Assessment Report: Cariboo Gold Project

WITH RESPECT TO THE APPLICATION BY OSISKO DEVELOPMENT CORP. FOR AN ENVIRONMENTAL ASSESSMENT CERTIFICATE

WRITTEN BY THE BRITISH COLUMBIA ENVIRONMENTAL ASSESSMENT OFFICE

SEPTEMBER 2023

BRITISH COLUMBIA
EAO | Environmental Assessment Office

PREFACE

When a major project is proposed in British Columbia, it must undergo an environmental assessment. In British Columbia, environmental assessments are managed by the Environmental Assessment Office (EAO), a neutral regulatory agency within the Provincial Government that works with and seeks input from scientific professionals, Indigenous nations, proponents, the public, local governments, and federal and provincial agencies to ensure that no adverse effects are missed.

The environmental assessment process ensures that any potential environmental, economic, social, cultural and health effects that may occur during the lifetime of a major project are thoroughly assessed. The EAO follows a clearly defined process in the *Environmental Assessment Act* to conduct the assessment of a major project and produce a detailed Assessment Report which includes recommendations regarding an Environmental Assessment Certificate. That report is then given to provincial Ministers to decide on if the project should proceed.

You can learn more about the environmental assessment process *here*. Information and records relating to environmental assessments are available on the *EAO's website*. Questions or comments can be directed to:

Environmental Assessment Office
PO Box 9426 Stn Prov Govt
Victoria BC V8W 9V1
Email: *eaoinfo@gov.bc.ca*

This report is the first Assessment Report issued under the 2018 *Environmental Assessment Act*. To make the material more accessible and easier to understand, it has been changed substantially from Assessment Reports under the previous legislation.

These changes include:

- Using plain language principles in the main body of the report;
- Shortening and summarizing the main body of the report to focus on the key issues and themes;
- Moving technical information to appendices; and
- Including an executive summary.

We hope you find these changes useful and our new approach more helpful. We welcome your general feedback on these changes. Please send your comments to *eaoinfo@gov.bc.ca*.

ACKNOWLEDGEMENTS

The Environmental Assessment Office would like to acknowledge and thank the people who participated in this Environmental Assessment. We are grateful to the Indigenous nations in whose traditional territory this assessment took place and who participated in the review of this assessment, the community members of Wells, technical advisors, local government members, consultants, staff, and all of those who helped this process run fairly and efficiently and who provided the important evidence and advice required to provide a comprehensive assessment for the Ministers.

We would like to provide a specific acknowledgement of the members of the Community Advisory Committee. This was the first Community Advisory Committee under the *Environmental Assessment Act* (2018) (the Act), and these individuals are not compensated in any way. The EAO would like to recognize their important contribution to this environmental assessment, which in turn benefits the future of their community. Thank you for your passion, contributions, and effort!

Thank you!

TABLE OF CONTENTS

List of Figures

List of Tables

Acronym and Abbreviation List

°C	Degrees Celsius	ENV	Ministry of Environment and Climate Change Strategy
Act	*Environmental Assessment Act* (2018)	ha	hectare
Application	Application for an Environmental Assessment Certificate	km	kilometre (km^2 = square kilometre)
B.C.	British Columbia	m	metre (m^2 = square metre, m^3 = cubic metre)
BGM	Barkerville Gold Mines	MOF	Ministry of Forests
Cariboo Gold	Cariboo Gold Project	ODV	Osisko Development Corp.
CCLUP	Cariboo-Chilcotin Land Use Plan	PM_{10}	Particulate matter 10 micrometres or smaller in diameter
CCSP	Crown Contaminated Sites Program	$PM_{2.5}$	Particulate matter 2.5 micrometres or smaller in diameter
CEAO	Chief Executive Assessment Officer	Report	Assessment Report
Certificate	Environmental Assessment Certificate	SRMP	Quesnel Sustainable Resource Management Plan
dBA	A-weighted decibel	t	tonne
EAO	Environmental Assessment Office	TNG	Tŝilhqot'in National Government
EMLI	Ministry of Energy, Mines and Low Carbon Innovation	WLRS	Ministry of Water, Land, and Resource Stewardship

EXECUTIVE SUMMARY

Osisko Development Corp. seeks approval to construct and operate Cariboo Gold

Osisko Development Corp. (ODV), a Canadian company based in Wells, British Columbia (B.C.) and headquartered in Montreal, Quebec, has proposed the Cariboo Gold Project (Cariboo Gold), a new underground gold mine with a production rate of up to 1,788,500 tonnes of ore per year. If Cariboo Gold is approved, mined ore (i.e., rock that contains minerals) would be crushed underground and then transported to the surface. For the first four years of operations, mined ore from the Lowhee Deposit south of Wells would be crushed and then transported through the town of Wells to the existing Quesnel River Mill, approximately 115 kilometres (km) from the Mine Site, to undergo further milling and gold recovery. Following the first four years, ore sorting, milling and initial metals processing would be completed in a services building at the Mine Site Complex located in the District of Wells and then transported by haul truck to the Quesnel River Mill. Waste rock would be stored at the nearby existing Bonanza Ledge Mine or underground. Access to the Mine Site Complex would be along Highway 26 and would include a new bypass on the highway in Wells to enable traffic to exit the highway before the community to reduce mining traffic in town. An electric transmission line between Quesnel and the Mine Site would also be built to provide power.

A provincial environmental assessment was conducted by the Environmental Assessment Office (EAO)

The annual production rate of the proposed mine triggered the legal requirement to conduct a provincial environmental assessment. The assessment began on October 24, 2019. This Assessment Report and proposed Environmental Assessment Certificate are now being provided to the Honourable George Heyman, Minister of Environment and Climate Change Strategy and the Honourable Josie Osbourne, Minister of Energy, Mines and Low Carbon Innovation (together, the Ministers), for a decision on whether Cariboo Gold will be approved. The Environmental Assessment process included extensive consultation with the public, a Community Advisory Committee, and a Technical Advisory Committee, and consideration of all potential environmental, economic, social, cultural and health effects of Cariboo Gold.

Consensus was sought with participating Indigenous nations throughout the process

One of the purposes of the EAO is to promote reconciliation with Indigenous peoples in B.C. Consensus was sought throughout the process at all key milestones with participating Indigenous nations (Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation). These Nations had the opportunity to provide a notice of consent or lack of consent at the end of the environmental assessment process, which if provided, will be provided to Ministers with the final referral documents and posted on the *EAO's Project Information Centre*. Nazko First Nation and Tsilhqot'in National Government, including ?Esdilagh First Nation, were notified of milestones during the environmental assessment process, based on their proximity to Cariboo Gold.

Key issues that arose during the environmental assessment

The EAO assessed a wide range of potential positive and negative effects to understand whether this mine would have significant adverse effects and if it would promote sustainability in B.C. The range of potential effects from constructing and operating a major mine in the remote community was discussed at length with the Technical Advisory Committee, Community Advisory Committee, local governments, participating Indigenous nations, and the public. The key issues that arose through the Environmental Assessment included:

- The reduction of air quality in the District of Wells and the potential effects on human health;

- The loss of the peaceful enjoyment of Wells for residents;
- Historical contamination from previous mines at the Mine Site, leading Northern Health to issue a health hazard advisory under the *Public Health Act* for the shoreline of Jack of Clubs Lake*;*
- Effects to drinking water in the District of Wells;
- Effects to the Barkerville woodland caribou herd;
- Effects on surface water and groundwater quality and aquatic life; and
- Loss of traditional or cultural use sites important to the participating Indigenous nations, including loss of harvested species and their habitats, and access to those sites.

Measures would be needed to reduce these effects

To mitigate potential adverse effects, ODV proposed a suite of mitigation measures as part of project design and operations. Additionally, the EAO has proposed conditions as legally binding requirements in the event an Environmental Assessment Certificate is issued. These would include requirements for ODV to:

- Monitor potential environmental, economic, social, cultural and health effects (such as on air and water quality, greenhouse gases, wildlife, light, noise, and other important measures);
- Implement measures to mitigate effects (such as fund a community liaison position and reduce road dust from haul trucks), including additional measures if monitoring shows that more mitigations are necessary to ensure effects do not exceed those predicted in the assessment;
- Report publicly the results of all monitoring programs; and,
- Continue to consult with the public, local governments, and participating Indigenous nations on issues related to Cariboo Gold.

If approved, Cariboo Gold would also require a number of additional provincial, federal and municipal approvals and permits that would impose additional requirements.

Cariboo Gold is not likely to result in significant adverse effects or cumulative effects

Determining significance can also be thought of as a limit of acceptable change. The EAO carefully considered all information submitted by ODV, Indigenous nations, local governments, public, the Community Advisory Committee, and the Technical Advisory Committee. Based on a thorough analysis of the assessment materials, the proposed mitigation measures, assuming the acceptable implementation of proposed Environmental Assessment Certificate conditions, and considering future permitting requirements, the EAO has determined that Cariboo Gold is not likely to result in significant adverse project-specific effects or contribute significantly to adverse cumulative effects.

Cariboo Gold would provide a low to moderate contribution to sustainability in B.C.

Based on the goals and visions identified by the participating Indigenous nations and the surrounding communities and municipalities, Cariboo Gold would improve the economic conditions of the region by creating more employment and training opportunities and generating higher revenue. At the same time, it would cause some adverse effects to the biophysical environment, cultural and material connections to land and water for current and future generations, and to the social and mental health and well-being of current residents in Wells. Based on the assessment, the EAO has concluded that the overall extent to which Cariboo Gold contributes to sustainability in B.C. would be low to moderate.

1.0 Purpose of this Assessment Report

The purpose of this Assessment Report (Report) is to summarize the procedures and findings of the environmental assessment conducted by the EAO for the Cariboo Gold Revised Application submitted by ODV on October 14, 2022.

This Report is provided to the provincial Ministers who are responsible for making the decision on Cariboo Gold under Section 29 of the *Environmental Assessment Act* (2018) (the Act). For mines, the deciding provincial Ministers are the Minister of Environment and Climate Change Strategy and the Minister of Energy, Mines and Low Carbon Innovation (together referred to as 'the Ministers').

The Cariboo Gold Project is the first project to be referred for decision to Ministers under the *Environmental Assessment Act* (2018). Please see the Preface for more information about what has changed in the EAO's Assessment Reports under this Act.

If the Ministers decide to issue an Environmental Assessment Certificate (Certificate), it will include a certified project description and table of conditions, pursuant to Section 29(4)(c) of the Act[1]. The certified project description describes 'what' is being certified by (i.e., the components of Cariboo Gold) and is a legally-binding description of Cariboo Gold, including all its components and their locations with any required constraints. Certificate conditions set 'how' Cariboo Gold will be implemented, and the Certificate holder (Holder) must adhere to them throughout the life of Cariboo Gold. Some of the conditions are procedural requirements common to all certified projects; others are project-specific and intended to prevent or reduce effects of Cariboo Gold. If approved, the Holder must design, build, operate and decommission Cariboo Gold in accordance with the Certificate.

1.1 Reader's Guide to this Report

This Report describes:

- An overview of Cariboo Gold (*Section 2.0*) and context of the region (*Section 3.0*);
- The EAO's environmental assessment process (*Section 4.0*);
- The engagement with Indigenous nations, including the EAO's efforts to seek consensus and ultimately seek consent with participating Indigenous nations, and a summary of the effects to these Nations (*Section 5.0*);
- The engagement undertaken with all advisors and stakeholders, including the Technical Advisory Committee, Community Advisory Committee, the public, and local governments (*Section 6.0*);
- The key concerns that resulted out of the environmental assessment process (*Section 7.0*);
- The proposed Certificate conditions (*Section 8.0*);
- The contribution of Cariboo Gold to sustainability in B.C. (*Section 9.0*); and
- The EAO's conclusions (*Section 10.0*).

This Report does not replicate the content presented in ODV's Revised Application. In the preparation of this Report, the following information has been considered:

- ODV's *Revised Application*, which includes supplemental information provided by ODV during the Application Review phase of the assessment and additional design changes which were reviewed with an additional public comment period during the Effects Assessment Phase (*Section 4.5*); and,

[1] For more information, please see the *EAO's website*

- Advice and comments provided by the Technical Advisory Committee, Community Advisory Committee, Indigenous nations, local governments, and the public on the Application, supplemental information, Revised Application, and this Report.

1.2 The Purposes of the Environmental Assessment Office

The *purposes of the EAO* are to carry out its responsibilities under the Act, by promoting sustainability by protecting the environment and fostering a sound economy and the well-being of British Columbians and their communities, and by supporting reconciliation with Indigenous peoples in B.C.

In November 2019, the Government of B.C. passed the *Declaration on the Rights of Indigenous Peoples Act* into law, which establishes the *United Nations Declaration on the Rights of Indigenous Peoples* as the framework for reconciliation, as called for by the Truth and Reconciliation Commission of Canada's *Calls to Action*. Through its work with Indigenous peoples, the EAO is committed to advancing reconciliation by implementing the *United Nations Declaration on the Rights of Indigenous Peoples*.

This Report and the environmental assessment process for Cariboo Gold are intended to support the fulfillment of these purposes of the EAO specific to this project.

2.0 Project Overview

2.1 Proponent Description

Osisko Development Corp. (ODV), a Canadian company based in Wells, B.C. and headquartered in Montreal, Quebec, has proposed Cariboo Gold. ODV is owned by Osisko Gold Royalties. ODV also submitted a *Project Statement*.

Contact information for ODV is:

ODV Corporate Office (Headquarters):
Osisko Development Corp.
1100 Avenue des Canadiens-de-Montréal
Bureau 300
Montréal, Quebec H3B 2S2
Website: *https://osiskodev.com*
Email: *info@osiskodev.com*

ODV's President:
Chris Lodder, President
Osisko Development Corp.
Cell Phone: (416) 388-1670
Email: *clodder@osiskodev.com*

ODV Site Office:
Osisko Development Corp.
3700 Ski Hill Road
Wells, BC V0K 2R0

ODV's Environmental Assessment Representative:
Francois Vezina, ing., P.Eng., MBA
Senior Vice President Project Development, Technical Services and Environment
Osisko Development Corp.
Telephone: (514) 940-0685 x161
Cell Phone: (514) 546-1082
Email: *fvezina@osiskodev.com*

Primary Environmental Assessment Consultants to Proponent:
Jennifer Turner
President and Founding Partner
Falkirk Environmental Consultants Ltd.
Telephone: (604) 649-6238
Email: *jen@falkirk.ca*

Michael Taylor
Manager – Ecology & EIA
WSP Canada Inc.
Email: *michael.taylor@wsp.com*

2.2 Project Description and Schedule

The purpose of Cariboo Gold would be to extract metal ore from the mine and process the extracted material to produce gold doré bars which will be sold to world markets, providing an economic return on investment for ODV. Cariboo Gold would include an underground gold mine with a maximum production capacity of 4,900 tonnes/day (1,788,500 tonnes/year).

The Cariboo Gold Mine Site Complex would be located in the District of Wells (Figure 1), the Cariboo Regional District, and approximately 80 kilometres (km) east of Quesnel. Cariboo Gold, if approved, would be a new underground mine with two main areas with project components (*Figure 2*):

Figure 1: Location of proposed Mine Site Complex west of Jack of Clubs Lake

- The Mine Site, which would consist of the underground mine and Mine Site Complex in the District of Wells, mining at the Lowhee Deposit through Cow Portal, and the waste rock storage at the existing Bonanza Ledge Mine (owned by ODV; also known as the Bonanza Ledge Site); and
- The mill at the existing Quesnel River Mill (owned by ODV).

Figure 2: Existing Bonanza Ledge Mine where waste rock from Cariboo Gold would be stored

For the first four years of operations, mined ore (i.e., rock containing minerals) from the Lowhee Deposit would be crushed on surface at Bonanza Ledge and transported through the town of Wells to the existing Quesnel River Mill, approximately 115 km from the Mine Site. Following that, mined ore would be crushed underground at the Mine Site Complex and then transported to the surface. Ore sorting, milling and initial metals processing would then be completed in a services building at the Mine Site Complex prior to transporting the resulting concentrate to the existing Quesnel River Mill. Waste rock would be stored at the existing Bonanza Ledge Site or underground. Access to the Mine Site Complex would be along Highway 26 to Wells and would include a new bypass in Wells to enable mine traffic to exit prior to entering the community from Quesnel.

Figure 3: The existing Quesnel River Mill where tailings from Cariboo Gold would be stored

Surface tailings management would occur at the Quesnel River Mill. Access to the Quesnel River Mill from the Mine Site includes 56 km along Highway 26 and 59 km of the 500 Nyland Lake Forest Service Road. Transportation corridors for workers and goods to the Quesnel River Mill from Quesnel would be along Highway 26 and the 500

Nyland Lake Road, and workers would access the Quesnel River Mill from Quesnel along the Quesnel Hydraulic Road to 2700 Road and the 500 Nyland Lake Road. Cariboo Gold would also include the construction and operation of a new 69.3 km-long 69-kilovolt transmission line from Barlow Substation near Quesnel to the Mine Site through a route north of Highway 26.

ODV has provided the following projections for the schedule of the related phases and activities, described in Table 1.

Table 1: Project Activities and Anticipated Schedule

Phase	*Activities*	*Anticipated Start*	*Anticipated End*
Construction Phase 1	Mine Site: • Construction of the underground mining area at the Lowhee Deposit; and • Commissioning of the water treatment plant at Bonanza Ledge Site. Quesnel River Mill: • Water treatment plant upgrades, site preparation and construction; and • Installation of the temporary tailings pond liner.	Q1 2024	Q1 2025
Construction/Operations	• Transmission Line site preparation and construction.	Q1 2025	Q4 2025
Operations Phase 1 and Construction Phase 2 – first four years	• Dewatering of the historical underground workings; • Mining of ore at the Lowhee Deposit; • Initiate waste rock deposition at the Bonanza Ledge Site; • Initiate deposition of filtered tailings at the Quesnel River Mill; • Construction/installation of portals, ramps, shafts, water treatment plant at the Mine Site Complex, crusher, vertical conveyor, Valley, and Shaft ventilation, escapeways, services building and Mine Site Complex, camp access road, and potable water well and pipeline; • Construction/commissioning of the flotation concentration circuit; • Stockpile and waste rock management; • Grading and brushing to maintain road and Transmission Line rights-of-way; and • Ongoing progressive reclamation.	Q1 2025	Q4 2027
Operations Phase 2 – year five and on	• Production of ore at the Mine Site; • Mineral processing (Mine Site Complex and Quesnel River Mill); • Stockpile and waste rock management; • Grading and brushing to maintain road and Transmission Line rights-of-way; and • Ongoing progressive reclamation.	Q1 2028	Q4 2040
Closure	• Reclamation and closure activities.	Q1 2041	Q2 2043
Post-Closure	• Post-closure active care.	Q3 2043	Q3 2048-2053
	• Post-closure passive care.	Q4 2048	Q4 2053+

2.3 Project Anticipated Expenditures

Cariboo Gold has a projected initial capital cost[2] of $137.3 million for Phase 1 construction, $451.1 million for Phase 2 construction, and $466.4 million total for operations. Total capital cost, including sustaining capital costs to the end of the life of mine, is estimated to be $1,055 million. Project closure is estimated to cost $17.3 million. Mines in B.C. are also required to pay financial securities to the Province in case the mine owner/operator is unable to pay for reclamation of the mine. This process occurs under the Ministry of Energy, Mines and Low Carbon Innovation (EMLI).[3]

