Environmental Effects

6.13.2.1 Change to the Environment

Changes to human health as a result of the Project are measured based on predicted human exposure to a contaminant through ingestion, inhalation, and dermal contact. Atmospheric emissions (vehicle exhaust, and rock and ore dust) and water discharges (e.g., effluent and seepage) from the MacLellan site project activities could increase COPC concentrations in ambient air, soil, water, and sediment. This can lead to increases of these chemicals in secondary environmental media including vegetation, wild meat, and fish tissue. In the absence of mitigation measures, potential changes in air may affect the health of Off-Duty Workers housed in the Worker Camp, and potential changes in air, water, and country food quality may affect the health of human receptors who live in the region and who may engage in hunting, trapping, traditional, and recreational activities.

6.13.2.2 Mitigation Measures

A number of mitigation measures have already been incorporated for the MacLellan site as detailed in previous sections. A summary of these mitigation measures as they pertain to human health is outlined below:

- The use of dust suppressants (e.g., water and chemical), dust collectors (e.g., baghouse and wet scrubbers at crushers) and dust enclosures at mill feed conveyors and storage areas as described in Section 6.1.2.2.
- An Air Quality Management Plan as described in the federal EIS (Chapter 23).
- Water management as described in Section 6.3.2.2 and Section 6.4.2.2 above, including surface water runoff control practices, diversion of fresh water away from the Project by designing culverts and ditches, management of contact water (by construction of collection pits, ponds, ditches and culverts), installation of dewatering ditches, and implementing soil covers and vegetation to reduce infiltration into the TMF and MRSA's by increasing evapotranspiration capacity.

6.13.2.3 Residual Effects

Inhalation Exposure

For the MacLellan site, the assessment of potential human health risks associated with inhalation exposures to NO₂ found that predicted annual average NO₂ concentrations were below the 2025 annual average NO₂ CAAQS. Four special receptor locations at the MacLellan site had a maximum predicted 1-hour NO₂ concentration in exceedance of the 2025 1-hour NO₂ CAAQS. Maximum exceedances were found to occur 0.37% of the time over the 5-year period at the MacLellan site. Based on the analysis it was determined that occasional exceedances of the 2025 1-hour NO₂ CAAQS represent a negligible human health risk for people who may be in the area. The CRs associated with inhalation to carcinogenic compounds are below 1.0, meaning that the incremental lifetime cancer risk associated with emissions from the Project is below cancer risk acceptability benchmark established by Health Canada (2012).



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For the work camp, with the exceptions of 1-hour exposure to NO₂ and 2-hour exposures to DPM, the CRs associated with inhalation exposures for COPC are below the benchmark of 1.0. Over the 5-year period that was modelled, 1-hour NO₂ concentrations were predicted to exceed the 2025 CAAQS 695 times (1.6% of the time). Considering the results of the assessment of potential health risks associated with inhalation exposures to 1-hour NO₂, inhalation exposure to NO₂ was found to represent a negligible human health risk for Off-Duty Workers housed at the Worker Camp. The DPM concentrations were predicted to exceed the 2-hour air quality standard of 10 µg/m³ on two occasions, representing 0.009% of the time. Given that the predicted exceedances of the short-term (2-hour) exposure limit are small and of short duration, and that the health effects associated the 2-hour limit are based on mild and reversible effects in sensitive members of the population (asthmatics), it was determined that for Off-Duty Workers, inhalation exposures to DPM represents a negligible human health risk. The CRs associated with inhalation exposures to SO₂, PM_{2.5}, HCN, volatile organic compounds, polycyclic aromatic hydrocarbons and metals are below 1.0 and thus, were found to represent a negligible human health risk for Off-Duty Workers.

Ingestion Exposure

In general, the risks associated with total ingestion exposures to metals are below the non-cancer risk acceptability benchmark of HQ<0.2 established by Health Canada. For several compounds, the total ingestion non-cancer risks exceed the acceptability benchmark; however, changes in non-carcinogenic and carcinogenic health risks due to Project-related chemicals are less than the applicable benchmarks and therefore, negligible and not significant at the MacLellan site. Risks related to sediment contact were evaluated and considered minor in the region. The average of the predicted future concentrations of metals in the lakes in the MacLellan region are less than the applicable Canadian drinking water guidelines; therefore, health risks related to metal exposures are considered negligible.

Noise and Vibration

Noise levels predicted at each of the human health special receptor locations in the MacLellan region were below the Health Canada 6.5% high annoyance target and were also below the World Health Organization sleep disturbance noise guideline of 40 dBA. Based on these results, noise and vibration represent negligible human health risks.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on human health are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

6.14 INDIGENOUS PEOPLES

6.14.1 Existing Environment

Existing conditions for Indigenous peoples are described based on the conditions for Indigenous health, Indigenous socio-economics, current use of lands and resources, Indigenous physical and cultural heritage, and Indigenous or Treaty rights. The Indigenous communities engaged on the Project have Indigenous or



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Treaty rights which are recognized and affirmed in Section 35(1) of the *Constitution Act, 1982* and as such have constitutional protection to these rights in Canada.

Health care for Indigenous communities in Manitoba is provided by the federal First Nations and Inuit Health Branch and through Regional Health Authorities. Health care for Indigenous communities in Saskatchewan is provided by the federal FNIHB and through the Saskatchewan Health Authority. The First Nations Regional Health Survey indicated that almost two-thirds (59.8%) of First Nation adults, one third (33.2%) of First Nation youth, and over one-quarter (28.5%) of First Nation children had one or more chronic health conditions (FNIGC 2018a; 2018b). Chronic health conditions such as diabetes, arthritis, hypertension, allergies, and chronic back pain were the most reported conditions among First Nation adults. Indigenous communities engaged on the Project hunt, fish, trap, and gather for the purposes of consumption and these activities are an integral component of Indigenous health. Baseline CR for compounds of potential concern were found to be below the risk acceptability benchmarks established by Health Canada. The HQs for metal exposures through ingestion were generally below the risk acceptability benchmark of 0.2, with some exceedances for methylmercury, primarily due to consumption of fish, and manganese and thallium, primarily due to consumption of wild meat, traditional plants (federal EIS Chapter 18).

Generally, participation rates in the labour force among the Indigenous population were lower than total population participation rates within Lynn Lake and the RAA and greater than provincial Indigenous averages. Indigenous communities engaged on the Project operate businesses such as construction, food retail, fueling service, casino operations, forestry, and emergency services. Guided sportfishing, commercial fishing, and trapping are also important sources of income for Indigenous communities in the RAA (federal EIS Chapter 13).

A total of 781 heritage resources sites have been recorded in the RAA, and of that 11 sites were identified within the MacLellan PDA and LAA. Marcel Colomb First Nation has also reported multiple burial sites in the RAA and stated that Goldsand Lake is a culturally important area that may house burial sites. Additionally, Manitoba Metis Federation identified access routes, campsites, and cultural sites within 100 km of the Project sites including a cemetery with Métis affiliation located near Lynn Lake (federal EIS Chapter 16).

Each of the First Nations engaged are signatories to one of the following historical treaties; Adhesions to Treaty No. 5, Treaty No. 6 or Treaty No 10. The terms of each treaty differ but generally stipulate that First Nations have the right to hunt, trap, fish, and gather resources in their traditional territory until lands are taken up for development or settlement. Métis Nations engaged on the Project have Indigenous rights as affirmed by Section 35(1) of the *Constitution Act*. The harvesting rights of the Manitoba Métis Nation are codified in the Manitoba Metis Federation Metis Laws of the Harvest.

6.14.2 Environmental Effects

6.14.2.1 Change to the Environment

Changes to effects on Indigenous peoples were characterized based on:

- changes to Indigenous health conditions



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- changes to Indigenous socio-economic conditions
- changes to Indigenous physical and cultural heritage
- changes to current use
- changes to Indigenous or Treaty Rights

During construction, changes to Indigenous health conditions, socio-economic conditions, physical and cultural heritage, current use and Indigenous or Treaty Rights are related to site preparation, transportation, infrastructure, water development, and mine components, including emissions, discharges, and wastes. During operation, changes are related to the presence of Project infrastructure and mine operation, including tailings management at the MacLellan site and the storage/stockpiling of ore, mine rock, and overburden. During decommissioning/closure, effects are predominately related to active closure activities (i.e., emissions, discharges, and wastes). Other effects during all Project phases include effects related to transportation within the LAA (i.e., movement of trucks, equipment, supplies) and socio-economic effects related to employment and expenditures. Change in disposition of Crown land (Crown land taken up by the PDA) may affect the ability to exercise Indigenous or Treaty Rights or may also constrain the selection of Treaty Land Entitlement lands under the Manitoba Treaty Land Entitlement Framework Agreement.

6.14.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on Indigenous Peoples.

Key mitigation measures that will be implemented to reduce changes in Indigenous health include:

- Avoidance of plant harvesting sites and access to lands and resources currently used for traditional purposes through Project design.
- Avoidance of plant harvesting sites and access to lands and resources currently used for traditional purposes through timing of Project activities and potential scheduling of construction during periods of lower sensitivity or least effect.
- Incorporation of plant species of interest to Indigenous communities into rehabilitation plans where appropriate and technically feasible.
- Signage.
- Ongoing engagement with Indigenous communities regarding their concerns, mitigation of potential Project effects on TLRU, and potential monitoring opportunities.
- Design for implementation of work schedules for Project construction workers (12 hours per day, seven days per week) will deter workers from hunting and fishing locally outside of working hours during a shift.



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- Development and implementation of Project-specific environmental management and monitoring plans, and discussion with Indigenous communities regarding these plans.
- Implementation of the additional mitigation measures outlined in Sections 6.5.2.2, 6.6.2.2, 6.7.2.2, and 6.10.2.2 above.

Mitigation measures that will be implemented to reduce adverse changes in Indigenous socio-economic conditions include:

- Engagement of local land and resource users (e.g., Indigenous guides), affected tenure holders (trappers), and the Town of Lynn Lake to address, to the extent possible, issues related to the removal and inaccessibility of lands and resources within the PDA at Project sites.
- Engagement of with local resource users (hunters, outfitters, trappers, anglers) and MCC Regional Officials as described in Section 6.10.2.2 above.
- Continued collaboration with Indigenous communities and continued work towards potential training and education partnerships with Manitoba Keewatinowi Okimakanak Inc, the Northern Manitoba Sector Council, and Atoskiwin Training and Employment Centre to provide opportunities for Indigenous people to obtain skills and training required for Project participation.
- Continued support by Alamos to Marcel Colomb First Nation to facilitate activities intended to increase Indigenous cultural awareness for Project employees. Alamos will continue to engage with Marcel Colomb First Nation in supporting development and presentation of these activities and events.
- Workers will be prohibited from bringing firearms and fishing gear to the sites while working as described in Section 6.10.2.2 above.
- Communicating the schedule of Project activities throughout the construction, operation, and decommissioning/closure phases to affected Indigenous communities.
- Development and implementation of Project-specific environmental management and monitoring plans, and discussion with Indigenous communities regarding these plans.
- Implementation of the mitigation measures for site security, worker transportation, and work scheduling as described in Section 6.9.2.2 above.
- Implementation of standard construction procedures and a Traffic Management Plan to reduce traffic delays during construction. The Traffic Management Plan will be developed during ongoing planning and engineering design to address traffic staging to reduce delays.
- Collaboration with the Town of Lynn Lake and surrounding Indigenous communities to discuss appropriate monitoring or management plans to address draws on services if, during operation, workers and their families relocate to Lynn Lake.
- Participation in discussions with Manitoba Infrastructure regarding the need for upgrades to PR 391 and/or weight exception requirements to support the Project.