[2] Source: *2023 Cariboo Gold Feasibility Study*

[3] For more information, please see the *EMLI website*

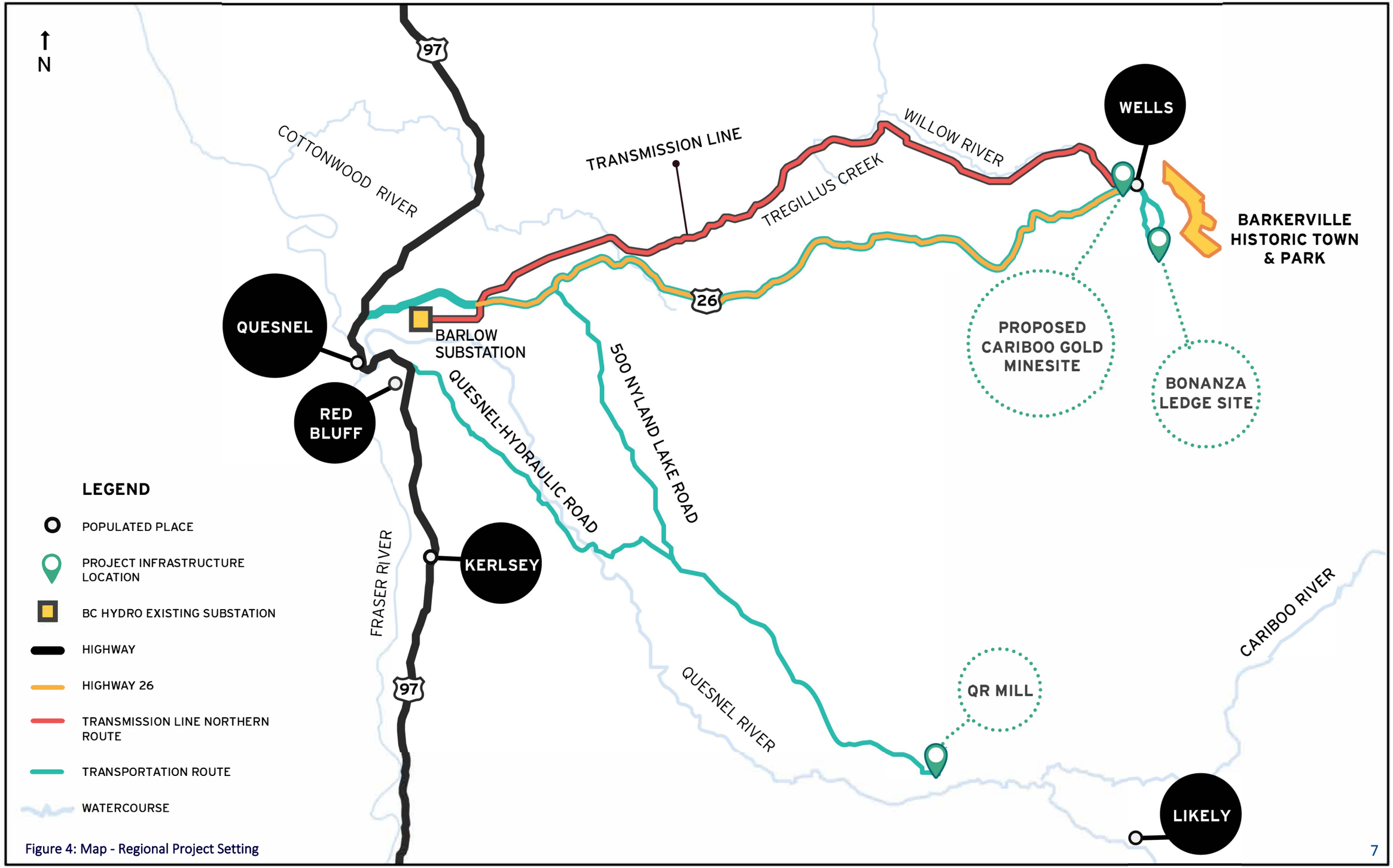
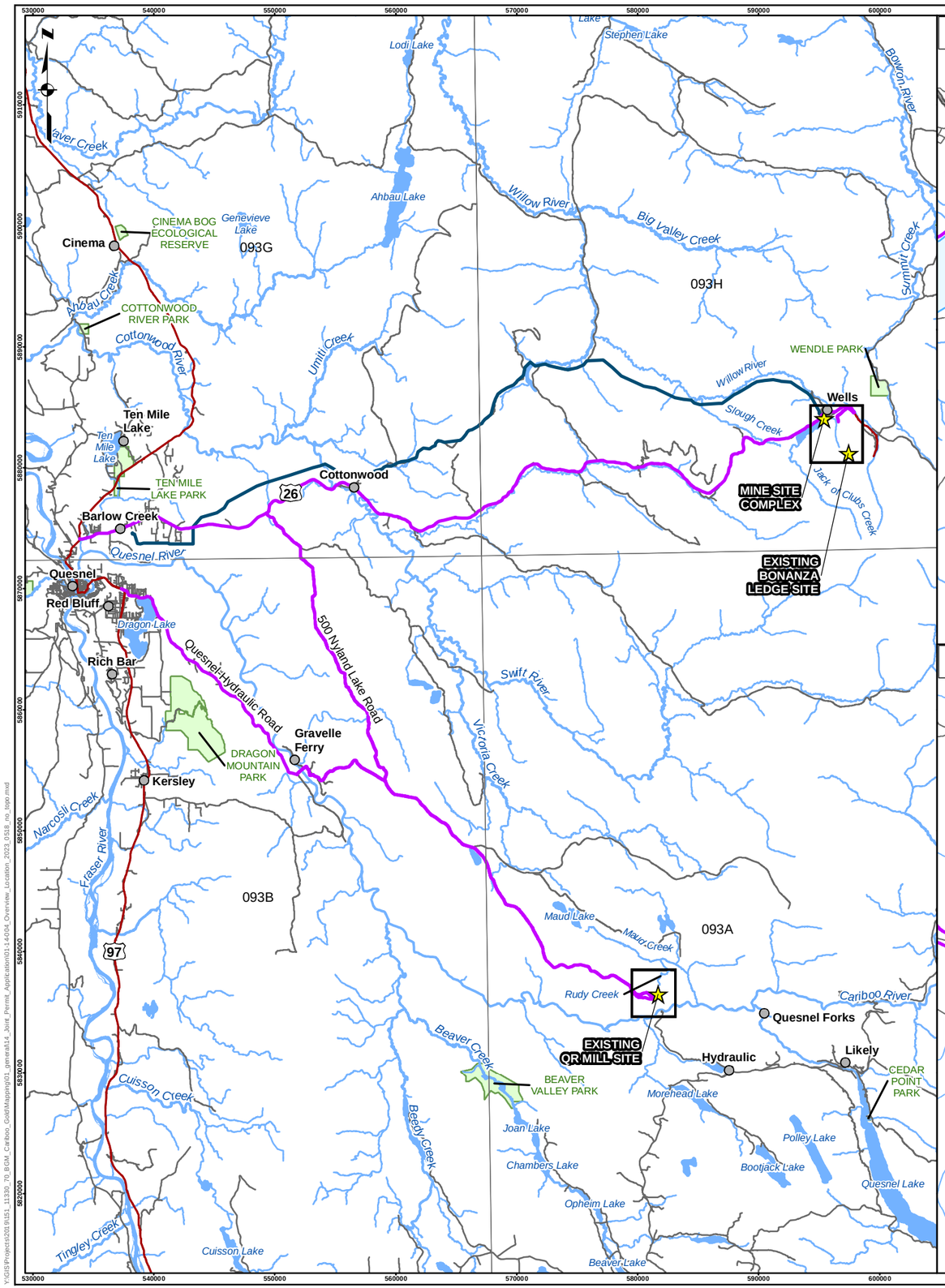
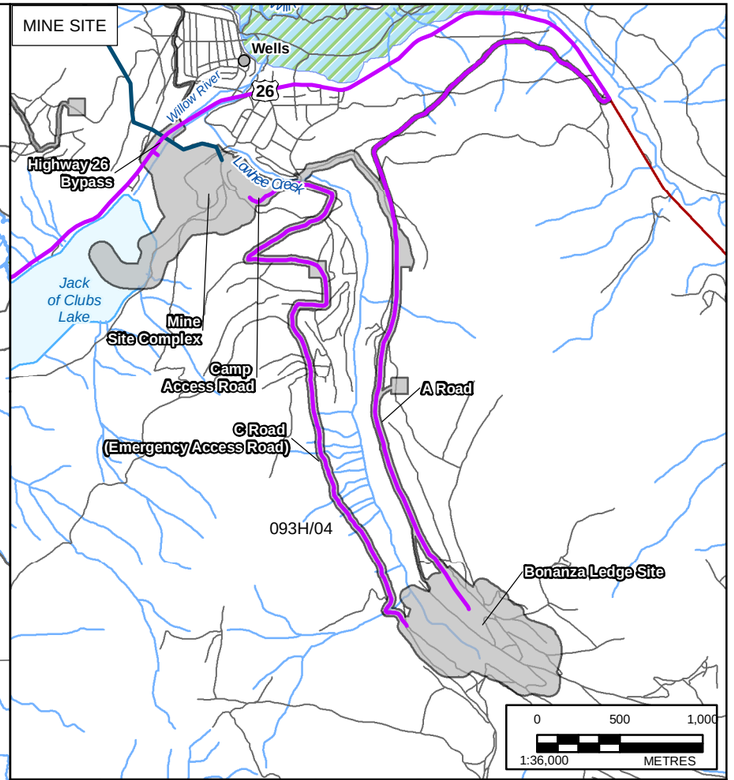
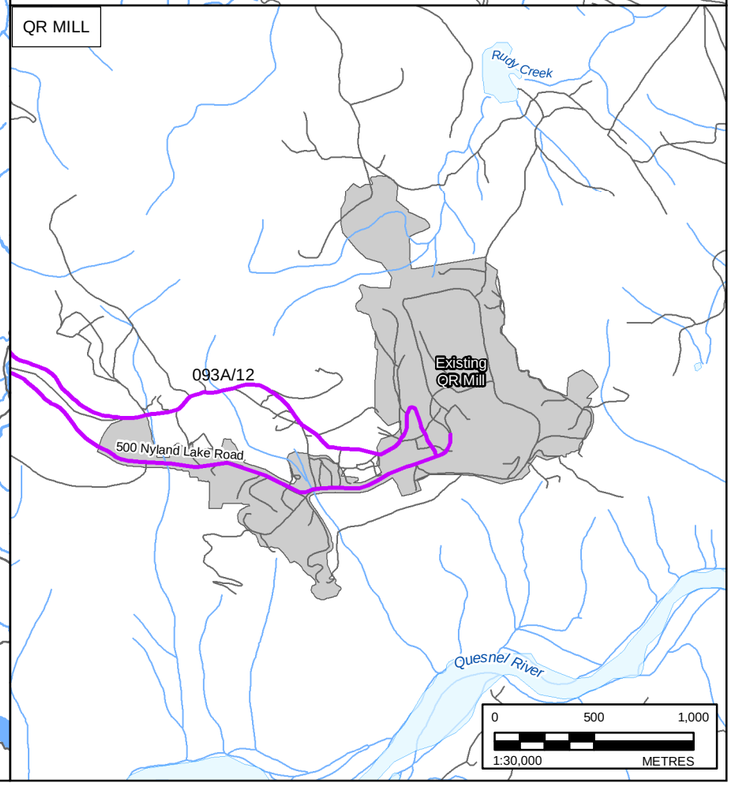


Figure 4: Map - Regional Project Setting

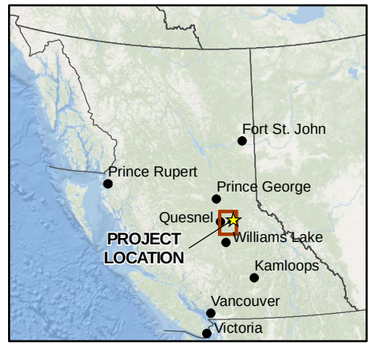






LEGEND

- POPULATED COMMUNITY
- PROJECT INFRASTRUCTURE LOCATION
- ROAD
- HIGHWAY
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- PROPOSED TRANSPORTATION ROUTE
- PROPOSED TRANSMISSION LINE ROUTE
- MAPSHEET 50/250K
- SURFACE FOOTPRINT



REFERENCE(S)

1.WATER FEATURES, TRANSPORTATION FEATURES OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. CITIES/TOWNS, INDIAN RESERVES, FEDERAL LANDS AND PARK/PROTECTED AREAS OBTAINED FROM BC MINISTRY OF FORESTS, LANDS NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM Zone 10N

0 5 10 15
1:400,000 KILOMETRES

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

PROJECT OVERVIEW

REV.	DESCRIPTION	DATE	INITIALS
0		8/25/2023	MY

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	0	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Y:\GIS\Projects\2019\151_11330_70_BGM_Cariboo_Gold\Mapping\03_general\14_Joint_Permit_Application\01-14-004_Overview_Location_2023_0518_no_topo.mxd

3.0 Regional and Regulatory Context

The purpose of this section is to provide high-level information about the region where Cariboo Gold is proposed as well as regulatory requirements as they relate to the project.

3.1 Indigenous Nations

Cariboo Gold is proposed within or near the territory of the following Indigenous nations:

- Lhtako Dené Nation;
- Xatśūll First Nation;
- Williams Lake First Nation (T'exelc);
- Tsilhqot'in National Government, including ?Esdilagh First Nation; and
- Nazko First Nation.

Throughout this document, the use of the term 'territory' refers to the traditional territories of Indigenous nations unless the territories are established treaty lands or otherwise established by law or recognized by B.C. and Canada. The environmental assessment process is not a rights-determining process. Through the environmental assessment process, the EAO seeks to understand what Cariboo Gold's effects would be on each Nation and its interests. Engagement with these Indigenous nations is described in *Section 6.0* (Indigenous Nation Engagement and Summary of Effects) of this Report.

Three of the Nations listed above became 'participating Indigenous nations' based on the proximity to Cariboo Gold and potential for impacts: Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation. A participating Indigenous nation is a Nation that would be affected by a proposed project and who wishes to participate in the environmental assessment process. For more information on participating Indigenous nations, please see the *EAO's guidance materials*.

Seeking consensus during the Cariboo Gold environmental assessment process was undertaken through cooperation and collaboration between the EAO and representatives of participating Indigenous nations. The participating Indigenous nations were able to express their consent or lack of consent as a component of the recommendations to the Ministers regarding whether to issue a Certificate at the conclusion of this environmental assessment process. Ministers are required to consider the consent or lack of consent of participating Indigenous nations.

3.2 Communities

Cariboo Gold is located within and near the following communities:

District of Wells: The community of Wells is located within the District of Wells, the Cariboo Regional District, and adjacent to the Mine Site Complex. Originally developed as a company town in the 1930s, Wells grew to a thriving community of 4,500 during the 1940s. However, the population of Wells has declined to 218[4] following the closure of the

Figure 6: The District of Wells Office

[4] Statistics Canada. 2021. *Link*

Cariboo Gold Quartz mine in 1967.[5] Wells also has many seasonal summer residents. The local economy is now primarily based on tourism, including visits to the Barkerville Historic Town and Park and Bowron Lakes Provincial Park, timber harvesting, mineral exploration, and development (including placer mining), arts and crafts production and sales, performing arts, restaurants, general stores, gas stations, various accommodation options, retail stores, and outdoor recreation. Community services in Wells include paramedics, volunteer fire department, nurse practitioner visits, one elementary school, and a federal police detachment staffed with officers who also service Quesnel.

Figure 7: Barkerville Historic Site, showing the Saint George Hotel

Barkerville Historic Town and Park: Barkerville is a provincially owned heritage property and designated historic park and a National Historic Site. It is located approximately 1.5 km from the Bonanza Ledge Site access road (A Road). In addition, two other National Historic Sites of Canada are located within Barkerville: the Cariboo Wagon Road, built to transport supplies during the gold rush, and the Chee Kung Tong building, an important community building for Chinese workers living in Barkerville during the gold rush. A non-profit organization, the Barkerville Heritage Trust operates and manages Barkerville on behalf of the B.C. Government. While the park offers visitors accommodations (three bed and breakfasts and four cottages within Barkerville, as well as three campgrounds), no one lives year-round in Barkerville.

City of Quesnel: Quesnel is located approximately 80 km west of the Mine Site, and 58 km northwest of the Quesnel River Mill. In 2021, Quesnel had a population of 9,889[6]. Quesnel is also home to the closest hospital to Wells as well as to the closest commercial airport to Wells with regularly scheduled air service. It is not uncommon for people working at Barkerville, in Wells, or at the Quesnel River Mill to live in Quesnel. Quesnel is also considered the gateway to the north Cariboo area, which offers considerable recreational opportunities.

Figure 8: City of Quesnel, Photo credit: Province of B.C.

New Barkerville: This community is located approximately 1 km from Barkerville and 7 km from Wells and is a small unincorporated settlement consisting of eight homes. It was formed when Barkerville was taken over by the Province, and the residents were relocated to an area along Reduction Road Hill.

Stanley, Beaver Pass House, Pinegrove, Wingdam, Goldspring House, and Cottonwood House: These are unincorporated rural areas in the Cariboo Regional District located off Highway 26 along the Transportation Route. The original settlement at Cottonwood House is a provincial and federal Historic Site.

Likely: Likely is a rural community located approximately 17.5 km southeast from the Quesnel River Mill, although there is no direct access to the mill, with a population of approximately 350 people and some small businesses and services.

[5] District of Wells. 2010. Official Community Plan. *Link*

[6] Statistics Canada. 2021. *Link*

3.3 Geography and Ecology

Cariboo Gold would be located in the Quesnel Highlands, which is west of the Cariboo Mountains and east of the Fraser Plateau. The highlands extend from Bowron Lake on the north to Mahood Lake on the south, encompassing an area of approximately 8,100 km^2. This region forms part of the Fraser Plateau (characterized by low-lying areas such as wetlands, lakes, and streams with additional moisture from being in low mountain ranges, where Douglas-fir forests are common) and Columbia Highlands (characterized by intense precipitation during fall to early spring, where sub-boreal spruce forests and Engelmann spruce forests are common) ecoregions. The region has seen much anthropogenic disturbance from mining and forestry; for example, since 1956, 31 percent of the region's land base has been logged. Numerous wildfires have been documented in the region between 1922 and 2018.

Jack of Clubs Lake is located immediately southwest of the proposed Mine Site Complex, which eventually flows northwest into the Fraser River. The lake is bordered by Island Mountain to the northwest, Cow Mountain, and Richfield Mountain to the southwest, and Barkerville Mountain to the east. The water quality in Jack of Clubs Lake has been affected by previous mine activity, with historical tailings deposited along the shoreline near the proposed Mine Site Complex.

Lowhee Creek, a historically-mined stream channel, is a tributary to the Willow River and flows northwest from the Bonanza Ledge Site between Cow Mountain and Barkerville Mountain towards Wells. There are multiple other small waterbodies in the immediate vicinity of the proposed project facilities.

Figure 9: Jack of Clubs Lake, looking towards the proposed Mine Site Complex and Wells

Approximately one km south of the Quesnel River Mill is the Quesnel River. The headwaters of Rudy Creek are located near the Quesnel River Mill, which flows into Maud Creek.

3.4 Regulatory Environment

3.4.1 Federal Impact Assessment

The Impact Assessment Agency of Canada determined that Cariboo Gold is not subject to review under the federal *Impact Assessment Act* since it does not meet the production capacity thresholds under Section 19(c) of the *Federal Physical Activities Regulations*. Although no federal impact assessment has occurred, a number of federal permitting agencies would require authorizations for Cariboo Gold, as described in the *Regulatory Coordination Plan*.

3.4.2 Land Use Plans

Cariboo Gold is located within the areas covered by the Cariboo Chilcotin Land Use Plan, Quesnel Sustainable Resource Management Plan, and District of Wells Official Community Plan. The consistency of Cariboo Gold with meeting the objectives in these plans is discussed further in *Section 11.19* (Consistency with Land Use Plans).

3.4.3 Regulatory Coordination

In addition to provincial environmental assessment approval, Cariboo Gold would need various authorizations from federal, provincial, and local governments. Please see the *Regulatory Coordination Plan* for more details.

3.4.4 Other Projects in the Region

Nine proposed or existing major projects are located within a 150 km radius of Cariboo Gold. These are shown on *Figure 10*. These projects were considered where cumulative effects were assessed.

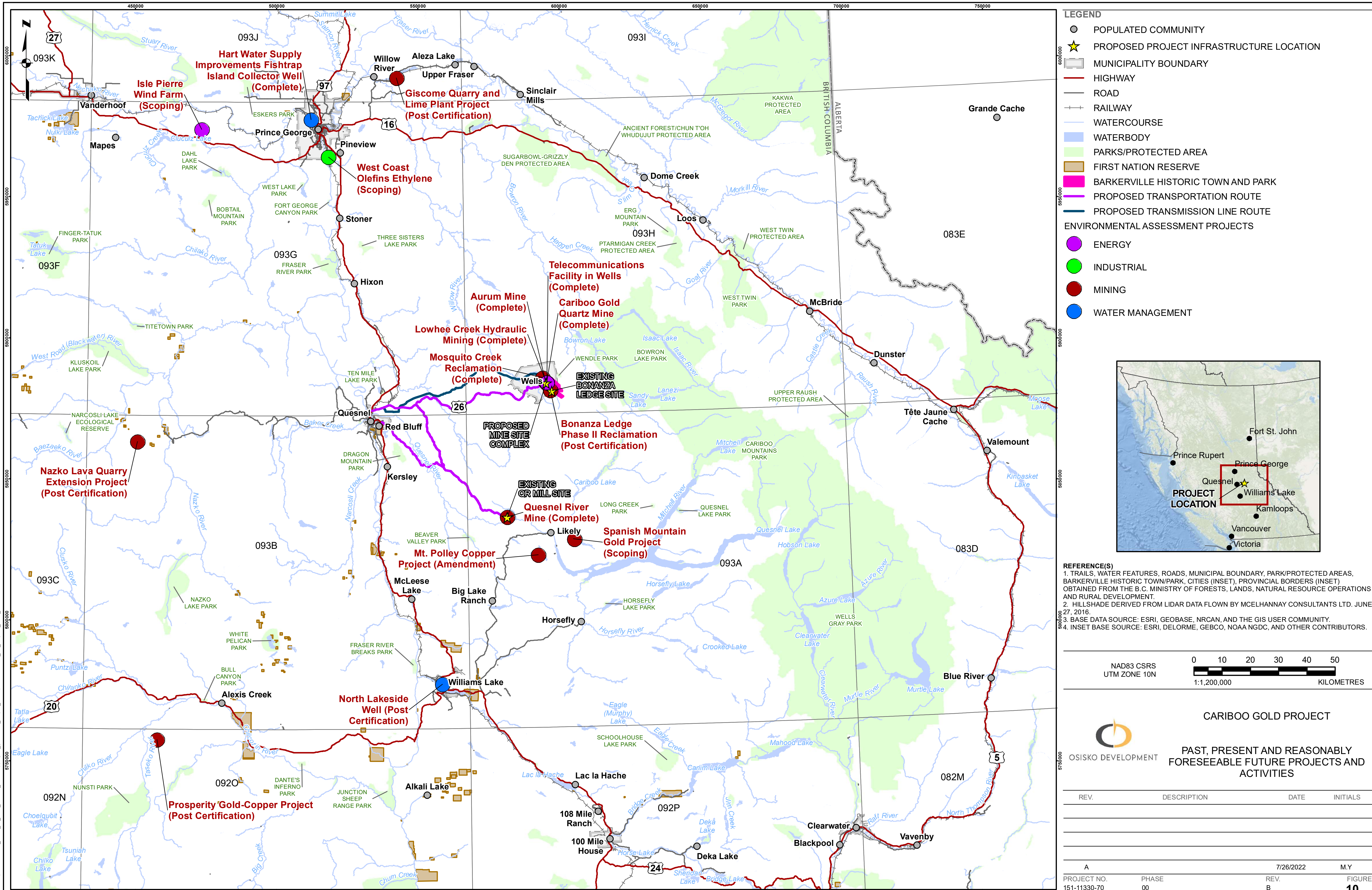


Figure 10: Map - Past, Present and Reasonably-Foreseeable Future Projects and Activities in the Region

4.0 THE ENVIRONMENTAL ASSESSMENT PROCESS

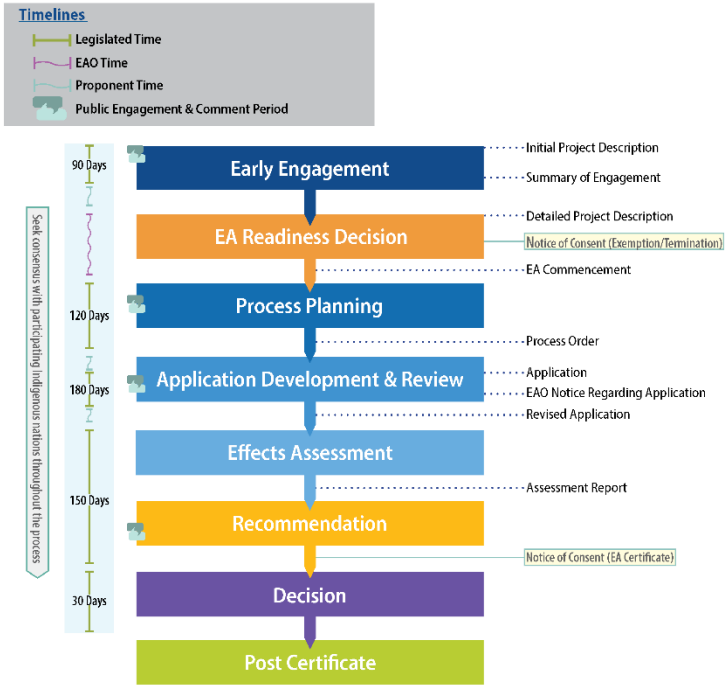


Figure 11: Overview of the B.C. Environmental Assessment Process

The Act and its regulations establish the legal framework for the environmental assessment process for proposed major projects in B.C. The Act requires that projects, including both new and modifications to existing projects, that exceed thresholds defined in the *Reviewable Projects Regulation* must undergo an environmental assessment and obtain a Certificate before proceeding. Cariboo Gold would exceed the following threshold under Part 3 (Table 6 – Mine Projects) of the *Reviewable Projects Regulation* and is therefore subject to review under the Act: *"Mineral Mines - A new mine facility that, during operations, will have a production capacity of >75,000 tonnes per year of mineral ore."*

The environmental assessment process as defined by the Act includes eight phases, as shown in Figure 11, each of which are described in the sections below, as carried out for Cariboo Gold.