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- Design the Project to enhance potential positive effects as described in Section 6.8.2.2 above.

Key mitigation measures that will be implemented to reduce changes to Indigenous physical and cultural heritage include:

- Consideration of mitigation measures proposed by Indigenous communities.
- Ongoing engagement with Indigenous communities regarding their concerns, mitigation of potential Project effects on traditional land and resource use, and potential monitoring.
- Development and implementation of Project-specific environmental management and monitoring plans, and discussion with Indigenous communities regarding these plans.
- Implementation of the mitigation measures for heritage resources as described in Section 6.11.2.2.
- Training of staff in the recognition of archaeological features and objects such as precontact Indigenous material culture, and 19th and 20th century Euro-Canadian material culture.
- Reviewing the potential and documented historical use and occupation of the PDA and LAA with staff.
- Potentially hiring of Indigenous field support staff as part of an environmental monitoring team.

6.14.2.3 Residual Effects

Indigenous health conditions may be affected by changes in the availability of country foods and value or perceived quality of country foods. The availability of country foods within the PDA is currently limited by the former mine sites. The Project will result in approximately 1,210 ha of upland and wetland disturbance in the PDA and is expected to increase wildlife mortality and habitat loss for wildlife, fish, and plants within the PDA. Although vehicular collisions and human-wildlife conflicts may result in mortality for a few individual animals, the health of harvested resources at a population level is not anticipated to change within the RAA. The health risks associated with inhalation and ingestion exposures to COPCs and noise levels are below applicable guidelines and are not expected to cause human health effects.

Residual effects to Indigenous socio-economic conditions are anticipated to Indigenous peoples living and working within the LAA and RAA. Project construction may affect, restrict, or change the land base available for recreational activities, including hunting and fishing. Project construction and operation may change Indigenous socio-economic conditions through the loss of land area, restriction of access to designated lands and competition with additional recreational land users, thereby affecting commercial trapping, and guiding hunters that Indigenous peoples engage in. Portions of Pukatawagan Registered Traplines 30, 36, and YTC will be removed through development of the PDA and Registered Traplines adjacent to the PDA may also be affected by Project related dust and noise. Construction activities and equipment can also affect recreational and cabin users in the LAA through sensory disturbance affecting the quality of the recreation experience. Visual quality within the LAA is also expected to change overall with the Project, as portions of the ore stockpile, overburden stockpile, and MRSA at the MacLellan site will be visible from viewpoints within the LAA. The Project will not place additional demands on power, water, and wastewater services and infrastructure; however, traffic volumes are expected to increase as a result of the Project,



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particularly along PR 391 between the Gordon and MacLellan sites, resulting in residual effects on traffic volumes for Marcel Colomb First Nation members who reside in Black Sturgeon Reserve. Bussing of workers to and from the job sites is anticipated to reduce overall vehicle traffic on PR 391. Recognizing that the Indigenous population represents 40% of Lynn Lake's labour force and just over 37% of the RAA labour force, Indigenous people may experience financial effects as a result of the Project, including increased income during construction and operation and loss of employment at closure, resulting in both positive and adverse effects related to wellbeing and social cohesion.

Residual effects to Current Use and Indigenous physical and cultural heritage are described in Sections 6.11.2.3 and 6.12.2.3 above. The Project is expected to affect the availability of lands and resources for traditional use, access to lands and resources for traditional use, cultural and spiritual sites and the cultural values or importance associated with traditional land and resource use. The Project is expected to directly interact with physical and cultural heritage sites and areas through the physical removal of, or changes to, features and indirectly through Project-generated emissions.

Impacts to Indigenous or Treaty rights are related to changes to the availability of resources, changes in access to resources, changes to areas of cultural importance, and changes to the conditions that support the exercise of Indigenous rights. Where the Project has a residual effect on Current Use, as described in Section 6.12.2.3, it has been considered as a residual effect on Indigenous or Treaty rights. Residual effects on fish, wildlife, and plant species health are anticipated as described in Sections 6.5.2.3, 6.6.2.3, and 6.7.2.3, potentially affecting Indigenous and Treaty rights related to consumption of those resources; however, effects are not anticipated at population levels for these species. Residual effects on Indigenous socio-economic conditions are anticipated such as impacts to fishing, trapping, and recreation as described in Section 6.8.2.3, potentially affecting the ability to exercise Indigenous or Treaty Rights; however, it is anticipated that the exercise of these rights will be able to continue at similar levels as under baseline conditions. Residual effects to Indigenous physical and cultural heritage are also anticipated as described in Section 6.11.2.3 and 6.12.2.3. Visual quality within the LAA is expected to change overall with the Project, and sensory disturbances are also likely, potentially affecting the exercise of Indigenous or Treaty Rights.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on Indigenous peoples with respect to health, socio-economic conditions, and physical and cultural heritage are predicted to be not significant. A significance determination for residual effects on Indigenous or Treaty Rights has not been undertaken as part of the EIS however the severity of impacts are characterized in keeping with IAAC's *Interim Guidance: Assessment of Potential Impacts on the Rights of Indigenous Peoples*. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.



7.0 SUMMARY OF RESIDUAL EFFECTS FROM PLANNED ACTIVITIES

Project residual effects for the MacLellan site were determined for 14 VCs including: atmospheric environment, acoustic environment, groundwater, surface water, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, labour and economy, community services, infrastructure and well-being, land and resource use, heritage resources, current use of lands and resources for traditional purposes, human health, and Indigenous peoples. The summary of this assessment is included in Appendix A; Table A-1.

Based on the results of the environmental assessment, including implementing the identified mitigation measures, the Project as planned (i.e., routine activities) will not result in significant adverse residual environmental effects.



8.0 ENVIRONMENTAL MONITORING AND MANAGEMENT

8.1 OVERVIEW

Proposed mitigation and environmental management measures have been developed for all VCs based on preliminary Project planning and design. These mitigation measures will be refined as Project design and engineering progress and will be informed by the outcomes of the EA process (including the results of EA-related modelling, as well as the results of public and Indigenous engagement carried out in support of the EA).

Opportunities for the reduction of potential adverse environmental effects will continue to be incorporated in the design and engineering of Project components and the planning, scheduling, and carrying out of activities during all phases of the Project. Currently proposed mitigation measures are anticipated to result in compliance with applicable environmental legislation and regulatory requirements, including the *Fisheries Act* and *Migratory Bird Convention Act*.

Proposed mitigation and environmental management measures include development and implementation of the following Project-specific environmental management and monitoring plans and consultation with applicable federal and provincial regulators and engagement with potentially affected Indigenous communities regarding these plans.

8.2 ENVIRONMENTAL MANAGEMENT PLANS

The following environmental management plans have been identified:

- Emergency Response and Spill Prevention and Contingency Plans
- Soil Management and Rehabilitation Plan
- Mine Rock Management Plan
- Groundwater Monitoring Plan
- Surface Water Monitoring and Management Plan
- Waste Management Plan
- Air Quality Management Plan
- Noise Monitoring Plan
- Greenhouse Gas Management Plan
- Explosives Management Plan



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Environmental Monitoring and Management

- Heritage and Cultural Resources Protection Plan
- Vegetation and Weed Management Plan
- Erosion and Sediment Control Plan
- Wildlife Monitoring and Management Plan
- Environmental Effects Monitoring Plan
- Closure Plan

For a discussion of follow-up and monitoring programs by VC, see federal EIS Chapter 20, Appendix 20B, Table 20B-1.

Alamos will plan for communication of Project activities, locations and timing throughout construction, operation, and closure to affected Indigenous communities, land and resource users, interest groups, the provincial government, and local authorities leading up to construction and throughout the life of the Project. In addition, as part of the Adaptive Management Framework, the environmental management and monitoring program and associated plans will be assessed regularly to verify implementation and the continued suitability, adequacy, and effectiveness as part of Alamos' commitment to continual improvement. The review of the program will identify elements and associated plans in need of revision and will evaluate performance against established performance objectives.



9.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The Project has been designed and will be carried out to withstand potential environmental forces, events, and conditions such as events related to climate (including weather and its variables), climate change, geologic hazards (such as seismic activity and landslides), and forest fires which can affect the project components and infrastructure, construction schedule, and operational performance. Further details on the effects of the environment on the Project and management of these effects are presented in federal EIS Chapter 21.

10.0 EFFECTS OF POTENTIAL ACCIDENTS AND MALFUNCTIONS

The Project is inherently designed to prevent accidents and malfunctions primarily through adherence to accepted design codes and standards. Most accidental events that could be expected to occur are small spills that are easily cleaned up on site with little or no environmental consequences. Emergency response and contingency plans will be advanced and implemented to effectively respond to accidents and malfunctions to reduce the magnitude and duration of adverse environmental and social effects. Details on the effects of potential accidents and malfunctions and management of these effects are presented in the federal EIS Chapter 22. Potential accidents and malfunctions that have been assessed include:

- Malfunction of the TMF which could lead to the release of untreated tailings solids and water.
- Malfunction of the seepage and contact water collection system and site water management pond which could lead to the release of untreated contact water into the receiving environment.
- Malfunction of a component of the processing system which could result in the release of liquids, reagents, or gases.
- Malfunction of the sewage treatment system which would result in the release of untreated effluent, domestic sewage, or reagents. Failure of the treated effluent discharge pipeline would also result in the release of treated effluent.
- Failure of the storage and dispensing facilities for gasoline and diesel fuels which would result in the release of petroleum-based pollutants. Failure of the on-site storage and handling facilities for hazardous materials which would result in the release of these materials. Collision or mechanical malfunctions involving construction equipment, mining equipment, or transport trucks which may result in the release of hazardous materials such as mill reagents, hydraulic fluid and fuel, or other non-hazardous materials such as construction material.
- Slope failure in the open pit which would result in areas adjacent to the open pit slumping into the open pit, and potential unintended expansion of the Project footprint.
- Slope failure of the materials storage area which would result in the release of mine rock, overburden, or ore outside the storage areas.
- Uncontrolled or unmanaged blasting which would cause damage resulting from dust and fly rock extending beyond defined boundaries and resulting in excess noise and vibration to the surrounding properties.
- A fire or explosion which may result in the destruction of Project infrastructure and vegetation and natural features within or beyond the PDAs, and the release of smoke, combustion gases and ash.



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Effects of Potential Accidents and Malfunctions

- Accidental collisions from the operation of Project vehicles or heavy equipment which could result in human or wildlife mortality or injury.

Environmental effects associated with the scenarios with the greatest likelihood of occurring (e.g., small spills), are predicted to be not significant. In the unlikely event of a major industrial accident at the site involving a large-scale environmental release, a significant adverse effect is possible for some valued components. Some accidental events are predicted to be of potentially high consequence with very low probability (e.g., TMF failure and tailings release); however, significant adverse residual effects from Project-related accidents and malfunctions are not likely and management planning, including adherence to design standards, addresses these risks.



Conclusion

11.0 CONCLUSION

This Environment Act Proposal (EAP) documents the results of the environmental assessment (EA) for the Lynn Lake Gold Project (the Project) proposed by Alamos Gold Inc. (Alamos) with reference to the MacLellan site. An environmental assessment of the Project (MacLellan site) is required under *The Environment Act* (Manitoba). The Project has been assessed to meet the requirements of the provincial Environment Act Proposal (EAP) Guidelines.

Engagement has been ongoing prior to and throughout the EA process, and will continue with agencies, local Indigenous communities, and stakeholders through the life of the Project. As part of the information sharing through the engagement process, Project-related information was provided by Indigenous communities and groups in the form of traditional knowledge and traditional land and resource use studies and other forms of information sharing. Government, Indigenous community and groups, and stakeholder engagement input and Project-related studies have been considered throughout the EA including baseline data collection, mitigation, residual effects assessment, and follow-up and monitoring, where appropriate. Alamos will continue, throughout the life of the mine to incorporate information shared from Indigenous communities and groups wherever appropriate, including changes to outcomes of mitigation and monitoring. Information provided herein is current to May 22, 2020. Information or feedback provided through engagement after May 22, 2020 will be shared with regulators in supplemental filings to the Environmental Impact Statement in January 2021.

Fourteen valued components (VCs) were identified as relevant and important to the environmental assessment based on regulatory requirements and engagement. They included the atmospheric environment; noise and vibration; groundwater; surface water; fish and fish habitat; vegetation and wetlands; wildlife and wildlife habitat; labour and economy; community services, infrastructure and well-being; land and resource use; heritage resources; current use of lands and resources for traditional purposes; human health; and Indigenous Peoples.

The assessment followed standard EA methods for describing Project interactions with each of the VCs and determining the potential environmental effects associated with the Project for the construction, operation, and decommissioning/closure phases. It presents mitigation and environmental protection measures to reduce or eliminate adverse effects, characterizes the residual environmental effects that remain after mitigation has been applied, and determines the significance of the effects. The MacLellan site EAP is based on the federally filed EIS document (May 2020) submitted to the Impact Assessment Agency of Canada (IAAC). The Gordon site is addressed in a separate EAP document.

Based on the results of the environmental assessment, including implementing the identified mitigation measures, the Project is not likely to cause significant adverse environmental effects. A number of monitoring and reporting commitments have been proposed as part of environmental management, follow-up and monitoring programs to verify the accuracy of the residual effects assessment, determine the effectiveness of mitigation measures, and monitor compliance with regulatory approvals, permits and authorizations.

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12.2 PERSONAL COMMUNICATIONS

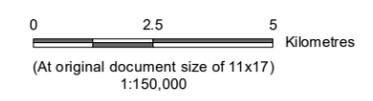
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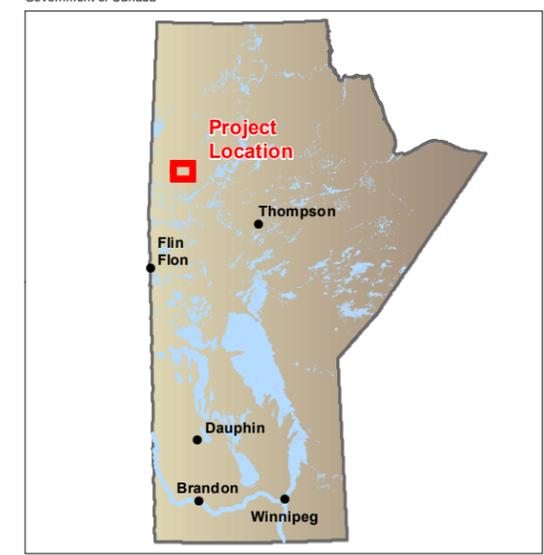


Landbase

-  Existing Access Road
-  Highway
-  Watercourse
-  Waterbody
-  First Nation Reserve



Notes
 1. Coordinate System: NAD 1983 UTM Zone 14N
 2. Base Data Sources: Government of Manitoba and Government of Canada

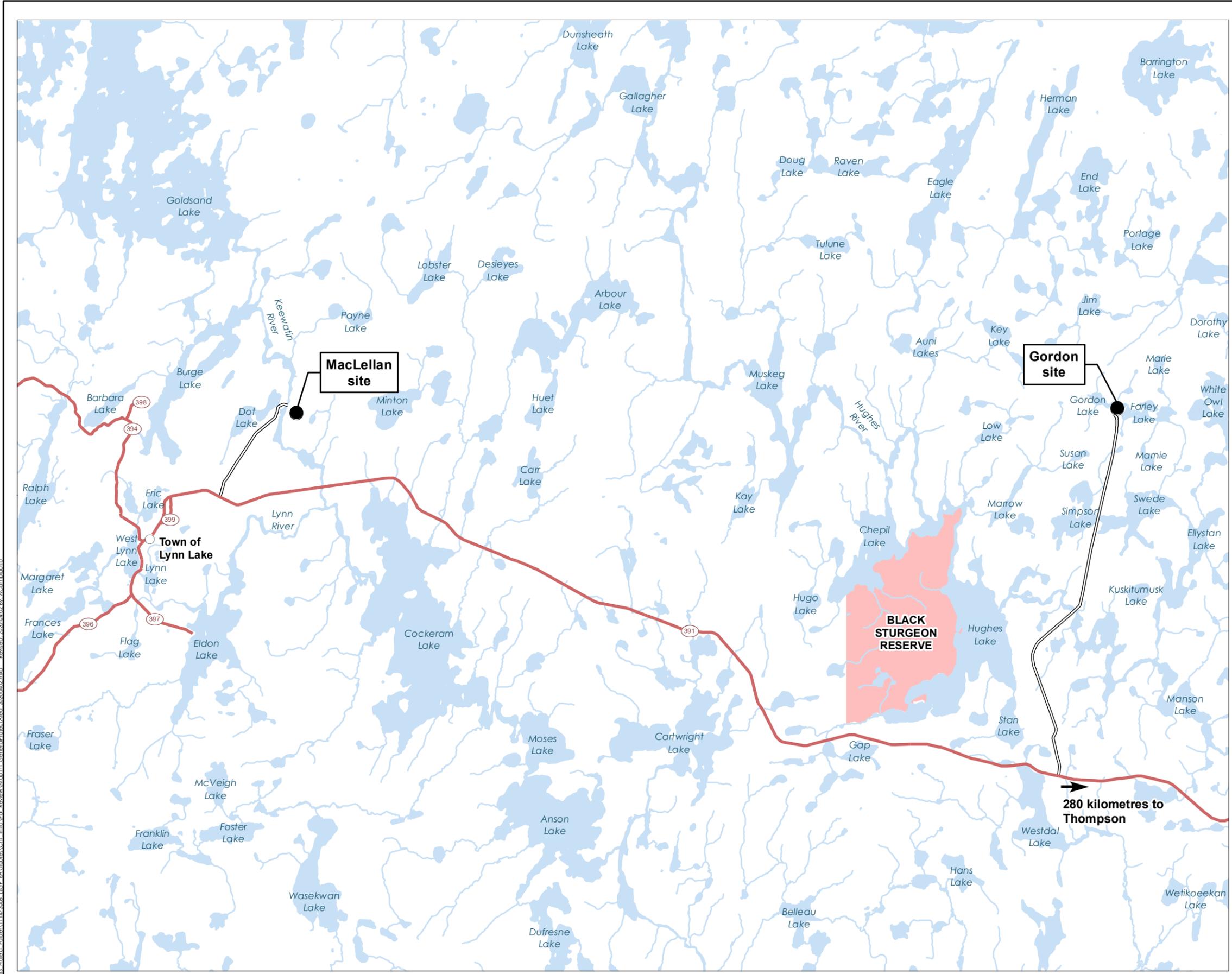


Project Location
 Lynn Lake, Manitoba
 Prepared by ACampigotto on 2020-04-02
 Technical Review by ASomers on 2020-04-02
 Senior GIS Review by GKroupa on 2020-04-02

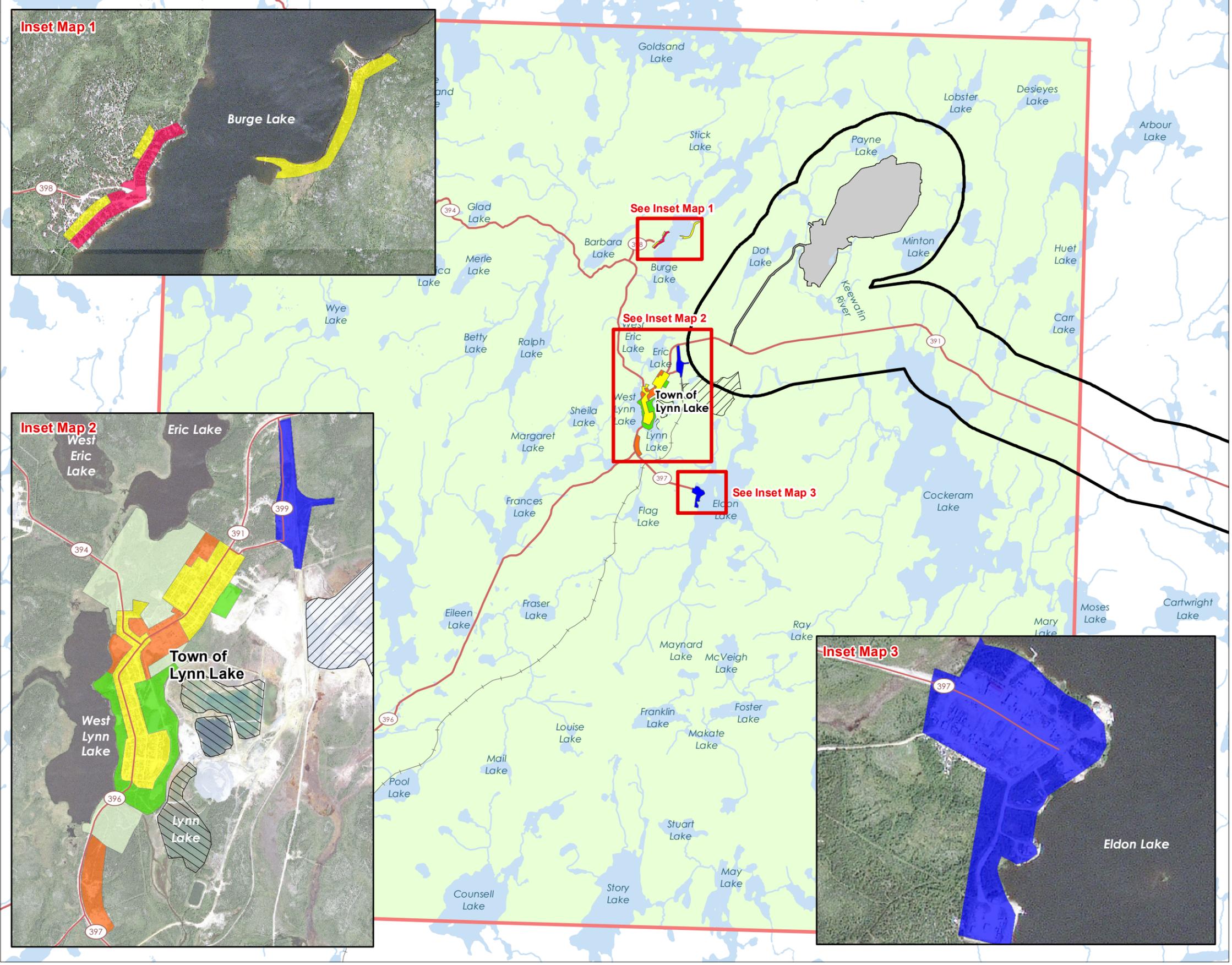
Client/Project
 ALAMOS GOLD INC.
 Lynn Lake Gold Project
 111473008