4.1 Early Engagement

The Early Engagement phase is the first phase of the provincial environmental assessment process and is an important preparatory stage during which meaningful conversations can begin about a proposed project with the proponent, Indigenous nations, public, local governments, provincial and federal government agencies, and other stakeholders to identify potential interests, issues, and concerns. The information gathered during the Early Engagement phase informs subsequent phases of the environmental assessment.

The Cariboo Gold project description was originally submitted by Barkerville Gold Mines Ltd. (BGM) to the EAO on October 24, 2019, under the former *Environmental Assessment Act* (2002). Cariboo Gold was transitioned to the new *Environmental Assessment Act* (2018) on February 21, 2020, when the Cariboo Gold project description was accepted by the Chief Executive Assessment Officer (CEAO) in complete fulfillment of the requirements of the Initial Project Description. BGM provided the EAO with an Engagement Plan detailing the proposed engagement with Indigenous nations and the public on May 4, 2020. The EAO issued an order under Section 13(3)(a) of the Act on May 14, 2020, accepting the Project Description and Engagement Plan and formally starting the Early Engagement phase of the environmental assessment.

During the Early Engagement phase, the EAO requested input from the public, potentially affected Indigenous nations, and technical advisors from provincial and federal government agencies, local governments, and health authorities to understand their preferred means of engagement and to gather their initial interests, concerns, questions, feedback, and knowledge regarding Cariboo Gold. To support engagement and feedback on the Project Description, the EAO hosted two virtual public open houses and held meetings and teleconferences with technical advisors and potentially affected Indigenous nations prior to and during the Early Engagement phase.

Typically the first part of the Early Engagement phase is 90 days; however, due to exceptional circumstances caused by start of the COVID-19 pandemic, *BGM requested* that the EAO extend the first 90 days of the Early Engagement phase to support additional participation by all participants. *The EAO responded* by extending this phase by an additional 21 days.

The EAO's *Summary of Engagement* was provided to BGM on September 1, 2020, setting out a summary of comments received on the Project Description, a description of *the public comment period* including a summary of what the EAO heard during the Early Engagement Phase from the public, a list of technical advisors, and a list of the participating Indigenous nations (Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation).

Following the EAO's *Readiness Decision Policy*, BGM provided a draft Detailed Project Description for Cariboo Gold on September 21, 2020, which contained additional detail and responses to input received during Early Engagement. This was reviewed by the EAO, participating Indigenous nations, local governments, and technical advisors, and comments were provided to BGM. On October 30, 2020, BGM filed a final Detailed Project Description for Cariboo Gold, which formally began the Readiness Decision Phase.

4.2 Readiness Decision

Under Section 16 of the Act, the CEAO determines whether a project should proceed to an environmental assessment that evaluates the effects of the project or should be referred to the Minister of Environment and Climate Change Strategy with a recommendation that the project be exempted from the requirement to obtain a Certificate, be terminated, or that the assessment be conducted by another assessment body, such as a review panel. This is referred to as the 'readiness decision.'

The EAO sought advice from the technical advisors, including local governments, health authorities and provincial government agencies, on the sufficiency of the Detailed Project Description and the recommendation of the EAO on the readiness decision. The EAO sought and achieved consensus on the recommendation for the readiness decision with the participating Indigenous nations. On December 18, 2020, the CEAO determined that Cariboo Gold could proceed to an environmental assessment. This decision was documented in the *Readiness Decision materials*, including a report and reasons.

4.3 Process Planning

The readiness decision then initiated the legislated 120-day Process Planning Phase of the environmental assessment for Cariboo Gold. During Process Planning, the EAO developed the following documents that set the scope, procedures, methods, and timelines for the environmental assessment of Cariboo Gold:

- The Process Order, including the Project Scope, Assessment Plan and Application Information Requirements; and,
- The Regulatory Coordination Plan.

On March 23, 2021, *BGM notified the EAO* that Osisko Development Corp (ODV) had replaced BGM as the proponent for Cariboo Gold and would fulfill the requirements set out in the Section 13(3)(a) Order.

The matters, or topics, to be assessed during the environmental assessment were determined by the EAO, in consultation with the TAC and the public, and with consensus with the participating Indigenous nations, through the *Application Information Requirements* set out by the EAO for Cariboo Gold.

During Process Planning, the EAO sought feedback on the draft Process Order from participating Indigenous nations, the technical advisors, and the public through a 30-day *public comment period*, which also included two open houses (held virtually due to ongoing concerns from the COVID-19 pandemic). The EAO then collected all the feedback received on the draft process planning documents, sought and achieved consensus with participating Indigenous nations, and issued the final *Process Order* on April 16, 2021 to ODV. The EAO also developed a *Summary of Engagement – Process Planning Phase*.

During this phase, the EAO also established the Technical Advisory Committee and Community Advisory Committee. For more details see *Section 5.1* and *5.2* of this Report.

4.4 Application Development and Review

During Application Development, ODV sought input from environmental assessment participants, including Indigenous nations, to develop the Application with the intention to resolve issues early in the process. The Technical Advisory Committee and participating Indigenous nations had the opportunity to review and comment on early information, including existing conditions reports, technical reports, and modelling plans by ODV.

ODV submitted the Application on July 28, 2021, beginning the 180-day legislated Application Review timeline.

During Application Review, the EAO, participating Indigenous nations, the Technical Advisory Committee, and the Community Advisory Committee reviewed the Application. Three rounds of review were completed on the Application, including additional technical memos from ODV. The EAO also held a *public comment period* and two open houses (still virtual due to COVID-19 pandemic concerns) during this time.

The 180-day legislated time period for Application Review ended on January 24, 2022, and the EAO provided a *Notice Regarding Application Review*, which included an overview of the issues and concerns raised during Application Review and direction to ODV on additional information and revisions to include in the Revised Application.

ODV then continued to work on the resolution of issues raised during Application Review with the Technical Advisory Committee and participating Indigenous nations. On October 14, 2022, ODV submitted the *Revised Application*. The EAO reviewed the Revised Application for sufficiency and sought and achieved consensus with the participating Indigenous nations on the decision to *accept the Revised Application* for review on November 30, 2022.

4.5 Effects Assessment and Recommendation

Following the acceptance of the Revised Application, the legislated 150-day Effects Assessment and Recommendation Phase began. During this phase, the EAO completed its assessment and developed the draft Assessment Report. The EAO also developed a proposed Certificate with conditions for the Ministers' consideration when deciding whether to issue a Certificate. All of the EAO documents considered the input received through engagement with participating Indigenous nations, the Technical Advisory Committee, the public, and the Community Advisory Committee.

The EAO completed a detailed assessment of effects on the valued components, Indigenous interests, and other assessment matters, as described under *Section 25* of the Act. These assessments incorporated information submitted by ODV, advice from the TAC and CAC, local information and concerns raised by the public, and Indigenous knowledge provided by the participating Indigenous nations. A figure showing the linkages and interactions between the different potential effects assessed is provided below in *Figure 12*, with a list of the factors assessed and where to find more detailed information is provided below in Table 2.

Table 2: Valued Components, Indigenous Interests, and Other Assessment Factors Assessed

Environmental Effects	Health Effects
Air Quality (Section 11.6)	Acoustics (Section 11.22)
Greenhouse Gas Emissions (Section 11.7)	Community Health (Section 11.23)
Groundwater (Section 11.8)	Human and Ecological Health (Section 11.24)
Surface Water (Section 11.9)	
Soil (Section 11.11)	**Cultural Effects**
Freshwater Fish (Section 11.10)	Archaeological and Heritage Resources (Section 11.25)
Vegetation (Section 11.12)	Culture (Section 11.26)

Wildlife (Section 11.13) Effects on Biophysical Factors that Support Ecosystem Function (Section 11.14) Potential Changes to Cariboo Gold Caused by the Environment (Section 11.15) **Economic and Social Effects** Land and Resource Use (Section 11.16) Infrastructure and Services (Section 11.17) Employment and Economy (Section 11.18) Consistency with Land Use Plans (Section 11.19) Disproportionate Effects on Distinct Human Populations (Section 11.20) Effects on Current and Future Generations (Section 11.21)	**Effects to Nations and Indigenous Interests** Lhtako Dené Nation (Section 11.1) Xatśūll First Nation (Section 11.2) Williams Lake First Nation (Section 11.3) Nazko First Nation (Section 11.4) Tŝilhqot'in National Government (Section 11.5) **Other Assessment Factors** Risks of Malfunctions and Accidents (Section 11.27) Risk and Uncertainty (Section 11.28) Alternative Means of Carrying out the Assessment (Section 11.29) Interaction Between Effects (Section 11.30)

During this phase of the Cariboo Gold environmental assessment, ODV also submitted a *Project Design Changes Report,* describing updates to the project design. The updates to project design were intended to address the following:

- Concerns raised by reviewers during Application Review;
- Additional underground mining area identified through recent exploration activities; and,
- Alignment of the project design with that proposed for subsequent permitting, in which further design effort had progressed.

A summary of these changes included the following:

- Incorporating an existing underground portal (Cow Portal) located south of Wells, with an additional underground mining area called the Lowhee Zone, and an underground connection from this area to the Mine Site Complex;
- Removing the 'B Road' as a haul route option, which was a concern during Application Review due to dust, noise, and visual impacts on Wells;
- Maintaining the existing water treatment plant at Bonanza Ledge Site (with a discharge location into Lowhee Creek) and building a new one at the Mine Site Complex;
- Increasing the maximum production rate from 4,750 to 4,900 tonnes per day;
- Adding a crusher, screening plant, and ore sorter at the Bonanza Ledge Site for the first four years of operations;
- Using the 'A Road' and Highway 26 through the District of Wells to transport concentrate from the Bonanza Ledge Site to the Quesnel River Mill during the first four years of operations; and,
- Increasing the maximum number of workers during operations.

These changes were reviewed by the Technical Advisory Committee and the Community Advisory Committee, and an additional 30-day public comment period was held to understand any public concerns with these design changes. This led to the 150-day legislated time period being extended by approximately four months to accommodate this additional review.

The EAO held a public comment period and two open houses (one in person, one virtual) on the draft Assessment Report and proposed Certificate. The EAO sought consensus with the participating Indigenous nations on this Report, with a

focus on the conclusions of the assessment and the proposed Certificate, and on the sustainability recommendation by the EAO.

The development of any major project is bound to have effects. The purpose of the environmental assessment process is to identify those effects, determine the appropriate mitigation to reduce the adverse effects and enhance any positive benefits, and ultimately determine if this effect (after mitigation and any proposed conditions) would be considered significant. The scale of this determination is important to consider – while the EAO looks at effects at a local to regional level, considering the implications for all British Columbians and the province of B.C. as a whole, those directly impacted by a project (such as residents in the District of Wells in this case) would individually and as a community feel a much stronger effect.

Recommendations from the CEAO are also provided to Ministers to inform their decision. Consensus-seeking, with participating Indigenous nations, continued through this phase. Participating Indigenous nations also have the opportunity to provide notice of their consent or lack of consent to the project to provincial decision-makers with the recommendations.

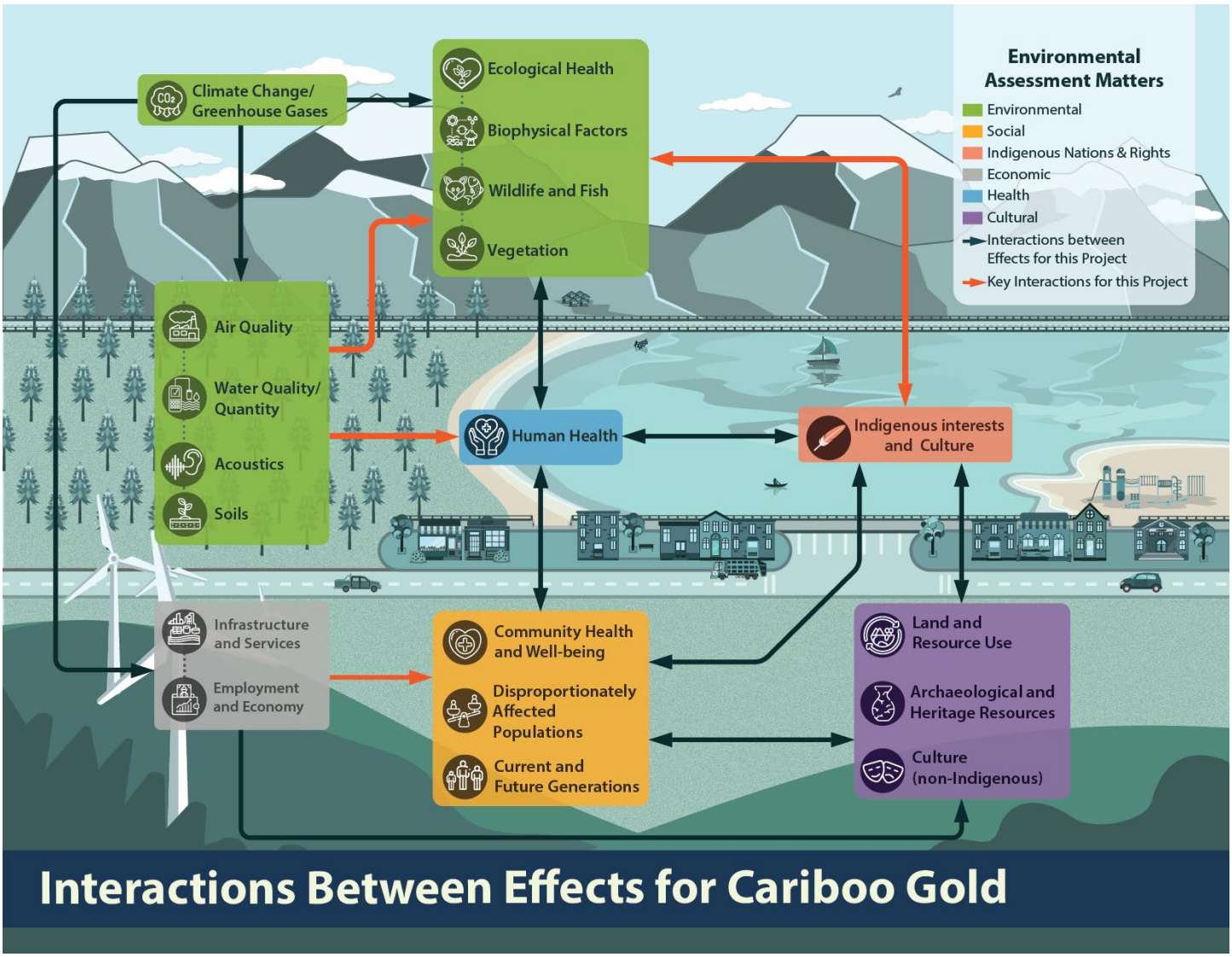


Figure 12: Interactions between the effects predicted for Cariboo Gold

4.6 Decision

This Report, the proposed Certificate, recommendations of the CEAO, and any notices of consent or lack of consent received from participating Indigenous nations will now be referred to the Ministers for decision and posted on the *EAO's Project Information Centre*. The Ministers must consider these materials and any other public interest considerations and decide to issue (with conditions) or refuse a Certificate. The Ministers must then also publish reasons for their decision.

4.7 Post-Certificate

If a Certificate is issued, this phase will include all post-certificate activities for Cariboo Gold, including mitigation effectiveness reports, audits, certificate amendments, certificate extensions, and certificate transfers.

The Compliance and Enforcement branch of the EAO conducts compliance inspections and, where required, uses enforcement to ensure that projects are compliant with the certificate conditions. For more information on compliance and enforcement, please see the *EAO's website*.

5.0 Stakeholder Engagement

5.1 Technical Advisory Committee

The EAO established a Technical Advisory Committee, made up of provincial and local government staff or representatives with the mandates and expertise relevant to the review of Cariboo Gold, as well as representatives of the participating Indigenous nations. The purpose of the Technical Advisory Committee is to advise the EAO and participating Indigenous nations on technical matters related to the assessment and review of the Application, Revised Application, supplemental materials submitted, and the EAO's draft assessment materials. The list of groups represented on the Technical Advisory Committee is available in *Appendix 2 – List of Parties on the Technical Advisory Committee*. A *terms of reference* was developed for this committee.

The EAO sought and considered advice from the Technical Advisory Committee to understand and assess any potential effects associated with Cariboo Gold. Technical Advisory Committee members were responsible for providing timely advice to the EAO and participating Indigenous nations throughout the assessment.

The EAO reviewed the adequacy of ODV's responses to all comments received from Technical Advisory Committee members and held various meetings with Technical Advisory Committee members to discuss outstanding issues and concerns. In the development of this Report and recommended provincial conditions, the EAO considered all comments and issues raised during the environmental assessment.

The full set of comments and resolution of issues is provided in the *Application Review Issues Tracking Table*. The key concerns are described in *Section 7.0* of this Report.

5.2 Community Advisory Committee

The EAO has the option to establish a Community Advisory Committee for environmental assessments, where there is sufficient public interest, to provide insight and advice to the EAO on potential effects of a project on nearby communities.

For the Cariboo Gold environmental assessment, the EAO established a Community Advisory Committee due to the proximity of Cariboo Gold within the District of Wells and the level of community interest in the Early Engagement and Process Planning public comment periods. During the first two public comment periods (during Early Engagement and Process Planning), the EAO requested that any members of the public interested in joining the Community Advisory Committee indicate this preference when submitting a public comment. Twenty-five members of the public indicated their interest in joining, and the Community Advisory Committee was officially formed during the Process Planning Phase

with all twenty-five members. It is noted that this committee was formed of members who self-selected to join because of their interest in participating more fully in the environmental assessment process. The EAO worked with the Community Advisory Committee to establish the goals and roles of this committee, formalizing this in the *Community Advisory Committee Terms of Reference*.

The EAO sought and considered advice from the Community Advisory Committee throughout the environmental assessment to understand and assess any potential effects associated with Cariboo Gold. Community Advisory Committee members were kept informed during the process, and they provided local knowledge and advice to the EAO regarding potential effects on and concerns of the community through the selection of valued components, Application Information Requirements, Application, draft Assessment Report, and proposed Certificate.

The EAO met regularly with the Community Advisory Committee during the Application Review and Effects Assessment phases, primarily using virtual meetings due to the ongoing COVID-19 pandemic and communicated regularly regarding project updates via email.

Thank you!

The members of the Community Advisory Committee are not compensated in any way, and the EAO would like to recognize their important contribution to this Environmental Assessment, which in turn benefits the future of their community.

Thank you for your passion, contributions, and effort!

The Cariboo Gold Community Advisory Committee was the first committee of its kind formed under the Act, and the experiences of both the members and organizers of this committee will be used to inform future Community Advisory Committees through the EAO. Additional engagement will occur following this environmental assessment.