Map No.
1-1

Title
General Project Area



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 Revised: 2020-04-02 By: ACampigotto



Project Infrastructure

Project Development Area

Study Area

Land and Resource Use Local Assessment Area (LAA)

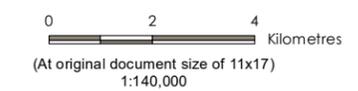
Development Plan

Land Use Designations

- Commercial and Public
- Industrial
- Parks and Open Space
- Provincial Park
- Residential
- Limited Development Area
- East Tailings Management Area
- West Tailings Management Area

Landbase

- Highway
- Access Road
- Rail
- Watercourse
- Waterbody
- Lynn Lake Municipal Boundary



Notes
 1. Coordinate System: NAD 1983 UTM Zone 14N
 2. Base Data Sources: Government of Manitoba and Government of Canada
 3. Imagery: SPOT-7 imagery, BlackBridge Geomatics Corp. July 2015.

Project Location
 Lynn Lake, Manitoba
 Prepared by A Campigotto on 2020-01-20
 Technical Review by BKrawchuk on 2020-01-20
 Senior GIS Review by GKroupa on 2020-01-20

Client/Project
 ALAMOS GOLD INC.
 Lynn Lake Gold Project
 111473008

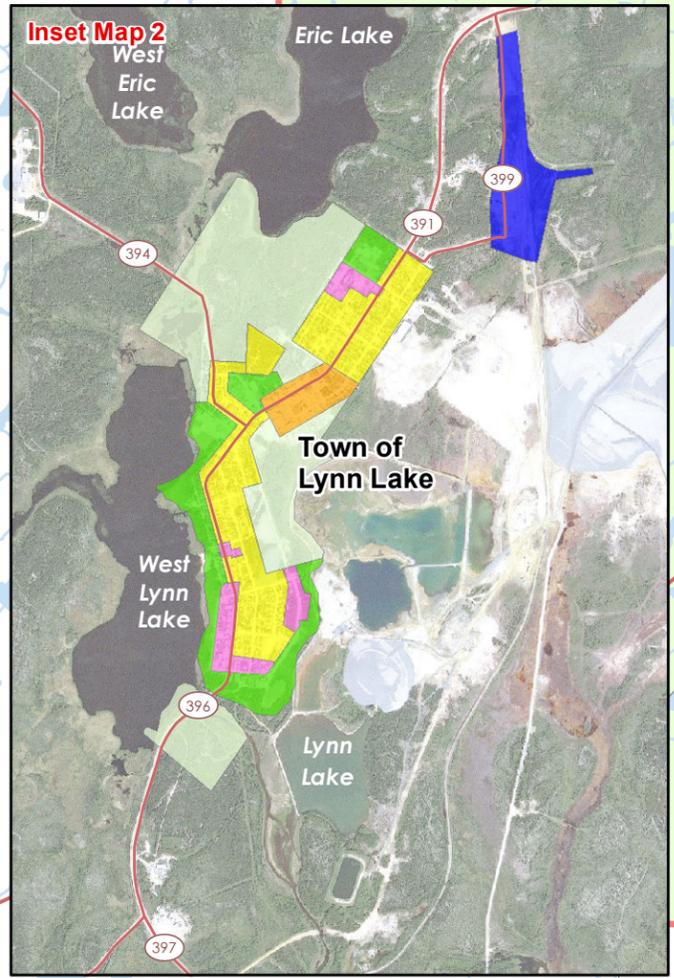
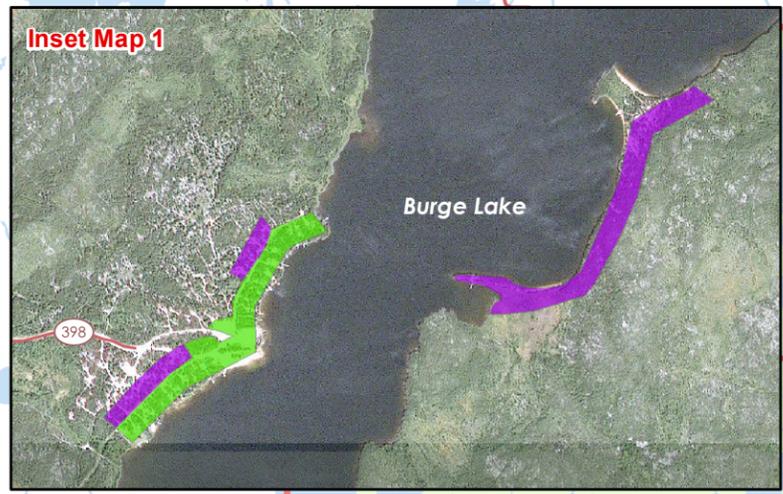
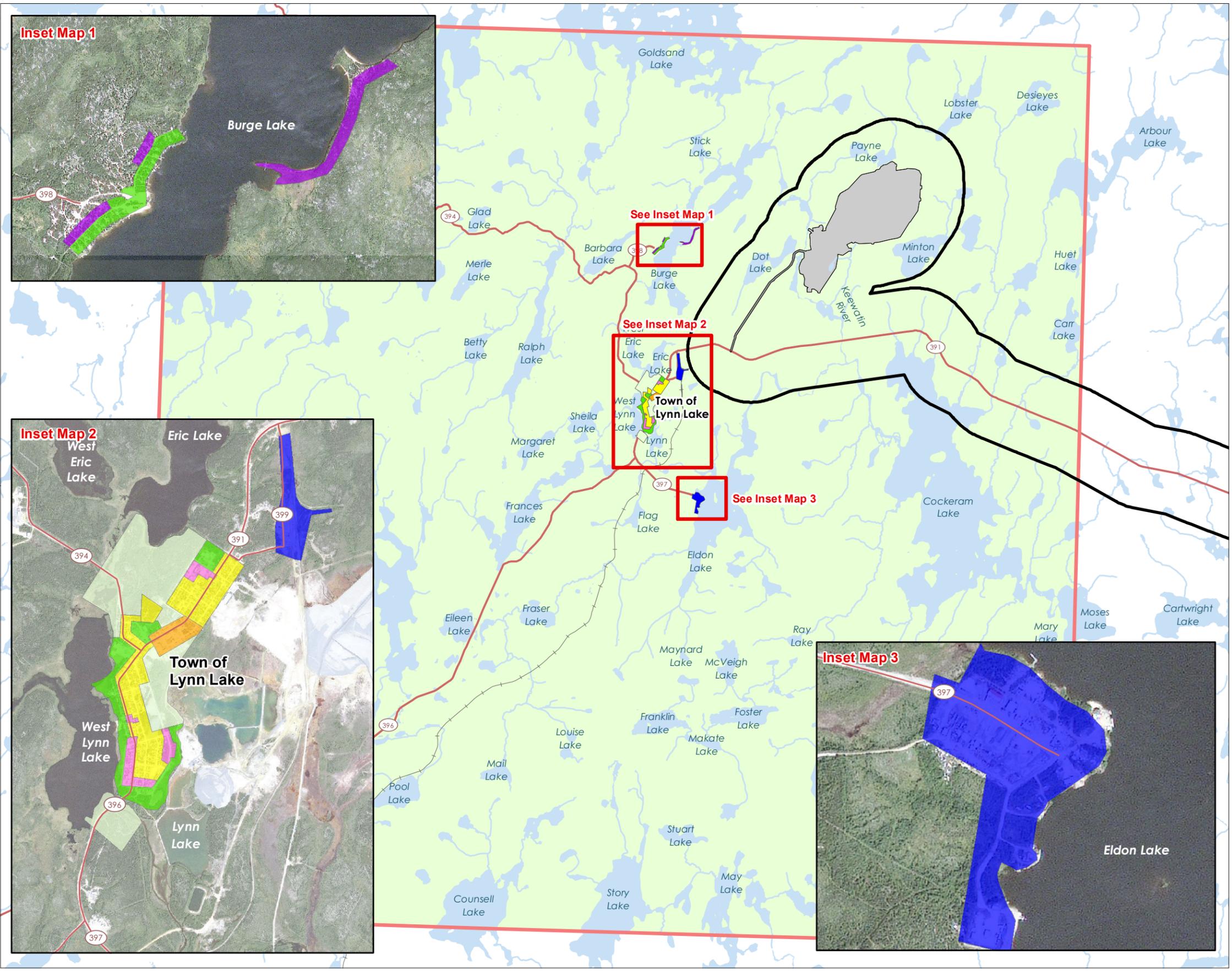
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Title

Development Plan Designations

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Project Infrastructure

Project Development Area

Study Area

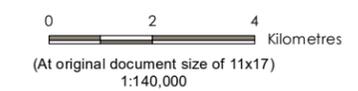
Land and Resource Use Local Assessment Area (LAA)

Zoning Districts

- CG - General Commercial District
- M - Industrial District
- LD - Limited Development District
- R - Residential
- R2 - Two-Family Dwelling District
- R3 - Multiple-Family Dwelling District
- P - Public Open Space District

Landbase

- Highway
- Access Road
- Rail
- Watercourse
- Waterbody
- Lynn Lake Municipal Boundary



Notes
 1. Coordinate System: NAD 1983 UTM Zone 14N
 2. Base Data Sources: Government of Manitoba and Government of Canada
 3. Imagery: SPOT-7 imagery, BlackBridge Gemoatics Corp. July 2015.

Project Location
 Lynn Lake, Manitoba
 Prepared by A Campigotto on 2020-01-20
 Technical Review by BKrawchuk on 2020-01-20
 Senior GIS Review by GKroupa on 2020-01-20

Client/Project
 ALAMOS GOLD INC.
 Lynn Lake Gold Project
 111473008

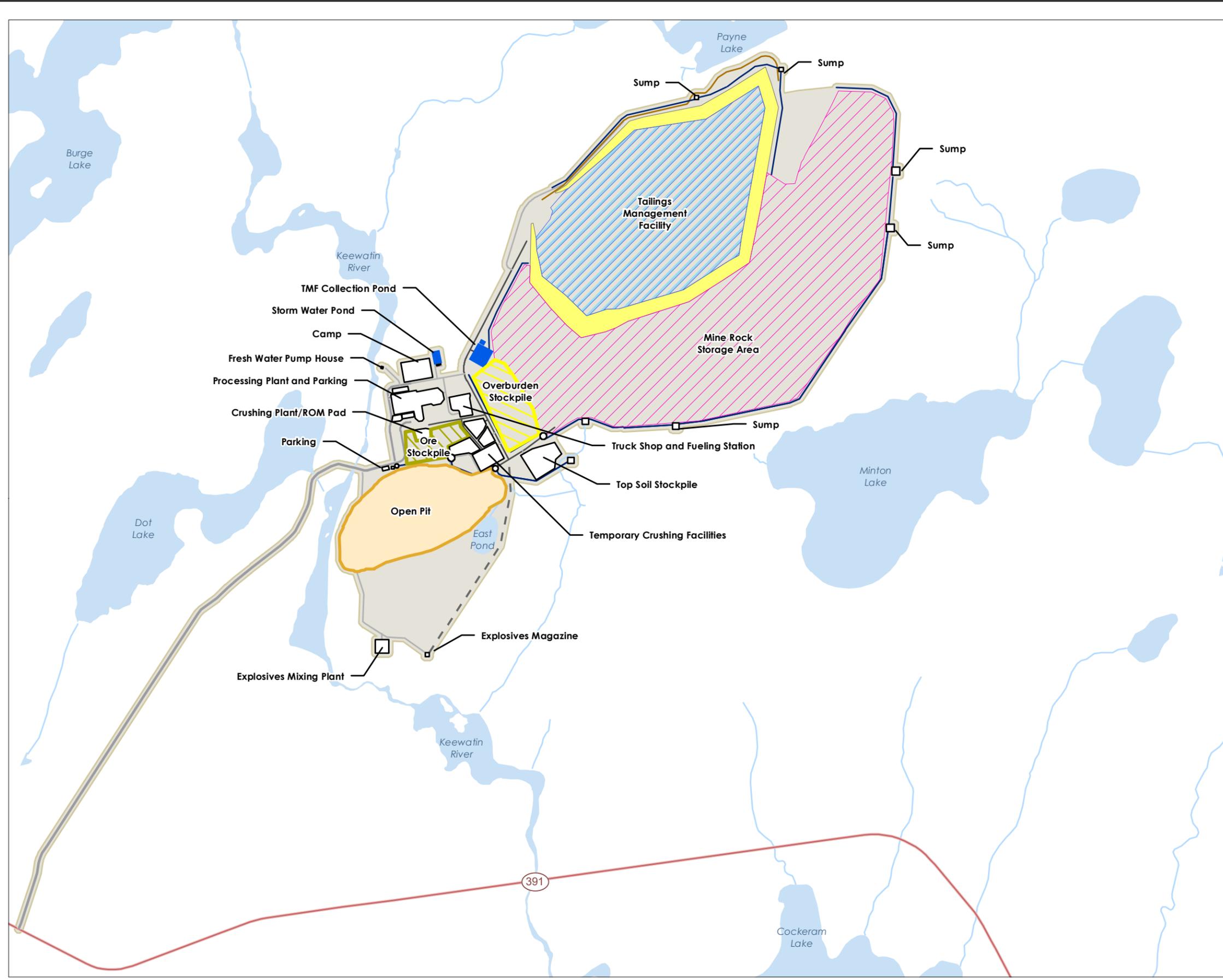
Map No.

1-3

Title

Zoning Districts

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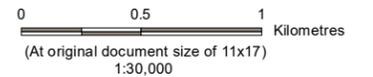


Project Infrastructure

- Project Development Area
- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Ore Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Drainage Ditch
- Access Road
- Haul Road
- Inplant Road
- Toe Road
- Future Access Road

Landbase

- Highway
- Existing Access Road
- Watercourse
- Waterbody



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 14N
 2. Base Data Sources: Government of Manitoba and Government of Canada.
 3. Project Infrastructure features provided by QPit and Ausenco.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-08
Technical Review by ASomers on 2020-05-08
Senior GIS Review by GKroupa on 2020-05-08

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

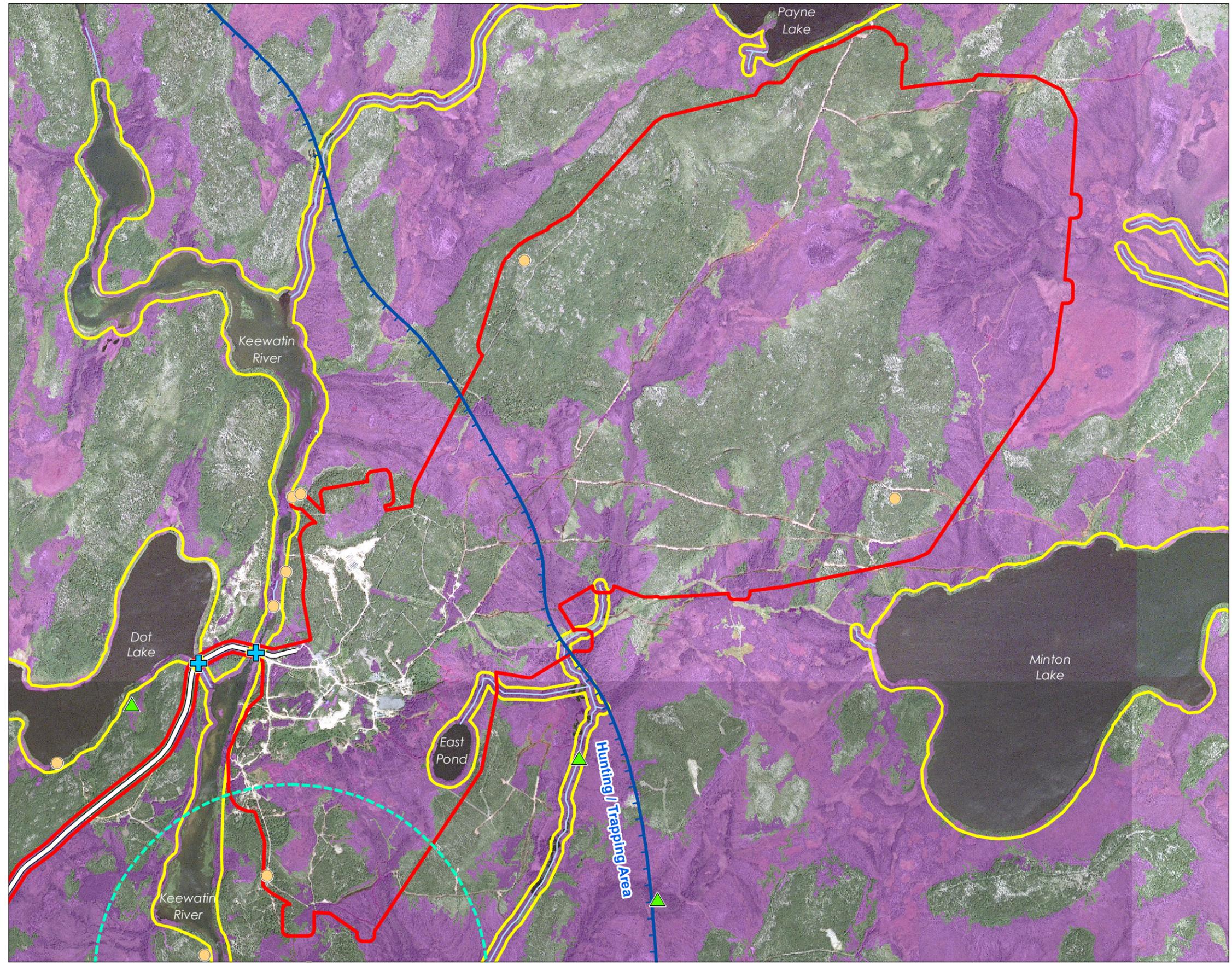
111473008

Map No.

2-1

Title

**Project Development Area -
MacLellan site**



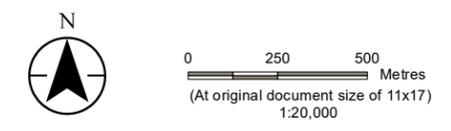
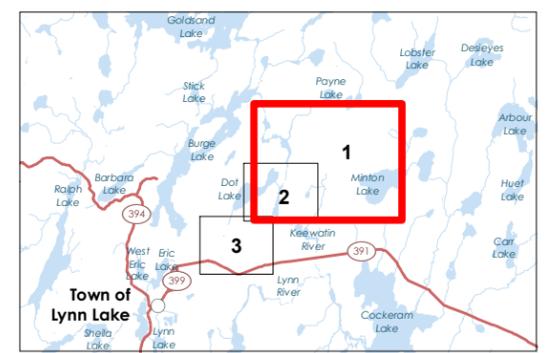
Project Infrastructure
 Project Development Area

Environmentally Sensitive Sites

-  Archaeological Site
-  Watercourse Crossing Location
-  Rare Plant Location
-  Bald Eagle Nest 1000m Buffer
-  Water Features 30m Buffer
-  Hunting / Trapping Area
-  Wetland Area (interpreted from satellite imagery)

Landbase

-  Existing Access Road
-  Watercourse



Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Imagery: SPOT-7 imagery, BlackBridge Geomatics Corp. July 2015.