Most of the members of the Community Advisory Committee appreciated that Cariboo Gold would bring employment and economic benefits to the District of Wells, but do not support Cariboo Gold as currently designed, specifically the location of the proposed Mine Site Complex located within Wells and the proposed location of the Transmission Line on Island Mountain, all within sight of many houses and businesses in town. Many of the Community Advisory Committee members felt that Cariboo Gold would substantially and negatively affect their mental and physical health and ability to peacefully enjoy their town and livelihoods, through the increase in traffic, noise, light trespass, and dust created during construction and operations through the location of the infrastructure and increase in workers and equipment present and visible from town. This issue is further discussed as one of the key issues raised during this environmental assessment in *Section 7.2* (Loss of Peaceful Enjoyment of Wells).

Other members indicated their support for Cariboo Gold, indicating that their participation in the Community Advisory Committee was valuable, their interactions with ODV had been positive, and that ODV has been an environmentally responsible corporate citizen in the region.

The discussions led to many new mitigation measures added to the proposed Certified Project Description and proposed Certificate conditions. These measures would require ODV to develop and implement a Community Effects Management Plan and Air Quality and Emissions Management Plan, limit project noise contribution to 40 A-weighted decibels above baseline (dBA) in the District of Wells, limit the number of haul trucks trips to 25 per day on Highway 26, reduce light trespass, provide a process for receiving complaints from the public regarding workers or the work camp, hold bi-annual community meetings, continue engagement and respond to complaints received from the public during the project, mitigate the effects of dust in the town, and screen the Mine Site Complex building and transmission line poles with vegetation.

It was noted that although many members of the Community Advisory Committee have appreciated the additional engagement that this committee has provided an opportunity for, many committee members have felt an inability to

affect project design and felt that they did not always receive meaningful responses to their concerns from the EAO and ODV, creating a strong sense of frustration and disappointment.

5.3 Public

Public consultation is an important aspect of the environmental assessment process. Public participation in the environmental assessment process helps ensure that community values and public goals are considered in project planning and decision-making. Public comments also help the EAO ensure that all potential adverse effects of a project are captured and appropriately assessed.

The EAO conducts its own public consultation but also requires additional public consultation from proponents. The EAO required ODV to prepare a *Public Engagement Plan*. The plan laid out ODV's consultation objectives and activities. Through the course of the environmental assessment, ODV submitted multiple Public Consultation Reports to the EAO: the first *Public Engagement Report* was submitted following the Application Review public comment period, and the second *Public Engagement Report* was submitted with the Revised Application.

The EAO held five public comment periods for Cariboo Gold that included virtual and in-person open houses. The virtual open houses each included a presentation by the EAO on the current and upcoming phases of the environmental assessment process, a presentation by ODV on Cariboo Gold, as relevant to the current phase, and an opportunity to ask questions online to the EAO and ODV. The in-person open house included poster boards with relevant technical experts for the public to have discussions with as well as a panel discussion and question and answer period with the EAO, ODV, and the community.

Table 3: Public Comment Periods and Open Houses

Phase	Comment Period Dates	Number of Comments	Date of Open Houses	Number of Attendees
Early Engagement	June 12 - July 27, 2020	57	June 17, 2020 (virtual) 2:00 - 4:00 PM	99*
			June 23, 2020 (virtual) 7:00 - 9:00 PM	52*
Process Planning	February 16 - March 18, 2021	75	February 23, 2021 (virtual) 1:00 - 3:00 PM	43*
			February 25, 2021 (virtual) 5:00 - 7:00 PM	39*
Application Review	September 7 - October 7, 2021	118	September 22, 2021 (virtual) 5:00 - 7:00 PM	33*
			September 23, 2021 (virtual) 11:00 AM - 1:00 PM	50*
Effects Assessment	Design changes report: May 9 - June 8, 2023	28	No open house	n/a
	Draft referral materials: July 19 - August 18, 2023	217	July 19, 2023 (In-person) 5:00 - 8:00 PM	33
			July 25, 2023 (virtual) 5:00 - 7:00 PM	20
* Attendance was virtual due to the COVID-19 pandemic and associated safety measures and health orders.				

Comments received during all five public comment periods were received primarily from individuals living near the location of Cariboo Gold including Wells, Quesnel, Prince George and McLeese Lake. Other comments came from individuals who indicated that they often travel to the region where Cariboo Gold is being proposed and from employees and contractors that self-identified that they have worked for ODV's existing operations.

The EAO's public engagement activities sought to capture the perspective of the local community of Wells and the surrounding area on Cariboo Gold and possible effects to the community. The key concerns raised during public engagement have been related to socio-economic effects, environmental effects, archaeological and heritage effects, tourism, arts, and culture effects. The full text of all public comments received during public comment periods are available on *EAO's Project Information Centre*.

Socio-economic Effects: Comments from the public on socio-economic effects included concerns regarding the proximity of mine infrastructure to Wells, workforce accommodations and effects to housing, and effects to the viewscape of Wells. Some commentors noted the positive effects of increased jobs in the community due to the mine and the impact that would have on the economy. These issues are discussed further in Sections in this Report: *11.18* (Employment and Economy), *11.17* (Infrastructure and Services), and *11.23* (Community Health), and led to the development of the proposed Certificate condition which would require ODV to develop and implement a Community Effects Monitoring Plan.

Environmental Effects: The community has expressed concerns with the potential air quality effects due to dust from the Mine Site and truck traffic through Wells. Concerns regarding increased noise and light in Wells from truck traffic and the mine generally were also raised frequently. Additionally, there were concerns that the mine would affect water quality for the District of Wells. Other concerns included effects to land and resources use, wildlife in the area, effects of the transmission line on caribou and caribou habitat, and consistency of Cariboo Gold design with land use plans. These issues are discussed further in later Sections in this Report: *11.6* (Air Quality), *11.24* (Human and Ecological Health), *11.22* (Acoustics), *11.16* (Land and Resource Use), and *11.8* (Groundwater), and led to the development of the proposed Certificate conditions which would require ODV to develop and implement a Community Effects Monitoring Plan and an Air Quality condition.

Archaeological and Heritage Effects: Concerns were raised about the potential effects to sites of historical importance and specifically Barkerville Historic Town. It was noted that not all sites of historical importance in the area receive automatic protection under B.C.'s *Heritage Conservation Act*. This issue is discussed further in *Section 11.25* (Archaeological and Heritage Resources) of this Report and led to the development of the proposed Certificate condition which would require ODV to develop and implement a chance-finds procedure during construction.

Tourism, Arts, and Culture Effects: Public engagement emphasized Wells' identity as a cultural tourism destination with visual, literary, and performing arts. There were concerns about the effects from Cariboo Gold to the tourism, recreation and arts sectors of Wells that could have an effect on both employment and the economy of the community. These issues are discussed further in later Sections in this Report: *11.26* (Culture) and *11.18* (Employment and Economy). This led to the development of the proposed Certificate condition which would require ODV to develop and implement a Community Effects Monitoring Plan.

Comments in the final public comment period on the draft referral materials were incorporated, where appropriate, into the final documents.

5.4 Local Governments

The EAO invited the mayor, council, and staff from District of Wells and Cariboo Regional District, due to their overlap with the main project infrastructure, to join the Technical Advisory Committee and kept them updated of project reviews and milestones. The EAO also met directly with these two local government bodies directly, presenting at some council meetings, and offered to have meetings on specific issues.

The District of Wells underwent substantial changes to mayor and council in late 2021, and the EAO worked closely with District of Wells municipal staff and the Ministry of Municipal Affairs to maintain connection with that government throughout the transition. The EAO attended council meetings when invited and provided opportunities for additional engagement with local governments.

The District of Wells and ODV have established partnerships to support various potential revitalization activities across the region. The District of Wells is also negotiating a Community Agreement with ODV, previously referred to as the Community Benefits Agreement.

The key concerns raised by the District of Wells and Cariboo Regional District are related to socio-economic, environmental, tourism, arts, and culture effects. More specifically, concerns raised by the District of Wells were about the increase in traffic and noise in the region resulting from Cariboo Gold's activities. Two Council members stated that "It is important to state that generally, the community does not object to a new gold mine as such, since there have been, and would continue to be, employment, contract work, and company investments in Wells which are needed and appreciated. However, they cannot come at the cost of a town that would become unlivable as residents know it, and at odds with their vision for the future." Concerns specifically around the reliance of Wells on volunteers for the fire brigade and tourism support (Trails Society, Island Mountain Arts, Sunset Theatre, Historical Society, and Snowmobile Club, for example), the possible loss of long-term residents due to the loss of peaceful enjoyment of the community, and the level of burn-out and exhaustion that some community members are experiencing from participating in the discussions regarding of the proposed mine.

These effects, proposed mitigation measures, and conclusions are described in more detail in Sections in this Report: *11.22* (Acoustics), *11.26* (Culture), and *7.2* (Loss of the Peaceful Enjoyment of Wells). The EAO proposed a condition to mitigate and monitor the effects of traffic, noise, tourism, and community health through the Community Effects Monitoring Plan.

Cariboo Gold would also bring several positive benefits to the region, in particular an increase in employment and revenue. A unique benefit of this mine is that the Mine Site Complex would be built in the area of historical waste rock storage, and the clean-up that would occur due to its construction would help in the efforts to remediate the historical contamination on the edge of Jack of Clubs Lake. ODV has also committed to searching for and installing a new, clean drinking water supply for the District of Wells, which the Council unanimously supported.

6.0 Indigenous Nation Engagement and Summary of Effects

The Government of B.C. has a duty to consult and, where needed, accommodate for government decisions that may affect potential or established Aboriginal or Treaty Rights (including title). In carrying out this duty in its assessment, the EAO considered potential for effects to Indigenous interests more broadly to include Aboriginal and Treaty rights, where applicable, as well as a range of interests held by Indigenous nations extending beyond just those that are strictly linked to the duty to consult. This approach is consistent with B.C.'s commitment to relationship building and reconciliation with Indigenous nations and the purposes of the EAO.

6.1 Participating Indigenous Nations

All Indigenous nations that may be adversely affected by a project can opt to be a participating Indigenous nation in an environmental assessment. The scope of engagement with each participating Indigenous nation was identified in the *Process Order* that included specific information necessary to assess effects of Cariboo Gold on an Indigenous nation and its rights, the level of involvement of each Indigenous nation on the Technical Advisory Committee and its sub-committees, the timing and nature of specific engagement activities, and whether an Indigenous nation wished to conduct certain aspects of the assessment of effects to their Indigenous interests. A goal of this engagement was to build shared understanding of the Indigenous nation's history, culture, traditions and connection to the land and resources. This included how the Indigenous nation has determined its priorities, visions, governance, and land use planning aspirations into the future.

The following Indigenous nations were the participating Indigenous nations for the Cariboo Gold environmental assessment: Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation (T'exelc).

6.1.1 Lhtako Dené Nation

Lhtako Dené Nation is part of the Dakelh (pronounced 'Ka-kelh') Nation in the Atapaskan language group, located just south of Quesnel, B.C. The *Lhtakot'en* or Lhtako Dené means "people of the Fraser River." Lhtako Dené Nation is a member of the Southern Dakelh Nation Alliance and is one of the four member communities that comprise the Carrier Chilcotin Tribal Council, whose member territories extend from the Coast Mountains on the east to the Alberta border on the west. The Carrier people traditionally identified themselves by their membership in subtribes, which were politically and economically autonomous communities distinguished by the use and occupation of a particular region.

The territory of Lhtako Dené Nation ranges from north and west of Quesnel, due east to the B.C. and Alberta border and south from Quesnel to west of Lhtako Dené. The Lhtako Dené community is located along the banks of the Fraser River, just south of the Town of Quesnel and its four reserves (Dragon Lake 3, Quesnel 1, Rich Bar 4 & Sinnce-Tah-Lah 2) occupy 682 hectares (ha). As of 2021, Lhtako Dené Nation had a total registered population of 186 people, with 85 members residing on reserve and 94 residing off reserve in the town of Quesnel or in southern B.C. or Alberta. Lhtako Dené Nation is governed by a Chief and three Councillors.

In 2020, Lhtako Dené Nation and ODV entered into a *Life-of-Project Agreement* to facilitate the development of Cariboo Gold in October 2020. The Cariboo Gold Project Agreement outlines the Cariboo Gold-related opportunities and benefits for current and future generations of the Lhtako Dené Nation as proposed by ODV and establishes the framework for ODV and Lhtako Dené Nation to work cooperatively and seek consent throughout the life of Cariboo Gold. The Cariboo Gold Life-of-Project Agreement was created after an initial Engagement Protocol in 2016, Relationship Agreement in 2016, and capacity funding agreements in 2019. This agreement was celebrated between Lhtako Dené Nation and ODV in a ceremony on site on October 22, 2022.[7]

The primary Indigenous interests raised by Lhtako Dené Nation during consultation and engagement activities were:

- Traditional land use and practices;
- Water quantity, water quality, and aquatic ecosystem health;
- Caribou conservation and recovery; and,
- Community well-being, including the integration of Lhtako Dené Nation ecological knowledge, language, culture, values, and community.

Employment opportunities and resource availability for future generations were considered as well. For more details on effects to this Nation, its Indigenous interests, and key issues raised, see *Section 11.1* of this Report.

6.1.2 Xatśūll First Nation

Xatśūll (pronounced 'Hat'sooth') First Nation is a member of the Great Secwépemc Nation, once known as the people of Xatśūll (meaning "on the cliff where the bubbling water comes out"). Xatśūll First Nation is the northernmost Shuswap tribe of the Secwépemc Nation, which is the largest Nation within the interior of B.C. The Xatśūll people have stewarded territory ranging from the Coast Mountains to the west, east to the Rocky Mountains. The use of the land brought about contact with neighbouring peoples.

Xatśūll First Nation was known to celebrate and war with the neighbouring Chilcotin Nation but were always wary of the Cree. There was a good relationship with the southern Carrier who referred to the Shuswap as the 'Atnah' meaning, "to

[7] Dyok, R. (2022). *Lhtako Dene Nation and Osisko Development Celebrate Life of Project Agreement*. Quesnel Cariboo Observer. Retrieved October 25, 2022. *Link*

live in underground dwellings." Inter-marriages between neighbouring communities were an important survival strategy, for failure of the annual salmon could result in starvation or migration and these relations could be relied on to share hunting and fishing territories. As with many other Indigenous nations, the Xatśūll First Nation followed a hunting and gathering lifestyle centered in family groups and focused on the Fraser River and the salmon. Patterns of land use were in harmony with the natural processes.

Xatśūll First Nation has traditionally occupied a vast territory in the Cariboo region including the area on which a portion of Cariboo Gold is proposed to be developed. The Xatśūll First Nation traditional territory in the central Cariboo covers an area from Valemount and McBride in the northeast to south of Clinton, and west of the Fraser River. As of 2021, the Xatśūll First Nation included approximately 450 members and is governed by a Chief and four Councillors.

The primary Indigenous interests raised by Xatśūll First Nation during consultation and engagement activities were traditional land use and cultural heritage practices; economic development and opportunities; land stewardship; and community health and safety.

An agreement between ODV and Xatśūll First Nation is in development at the time of this Report. For more details on effects to this Nation, its Indigenous interests, and key issues raised, see *Section 11.2* of this Report.

6.1.3 Williams Lake First Nation

Williams Lake First Nation (or the T'exelcemc people) is one of the Nations which comprises the Secwépemc (pronounced 'She-KWE-pem'), in the central interior of B.C., near the City of Williams Lake. Along with Xatśūll Cmetem' (Soda Creek/Deep Creek), Stswecemc Xgat'tem (Canoe Creek/Dog Creek), and Tsq'escen (Canim Lake), Williams Lake First Nation comprise the Northern Shuswap Tribal Council (Northern Secwépemc te Qelmucw). Williams Lake First Nation has been part of the Secwépemc Nation for more than 6,500 years. The environment, ceremony and family are very important to this Nation.

The primary Indigenous interests raised by Williams Lake First Nation during consultation and engagement activities were traditional land use and cultural heritage practices, economic development and opportunities, land stewardship, and community health and safety.

An *agreement with Williams Lake First Nation* and ODV was signed in June 2022. For more details on effects to this Nation, its Indigenous interests, and key issues raised, see *Section 11.3* of this Report.

6.2 Other Indigenous Nations

The EAO also notified Nazko First Nation and Tsilhqot'in National Government, including ?Esdilagh First Nation, of milestones for the Cariboo Gold environmental assessment.

6.2.1 Nazko First Nation

Nazko First Nation (Nazko) is part of the Carrier Nation in the north-central region of B.C, stretching 500 km from the Coast Mountains in the west to the Rocky Mountains in the east, and 300 km from Takla Lake in the north to the Chilcotin plateau in the south. Nazko's traditional language, Carrier, is part of the northern Athapaskan language family. Nazko has a traditional territory which extends from Quesnel to Prince George and overlaps a small portion of the Cariboo Gold Transmission Line and Transportation Route. The overlaps are restricted to the Transmission Line from the Barlow Sub-station to approximately 16 km east and the western portion of the Transportation Route near the junction of Highway 26 and 500 Nyland Lake Road.

The EAO advised Nazko that there may be increased traffic along the Transportation Route because of Cariboo Gold. ODV has informed Nazko regarding Cariboo Gold and related activities since 2018, providing Nazko with project notifications

and information for comment and review. Nazko opted to receive notifications from the EAO on key project milestones for Cariboo Gold and had the opportunity to provide comments through the public comment periods held by the EAO. The EAO has not received any responses or comments on Indigenous interests identified by Nazko related to Cariboo Gold either directly, through ODV or through public comments.

The EAO does not anticipate any residual or cumulative effects to Nazko or its interests from Cariboo Gold and has notified Nazko at key project milestones throughout the environmental assessment process. For more information, see the detailed assessment of potential effects on Nazko in *Section 11.4*.

6.2.2 Tŝilhqot'in National Government

The Tŝilhqot'in (pronounced 'Tsill-COAT-ten') National Government (TNG) represents six bands which comprise the Tŝilhqot'in Nation: ʔEsdilagh (Alexandria), Tl'etinqox (Anaham), Tŝi Deldel (Redstone), Yunesît'in (Stone), Xeni Gwet'in (Nemiah) and Tl'esqox (Toosey). Tl'etinqox, Yunesît'in, Tŝideldel, Tl'esqox and Xeni Gwet'in are located west of Williams Lake. ʔEsdilagh is located north of Williams Lake, B.C. Tŝilhqot'in Nation, and TNG are parties to the *Tsilhqot'in Stewardship Agreement*, a Strategic Engagement Agreement for shared decision-making respecting land and resource management. Cariboo Gold overlaps portions of the TNG engagement zones A and B as outlined in the Tsilhqot'in Stewardship Agreement. The Tsilhqot'in Stewardship Agreement provides a framework and engagement criteria for activities occurring within a series of defined Engagement Zones within TNG member territories. The Cariboo Gold Transmission Line overlaps with a small portion of TNG's Engagement Zone A, with a portion of the Transportation Route overlapping Engagement Zone B. As per the Tsilhqot'in Stewardship Agreement, Engagement Level 5 projects located within Engagement Zones A and B remain subject to applicable laws, including the *Environmental Assessment Act*, and the Crown's duty to consult and accommodate.

Based on the potential effects, the EAO notified TNG (and ʔEsdilagh First Nation individually at its request) at key milestones for Cariboo Gold. TNG did not respond to any of these notifications and did not provide any additional information or identify any additional interests related to Cariboo Gold.

The EAO has not identified, and does not anticipate, any residual or adverse cumulative effects to TNG or TNG's interests from Cariboo Gold. For more information, see the detailed assessment of potential effects on TNG in *Section 11.5*.

7.0 Key Concerns Identified in the EAO's Assessment of Effects

Appendix 3 provides the detailed assessments of potential effects of Cariboo Gold, identifies mitigation measures, discusses the key issues raised, and reaches conclusions on the significance of residual effects on each valued component and other required assessment matters, as required by *Section 25* of the Act. The matters to be assessed were determined by the EAO, in consultation with the Technical Advisory Committee and the public, and through seeking consensus with the participating Indigenous nations, in the *Application Information Requirements* set out by the EAO. These assessments incorporate information submitted by ODV, advice from the Technical Advisory Committee and Community Advisory Committee, local information and concerns raised by the public, and Indigenous knowledge provided by the participating Indigenous nations. The EAO's *Effects Assessment Policy* provides guidance on how to consider these assessment matters, including how to identify, assess and manage potential environmental, economic, social, cultural and health effects.

The remainder of this section summarizes the key themes that, due to their complexity and the level of concern from the Technical Advisory Committee, Community Advisory Committee, participating Indigenous nations, and the public, became the main focus of the Cariboo Gold environmental assessment.

7.1 Reduced Air Quality and Effects on Human Health

The initial Application from ODV contained air quality models indicating that nitrogen dioxide and particulate matter (i.e., small particles) would be elevated beyond *B.C. air quality objectives*. Local particulate matter concentrations are also influenced by existing sources in the area such as wood-burning stoves, open and backyard burning, dust from unpaved roads, and combustion emission sources, as well as major disturbance events such as wildfires. ODV did not collect baseline data for Wells for the Application and instead developed the air quality modelling on representative data from the city of Quesnel (for particulate matter, nitrogen dioxide, and sulphur dioxide) and Kelowna (for carbon monoxide). This lack of local air quality baseline data led to concerns regarding the understanding of the local situation and how Cariboo Gold could affect it.