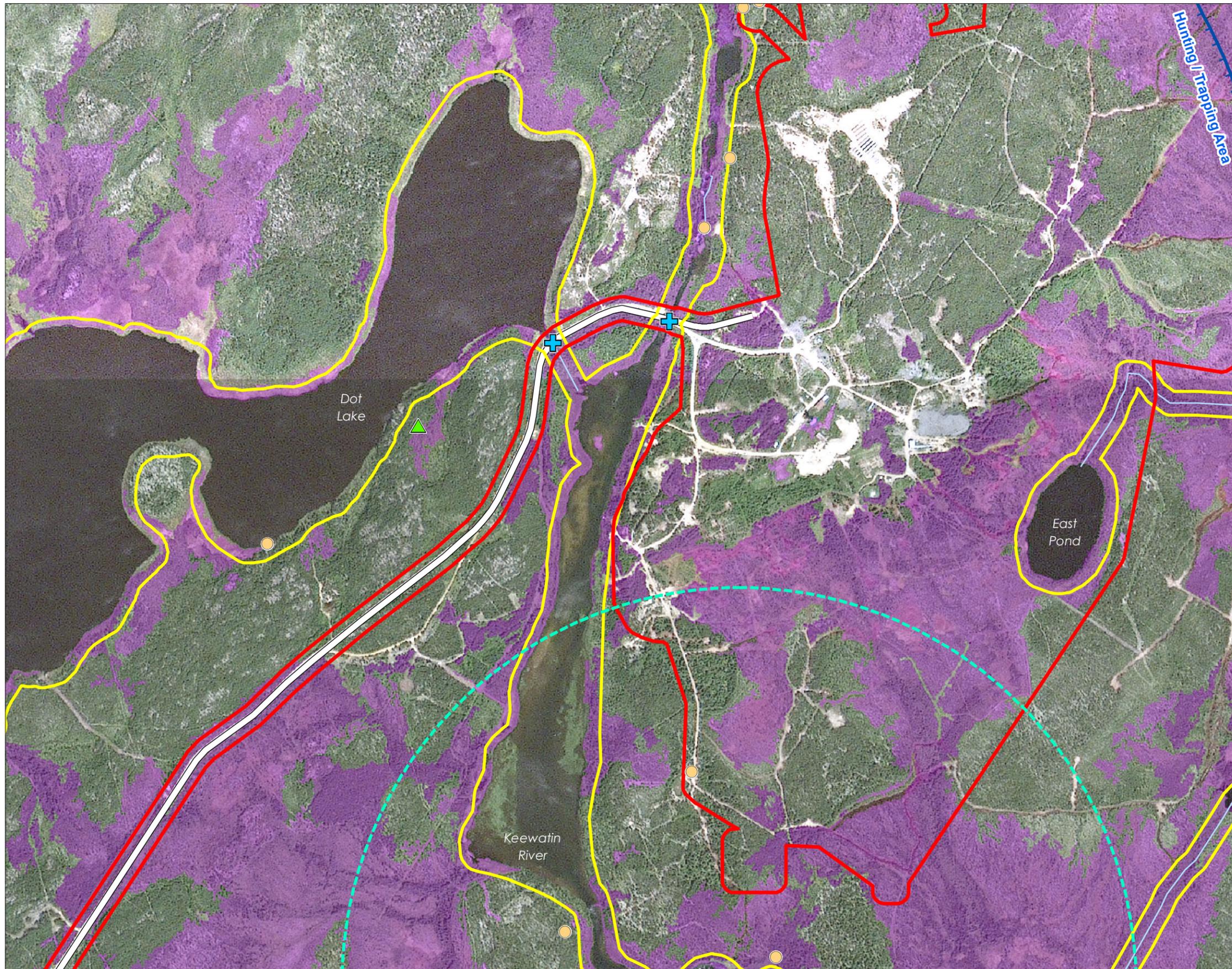
Project Location
 Lynn Lake, Manitoba
 Prepared by A Campigotto on 2020-04-03
 Technical Review by ASomers on 2020-04-03
 Senior GIS Review by GKroupa on 2020-04-03

Client/Project
 ALAMOS GOLD INC.
 Lynn Lake Gold Project
 111473008

Map No.
2-3a

Title
Environmentally Sensitive Sites at the MacLellan site

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Project Infrastructure

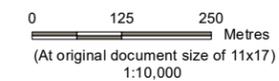
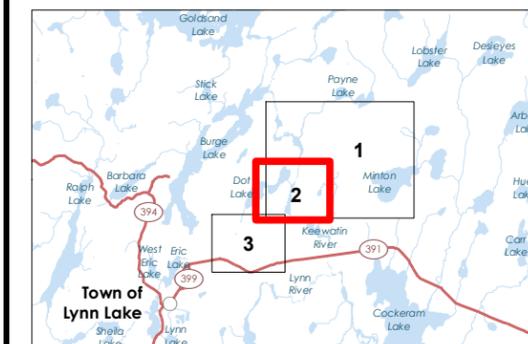
Project Development Area

Environmentally Sensitive Sites

- Archaeological Site
- Watercourse Crossing Location
- Rare Plant Location
- Bald Eagle Nest 1000m Buffer
- Water Features 30m Buffer
- Hunting / Trapping Area
- Wetland Area (interpreted from satellite imagery)

Landbase

- Existing Access Road
- Watercourse



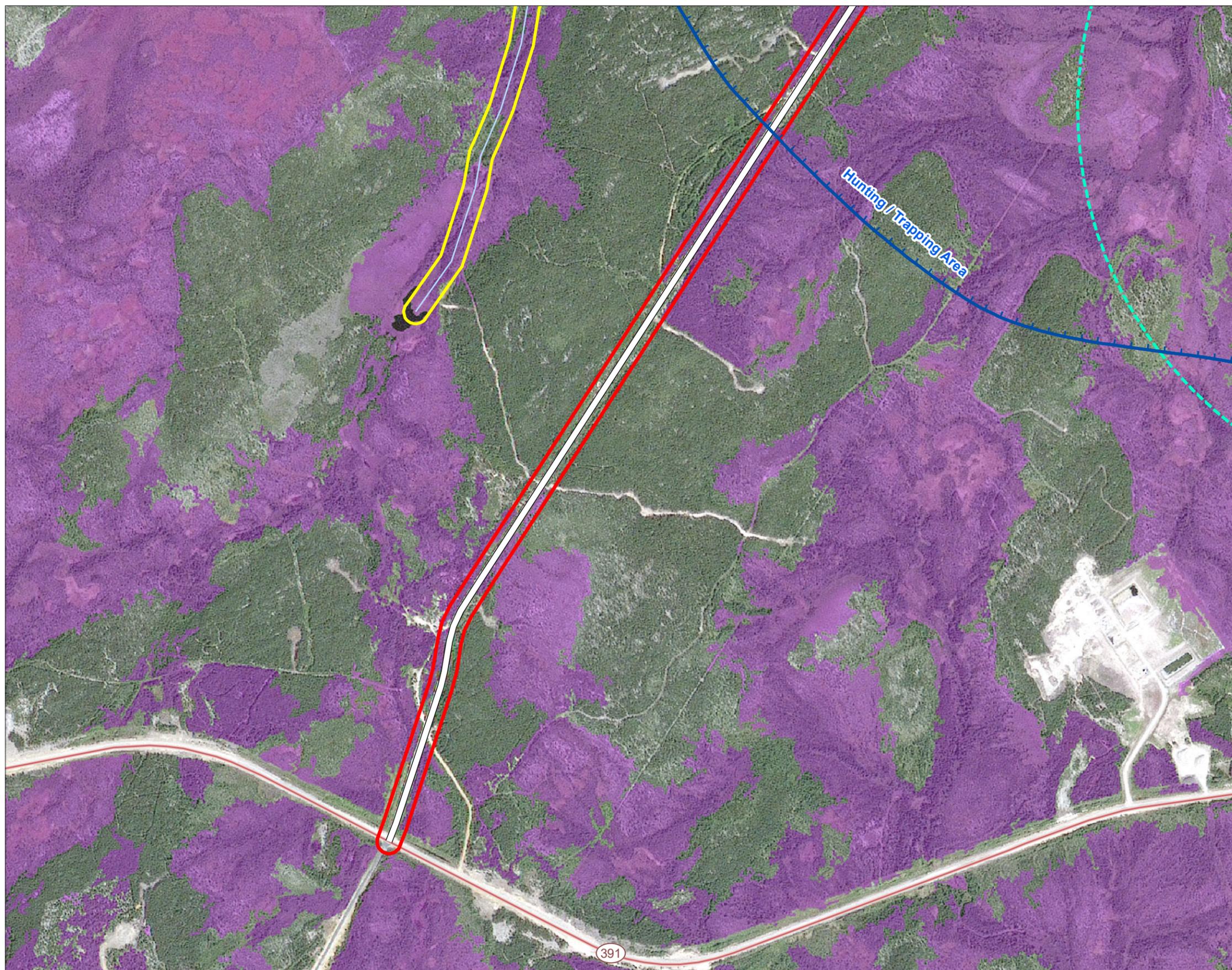
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 2. Base Data Sources: Government of Manitoba and Government of Canada.
 3. Imagery: SPOT-7 imagery, BlackBridge Geomatics Corp. July 2015.

Project Location
 Lynn Lake, Manitoba
 Prepared by ACampigotto on 2020-04-03
 Technical Review by ASomers on 2020-04-03
 Senior GIS Review by GKroupa on 2020-04-03

Client/Project
 ALAMOS GOLD INC.
 Lynn Lake Gold Project
 111473008

Map No.
 2-3b

Title
 Environmentally Sensitive Sites at the MacLellan site



Project Infrastructure

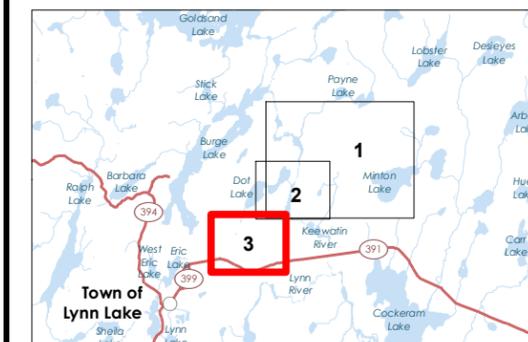
Project Development Area

Environmentally Sensitive Sites

- Bald Eagle Nest 1000m Buffer
- Water Features 30m Buffer
- Hunting / Trapping Area
- Wetland Area (interpreted from satellite imagery)

Landbase

- Existing Access Road
- Highway
- Watercourse



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- Notes**
1. Coordinate System: NAD 1983 UTM Zone 14N
 2. Base Data Sources: Government of Manitoba and Government of Canada.
 3. Imagery: SPOT-7 imagery, BlackBridge Geomatics Corp. July 2015.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-03
Technical Review by ASomers on 2020-04-03
Senior GIS Review by GKroupa on 2020-04-03