Figure 13: Houses in Wells showing chimneys with evidence of previous wood stove use, along an unpaved town street

The likelihood of elevated air quality emissions from Cariboo Gold leading to potential effects on human health were a cause of concern from Northern Health, Xatśūll First Nation, Williams Lake First Nation, the Community Advisory Committee, and the Ministry of Environment and Climate Change Strategy (ENV). This led to a series of discussions, technical memos, additional air quality and human health risk modelling, and project design changes. ODV worked with ENV and Northern Health to add mitigation measures that would reduce the effect of changes in air quality, including changes to mine design to move ventilation portals away from Wells, greatly reducing the nitrogen dioxide emissions from the mine into the District of Wells. ENV also recommended mitigation measures to reduce the baseline air emissions in the District of Wells such as providing clean gravel to the District of Wells to reduce dust on unpaved roads, using dust suppression measures, requiring a Fugitive Dust Management Plan that would contain appropriate monitoring, management and responses to events and concerns as part of any future *Environmental Management Act* permits, and automating or electrifying underground equipment and haul trucks where possible to reduce air emissions. ODV also proposed to install air quality monitoring stations in Wells to better understand the current air quality levels.

The EAO proposes conditions in the Certificate for ODV related to air quality, which would require mitigation measures, monitoring, and reporting to reduce air emissions from Cariboo Gold, as well as the implementation of continuous air quality monitoring in Wells. ODV would also be required to develop a Fugitive Dust Management Plan for the *Environmental Management Act* permit. With effective implementation of these mitigation measures, as well as any additional measures imposed by ENV during permitting, the EAO expects the effects of changes in air quality to be greatly reduced.

7.2 Loss of the Peaceful Enjoyment of Wells

Although the town of Wells was historically a mining and industrial town, the current residents of Wells enjoy a peaceful and remote existence, about an hour east of the nearest city of Quesnel, along the stretch of Highway 26 that primarily only reaches Wells, resource extraction facilities and industrial operations, backcountry recreation opportunities, and

Figure 14: The Sunset Theatre, Island Mountain Arts Artist Residence Building, and Barkerville Historic Site

tourist attractions such as the Barkerville Historic Site and the Troll Ski Resort. Wells is known for its thriving arts community, with art galleries, course offerings at Island Mountain Arts Centre, arts festivals, and performances at the Sunset Theatre. As the District of Wells *webpage* states, "Wells is more than just gold. Wells is History, Art & Adventure."

Cariboo Gold would bring a 200-person work camp into the town of Wells, approximately equivalent to the current number of permanent residents, increasing interactions with project staff in town. It would also bring the Mine Site Complex, including a large services building, within the town of Wells and within view of many of the residences. Cariboo Gold would also increase traffic along Highway 26, and increase light, noise, and visual effects in the District of Wells. The increase of the mining population in the community may further contribute to a lack of social cohesion amongst groups with competing interests. For artists, there is a fear that cultural displacement that could take place. The EAO also heard that more people could bring more opportunities for some local businesses and an increase in employment opportunities. However, the potential effects to the ability of residents to peacefully enjoy their town has caused serious concern among some residents, tourism operators, and arts organizations, particularly those who joined the Community Advisory Committee to advise the EAO on these concerns. Many residents felt that the only acceptable solution to their concerns would be for the Mine Site Complex to be relocated.

ODV responded by indicating that it will develop a strategy to mitigate pressures on recreation and tourism and work with the District of Wells to better understand the effects of an increased population. These plans include a strategy on maximizing local hiring. ODV also plans to host or support community events to promote and encourage arts and culture within the District of Wells. Because of the effects anticipated and recognizing that those effects can not be fully avoided, the EAO has proposed Certificate conditions to address or reduce the adverse effects. The EAO proposes a condition in the Certificate which would require ODV to develop and implement a Community Effects Management Plan which would include mitigation measures to limit project noise contribution to 40 dBA above ambient noise levels, provide a reporting mechanism for the public to discuss issues occurring in town from those living in the work camp, create policies for

Figure 15: Location of proposed work camp near Town of Wells – existing trees in background would be maintained to shield view from town.

any gender-based violence, increase diversity in employment, screen the Mine Site Complex building and Transmission Line poles with vegetation to the extent possible, hold bi-annual community meetings, and support a social worker position and community liaison position in the District of Wells. With the effective implementation of these mitigation measures, the EAO anticipates the adverse effects on the peaceful enjoyment of Wells to be reduced to a reasonable level.

While the EAO considers effects at a local to provincial level, it is important to note that the individual residents of Wells would be the most directly affected by the construction and operation of Cariboo Gold, and much tension and fear of the potential changes that may occur and the effectiveness of the proposed mitigation measures exists for those that are concerned about the way this will change their everyday life and future in Wells.

7.3 Historical Tailings Contamination and Drinking Water Supply

Historical tailings and waste rock generated from the former Island Mountain and Cariboo Gold Quartz Mines (in operation from 1933 to 1967) are located within the proposed Mine Site Complex area, which is within the District of Wells and on the shoreline of Jack of Clubs Lake. These tailings include high levels of arsenic, cobalt, cadmium and lead in the soils/sediment and arsenic, cobalt, iron, nickel, and sulphate in groundwater.

Figure 16: New caution sign at the edge of Jack of Clubs Lake

ENV investigated the Wells tailings site beginning in the late 1980s. In 2008, the Ministry of Forests' (MOF) Crown Contaminated Sites Program (CCSP) prioritized the vacant Crown land site for further investigation. A preliminary human health risk assessment in 2011 identified that certain areas of the site may be associated with potential unacceptable health risks and recommended additional human health risk assessment work. Where this investigation indicated potential human health risks, seven caution signs were installed in 2012. By 2022, two of these signs had been taken down. At the request of Northern Health in June 2023, the caution signs were replaced with larger signs with updated text and installed at three additional locations: the District of Wells' tourist pullout, at the pathway entering Williams Meadow and Creek walking trails, and an additional tailings shore area sign. Based on available health risk documentation and evidence of site usage and exposure potential, Northern Health deemed the site a health hazard in December 2023 under the *Public Health Act*. In June 2023, Northern Health also issued a *health hazard advisory* for Jack of Clubs Lake tailings and the Visitor Centre shorelines, advising the public to avoid contact with sandy areas and sediment in wading areas along the impacted shorelines.

CCSP has initiated a detailed site investigation, background assessments, and a drinking water standards applicability study. These will inform a detailed human health and ecological risk assessment which, in turn, will inform remedial options and solutions. SLR Consulting Ltd. is currently working on a risk communication plan to increase awareness about the contamination at the site and potential associated risks.

What are **waste rock** and **tailings**?

Mine waste rock is the rock removed in the mining process to access ore, and it is not further processed. It is also called 'overburden.'

Mine tailings are the materials left over after processing the mined ore, and are usually a slurry of fine particles, often containing concentrated heavy metals and other processing materials.

Although the remediation of contamination from historical mining activities is not currently the responsibility of ODV, building near and partially overlapping the contaminated area would require ODV to take care of any increase in the mobility of contamination as well as protecting its workers from any contaminated soil, water, or air. It should be noted that the majority of the Mine Site Complex would be built on historical waste rock, not the historical tailings which contain the high levels of arsenic (see box describing mine waste rock versus tailings). The contamination from the historical tailings area is a complex remediation issue, and ODV has committed to working with CCSP and EMLI on this issue through the *Memorandum of Understanding* between the CCSP, EMLI, Barkerville Gold Mines Ltd. and ODV, regarding the exposed tailings adjacent to Jack of Clubs Lake (signed July 11, 2022). The EAO has also created a *table* outlining the roles of various parties in the management of contaminated sites. ODV has committed to collaborating with CCSP and the other parties involved on the remediation efforts. One factor in ODV's decision to propose the Mine Site Complex within the District of Wells was to locate it within the historical waste rock area, which would require ODV to remove contaminated soils through construction where excavation is required to assist with the clean-up effort. ODV has also committed to helping the District of Wells find a new source of drinking water nearby, and if found, ODV would help to implement the new drinking water source.

The EAO has included a proposed a Certificate condition which would require ODV to describe any actions that ODV would contribute towards the remediation efforts in the project area in an End Land Use Plan following additional engagement between the parties involved in the management of the contaminated area. With the work of CCSP, EMLI, Northern Health, and ENV, and the participation of ODV in the remediation effort, the EAO anticipates the groundwater supply and public awareness of the health hazards of the site would be improved overall for the District of Wells due to the development of Cariboo Gold.

Figure 17. Jack of Clubs Lake, with historical tailings beach in centre

7.4 Effects to the Barkerville Caribou Herd

Woodland caribou (*Rangifer tarandus*) is a northern species that thrive in cold and harsh landscapes, depending on large, undisturbed areas for food, reproduction, and protection from predators and the weather. They are recognized to exist in three sub-species (northern mountain, southern mountain, and boreal). The southern mountain population, which overlaps the Cariboo Gold area, is further broken down into northern, central, and southern groups and split again into 32 subpopulations or herds, including the Barkerville woodland caribou herd located near Cariboo Gold. This southern group

is designated as threatened under the Canada's *Species at Risk Act*[8], recommended as endangered by the Committee on the Status of Endangered Wildlife in Canada, and red-listed[9] by the Province of B.C.[10] In 2021, the Barkerville woodland caribou herd was found to be decreasing[11] as it had declined by 26 percent in the last 8 years (88 to 65 individuals from 2012 to 2020).

In 2018, informed by an imminent threat assessment[12], the federal Minister of Environment and Climate Change determined that southern mountain caribou were facing imminent threats to recovery, with particular concern noted for ten specific caribou herds; however, this did not include the Barkerville herd.

The potential effects of Cariboo Gold on the Barkerville herd include habitat disturbance along the Transmission Line, increased access to caribou habitat by wolves leading potentially to increased hunting pressure and mortality for caribou, caribou habitat fragmentation, and sensory disturbance to caribou particularly during construction and maintenance. Due to the low numbers of the herd, and the status of southern mountain caribou generally, these adverse effects would represent a potential significant effect if not mitigated. WLRS also raised concerns that the effects of the proposed Transmission Line on caribou may not be able to be mitigated, and that the effectiveness of mitigation is highly uncertain.

Figure 18: A southern mountain caribou, Photo credit: Government of B.C.

ODV proposed several mitigation measures to reduce the adverse effects to the Barkerville woodland caribou herd, including using existing disturbance areas and roads for the Transmission Line route, providing wildlife education to employees and contractors, and minimizing traffic to reduce disturbance along the Transportation Route. Additional mitigation measures were recommended by the Technical Advisory Committee and Lhtako Dené Nation, including adhering to timing windows to avoid sensitive caribou calving periods, limiting access for hunters and predators, managing caribou access to seasonal use areas, promoting foraging success, reducing habitat fragmentation, committing to contributing to woodland caribou conservation and recovery, and managing noise in caribou habitat. The recovery of caribou is an issue of particular importance to the participating Indigenous nations. Lhtako Dené Nation and ODV established a Stewardship Initiative which will prioritize and focus on the recovery of caribou and other fish and wildlife.

[8] Government of Canada. (2013). Bird Conservation Strategy for Bird Conservation Region 10 Pacific and Yukon Region: Northern Rockies. *Link*. Accessed May 6, 2021

[9] Red-listed refers to "Any species or ecosystem that is at risk of being lost (extirpated, endangered or threatened)." See the *CDC website* for more information.

[10] BC Conservation Data Centre. (2021a). BC Species and Ecosystems Explorer. BC Ministry of Environment and Climate Change Strategy. Victoria, B.C. *Link*

[11] Available at *link*

[12] Available at *link*

The EAO has proposed a condition which would require ODV to develop and implement a Caribou Mitigation and Monitoring Plan, in consultation with technical advisors and participating Indigenous nations, to monitor and mitigate effects from Cariboo Gold on caribou. A Caribou Mitigation and Monitoring Plan would also be a requirement under any *Mines Act* permit, regulated by EMLI.

Even with an effective mitigation and monitoring plan, the effects to the Barkerville herd are highly uncertain, although not likely to be significant, due to the location of the Transmission Line in their habitat. For further details on the assessment of effects to woodland caribou, please see *Section 11.13* (Wildlife).

7.5 Effects on Surface Water and Fish

Cariboo Gold has the potential to increase erosion and sedimentation and decrease the water quality of lakes, creeks, and other waterways in the local area. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation all identified the importance of surface water and fish to supporting their cultural land use and protecting ecosystems, in particular the effects of historical and new mining activities on fish distribution and abundance and fish consumption and harvest by Indigenous people. The three Nations were concerned about the potential effects of Cariboo Gold on surface water, fish, and other aquatic life. ENV also raised concerns that even after the proposed water treatment, some parameters (cadmium, lead, nickel, silver, and zinc) would likely exceed B.C. water quality guidelines for the protection of aquatic life[13]. Further assessment work would be required to determine if site-specific conditions are such that detrimental effects are likely; this detailed work will be conducted in the subsequent permitting process, and likely additional mitigation measures added, during permitting reviews under the *Environmental Management Act*.

To address this uncertainty, the EAO proposed Certificate conditions which would require erosion and sediment control measures as part of the Construction Environmental Management Plan and which would require ODV to mitigate and manage aquatic effects through an Aquatic Effects Monitoring Plan. Other management plans would be required for Cariboo Gold as part of permitting, including an environmental management system, surface erosion prevention and sediment control plan, a metal leaching/acid rock drainage management plan, and a water management plan that includes monitoring and mitigation of any effluent discharged to the environment. For further details on the assessment of effects to surface water and fish, please see *Sections 11.9* (Surface Water) and *11.10* (Freshwater Fish).

Figure 19: Willow River in Wells

8.0 The EAO's Proposed Conditions

As part of the recommendations of the CEAO to the Ministers, the EAO proposes a Certificate. This Certificate, if issued, would allow Cariboo Gold to proceed to permitting and other authorizations. The Certificate sets out legally binding

[13] See *link* for more information.

requirements (or, conditions) to which the Holder must adhere throughout the life of Cariboo Gold. These conditions describe 'how' a project must be constructed, operated, and decommissioned. Some of the proposed conditions are procedural requirements common to all certified projects; others are project-specific and intended to prevent or reduce adverse effects identified during the environmental assessment process. A description of how conditions are developed is available in the *EAO's Certificate Policy*.

If a Certificate is issued, the EAO's Compliance and Enforcement branch would become responsible for the verification and enforcement of the requirements in the Cariboo Gold Certificate. The Compliance and Enforcement branch of the EAO conducts compliance inspections and, where required, uses enforcement to ensure that projects are compliant with the certificate conditions. For more information on compliance and enforcement, please see the *EAO's website*.

For Cariboo Gold, the EAO has proposed the ten standard conditions which are common to all certified projects (see the text box at the end of this section) and 12 project-specific conditions to prevent or reduce adverse effects identified through the environmental assessment process. The following are project-specific conditions and their purpose:

- Environmental Effects Management Plan: This plan would require ODV to avoid, monitor, mitigate, and offset for the effects to wildlife and vegetation from Cariboo Gold. Specifically, this would include conducting pre-construction surveys for wildlife features, whitebark pine, and bat roosting habitat (including establishment of disturbance buffers), monitoring and recording any wildlife-vehicle collisions, engaging with the participating Indigenous nations to identify valued traditional plant species, monitoring for amphibians where erosion fencing is used, and reporting results of wildlife and vegetation monitoring.
- Caribou Mitigation and Monitoring Plan: This plan would require ODV to monitor, mitigate, and offset of effects to caribou, requiring removal of the Transmission Line following decommissioning, and require mitigation intended to reduce predator movement along and access to the Transmission Line right-of-way.
- Air Quality: This condition would require mitigation measures to reduce air emissions and air quality monitoring data to be collected by ODV in the District of Wells prior to construction.
- Community Effects Management Plan: This plan would require ODV to develop and implement mitigation measures to reduce the effects on the local community, including a 40 dBA limit of project noise contribution above ambient levels, descriptions of all work camp policies, practices to reduce gender-based violence and increase diversity in employment, corporate codes of conduct to apply to workers, blasting to occur during the daytime only, at least 75 percent of Cariboo Gold workforce hired from the region where qualified people are available, funding for a social worker and community liaison position in the District of Wells, support for the Quesnel Women Resource Centre for diverse groups who may be impacted, a process for complaints from the public regarding workers and the work camp, screening of the Mine Site Complex building and Transmission Line poles with vegetation, communication and engagement with participating Indigenous nations, Northern Health, Interior Health, and the District of Wells regarding project-related social and economic issues or concerns, and a project emergency response plan.
- Health and Medical Services Plan: This plan would require ODV to consider Northern Health guidance and relevant reports and knowledge from participating Indigenous nations in developing and implementing a plan for how health and medical services would be provided to workers, including a plan for addressing communicable disease, disease and infection prevention, and outbreaks, minimizing impacts to local non-urgent care services by encouraging workers to seek medical care in their home communities or in camps, and working with local health service providers on patient care and transfer, data collection, and reporting.
- Drinking Water Plan: This plan would require ODV to search for and, if found, fund the development of a new drinking water supply source for the District of Wells or otherwise mitigate the movement of underground mine water following closure to prevent contamination of the District of Wells drinking water source, update the

human health risk assessment if needed based on the new water supply source, and provide information collected regarding groundwater quality monitoring to the District of Wells and the public.

- Human Health Monitoring and Management Plan: This plan would require ODV to monitor and manage of environmental contaminants with the potential to impact human health (including both for work camp residents and local land users). This would include a sampling plan for air, soil, water, vegetation, fish, and wild game, and a requirement for additional mitigation measures if additional human health risks are identified.
- Public Information: This plan would require ODV to establish a website to provide information to the public regarding Cariboo Gold, results of monitoring programs, information about safety, and how to provide a complaint or comment, and contact information for ODV.
- End Land Use Plan: Although EMLI would require a full reclamation plan as part of a *Mines Act* permit, this plan would describe the final end land use (including reclamation objectives and types of habitat, for example) to understand long-term effects at the environmental assessment level. This plan would also include how ODV would contribute towards remediation of the contaminated area within the Project area.
- Greenhouse Gas Reduction Plan: This plan would require ODV to consider recent and future climate data in project design, report greenhouse gas emissions as part of a climate change considerations plan, and re-consider any best available technology related to greenhouse gases every five years.
- Aquatic Effects Monitoring Plan: This plan would require ODV to monitor effects on aquatic environments and identify requirements for sampling of surface water, sediment, fish tissue, aquatic invertebrates, fish communities, and fish.

The following conditions are standard in most Environmental Assessment Certificates and proposed for inclusion in the Cariboo Gold Certificate:

Document Review: sets out timelines for document reviews and requirements for plan implementation.

Document Updates: allows the Holder or the EAO to require the Holder to make changes to any document if it is not meeting objectives or intended effects, or if it is not consistent with changes in industry best practice or technology.

Document Development: requires all documents to include the purpose, roles, and responsibilities, schedules, plans for evaluating mitigation effectiveness, schedules for reporting, schedules for document updates. If monitoring is required by a condition, the methods, baseline information, frequency, timing, and duration of monitoring and how reporting will occur must also be included.

Trigger Response: requires trigger-response plans to understand when additional mitigation is needed when monitoring is required in a plan.

Consultation: sets out the details of what consultation entails. This includes providing a written record of comments received and explanation of how they have been considered and addressed.

Compliance Verification and Reporting: allows the EAO to request information for the purposes of compliance inspection and verification and sets out requirements for compliance self-reports for Holders.

Project Status Notification: requires the Holder to provide project status notification, primary contact details, and notice if the primary contact for Cariboo Gold changes.

Compliance Notification: requires the Holder to notify the EAO in the event of any instances where the Holder is has not fully complied with the Certificate.

Independent Environmental Monitor: requires an Independent Environmental Monitor; includes a terms of reference that sets out the expectations and requirements for the Independent Environmental Monitor.

Construction Environmental Management Plan: addresses standard issues with the potential to cause impacts to the environment during construction, including access management, chance finds of archaeological findings, management of invasive plants, and erosion and sediment control, among other topics.

Care and Maintenance Plan: sets out the requirements for the plans and conditions that would apply during a period of care and maintenance or temporary closure.

9.0 Cariboo Gold's Contribution to Sustainability

9.1 Introduction

This section assesses the extent to which Cariboo Gold contributes to sustainability in B.C. Section 2 of the Act describes that one of the EAO's purposes is to promote sustainability through protecting the environment and foster a sound economy and the well-being of British Columbians and their communities. Section 29 of the Act describes that the EAO must provide recommendations for the ministers for decision regarding whether a project is consistent with the promotion of sustainability. The purpose of this section is to provide the information to support this recommendation.

This section relies primarily on the following resources:

1. Lhtako Dene Nation Traditional Land Use and Occupancy Study for Barkerville Gold Mines Ltd. Proposed Cariboo Gold Mine Project (2019);[14]
2. *City of Quesnel Integrated Community Sustainability Plan*;
3. *City of Quesnel Official Community Plan*;
4. *District of Wells Draft Official Community Plan*;
5. *District of Wells Integrated Community Sustainability Plan*;
6. *Williams Lake City Official Community Plan*;
7. *Osisko Development Sustainability Reports (2020-2021)*;
8. Cariboo Gold Environmental Assessment Revised Application:
    a. *Chapter 7, Section 7.10 – Employment and Economy*;
    b. *Chapter 7, Section 7.11 - Land and Resource Use*;
    c. *Chapter 7, Section 7.13 – Human and Ecological Health*;
    d. *Chapter 7, Section 7.14 – Community Health*;
    e. *Chapter 11 – Lhtako Dene Nation*;
    f. *Chapter 12 – Williams Lake First Nation*;
    g. *Chapter 13 – Xatśūll First Nation*;
    h. *Chapter 18 – Summary of Impacts to Current and Future Generations*; and
9. Cariboo Gold Assessment Report (this Report): *Section 11.1* (Lhtako Dené Nation), *Section 11.2* (Xatśūll First Nation), *Section 11.3* (Williams Lake First Nation), *Section 11.6* (Air Quality), *Section 11.7* (Greenhouse Gas Emissions), *Section 11.14* (Effects on Biophysical Factors that Support Ecosystem Function), *Section11.16* (Land

[14] This study includes local Indigenous knowledge and is not available publicly.

and Resource Use), *Section 11.18* (Employment and Economy), and *Section 11.21* (Effects on Current and Future Generations).

9.1.1 Sustainability Framework

A sustainability framework for any project starts by first identifying the sustainability goals, visions, and future aspirations of local communities, establishing the current context under which these communities live and work, and then assessing if the proposed project contributes to these goals and visions. This is done by identifying pathways for sustainability that bridge the gap between the current standing and the ideal future that these communities have expressed. The EAO based its sustainability assessment for Cariboo Gold on the following questions:

- What are the sustainability goals, visions, and future aspirations for the Cariboo Region communities and Indigenous nation communities?
- What are the current social, cultural, economic, and environmental issues felt by the communities of the Cariboo Region?
- What are the principles and priorities that Indigenous nations and nearby communities have established to reach their sustainability goals, visions, and future aspirations?

9.1.1.1 Goals, visions, and future aspirations of Cariboo Region communities and Indigenous nations

The goals, visions, and future aspirations expressed by the Lhtako Dené Nation, Xatśūll First Nation, Williams Lake First Nation, and the surrounding communities in the Cariboo Region were identified through the review of a variety of secondary sources including Indigenous literature, websites, comprehensive community plans, cultural land use studies, community plans, and EAO literature. The common themes identified by Indigenous nations and local communities as important to sustainability included:

- Socio-economic:
    - Generating more revenue for the Cariboo Region through increased employment opportunities for community members;
    - Engaging youth in economic development through training and employment opportunities;
    - Increasing the communities' use and knowledge of traditional and cultural ecological practices while considering the importance of future use and maintenance of the health of, and access to, culturally significant areas for future generations;
    - Establishing efficient socio-cultural systems that will meet the needs of current and future generations through efficient educations systems and health services;
    - Ensuring healthy inter-generational and inter-familial well-being;
- Environmental:
    - Ensuring a clean and healthy environment in which the air is clean, drinking water is high quality, and all industries work towards transitioning to renewable energy resources and supplies;
    - Coordinating climate action and readiness; and
- Governance: Enhancing governance and collaboration between Indigenous nation communities and the City of Quesnel.

9.1.1.2 Existing conditions of the Cariboo Region regarding sustainability

The existing environmental, social, and governance conditions that describe the major components of sustainability helped to inform and understand how Cariboo Gold would contribute to the sustainability goals, visions, and future aspirations of Indigenous nations and local communities. The existing conditions included:

- Historical disturbance of important local ecosystems influenced by industrial activities, specifically mining, resulting in the region experiencing an increase in major disturbances such as wildfires and flooding;
- High per-capita of greenhouse gas emissions;
- The Cariboo Region's economy is primarily based on tourism, timber harvesting, mineral exploration, development, and arts production;
- A high unemployment rate in the region (ranged between 7 percent and 15 percent in 2016) with the highest unemployment rates occurring in the District of Wells (increasing to 38 percent is 2021);
- High inflation rates with decreasing affordability; and,
- Lack of continuous engagement and collaboration in decision-making between Lhtako Dené Nation, Xatśūll First Nation, Williams Lake First Nation, and the Cariboo Regional District.

9.1.1.3 Sustainability Principles and Priorities

Table 4 below summarizes how the sustainability principles and priorities were applied to the Cariboo Gold sustainability assessment and how Cariboo Gold would contribute to the Cariboo Region in terms of sustainability.

Table 4: Sustainability Assessment of Cariboo Gold

Sustainability Principle	Relevant Sections of this Report	Cariboo Gold's Contributions to Sustainability
Principle 1: Protecting the environment through: Long-term socio-ecological system integrity by protecting the irreplaceable life support functions upon which human and ecological well-being depend; Environmental stewardship by protecting the environment adequately through all phases of the mine construction, operations, and through post-closure; and Precaution and adaptation by considering uncertainty and the risk of irreversible harm.	Section 11.6: Air Quality Section 11.8: Groundwater Section 11.9: Surface Water Section 11.10: Freshwater Fish Section 11.11: Soils Section 11.12: Vegetation Section 11.13: Wildlife Section 11.14: Biophysical Functions that Support Ecosystem Function Section 11.24: Human and Ecological Health	Cariboo Gold would operate on previously used mining areas in the region, minimizing its environmental footprint. Most of the underground mining activities would operate using electric vehicles; however, during construction and the first four years of operations, diesel equipment is planned to be used. Through the proposed Certificate conditions, ODV would be required to develop management plans with the purpose of mitigating, monitoring, and adaptively managing the effects of the project to the environment, including to the land, air, water, vegetation, and wildlife. ODV also plans to contribute to the remediation of the historical contamination in the area, benefiting water quality in the local area. The EAO concludes that the extent to which Cariboo Gold would contribute to the overall protection of the environment is low.
Principle 2: Fostering a sound economy through: Quality economic growth by ensuring Cariboo Gold would fit within B.C.'s Climate Plan and legislated greenhouse gas targets, steady increases in real wages, and increasing government revenue while protecting the natural environment; and	Section 11.1: Lhtako Dené Nation Section 11.2: Xatśūll First Nation Section 11.3: Williams Lake First Nation Section 11.18: Employment and Economy	Cariboo Gold would provide local and regional residents as well as Indigenous nation communities over 20 years of employment opportunities. Approximately 75 percent of the total workforce would be hired from within the region, potentially lowering the unemployment rate. ODV would provide training opportunities for local, regional, and Indigenous nation communities resulting in an enhanced skillset in the region.

Sustainability Principle	Relevant Sections of this Report	Cariboo Gold's Contributions to Sustainability
Fair distribution of economic benefits and costs by ensuring benefits and costs are shared broadly across B.C. and across the population and do not compromise future generations' possibilities for opportunities.	Section 11.23: Community Health	Current and future generations would benefit from increased employment opportunities, additional labor income, as well as contracting opportunities for local and regional businesses. The EAO anticipates that the creation of steady, well-paying jobs in the region during the lifetime of Cariboo Gold would reduce population drift from the Cariboo region and would bring new professionals attracted to opportunities. However, since the mine life is estimated at 20 years, the EAO also anticipates that the unemployment rate would potentially increase following closure and only the current generation would be able to benefit from Cariboo Gold's economic benefits. Based on the economic benefits Cariboo Gold would provide to the whole region, the EAO concludes that the extent to which Cariboo Gold would contribute to the overall economy of the region is moderate to high.
Principle 3: Fostering the well-being of British Columbians and their communities through: Intergenerational equity by favouring present options or actions that are most likely to preserve or enhance the opportunities and capabilities of future generations to live sustainably; and Social and cultural well-being by considering whether Cariboo Gold contributes to community and social well-being of all potentially affected people, including whether it is compatible with their cultural interests and aspirations.	Section 11.16: Land and Resource Use Section 11.18: Employment and Economy Section 11.19: Consistency with Land Use Plans Section 11.21: Effects on Current and Future Generations Section 11.23: Community Health Section 11.24: Human and Ecological Health Section 11.25: Archaeological and Heritage Resources Section 11.26: Culture	ODV has committed to provide funding for the District of Wells. The District of Wells Draft Official Community Plan aims to have a clear vision on how all industries including tourism, mining, arts, and recreation can work together to benefit the community. ODV aims to continue its support for the Wells Community Foundation that promotes a healthy, vibrant, livable community and enhances overall civic engagement. ODV is committed to provide long-term benefits to Indigenous nation communities. This includes supporting Lhtako Dené Nation in efforts towards caribou and salmon restoration as well as enabling the Nations to benefit from stewardship, cultural, economic and employment opportunities. The EAO concludes that the extent to which Cariboo Gold would contribute to the overall well-being of nearby communities is low to moderate.

The EAO's sustainability assessment considered the project-specific context, including key issues of importance to Indigenous nations and local communities. The following are key considerations in determining the extent to which Cariboo Gold would contribute to sustainability:

- Positive effects to current and future generations from increased economic and employment opportunities would contribute to the well-being of communities, including financial stability, improved skill set, and experience in the mining industry;
- Positive effects through supporting the cultural and economic interests of Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation;
- Positive effects to current and future generations through the implementation of skills training programs and social services programs, contributing to the social well-being of local and regional residents, as well as Indigenous communities;

- Adverse effects to current and future generations from airborne particles emitted during project activities as well as potential contamination of waterways could pose risk to food security and the health and well-being of local communities;
- Adverse effects to cultural and material connections to land and water for current and future generations, posing a risk to the transfer of traditional Indigenous knowledge and the mental health and overall well-being of Indigenous nations;
- Adverse effects to the biophysical environment that supports ecosystem functioning through contamination and degradation of waterways and loss or alteration of wildlife habitat; and
- Positive effects on current and future generations from ODV's business ethics, integrity, hiring practices, and diversity and inclusion policies.

The EAO considered that the mitigation, monitoring, and management plans incorporated into ODV's project design and the EAO's proposed conditions would reduce potential cumulative and residual negative effects. This would reduce the long-term impacts on current and future generations and Indigenous communities.

9.2 Analysis and Conclusion

Based on the goals and visions identified by Lhtako Dené Nation, Xatśūll First Nation, Williams Lake First Nation, and the local communities, Cariboo Gold would likely improve the economic conditions of the region by creating more employment and training opportunities and generating higher revenue.

However, Cariboo Gold would also involve a loss of values associated with adverse effects to the biophysical environment, to the cultural and material connections to land and water for current and future generations, and to the social and mental health and well-being of current residents in Wells.

Overall contributions to sustainability are therefore expected for present and future generations but depend on the effectiveness of mitigation measures to reduce adverse effects (effects to health and social conditions, effects to cultural continuity and food security, and cumulative effects) and enhance positive effects (employment and income opportunities, training opportunities, and revenue). ODV must ensure continuous progress towards sustainability through its commitment to management, monitoring, and mitigations plans.

Based on the assessment, the EAO is of the view that the overall extent to which Cariboo Gold would contribute to sustainability in B.C. would be overall low to moderate.

10.0 Conclusions

Based on:

- Information contained in ODV's Revised Application, as well as supplemental information provided by ODV, participating Indigenous nations, the Technical Advisory Committee, and the Community Advisory Committee during Application Review;
- ODV and the EAO's consultation and engagement with participating Indigenous nations, provincial, and local government agencies, and the public;
- Comments received during the Cariboo Gold environmental assessment made by the participating Indigenous nations, provincial and local government agencies as members of the EAO's Technical and Community Advisory Committees, as well as ODV and the EAO's responses to those comments;
- Comments received during the Cariboo Gold public comment periods, and ODV's responses to those comments;

- Issues raised by participating Indigenous nations regarding the potential effects of Cariboo Gold on their Indigenous interests, as well as ODV's response and best effort to address those issues;
- Issues raised by participating Indigenous nations and the Community Advisory Committee that were outside of the scope of the Cariboo Gold, and ODV's approaches to addressing those issues;
- The design of Cariboo Gold as specified in the EAO's proposed Certified Project Description (Schedule A of the Certificate, if issued) which authorizes Cariboo Gold components and activities that may occur;
- Mitigation measures identified in the EAO's proposed conditions (Schedule B of the Certificate, if issued) to be implemented by ODV during all phases of Cariboo Gold; and,
- Permitting and other regulatory requirements that Cariboo Gold would be subject to if it receives a Certificate.

Considering Indigenous nations' conclusions including that:

- Lhtako Dené Nation concluded that the potential for residual and cumulative impacts to Lhtako Dené Nation and its interests would be moderate, acknowledging that there will be unavoidable project-related impacts to Lhtako's interests while at the same time, based on a trusting and respectful relationship with ODV, there would be positive project-related benefits for Lhtako and an expectation that ODV would work with Lhtako to mitigate and avoid unexpected impacts for the life of Cariboo Gold and beyond;
- Xatśūll First Nation concluded that the potential for overall residual and cumulative effects to Xatśūll First Nation and its interests would be moderate-to-serious as a result of the effects of Cariboo Gold interacting with the effects of other past, present, and reasonably foreseeable future projects and activities; and
- Williams Lake First Nation concluded that the potential for overall residual and cumulative effects to Williams Lake First Nation and its interests would be moderate-to-serious as a result of the effects of Cariboo Gold interacting with the effects of other past, present, and reasonably foreseeable future projects and activities

The EAO is satisfied that:

- The environmental assessment process has adequately identified and assessed potential adverse environmental, economic, social, cultural, and health effects of Cariboo Gold, having regard to the proposed conditions set out in the Table of Conditions (Schedule B to the Certificate, if issued);
- Cariboo Gold is expected to result in net positive residual effects to regional employment, businesses, and economy, and these positive effects have been maximized to the extent possible;
- Other assessment matters have been adequately assessed including: risks and uncertainties associated with effects, interactions between effects, the risks of malfunctions and accidents, disproportionate effects on distinct human populations, effects on biophysical factors that support ecosystem functions, effects on current and future generations, contributions to sustainability, consistency with land use plans, greenhouse gas emissions, alternative means for carrying out Cariboo Gold, and potential changes to Cariboo Gold that may be caused by the environment;
- Consultation with agencies and the public has been adequately carried out;
- Issues identified by the Technical and Community Advisory Committees, as well as members of the public (that were within the scope of this environmental assessment), were adequately and reasonably addressed;
- Cariboo Gold would result in adverse residual or cumulative effects to environmental, social, cultural, and health components, but with the application of mitigation measures and legally binding conditions, these effects would not be significant, with additional planned detailed assessment at permitting;

- Practical means have been identified to prevent or reduce adverse effects, and these are included as appropriate in the proposed conditions set out in the Certificate;
- The EAO's collaborative engagement, consensus seeking efforts, and the process of seeking to understand potentially outstanding issues and impacts on Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation and each of their interests have been carried out in good faith;
- The potential for adverse effects on the Indigenous interests of the participating Indigenous nations that are within the scope of this environmental assessment, has been avoided, minimized, or otherwise accommodated to a reasonable level; and
- The Province has fulfilled its legal obligations to consult and accommodate potentially affected Indigenous nations related to the potential issuance of a Certificate for Cariboo Gold.

10.1 Provision of Consent by Participating Indigenous Nations

It is the objective of the entire environmental assessment process that both Indigenous and provincial decision-makers are able to freely make fully-informed decisions regarding whether or not a project should proceed. Participating Indigenous nations make decisions on consent based on their own laws and traditions; this is an expression of their right to Indigenous self-determination and self-government. Under the Act, a participating Indigenous nation may choose to provide a notification of consent or lack of consent and their reasons. Provincial decision-makers are required by the Act to consider the notification of consent or lack of consent provided by participating Indigenous nations before making their decisions. If the participating Indigenous nations for the Cariboo Gold environmental assessment choose to provide a notification of consent or lack of consent, the notifications will be posted with the final referral materials on the *EAO's Project Information Centre*.

APPENDIX 1 - RESIDUAL EFFECTS CHARACTERIZATION DEFINITIONS

Residual effects are usually described using standard criteria: context, magnitude, extent, duration, reversibility, and frequency. These criteria, as well as likelihood, are summarized in the following table.

Table 5: Residual Effects Characterization Definitions

Criteria	General Description	Assessment Definitions
Context	Consideration of context draws heavily on the description of existing conditions (the environmental, economic, social, cultural and/or health setting) of the valued component, which reflect cumulative effects of other projects, and activities that have been carried out, and especially information about the effect of natural and human-caused trends in the condition of the valued component.	**Low:** the receiving environment or population has low resilience to imposed stresses and will not easily adapt to the potential residual effect. **Moderate:** the receiving environment or population has a moderate resilience to imposed stresses and may be able to respond and adapt to the potential residual effect. **High:** the receiving environment or population has high natural resilience to imposed stresses and can respond and adapt to the potential residual effect.
Magnitude	Magnitude refers to the expected size or severity of the residual effect. When evaluating magnitude of residual effects, consider the proportion of the Valued component affected within the spatial boundaries and the relative effect (e.g., relative to natural annual variation in the magnitude of the valued component or other relevant characteristic).	**Negligible:** no detectable change from existing conditions. **Low:** the potential residual effect will slightly alter or change the valued component without changing its role or function. **Medium:** the potential residual effect will alter or change the nature, role, or function of a valued component but will not affect its integrity. **High:** the potential residual effect will substantially alter or change the nature, role, or function of a valued component and may jeopardize the valued component's integrity.
Extent	The spatial scale over which the residual effect is expected to occur.	**Limited**: the potential residual effect is restricted to the Cariboo Gold footprint. **Local**: the residual effect will be within the local assessment area.

Criteria	General Description	Assessment Definitions
		Regional: the potential residual effect will be within the regional assessment area. **Beyond Regional:** the potential residual effect will be beyond the regional assessment area.
Duration	The period during which the potential effect persists and acts upon the valued component. This may be longer than the duration of the physical work or activity that produced the potential residual effect.	**Short-term:** the anticipated potential residual effect will be felt temporarily during Cariboo Gold's construction or closure stages only. It also applies to any effect that will occur for less than two years in operations. **Medium-term:** the anticipated potential residual effect will be felt for a limited period of time greater than two years, generally corresponding to the operations phase and closure phase. **Long-term:** the anticipated potential residual effect will be felt beyond closure.
Reversibility	Whether or not the residual effect on the valued component can be reversed once the physical work or the activity causing the effects stop or mitigation measures take effect to eliminate the effect.	**Fully reversible:** may fully recover and return to its pre-project state. **Partially reversible:** may partially recover from Cariboo Gold changes. **Irreversible:** will not recover and return to its pre-project state.
Frequency	How often or how many times the anticipated residual effect may occur.	**Once:** the effect is confined to one discrete event. **Regular:** the effect occurs at consistent intervals. **Irregular:** the effect occurs at sporadic intervals. **Continuous:** effects occur constantly.
Affected Populations	A subset of the population being affected disproportionately by certain valued components. Examples of affected populations	**Even:** the potential effect is experienced by any or all sub-populations.

<table>
<tr><th>Criteria</th><th>General Description</th><th>Assessment Definitions</th></tr>
<tr><td></td><td>could include different groups within the Indigenous nation who may experience the effects in a different way, such as youth, Elders, or women.</td><td>Disproportionate: the potential effect is experienced only by certain populations or experienced more acutely by certain sub-populations.</td></tr>
<tr><td>Risk (likelihood and consequences)</td><td>The likelihood (probability) of an event (incident) occurring and its consequences. Likelihood is whether a residual effect is likely to occur. It may be influenced by a variety of factors, such as the likelihood of a causal disturbance occurring or the likelihood of mitigation being successful. The consequences are the residual effect, positive or negative. The magnitude and extent of the residual effect provides information on the consequence, which in conjunction with likelihood, informs the understanding of risk.</td><td>Low: less than 40 percent chance of effect occurring
Medium: 40 to 80 percent chance of effect occurring
High: more than 80 percent chance of effect occurring
Consequence can be assessed as minor, moderate or major based on the combination of magnitude and extent. Risk is consequence multiplied by likelihood.
<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Consequences</th></tr>
<tr><th>Major</th><th>Moderate</th><th>Minor</th></tr>
<tr><th rowspan="3">Likelihood</th><td>High</td><td>High</td><td>Moderate</td><td>Low</td></tr>
<tr><td>Medium</td><td>High</td><td>Moderate</td><td>Low</td></tr>
<tr><td>Low</td><td>Moderate</td><td>Low</td><td>Low</td></tr>
</table>
</td></tr>
<tr><td>Uncertainty</td><td>The natural variation in complex biophysical environments or the statistical variation in data sets and models that arises from the imperfection of unknown information. Where uncertainty is unable to be reduced, how it affects valued components needs to be</td><td>Low: there is a good understanding of the cause-effect relationship between Cariboo Gold and the valued component, and sufficient data are available to support the assessment. The effectiveness of the selected mitigation measures is moderate to high. There is a low degree of uncertainty associated with data inputs and/or modelling techniques, and variation from the predicted effect is expected to be low.</td></tr>
</table>

Criteria	General Description	Assessment Definitions
	described so that it can be considered in decision making	**Moderate:** the cause-effect relationships between Cariboo Gold and a valued component are not fully understood (e.g., several unknown external variables or data for the Cariboo Gold project area are incomplete). The effectiveness of mitigation measures may be moderate or high. Modelling predictions are relatively confident. **High:** the cause-effect relationships between Cariboo Gold and a valued component are poorly understood. There may be several unknown external variables and/or data for the Cariboo Gold project area that are incomplete. The effectiveness of the mitigation measures may not yet be proven. Modelling results may vary considerably given the data inputs. There is a high degree of uncertainty in the conclusions of the assessment. To consider when determining confidence: the reliability of data inputs and analytical methods used to predict project effects, the confidence regarding the effectiveness of mitigation measures, and the certainty of the predicted outcome.
Importance	Have any issues been identified as an interest/priority by potentially affected Indigenous nations, local governments, provincial and federal government agencies, or stakeholders.	**Low:** previously identified by some individuals, but not by Indigenous nations, community members, or government agencies. **Moderate:** previously identified as an interest by Indigenous nations, community members, the public, local governments, and/or provincial and federal government agencies, but not stated as a top interest. **High:** identified repeatedly as a top interest by Indigenous nations, community members, the public, local governments, and/or provincial or federal government agencies.