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473008

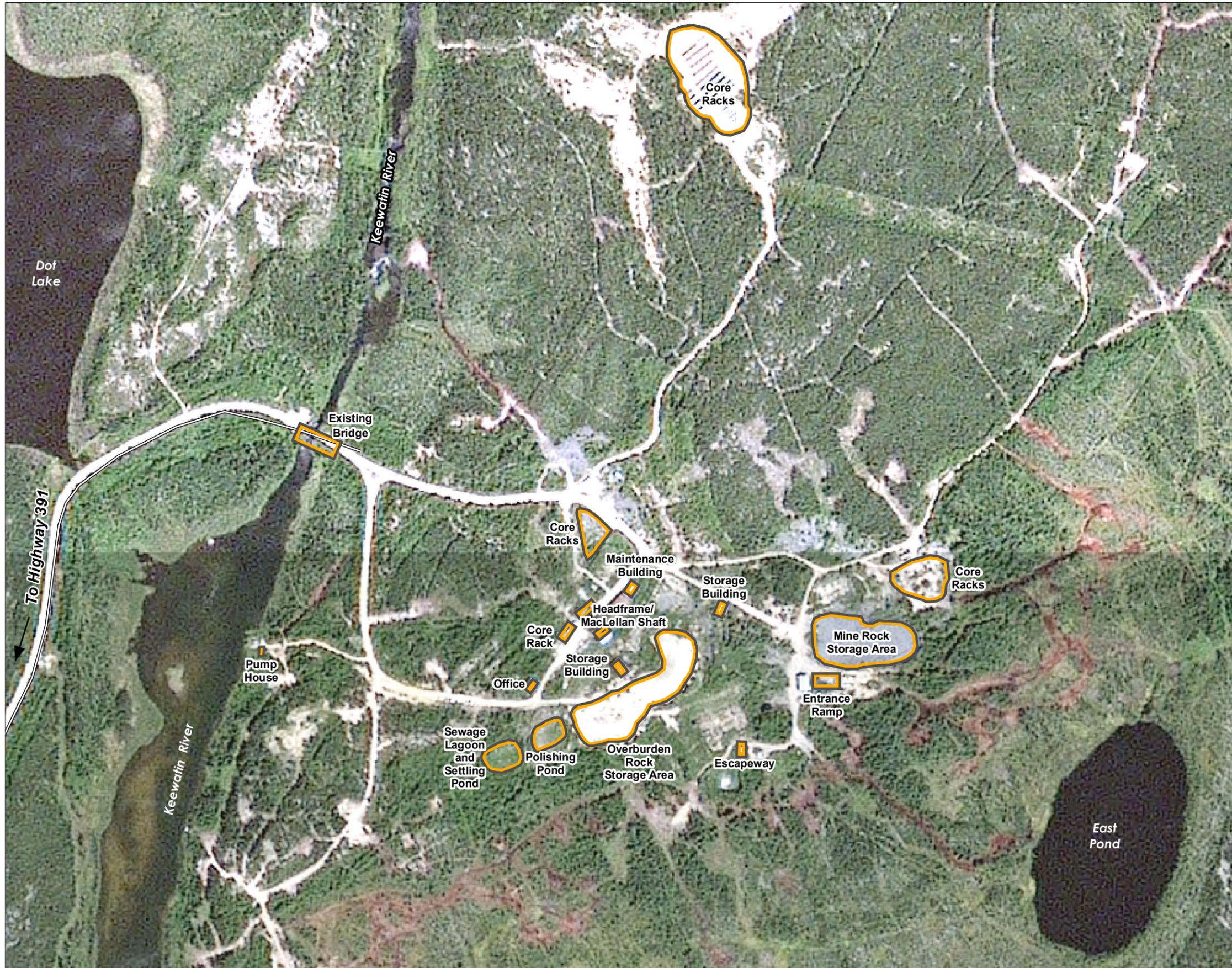
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2-3c

Title

Environmentally Sensitive Sites at the MacLellan site

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Historical Mine Infrastructure

Existing Infrastructure Associated with Historical Mine

Landbase

Existing Access Road



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- Notes**
1. Coordinate System: NAD 1983 UTM Zone 14N
 2. Base Data Sources: Government of Manitoba and Government of Canada.
 3. Imagery: SPOT-7 imagery, BlackBridge Gemoatics Corp. July 2015.

Project Location
Lynn Lake, Manitoba
Prepared by ACampigotto on 2019-10-24
Technical Review by ASomers on 2019-10-24
Senior GIS Review by GKroupa on 2019-12-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project
111473008

Map No.

2-4

Title

Existing MacLellan Site

Appendix A SUMMARY OF RESIDUAL EFFECTS



LYNN LAKE GOLD PROJECT ENVIRONMENT ACT PROPOSAL REPORT – MACLELLAN SITE

Appendix A Summary of Residual Effects

Table A-1 Summary of Effects Assessment for the MacLellan Site for Routine Project Effects and Activities

Potential Effect	Project Activity	Residual Effects								Significance of Residual Effect
		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Value Component: Atmospheric Environment										
Change in air quality • Atmospheric dispersion of air emissions from Project equipment and activities during operation	C	A	L	LAA	ST	A	IR	R	D	Not significant
	O	A	L/M/H	LAA	MT	A	IR	R	D	Not significant
	D	A	N	LAA	LT	A	IR	R	D	Not significant
Change in atmospheric greenhouse gases (GHG) • GHG emissions from Project equipment and activities during construction and operation	C	A	L	N/A*	ST	N/A	C	I	D	Not significant
	O	A	L	N/A*	MT	N/A	C	I	D	Not significant
	D	A	N	N/A*	LT	N/A	IR	I	D	Not significant
Note: * Geographic extent during construction and operation is not applicable as the effect is determined at the provincial, national, and global scales. Geographic extent during decommissioning/closure is not applicable because the effect is global.										
Valued Component: Acoustic Environment										
Change in noise level • Noise emissions from Project equipment and activities, including pile driving, ore movement, and equipment operation	C	A	L-M	RAA	ST	N/A	C	R	D	Not significant
	O	A	L-M	RAA	MT	N/A	C	R	D	
	D	A	L-M	RAA	ST	N/A	C	R	D	
Change in vibration level • Vibration from activities such as pile driving, compacting, and haul truck traffic • Blast-related ground-borne vibration and air overpressure	C	A	N-L	LAA	ST	N/A	R	R	D	Not significant
	O	A	N-M	RAA	MT	N/A	R	R	D	
	D	A	N-L	LAA	ST	N/A	R	R	D	
Valued Component: Groundwater										
Change in groundwater quantity and/or flow • Project activities will result in changes in groundwater recharge and changes to groundwater levels and flow. A decrease in groundwater levels may result in loss of yield to dug or drilled wells, reducing their ability to meet water supply requirements.	C	A	H	PDA & LAA/RAA	MT	A	C	R	D	Not significant
	O	A	L	PDA & LAA/RAA	MT	A	C	I	D	

Legend Key: Project Activity: C – Construction; O – Operation; D – Decommissioning/Closure; **Direction:** P – Positive; A – Adverse; **Magnitude:** N – Negligible; L – Low; M – Moderate; H – High; **Geographic Extent:** PDA – Project Development Area; LAA – Local Assessment Area; RAA – Regional Assessment Area; **Duration:** ST – Short-term; MT – Medium-term; LT – Long-term; **Timing:** A – Applicable; N/A – Not Applicable; **Frequency:** S – Single; IR – Irregular; R – Regular; C – Continuous; **Reversibility:** R – Reversible; I – Irreversible; **Ecological/Socio-economic Context:** D – Disturbed; U – Undisturbed; R – Resilient; NR – Not Resilient

LYNN LAKE GOLD PROJECT ENVIRONMENT ACT PROPOSAL REPORT – MACLELLAN SITE

Appendix A Summary of Residual Effects

Table A-1 Summary of Effects Assessment for the MacLellan Site for Routine Project Effects and Activities

Potential Effect	Project Activity	Residual Effects								Significance of Residual Effect
		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
<ul style="list-style-type: none"> As a pathway to surface water and wetlands, a decrease in groundwater levels and changes in the natural groundwater flow could affect discharge to nearby surface water bodies (assessed in Chapter 9 of EIS) and water levels within wetlands (assessed in Chapter 11 of EIS). 	D	A	L	LAA/RAA	LT	A	C	I	D	Not significant
Change in groundwater quality <ul style="list-style-type: none"> Changes in groundwater levels and flow direction and recharge or infiltration from the Project activities may alter groundwater quality in dug or drilled wells, reducing their ability to meet water supply requirements without treatment. As a pathway, recharge or infiltration from Project activities may result in changes to groundwater quality discharging to surface water (assessed in Chapter 9). 	C	P	M	PDA & LAA/RAA	ST	A	C	I	D	
	O	A	M	PDA & LAA/RAA	LT	A	C	I	D	
Valued Component: Surface Water										
Change in surface water quantity <ul style="list-style-type: none"> Change in lake levels and stream flows due to diversion, extraction, storage, or discharge of surface water during development, operation, and closure of the open pits, TMF, MRSAs, and associated mine infrastructure. 	C	A	N	LAA	ST	N/A	C	R	D	Not significant
	O	A	N	LAA	MT	N/A	C	R	D	
	D	A	N	LAA	LT	N/A	C	I	D	
Change in surface water quality <ul style="list-style-type: none"> Change in surface water quality associated with any mine effluent releases or surface runoff during construction, operation, and closure of the open pits, TMFs, MRSAs, and associated mine infrastructure. 	C	A	L	LAA	MT	N/A	R	R	D	Not significant
	O	A	L	LAA	MT	N/A	R	R	D	
	D	A	M	LAA	LT	N/A	R	I	D	
Valued Component: Fish and Fish Habitat										
Change in fish habitat <ul style="list-style-type: none"> Change in physical habitat due to mine infrastructure Altered lake levels and stream flow (timing, duration, volume) for surface water due to construction of water management facilities and pits 	C	A	L	LAA	ST	A	R	R	D	Not significant
	O	A	L	LAA	ST	A	R	R	D	
	D	A	L	LAA	ST	A	R	R	D	
Change in fish health, growth, or survival <ul style="list-style-type: none"> Lethal effects due to dewatering, infilling, blasting, change in angling pressure, or entrainment in water intakes Change in water quality parameters that influence habitat suitability: dissolved oxygen, temperature, total suspended solids Chronic or acute toxicity effects due to changes in water and sediment quality from mine effluent releases 	C	A	N	LAA	LT	A	R	I	R	Not significant
	O	A	N	LAA	LT	A	R	I	R	
	D	A	N	LAA	LT	A	R	I	R	

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Table A-1 Summary of Effects Assessment for the MacLellan Site for Routine Project Effects and Activities

Potential Effect	Project Activity	Residual Effects								Significance of Residual Effect
		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Valued Component: Vegetation and Wetlands										
Change in landscape diversity • Fragmentation of native plant community patches arising from native vegetation clearing	C	A/P	L	RAA	LT	N/A	S	R	D	Not significant
	O	A/P	L	RAA	LT	N/A	S	R	D	
	D	A/P	L	RAA	LT	N/A	S	R	D	
Change in community diversity • Direct loss or alteration of native vegetation communities, including ecological communities of management concern arising from native vegetation clearing • Indirect alteration of native vegetation communities, including ecological communities of management concern from the introduction or establishment of regulated weeds, vegetation control (i.e., herbicide application) or deposition of dust and contaminants	C	A	L	PDA	LT	N/A	C	I	D	Not significant
	O	A	L	PDA	LT	N/A	C	I	D	
	D	A	L	PDA	LT	N/A	C	I	D	
Change in species diversity • Direct loss of plant SOCC or traditional use plant species due to vegetation clearing • Indirect loss of plant SOCC or traditional use plant species due to the introduction or establishment of regulated weeds, vegetation control (i.e., herbicide application) or deposition of dust and contaminants	C	A	M-H	LAA	LT	N/A	C	I/R	U	Not significant
	O	A	M-H	LAA	LT	N/A	C	I/R	U	
	D	A	M-H	LAA	LT	N/A	C	I/R	U	
Change in wetland functions • Direct loss or alteration of wetland area or change in wetland type from vegetation clearing or alteration of surface or groundwater flow patterns • Indirect loss or alteration of wetland area, structure, or function (i.e., nutrient cycling and carbon sequestration)	C	A	M	LAA	LT	N/A	C	I/R	U	Not significant
	O	A	M	LAA	LT	N/A	C	I/R	U	
	D	A	M	LAA	LT	N/A	C	I/R	U	

Legend Key: Project Activity: C – Construction; O – Operation; D – Decommissioning/Closure; **Direction:** P – Positive; A – Adverse; **Magnitude:** N – Negligible; L – Low; M – Moderate; H – High; **Geographic Extent:** PDA – Project Development Area; LAA – Local Assessment Area; RAA – Regional Assessment Area; **Duration:** ST – Short-term; MT – Medium-term; LT – Long-term; **Timing:** A – Applicable; N/A – Not Applicable; **Frequency:** S – Single; IR – Irregular; R – Regular; C – Continuous; **Reversibility:** R – Reversible; I – Irreversible; **Ecological/Socio-economic Context:** D – Disturbed; U – Undisturbed; R – Resilient; NR – Not Resilient



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Appendix A Summary of Residual Effects

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Potential Effect	Project Activity	Residual Effects								Significance of Residual Effect
		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Valued Component: Wildlife and Wildlife Habitat										
Change in habitat • Direct and/or indirect loss or alteration of habitat due to vegetation clearing, sensory disturbance (e.g., avoidance), and/or edge effects.	C	A	M/H**	RAA	ST	A	S	R	D/U	Not significant
	O	A	L	RAA	MT	A	C	R	D/U	
	D	P/A	L	RAA	LT	A	C	R	D/U	
Change in mortality risk • Direct change in mortality risk due to vegetation clearing activities, vehicular collisions, human-wildlife conflicts, and indirect change in mortality risk due to predation and harvest pressure.	C	A	L	LAA	ST	A	IR	R	D/U	Not significant
	O	A	L	LAA	MT	A	IR	R	D/U	
	D	A	L	LAA	LT	A	IR	R	D/U	
Change in wildlife health • Activities associated with construction, operation, and/or decommissioning/closure of the Project may result in increased risk of exposure of wildlife to contaminants.	C	A	N-L	LAA	LT	A	C	R	D/U	Not significant
	O	A	N-L	LAA	MT	A	C	R	D/U	
	D	A	N-L	LAA	LT	A	C	R	D/U	
Note: ** magnitude moderate to high for the MacLellan site as effects will result in a >10% change in wildlife habitat and >20% change in SAR and SOCC habitat.										
Valued Component: Labour and Economy										
Change in local and regional labour force • Project demand for labour	C	P	L	LAA/RAA	ST	N/A	C	R	NR/R	Not significant
	O	P	L	LAA/RAA	MT	N/A	C	R	NR/R	
	D	A	L	LAA/RAA	ST	N/A	C	I	NR/R	
Change in local and regional business • Project regional expenditures • Project direct employment	C	P	L	LAA/RAA	ST	N/A	C	R	NR/R	Not significant
	O	P	L	LAA/RAA	MT	N/A	C	R	NR/R	
	D	A	L	LAA/RAA	ST	N/A	C	I	NR/R	
Change in local and regional economy • Project regional expenditures • Project direct employment • Project property taxes	C	P	L-M	LAA/RAA	ST	N/A	C	R	R	Not significant
	O	P	L-M	LAA/RAA	MT	N/A	C	R	R	
	D	A*	M	LAA/RAA	ST	N/A	C	I	R	

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Potential Effect	Project Activity	Residual Effects								Significance of Residual Effect
		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Note: * Adverse effects associated with losses in employment and contributions to GDP occur continuously over the short-term during decommissioning/closure.										
Valued Component: Community Services, Infrastructure and Well-being										
Change in housing and temporary accommodations • Demand on housing and temporary accommodations may be affected by Project activities and Project-related population growth.	C	A	N	LAA	MT	N/A	C	R	NR	Not significant
	O	A	N	LAA	MT	N/A	C	R	NR	
	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Change in local services and infrastructure • Demand on local services and infrastructure may be affected by Project activities and Project-related population growth.	C	A	L	LAA	MT	N/A	C	R	R	Not significant
	O	A	L	LAA	MT	N/A	C	R	R	
	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Change in transportation services and infrastructure • Demand on transportation services and infrastructure may be affected by Project activities and Project-related population growth.	C	A	L	LAA	MT	N/A	C	R	R	Not significant
	O	A	L	LAA	MT	N/A	C	R	R	
	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Change in community well-being • Project-related employment has the potential to increase individual and household income, increase disposable income, and reduce financial barriers to beneficial health practices or negative coping mechanisms. • Project-related population growth has potential to change the demographics of nearby communities and result in changes to community cohesion • The Project has the potential to change (increase or decrease) the amount of time individuals and households have to participate in recreational, subsistence, and family-related activities through gained employment	C	P/A	L/M	LAA	MT/LT	N/A	C	R	NR	Not significant
	O	P/A	L/M	LAA	MT/LT	N/A	C	R	NR	
	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Valued Component: Land and Resource Use										
Change in land use • Project activities incompatible with applicable land use plans and zoning • Disturbance and nuisance effects on property (noise, dust) • Project presence and site activities may affect use/future development	C	A	L-M	PDA/LAA	ST-LT	N/A	IR/C	R/IR	D	Not significant
	O	A	L-M	PDA/LAA	ST-LT	N/A	IR/C	R/IR	D	
	D	A	L-M	PDA/LAA	ST-LT	N/A	IR/C	R/IR	D	

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Potential Effect	Project Activity	Residual Effects								Significance of Residual Effect
		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Change in recreation • Project clearing may result in the loss of area available for recreational use • Project presence and site activities may affect access to or quality of recreational use (inclusive of land and water-based activities)	C	A	L-M	PDA/LAA	ST-LT	A	IR/C	R/IR	D	Not significant
	O	A	L-M	PDA/LAA	ST-LT	A	IR/C	R/IR	D	
	D	A	L-M	PDA/LAA	ST-LT	A	IR/C	R/IR	D	
Change in resource use • Project can reduce productive forest land, annual allowable cut (AAC) and merchantable timber, and cause disturbance to high-value forest sites • Disruption effects to development/extraction (minerals and aggregate) • Can disrupt resource harvesting success (hunting, trapping, fishing)	C	A	L	PDA/LAA	ST-LT	N/A	S/IR/C	R/IR	D	Not significant
	O	A	L	PDA/LAA	ST-LT	N/A	S/IR/C	R/IR	D	
	D	A	L	PDA/LAA	ST-LT	N/A	S/IR/C	R/IR	D	
Valued Component: Heritage Resources										
Change to heritage resources • Project components requiring ground disturbance have the potential to change the horizontal and vertical context of known or potential heritage resource sites	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not significant
	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Valued Component: Current Use of Lands and Resources for Traditional Purposes										
Change in availability of resources currently used for traditional purposes • Vegetation clearing associated with Project construction could result in a loss of habitat for species of traditional importance, including plants and animals relied on for traditional hunting, trapping, or plant harvesting • Loss or alteration of fish habitat resulting from disturbance to watercourses • Sensory disturbance from Project operation has the potential to affect the availability of habitat for species of traditional importance • An increase in hunting or fishing pressure by non-Indigenous people has the potential to affect the availability of traditionally used species • Potential effects on wildlife, fish, and vegetative health that could affect the availability of traditional resources	C	A	L	LAA	LT	A	C	R	D	Not significant
	O	A	L	LAA	LT	A	C	R	D	
	D	A	L	LAA	LT	A	C	R	D	

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Potential Effect	Project Activity	Residual Effects								Significance of Residual Effect
		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Change in access to resources or areas currently used for traditional purposes • Loss, alteration, or restriction of access (including trails and travelways) to current lands and resources used for traditional purposes	C	A	L	LAA	LT	A	C	R	D	Not significant
	O	A	L	LAA	LT	A	C	R	D	
	D	A	L	LAA	LT	A	C	R	D	
Change to traditional cultural and spiritual sites and areas • Project construction and operation could result in a loss or alteration of identified current use harvesting sites, habitation areas, cultural and sacred sites • Indirect effects on the experience of Indigenous peoples which adversely alter the perceived values of current use sites or areas	C	A	L	LAA	MT	N/A	C	R	D	Not significant
	O	A	L	LAA	MT	N/A	C	R	D	
	D	A	L	LAA	MT	N/A	C	R	D	
Change to the environment that affects cultural value or importance associated with current use* • Indirect effects on the experience of Indigenous peoples which adversely alter the perceived value of access to traditional resources for current use or current use sites and areas • Change to values or attributes of the area that make it important • Presence of worker or increased access to the area by non-Indigenous peoples • Sensory disturbance from Project construction and operation has the potential to affect • Changes that could detract from use of the area or lead to avoidance of the area as a result of real and perceived disturbance of the environment	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not applicable
	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Note: * Change to the environment that affects cultural value or importance associated with current use is considered in Chapter 17 of the EIS. As indicated there, effects on cultural value are often intangible, and do not lend themselves well to being characterized. As such, the discussion in Chapter 17 regarding cultural values is focused on presenting information shared by Indigenous communities engaged on the Project and does not assign residual effects characterizations. The inclusion of 'N/A' in the characterization categories is not meant to imply that there is no effect, but rather that this particular potential effect was not considered in the way that other potential effects are considered by other VCs.

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		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Valued Component: Human Health										
Change in human health • Inhalation of contaminants of potential concern (COPC) emissions in air • Ingestion and dermal contact with COPC in soil due to Project emissions. • Ingestion of COPC in surface water due to Project emissions. • Ingestion of COPC in backyard produce, traditional plants, wild meat, and fish due to Project emissions and uptake of COPC from soil, water and/or tissue. • Ingestion and dermal contact with COPC in sediment due to Project emissions.	C	A	N	LAA, RAA	LT	N/A	C	I	D	Not significant
	O	A	N	LAA, RAA	LT	N/A	C	I	D	
	D	A	N	LAA, RAA	LT	N/A	C	I	D	
Valued Component: Indigenous Peoples										
Indigenous Health Conditions Considered: - Change to lands and resources currently used for traditional purposes - Change in human health	C O D	A	M	LAA	LT	A	IR	I/R	D	Not significant
Indigenous Socio-economic Conditions Considered: - Change to land and resource use - Change in community services, infrastructure, and well-being - Change in labour and economy	C O D	A, P	M	LAA	LT	A	C	R	D	Not significant
Indigenous Physical and Cultural Heritage Considered: - Change to heritage resources - Change to lands and resources currently used for traditional purposes	C O D	A	L	LAA	LT	N/A	C	I	D	Not significant

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