APPENDIX 2 - LIST OF PARTIES ON THE TECHNICAL ADVISORY COMMITTEE

PROVINCIAL GOVERNMENT

Ministry of Energy, Mines and Low Carbon Innovation

Ministry of Environment and Climate Change Strategy

Ministry of Water, Land and Resource Stewardship

Ministry of Forests

Ministry of Jobs, Economic Recovery and Innovation

Ministry of Municipal Affairs and Housing

Ministry of Indigenous Relations and Reconciliation

Ministry of Transportation and Infrastructure

Ministry of Agriculture

HEALTH AUTHORITIES

Interior Health

Northern Health Authority

LOCAL GOVERNMENTS

Cariboo Regional District

District of Wells

City of Quesnel

INDIGENOUS NATIONS AND REPRESENTATIVES

Lhtako Dené Nation

Williams Lake First Nation

Xatśūll First Nation

PGL (representing Lhtako Dené Nation)

LGL Limited - environmental research associates, Source Environmental Associates, and Intrinsik Corp. (representing Xatśūll First Nation and Williams Lake First Nation)

APPENDIX 3

11.0 DETAILED ASSESSMENTS

The EAO uses a values-based method that relies on valued components as the framework for assessing project effects. Valued components are those elements of the natural and human environments considered by the proponent, public, Indigenous nations, scientists and other technical specialists, and government agencies involved in the environmental assessment process to have scientific, conservation, ecological, economic, social, cultural, archaeological, or other importance. This Report assesses the effects of Cariboo Gold on these valued components, identifies mitigation measures, discusses the key issues raised, and reaches conclusions on the significance of residual effects on each valued component and other required assessment matters.

What is a Valued Component?

Components of the biophysical and human environment that are considered to have scientific, ecological, economic, social, health, cultural, archaeological, historical, or other importance to an environmental assessment.

This appendix provides the detailed assessments of effects on those valued components, Indigenous interests, and other assessment matters, as required by *Section 25* of the Act. The matters, or topics, to be assessed were determined by the EAO, in consultation with the Technical Advisory Committee and the public, and with consensus with the participating Indigenous nations, through the *Application Information Requirements* set out by the EAO for Cariboo Gold.

11.1 Lhtako Dené Nation

11.1.1 Introduction

Lhtako Dené Nation is part of the Dakelh (or Southern Dakelh) Nation in the Atapaskan language group, located just south of Quesnel, B.C. Lhtako Dené Nation is a member of the Southern Dakelh Nation Alliance and is one of the four member communities that comprise the Carrier Chilcotin Tribal Council, whose member territories extend from the Coast Mountains on the east to the Alberta border on the west. The Carrier people traditionally identified themselves by their membership in subtribes, which were politically and economically autonomous communities distinguished by the use and occupation of a particular region.

The territory of Lhtako Dené Nation ranges from north and west of Quesnel, due east to the B.C./Alberta border and south from Quesnel to west of Lhtako Dené. The Lhtako Dené community is located along the banks of the Fraser River, just south of the Town of Quesnel and four reserves (Dragon Lake 3, Quesnel 1, Rich Bar 4 & Sinnce-Tah-Lah 2), and it occupies 682 ha. As of 2021, Lhtako Dené Nation had a total registered population of 186 people, with 85 members residing on reserve and 94 residing off reserve in the town of Quesnel or in southern B.C. or Alberta. Lhtako Dené Nation is governed by a Chief and three Councillors.

In 2020, Lhtako Dené Nation and ODV entered into a *Project Agreement* to facilitate the development of the Cariboo Gold Project in October 2020. The Project Agreement outlines the project-related opportunities and benefits for current and future generations of Lhtako Dené Nation and establishes the framework for ODV and Lhtako Dené Nation to work cooperatively and seek consent throughout Cariboo Gold. The Project Agreement was created after an initial Engagement Protocol in 2016, Relationship Agreement in 2016, and capacity funding agreements in 2019 with ODV. The EAO also provided capacity funding for Lhtako Dené Nation to participate in the preliminary stages of the environmental assessment.

11.1.2 Indigenous Interests

The Indigenous interests raised by Lhtako Dené Nation during consultation and engagement activities were traditional land use and practices, water quality/quantity and aquatic ecosystem health, caribou conservation and recovery, and community well-being.

- Traditional Land Use and Practices: This includes the effects of ongoing development and loss in the overall territory including existing habitat sites, spiritual sites, and traditional use areas integral to the traditional land uses and practices of the community. Traditional resource use areas include sites for fishing, hunting, trapping, plant and berry harvesting, medicinal plant gathering, non-consumptive materials gathering, habitation, ceremony, and transportation routes. The Traditional Land Use and Occupancy Study conducted by Lhtako Dené for Cariboo Gold identified numerous traditional land use sites that are either fully or partially within the Cariboo Gold study area and/or buffer used for the study, with a concentration of sites near the Mine Site and the District of Wells. During engagement activities, the importance of harvesting areas along the 500 Nyland Lake Road was also identified. Concerns over loss or loss of access to traditional use sites, including the loss of harvested species and their habitats remains a key concern.
- Water Quality and Quantity: This includes the potential effects of Cariboo Gold on groundwater, surface water, riparian ecosystems and wetlands, and negative disturbance to aquatic wildlife habitat and species such as salmon and other fish species. Lhtako Dené also expressed interest in the reclamation of Jack of Clubs Lake that has been abandoned for resource harvesting due to historical contamination from mining.
- Caribou: Woodland caribou is an important species to Lhtako Dené Nation. Caribou in the area have been heavily impacted by historical and current land use and habitat loss and are particularly sensitive to cumulative effects. When caribou were more plentiful, they were considered the main game animal for Lhtako Dené Nation. Caribou were harvested throughout their range with areas noted in the Traditional Land Use and Occupancy Study north of Highway 26 along the Willow River, at Island Mountain, and at Wells and Jack of Club Lake. These areas include the proposed Transmission Line route and the Mine Site.
- Community Well-being: Lhtako Dené Nation noted how cumulative effects from many cultural losses over time have affected both social and environmental resilience. As each new negative impact is introduced, the trends in terms of ecosystem and community wellness are less likely to continue in a positive and healthy trajectory. This informs the approach to community well-being for Lhtako Dené Nation. Community well-being was described as the integration of Lhtako ecological knowledge, Dakelh language and teaching, community and cultural cohesion, intergenerational knowledge transfer, and governance and stewardship systems, customs, beliefs, and values. Community well-being also includes the consideration of community safety, employment opportunities, and resource availability for future generations.

11.1.3 Assessment Boundaries

The spatial assessment boundaries for each Indigenous interest were identified based on the local assessment area and regional assessment area for valued components and Lhtako Dené Nation traditional territory. Where there were multiple valued components, the largest area was selected to incorporate the valued component and Lhtako Dené Nation use of the area. The assessment boundaries for traditional land use interests at both the local and regional assessment area were determined by the largest overlapping area of the air quality, water quality and wildlife assessment areas. Assessment boundaries for water concerns at a local area was determined by the watersheds of the Willow River, Slough Creek, and Maud Creek. At a regional scale they were bound by the Willow River drainage upstream of the confluence with Stephanie Creek and the Quesnel River drainage upstream of the Beaver Creek confluence. The caribou assessment was bound by the surface footprint of Cariboo Gold and the current Barkerville caribou herd boundary. The area of assessment of the community well-being was Lhtako Dené Nation's traditional territory.

The temporal boundaries of assessment included Construction, Operations, Closure, and Post-Closure. These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.1.4 Baseline Conditions by ODV

To inform the effects assessment for Lhtako Dené Nation, ODV used primarily the Traditional Land Use and Occupancy Study that was completed in 2019 and other ongoing engagement discussions (summarized in *Chapter 11.3.4* of the Revised Application). The original Traditional Land Use and Occupancy Study did not scope in all areas of the proposed Transmission Route (which was moved north from Highway 26 during the early engagement phase of the Environmental Assessment), so effects to this area will be informed by additional baseline studies that have been completed with Lhtako Dené Nation's input. Site-specific information was provided by Lhtako Dené Nation as necessary for project planning to ODV and with the intention that the application of this information be restricted to developing site protection and site mitigation measures for Cariboo Gold. Other information sources included Lhtako Dené Nation community liaison interviews in 2021, the *Lhtako Dené Nation* website, the *B.C. Assembly of First Nations* website), and *Indigenous and Northern Affairs Canada*.

Existing conditions were summarized for the Indigenous interests as follows.

11.1.4.1 Traditional land use and practices

Lhtako Dené Nation traditionally relies on big game hunting to provide food for the community. Interviews with community members stressed the importance of seasonal hunting practice traditions, particularly for beaver and moose (in the spring and fall respectively). Other important traditional resources include berry harvesting sites, fishing, and trapping of small fur-bearing animals. The area near the 500 Nyland Road was identified as important for early season berry harvesting. Sixteen hunting sites and twenty-three plant and berry harvesting sites were identified during the Traditional Land Use and Occupancy Study. Three traditional and current fishing areas were also identified as important to the community, including the Jack of Clubs Lake that is no longer available for harvest due to historical contamination from mining. It was noted in interviews for the Traditional Land Use and Occupancy Study that this contamination has a broader impact on ecosystem health in the area. Two trapping areas were identified within the Cariboo Gold area. Camping and gathering sites were found at Willow River, Lowhee Creek, and Jack of Clubs lake. Additionally, a historical village site and cabin were identified by a Lhtako Dené Nation knowledge holder less than a kilometer northeast of the District of Wells. The Traditional Land Use and Occupancy Study also identified two sites within the Cariboo Gold footprint that are culturally sensitive important spiritual sites for the Lhtako Dené community. In 2021, Lhtako Dené knowledge holders also identified approximate locations of burial sites and traplines on their territory that could be affected by Cariboo Gold. Additional details regarding existing conditions for vegetation and wildlife can be found in *Sections 11.13* (Wildlife) and *11.12* (Vegetation).

11.1.4.2 Water, including water quality, hydrology, and aquatic ecosystems

Effects to surface water and groundwater quality and quantity as well as water routes as a means of transportation and access to harvesting resources were all raised as concerns by Lhtako Dené Nation. Water based food resources include char (lake trout), bull trout (dolly varden), lingcod, chum salmon, pink salmon, sockeye salmon (kokanee), chinook salmon (spring), sturgeon, suckers, northern pike minnow, trout, rainbow trout, whitefish, frog, beaver, and muskrat. The Traditional Land Use and Occupancy Study described Lhtako Dené Nation harvesting of salmon from the Fraser and Quesnel Rivers as well as fishing activities in Dragon Lake, Jack of Clubs Lake, Ten Mile Lake and Bowron Lake. Additional details regarding existing conditions for surface water and groundwater can be found in *Sections 11.9* (Surface Water) and *11.8* (Groundwater).

11.1.4.3 Conservation and recovery of the Barkerville caribou herd

Currently there are restrictions on hunting caribou and its habitat is threatened further by forestry and other development activities in caribou habitat that cause habitat loss and degradation. Predation by wolves and forest fires also threaten caribou and its habitat. The Traditional Land Use and Occupancy Study identified traditional caribou hunting areas for Lhtako Dené Nation near the District of Wells, Island Mountain, and the eastern portion of the Transmission Line. Community engagement with Lhtako Dené Nation has indicated caribou carries a high cultural importance for the Nation and people. Further existing conditions information related to caribou can be found in *Section 11.13* (Wildlife).

11.1.4.4 Community well-being

Community well-being is a broad assessment that includes the integration of Lhtako Dené Ecological Knowledge, Dakelh language and teaching, community and cultural cohesion, intergenerational knowledge transfer as well as governance and stewardship systems that support the customs, beliefs, and values of Lhtako Dené Nation. It also includes consideration of community safety, employment opportunities, and resource availability for current and future generations. Lhtako Dené Nation anticipates potential economic gains from Cariboo Gold as well as training and meaningful employment of community members. Community members expressed a lack of certainty about Cariboo Gold's effects and therefore perceive the associated negative impacts to be high. Through the Traditional Land Use and Occupancy Study, important historical travel routes were identified near Lightning Creek and heading north from Wells to the Bowron Lakes. Elders and community members also identified five current transportation routes in the Cariboo Gold area.

11.1.5 Potential Project Effects by ODV

In the Revised Application, ODV identified the following potential effects due to Cariboo Gold.

- Effects to traditional land use and practices would include any changes in the use and enjoyment of land use and resources, viewscapes, noise and access. Other effects could include any changes to access or damage to archaeological, historical, or palaeontological sites or deposits if found during construction or operations. Traditional land use is dependent on traditional plants and animal species so any loss or changes to plant species of cultural significance including traditional food sources or loss of habitat availability and distribution of wildlife, both terrestrial and aquatic, would be a negative impact;
- Effects to water would include any alteration of groundwater flow quantity and quality that may result from the mine site, Quesnel River Mill, or the Quesnel River tailings storage facilities and operation of a water supply well that would affect human health or fish and fish habitat. Other potential project effects would include changes to surface water drainage pathways including to surface water quality, quantity, and any changes in concentrations in contaminants of concern. The project design changes would increase effects on water quality in Lowhee Creek;
- Effects on woodland caribou would include any disruption to caribou movement patterns or corridors as well as loss of habitat or increase in direct or indirect mortality; and
- Effects on community well-being would include effects to human health through changes to air quality, soil and food quality or changes in surface and ground water quality. Effects to community health would include changes to community population through the in-migration of workers and the increased demand for emergency and social services. There would also be effects on the temporary housing supply locally, local employment both gains and losses, increased demand for goods, and increased transportation infrastructure through the District of Wells, Lhtako territory, and along roadways. Loss of access to traditional use sites would also impact community well-being, including the teaching of Indigenous language and cultural traditions.

11.1.6 Proposed Key Mitigation Measures by ODV

ODV identified the following key mitigation measures in the Revised Application:

- Lhtako Dené Nation with ODV intends to develop an effective communication strategy to inform their community members of any clearing and reclamation activities prior to start;
- If existing Lhtako Dené Nation traditional land use sites are identified through further studies, ODV will consider additional project design modification options;
- Lhtako Dené Nation traditional land use sites will be temporarily marked with high visibility flagging or other barriers to prevent accidental disturbance;
- If existing Lhtako Dené Nation traditional plant species are identified through further studies or engagement, ODV will consider incorporating them into their project design and reclamation plan;
- ODV will support Lhtako Dené Nation in pursuing and/or developing salmon enhancement and/or outreach opportunities for other stewardship priorities;
- ODV will support the implementation of a Stewardship Society to implement Lhtako Dené Nation stewardship interests related to caribou and salmon conservation and recovery, as well as other potential fish and wildlife concerns;
- ODV will work with Lhtako Dené Nation to develop a Caribou Mitigation and Monitoring Plan, which will include project-specific mitigations relating to effects on caribou, caribou habitat, and caribou recovery objectives; this plan will also confirm habitat offsetting requirements and collaboration with Lhtako Dené Nation throughout the implementation of the plan;
- ODV will conduct a wildlife camera study along the Transmission Line right-of-way to determine wildlife species presence, use and distribution along a new linear corridor will be instituted to inform population statistics;
- On-going monitoring programs will occur during all phases of Cariboo Gold with quarterly and annual reports being shared with Lhtako Dené Nation related to air quality, water quality and reclamation;
- ODV will develop a chance finds procedure for use by contractors and staff that will include a process or contacting Lhtako Dené Nation in the event any archeological remains are observed at any time during project activities;
- ODV will develop a reclamation plan to establish site conditions that allow for realistic and operationally feasible ecological targets, taking into consideration ecosystem function and wildlife habitat objectives; and
- Revegetation will be ecosystem-based and progressive reclamation will be employed where practical to reduce erosion potential and promote the initiation of successional ecological processes.

11.1.7 Key Issues Raised

The following key issues were raised by Lhtako Dené Nation.

11.1.7.1 Impacts to Traditional Land Use and Practices

Lhtako Dené Nation expressed concerns regarding how ongoing development in their territory may affect existing traditional use sites, spiritual sites, commercial use and harvesting areas, access to these areas, water and air quality, subsistence and medicinal plant gathering areas, and wildlife health and habitat, noting that each of these elements contribute to traditional land use and practices that are continued today. Lhtako Dené also identified several traditional land use sites that have been identified near the Mine Site and the District of Wells. The use of land and waterway access routes and trapping routes were identified via interviews with Elders and Lhtako community members as a particular concern, with members sharing their concerns around traplines that may overlap the project footprint. Access to important harvesting sites needs to be considered not just spatially, but in terms of seasonal timing.

Vegetation including culturally-important species and seasonal access is an important aspect to traditional land use for Lhtako Dené Nation. The area along the 500 Nyland Lake Road was identified as important for harvesting of cranberries, huckleberries, Saskatoon berries and soapberries and is the first harvesting site in the seasonal round. ODV considered berry harvesting sites along the 500 Nyland Road in the Human Health and Ecological Risk Assessment (*Chapter 7.13* of the Revised Application) and does not anticipate that Cariboo Gold will result in restricted access to the resource use area. ODV noted that while the specific locations of berry picking sites along 500 Nyland Lake Road were not disclosed it is generally understood, by ODV, that they are present along that portion of the Transportation route. Because no upgrades are required along 500 Nyland Lake Road, the sites would not be physically disturbed by the Cariboo Gold footprint. Any potential effects to berry picking sites would be through dust deposition which is further discussed including mitigation measured in *Section 11.12* (Vegetation). The commitments to Lhtako Dené Nation regarding mitigation of dust near berry picking sites has been included in the proposed Certificate conditions by the EAO.

An important consideration for traditional practices would be any impacts to burial sites. In recognition of this impact, ODV removed the Transmission Line option along Highway 26 during the early engagement phase of the Environmental Assessment.

Lhtako Dené Nation requested that if clearing or reclamation activities directly overlap Lhtako's harvesting sites, ODV must work with Lhtako Dené Nation in a timely manner to mitigate effects. ODV committed to avoiding dust emissions from surface activities near berry harvesting sites and consult Lhtako Dené Nation on the approaches that would be considered for reducing air emissions. ODV's commitment to engage and discuss with Lhtako Dené Nation to address concerns related to the Reclamation and Closure Plan and consult with Lhtako to mitigate effects to traditional food sources has been recorded in the *Issues Tracking Table* as a permitting commitment. For the seasonal aspect of harvesting activities, ODV has committed to notifying Lhtako Dené Nation of any clearing or reclamation activities including the location and schedule prior to start. This mitigation aims to inform community member of potential project activities that might affect their traditional harvesting activities in areas where the two may overlap. Lhtako Dené Nation was also included as a reviewer for the proposed Certificate condition to require an End Land Use Plan.

11.1.7.2 Groundwater

Water quality and quantity was identified as a key issue for Lhtako Dené Nation, including concerns regarding the potential for acid leaching from the waste rock being discharged into Willow River. ODV has clarified that the rock fill used for construction is expected to be non-potential acid generating and water, including seepage, will be collected and treated prior to discharge. Water treatment has been captured as a requirement in the proposed Certified Project Description by the EAO. Additionally, ODV has committed to including monitoring for iron, sulfate, and other elevated metals in the underground mine water as part of the water quality monitoring program. This commitment has been captured as a permitting requirement in the *Issues Tracking Table*. More detail regarding the impact of Cariboo Gold to groundwater is available in *Section 11.8* (Groundwater).

11.1.7.3 Surface Water

Lhtako Dené Nation raised concerns regarding effects from Cariboo Gold on flow rates and volume of Willow River downstream of the confluence with Mosquito Creek for the duration of Cariboo Gold. There were also concerns regarding the extent of water quantity alteration calculations and whether climate change had been considered fully in the models. ODV provided information collected on streamflow rates at the identified location and committed to further the description and clarity regarding the magnitude of water quality alterations and how climate change would be incorporated to address these concerns.

Jack of Clubs Lake was also identified by Lhtako Dené Nation as an important historical site and a source of fish for traditional harvesting that is no longer available due to historical industrial contamination. The access to traditional harvesting sites is a key Lhtako Dené Nation interest for Cariboo Gold and there was significant interest expressed during engagement activities about the possible restoration of the lake. ODV and Lhtako Dené Nation have agreed to address

concerns through ongoing engagement on the conceptual aquatics restoration plan for the lake, which the EAO noted as a follow up commitment in the *Issues Tracking Table*. Specifically, ODV will engage with Lhtako Dené Nation further during permitting on the site-wide water balance and water quality model to predict changes in water quality in Jack of Club Lake and Willow River and provide Lhtako Dené Nation with a detailed Discharge Management Plan and Aquatic Effects Monitoring Plan that outlines when a Willow River discharge would occur. ODV has also entered a Memorandum of Understanding with EMLI and the Crown Contaminated Sites Group related to the restoration of historical mine contaminants at the lake site. More information on this can be found in *Section 11.11* (Soils).

11.1.7.4 Aquatic Ecosystems

Harvesting of fish and other aquatic resources is integral to Lhtako Dené Nation traditional land use. There were concerns over the impact of Cariboo Gold to freshwater fish and fish habitat from the construction and maintenance of the Transmission Line and associated components (e.g., watercourse crossings and access roads) and how the disturbance would impact valued fish species and their habitat in the immediate vicinity and downstream. Lhtako Dené Nation expressed concerns over the effects of Cariboo Gold on specific salmon species, which were identified as species of particular value to Lhtako Dené Nation, as well as the seasonality of the freshwater fish surveys and instream fish habitat quality and changes to water flow changing downstream habitat in Rudy Creek.

ODV clarified that the discharge of treated effluent to Rudy Creek during drawdown and operations would result in an incremental increase in streamflows in the downstream system, which would be maintained within the historical range of variability. ODV committed to mitigation measures that follow provincial and federal standards to protect fish habitat and are engaging in discussions with Lhtako Dené Nation to pursue salmon enhancement and outreach opportunities. In addition, ODV indicated that Transmission Line crossings would not disturb surface water as instream works would not be required. ODV indicated that some instream works may occur within amphibian breeding habitat and that detailed mitigation strategies will be provided for avoiding or reducing impacts to amphibians during works within a wetland as part of the Environmental Management Plans. ODV noted that while some ground disturbance activities may be required for the installation of the Willow River bridge, the bridge location on the Mine Site is on an area that was been historically disturbed through past mining activities and deposition of mine waste. The location of this bridge is captured in the proposed Certified Project Description by the EAO. ODV committed that any upgrades to water crossings that may be required will follow provincial and federal best management practices to reduce potential harmful alteration disruption or destruction to fish habitat. Permits to disturb fish habitat, if required, would need to be applied for through the Department of Fisheries and Oceans Canada.

11.1.7.5 Caribou

Lhtako Dené Nation desires a revitalization of caribou herds and habitat in the region, including the cultural values to which caribou contribute. Lhtako Dené Nation expects ODV to support conservation and recovery of the woodland caribou herd. In response, ODV is working with Lhtako Dené Nation in a caribou recovery initiative that is unique to the agreement between Lhtako Dené Nation and ODV and additional mitigation measures to minimize or reduce effects to caribou are being discussed with MOF. For more information regarding caribou, refer to Section 11.13 (Wildlife). The EAO has also proposed a Certificate condition requiring ODV to develop and implement a Caribou Mitigation and Monitoring Plan in consultation with Lhtako Dené Nation.

11.1.7.6 Wildlife

Lhtako Dené Nation noted that the wildlife surveys conducted to detect the presence and distribution of wildlife do not account for ephemeral wildlife that use the habitat features annually and expressed concerns that the Cariboo Gold design would not be flexible enough to accommodate multi-year habitat features and an appropriate buffer if they are found. The EAO has proposed a condition where ODV is committed to conduct pre-disturbance surveys to identify wildlife habitats and use buffers where necessary to protect any habitat features identified. ODV would be required to consult

with Lhtako Dené Nation in the development of these surveys. For more wildlife information, refer to *Section 11.3* (Wildlife).

11.1.7.7 Indigenous Language

Lhtako Dené Nation has promoted the inclusion of project-related changes and to include benefits to Indigenous language and teaching. ODV and Lhtako Dené Nation have engaged on how Lhtako Dené Nation can support ODV in curating Indigenous training that goes beyond onboarding of new employees. To promote the incorporation of Lhtako language, the Indigenous names for plant species, ODV will incorporate Indigenous names and language as needed in addition to the common and scientific names in the Revised Application.

11.1.7.8 Transmission Line Route

The area of the Transmission Line route was not included in the original Traditional Land Use and Occupancy Study completed by ODV and Lhtako Dené Nation for Cariboo Gold. There were outstanding concerns related to vegetation clearing activities and the impacts to riparian habitat, fish, and other wildlife effects.

In response, ODV committed to additional baseline studies to be completed with Lhtako Dené Nation along the Transmission Line route. ODV acknowledged that alteration of species may occur due to edge effects related to previously cleared areas, clearing along the Transmission Line during construction and operations (vegetation maintenance) and through dust deposition from use of gravel-surfaced roads. Project activities can also lead to the introduction of invasive and non-native plant species to the Cariboo Gold footprint and could also lead to the spread of these species into adjacent areas. Invasive species can affect plant community composition and function and may result in the reduction or loss of biodiversity. The EAO proposed a Certificate condition to require a plan to manage invasive species in the Construction Environmental Management Plan.

11.1.8 The EAO's and Lhtako Dené's Characterization of Residual Effects

After considering the proposed mitigation measures and conditions proposed, the EAO, working collaboratively with Lhtako Dené Nation, concludes that Cariboo Gold would result in the following residual adverse effects on Lhtako Dené Nation and its Indigenous interests:

- Loss or alteration of traditional use plants and species through project clearing activities;
- Negative effects to wildlife species important to traditional use, including caribou, through habitat displacement, sensory disturbance, and direct or indirect mortality as an effect of operational activities;
- Dust accumulation on plants affecting the safe consumption of species; and
- Negative effects to groundwater and surface water quality.

To address key issues related the potential effects, the EAO has proposed the following Certificate conditions if a Certificate is issued:

- Chance finds procedure and invasive plants management plan under the Construction Environmental Management Plan;
- Air Quality Management Plan to mitigate effects to air quality;
- Additional mitigation to berry-picking locations along the 500 Nyland Road;
- Caribou Mitigation and Monitoring Plan to mitigate effects to caribou; and
- Environmental Effects Management Plan to mitigate effects to wildlife and vegetation and require additional baseline studies for wildlife habitats.

ODV has also committed to developing an Indigenous Partnership Plan with Lhtako Dené. Additional specific environmental monitoring plans during permitting will also be required, as described in the *Regulatory Coordination Plan*.

The EAO's characterization of the expected residual effects of Cariboo Gold on Lhtako Dené Nations' Indigenous interests is summarized below, as well as the EAO's level of confidence in the effects determination (including their likelihood and impact). These conclusions were determined collaboratively with Lhtako Dené Nation.

Table 6: Summary of Residual Effects for Lhtako Dené Nation and its Indigenous interests

Indigenous Interest	Assessment Rating*	Impact and Rationale
Traditional Land Use and Practices	Context (resilience): Low Magnitude: Moderate Extent: Regional Duration: Long-term Reversibility: Partially reversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Moderate Importance: High	**Lhtako Dené Nation conclusion: Moderate impact** The practice of traditional land use by Lhtako Dené Nation members has been highly affected by past and current land alteration and socio-economic impacts from colonization. This has determined the low resiliency to ongoing development in the territory and the desire for future development to complement the ongoing revival of land use practices. Magnitude was determined to be moderate based on expected loss or alteration of habitat as well as access and peaceful use of the area, noting that reclamation and reforestation practices are expected to allow for the re-establishment of ecosystems without changing their ability to persist in the region. Regional effects are expected because of ongoing forestry practices. The duration would be long-term: the re-establishment of affected ecosystems, especially old forests would take decades beyond reclamation. Effects are anticipated to be partially reversible through mitigation, reclamation, and reforestation; however, it is uncertain that all affected forests would re-establish and if species traditionally harvested would return. Effects would be continuous, with loss and alteration of ecosystems only expected during construction and when clearing activities associated with mining and forestry occur, but access and use of the land would be reduced throughout the life of Cariboo Gold. The risk would be moderate as the likelihood of effects is considered high and the consequence moderate. There is a moderate level of confidence in the assessment of residual effects to traditional land use and practices; the cause-effect relationships between Cariboo Gold and past, present and future activities and ecosystems is not fully understood due to a lack of understanding of expected alteration to vegetation due to edge effects, potential changes to hydrology, dust deposition, forest pests and diseases and effects from projected climate change, and how these changes would affect traditional land use in the future. Lhtako Dené has indicated the high importance of this interest.
Water Quality and Quantity	Context (resilience): Low to neutral Magnitude: Low to medium Extent: Local Duration: Long-term Reversibility: Partially reversible to irreversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Low	**Lhtako Dené Nation conclusion: Moderate impact** Water bodies have the capacity to adapt to changes from Cariboo Gold; however, the groundwater flow system at the Wells Aquifer has a low resilience to imposed stresses and has been affected over time by historical use by industry. The magnitude of effects would range from low to medium. While expected changes would be within the historical range of variabilities, the Wells Aquifer and groundwater down-gradient of the mine workings would be a higher magnitude. All effects to water from Cariboo Gold fall within the local assessment area for surface water. Surface water and groundwater effects would occur throughout operations, and some would persist in post-closure. While effects related to effluent discharge would reverse at the end of the mine operations, there are some effects that would persist in post-closure. Members of the Lhtako Dené community may be affected disproportionately depending on how and where they access water during traditional land use and practices. There is a high level of confidence that the implications of changes to water due to Cariboo Gold are well understood. The risk is assessed to be moderate, with a moderate consequence level and a high likelihood of occurrence. Lhtako Dené has indicated the high importance of this interest.

Indigenous Interest	Assessment Rating*	Impact and Rationale
	Importance: High	
Caribou	Context (resilience): Low Magnitude: High Extent: Regional Duration: Medium- to long-term Reversibility: Partially reversible to irreversible Frequency: Irregular to regular Affected Populations: Disproportionate Risk (likelihood and consequences): Medium Uncertainty: High Importance: High	**Lhtako Dené Nation conclusion: Moderate impact** Caribou context is considered low as caribou have a low natural resilience to imposed stresses and do not adapt to potential residual effects and the existing herd is considered vulnerable. The magnitude was considered high due to habitat disturbance as well as the interruption of migratory routes by the Transmission Line, including facilitation of increased predation. The effects would occur throughout the local herd area. While reclamation activities would allow vegetation to regrow, it may take many years for the habitat to recover to a point that supports abundant lichen. Sensory disturbance from traffic and mining operations noise would continue through to the end of operations. Disturbance to movement and mortality risk associated with the Transmission Line and Transportation Routes would occur throughout operations. Lhtako Dené Nation has traditionally hunted southern mountain caribou and the recovery or maintenance of this species is of high cultural importance, therefore, the Nation would be affected to a greater extent. The likelihood of effects would be medium for southern mountain caribou, and the consequence would be moderate (medium magnitude and regional extent) as Cariboo Gold may affect this species at a herd level. This led to a medium risk rating for effects to caribou. The unknown effectiveness of mitigation measures for southern mountain caribou and the need for long-term monitoring and adaptive management, however, led to high uncertainty of the effect to this species. Southern mountain caribou were identified as highly important by Lhtako Dené Nation.
Community Well-Being	Context (resilience): Low Magnitude: Low Extent: Limited Duration: Medium-term – Long-term Reversibility: Partially to Fully reversible Frequency: Irregular Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Low Importance: High	**Lhtako Dené Nation conclusion: Moderate impact** Community well-being was considered to have a low resilience based on historical development and colonization resulting in prolonged impacts, including depressed employment opportunities, integration of Traditional Ecological Knowledge, use of Dakelh, restricted resource availability and accessibility and general concern for healthy traditional community for future generations. Lhtako Dené Nation expects that Cariboo Gold would improve community well-being through economic and social benefits, including an improved ability to steward and use important cultural resources. For plant species of cultural significance and forage species for wildlife, they are common in the region and mitigation plans, management, reclamation, and revegetation would support the protection of culturally important vegetation. If fully implemented, the mitigation and reclamation plans should reduce potential effects to a low magnitude of change. The extent of the effects would be restricted to the surface footprint of Cariboo Gold. The re-establishment of pre-disturbance plant communities within the mine site and Quesnel River Mill footprints would take decades beyond reclamation to support pre-disturbance micro-habitats for plant species of cultural significance. Loss of plant species would only be expected to occur during vegetation clearing during construction. Lhtako Dené Nation has indicated the high importance of this interest.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

It is the EAO's view that the conclusion on the impact to Lhtako Dené Nation and its interests is best identified by the nation itself that would experience the impacts, and the EAO has chosen not to modify the conclusions above from those as stated by the nation.

11.1.9 Cumulative Effects Assessment

There are three existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold and Lhtako Dené Nation interests: Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, and the Spanish Mountain Gold Project. This is in addition to regional forestry, mineral exploration, transportation, and placer mining activities that are ongoing in the region.

Cariboo Gold would cause residual effects to Lhtako Dené Nation traditional land use and cultural well-being primarily related to project activities along the Transmission Line and in the Mine Site area that could affect vegetation, wildlife, freshwater fish, and land resource use. Local effects to caribou would also be expected primarily along the Transmission Line. There would be expected residual effects to water, primarily related to the changes in surface water quantity and changes to groundwater from the flooding of the underground workings. Therefore, effects to all Indigenous interests were assessed further for potential cumulative effects. Lhtako Dené Nation expressed concerns specifically about the cumulative effects of industrial activities and development impacting the ecosystems and viability of traditional use of the land and resources in its territory.

ODV identified the cumulative effects and mitigation strategies for Cariboo Gold, separated by individual valued components. Lhtako Dené Nation raised concerns over the integration of the effects of natural events such as forest fires in cumulative effects assessment.

The impacts on Indigenous interests to Lhtako Dené Nation are expected to overlap cumulatively with other past, present, and reasonably foreseeable future projects and activities within the regional assessment area, in particular for traditional land use, community well-being, and caribou. Lhtako Dené Nation concluded that the potential for cumulative impacts to Lhtako Dené Nation is considered moderate, acknowledging that there will be unavoidable project-related impacts to Lhtako Dené Nation's interests while at the same time, based on a trusting and respectful relationship with ODV, there would be positive project-related benefits for Lhtako Dené Nation and an expectation that ODV would work with Lhtako to mitigate and avoid unexpected impacts for the life of Cariboo Gold and beyond.

11.2 Xatśūll First Nation

11.2.1 Introduction

This chapter summarizes the potential effects of Cariboo Gold on Xatśūll (pronounced ‘Hat’sooth’) First Nation and its Indigenous interests. Xatśūll First Nation is a member of the Great Secwépemc Nation, once known as the people of Xatśūll (on the cliff where the bubbling water comes out). Xatśūll First Nation is the northernmost Shuswap tribe of the Secwépemc Nation, which is the largest Nation within the interior of B.C. The Xatśūll people have stewarded territory ranging from the Coast Mountains to the west, east to the Rocky Mountains. The use of the land brought about contact with neighbouring peoples. Xatśūll First Nation has traditionally occupied a vast territory in the B.C. Cariboo region including the area on which a portion of Cariboo Gold is proposed to be developed. The traditional territory in the central Cariboo covers an area from Valemount and McBride in the northeast to south of Clinton, and west of the Fraser River.

Xatśūll First Nation was known to celebrate and war with the neighbouring Chilcotin Nation but were always wary of the Cree. There was a good relationship with the southern Carrier who referred to the Shuswap as the ‘Atnah’ (meaning to live in underground dwellings). Inter-marriages between neighbouring communities were an important survival strategy, for failure of the annual salmon could result in starvation or migration and these relations could be relied on to share hunting and fishing territories. Xatśūll First Nation followed a hunting and gathering lifestyle centered in family groups and focused on the Fraser River and the salmon. Patterns of land use were in harmony with the natural processes.

In 2021, Xatśūll First Nation included approximately 450 members and is governed by a Chief and four Councillors.

11.2.2 Indigenous Interests

The primary Indigenous interests raised by Xatśūll First Nation during consultation and engagement activities included:

- Cultural Land Use and Cultural Heritage Practices: Concerns included the effects of ongoing development in the territory on existing habitat sites, spiritual sites, and cultural use areas integral to the cultural land uses and practices of the community. Cultural resource use areas include sites for fishing, hunting, trapping, plant and berry harvesting, medicinal plant gathering, non-consumptive materials gathering, habitation, ceremony, and transportation routes. Existing developments and on-going activities in the area have already affected the meaningful exercise of Section 35 Aboriginal and treaty rights;
- Economic Development and Opportunities: Xatśūll First Nation is interested in capacity building, sustainable development, and creating safe and empowering employment for the community. There is interest in environmental work that can be completed by a Xatśūll First Nation owned company as a means of building community capacity and improving community trust in information related to Cariboo Gold;
- Land Stewardship: Stewardship of the land is a central value of Secwépemc society which has strongly persisted to the present and includes the active management of the environment, to ensure predictable and abundant sources of the plant and animal species relied upon for food, medicine, and material manufacture. Xatśūll First Nation is concerned about any aspects of Cariboo Gold that could impede land stewardship; and
- Community Health and Safety: Secwépemc well-being is tied to their ability to carry out sociocultural activities, practices, and pursuits, including land use activities within their traditional territories, which includes the study area. It is particularly important for social cohesion and instilling respect for the land, respectful practice of land use activities for the management of resources, beliefs, norms and values, and customs and protocols around land use. Any aspects that compromise the safe access to the land for Xatśūll First Nation, in particular added traffic, vehicle speeds, and increased presence of non-Indigenous harvesters, is a concern.

11.2.3 Assessment Boundaries

The spatial assessment boundaries for each Indigenous interest were identified based on the local assessment area and local assessment area for valued components and Xatśūll First Nation traditional territory. Where there were multiple valued components, the largest area was selected to incorporate the valued component and Xatśūll First Nation use of the Cariboo Gold area. The assessment boundaries for cultural land use interests at both the local and regional assessment area were determined by the largest overlapping area of the air quality, water quality and wildlife local assessment areas. Land stewardship, economic development and community health and safety were assessed to the extent of Xatśūll First Nation's traditional territory which includes portions of the Mine Site, Quesnel River Mill, and the Transportation Routes.

The temporal boundaries of assessment included construction, operations, closure, and post-closure. These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report. No administrative or technical boundaries were identified for the assessment of Indigenous interests.

11.2.4 Baseline Conditions by ODV

To inform the assessment of effects on Xatśūll First Nation and its Indigenous interests, sources primarily included the Cultural Land Use Study which was jointly completed with Williams Lake First Nation in 2021. The study incorporated Indigenous knowledge and was created to provide a permanent record of Xatśūll First Nation and Williams Lake First Nation Indigenous knowledge and land use in the area as well as to provide a decolonized approach for understanding and utilizing cultural knowledge of the area in this and future environmental assessments. There have also been ongoing engagement discussions as summarized in *Chapter 13.3* of the Revised Application. Other information sources include the *Xatśūll First Nation website*, the *B.C. Assembly of First Nations website*, and *Indigenous and Northern Affairs Canada*.

Existing conditions were summarized for the following Indigenous interests.

11.2.4.1 Cultural Land Use and Cultural Heritage Practices

Traditional transportation routes were identified during the Cultural Land Use Study as integral to cultural land use and cultural heritage practices in the Xatśūll First Nation traditional territory. Specific sites identified included a travel corridor following part of the Swift River as identified by Knowledge Keepers, and an existing access route through traditional territory from Ghost Lake to Wells used for harvesting cedar, devils club, Douglas fir, balsam, huckleberries, saskatoon berries, highbush blueberries, raspberries, and juniper.

Xatśūll First Nation identified cultural resource use areas as a key value for assessment. This included vegetation important to cultural activities and wildlife species such as caribou. Caribou are considered endangered federally due to population declines and increased threats from forestry operations that cause habitat loss and degradation, predation by wolves and hunters, and forest fires that further reduce suitable habitat. During early engagement, 12 subsistence sites important for vegetation gathering were identified in the region. Knowledge Keepers identified an area near Wells for its abundance of soap berries and balsam and the area along Stanley Creek and Lightning Creek Roads towards Bowron Lakes for soopolallie, low bush blueberries and huckleberries.

Fishing and trapping practices remain an important part of Xatśūll First Nation's culture and subsistence. Fishing practices have changed in recent years because of ongoing and historical water contamination and resource extraction projects and trapping lines have been disrupted by land privatization. ODV noted that there are no anticipated impacts to trapping areas or water quality near the mine site or Quesnel River Mill, but acknowledge that resource extraction projects, such as large-scale mining, small-scale placer-mining, logging, and urbanization along with incidents such as the Mount Polley tailings dam failure, have all resulted in reduced access to water.

Access was also raised as a concern for traditional habitation sites. These are camping and gathering sites such as Maud Lake and the general Yanks Peak and Keithley Creek area that are used by Xatśūll First Nation for culturally significant activities and practices such as food processing, gathering, and knowledge transfer that have been degraded by privatization of land, industrial development, and the increases in access by non-community members.

11.2.4.2 Land Stewardship

Xatśūll First Nation places a strong emphasis on environmental stewardship in their territory. The stewardship of the land is intrinsically linked not just to resource use and management, but to cultural and spiritual practices, transfer of knowledge, and the maintenance of traditional living. The Secwépemc made it clear there is interest in maintaining resources for cultural use, as well as for potential economic development in the future, with stewardship playing both an economic and spiritual role. As part of an ongoing commitment to land stewardship, Xatśūll First Nation requested that ODV ensure that activities around the Mine Site, Quesnel River Mill, and Transportation Route can be conducted while protecting wildlife, fish, vegetation, and water and are interested in protecting connectivity corridors for wildlife (e.g., establishment and protection), wildlife habitat, and wildlife populations.

There were 20 areas of potential environmental concerns with some form of contamination identified within the local study area for Cariboo Gold. The Cultural Land Use Study identified 43 registered contaminated sites within the Local Assessment Area, noting that overall soil in the area was poor. Most of the contaminated sites were located near waterways, including the Fraser and Quesnel River. Xatśūll First Nation, as part of their stewardship, also referenced soil reclamation as a priority post mine-closure.

11.2.4.3 Economic Development and Opportunities

Currently, the employment rate of the Xatśūll First Nation is lower than that of B.C. overall. Xatśūll First Nation does operate several businesses in the region which may engage in agreements and contracts through Cariboo Gold. Interests in economic opportunities and training were expressed by Xatśūll First Nation that could lead to meaningful and long-term employment beyond the life of Cariboo Gold. Interest was expressed for the possibility of training water technicians

from within the community that would provide the Nation with the agency to internally monitor impacts to water within the territory.

11.2.4.4 Community Health and Safety

Community health for Xatśūll First Nation was identified as inextricably linked to the health of the land. For the Nation to be healthy, the community must be able to uphold stewardship systems, customs, beliefs, and values. Continued access to transportation routes and cultural sites (for fishing, gathering, harvesting etc.) along with protection from encroachment of non-community members will play a significant role in community well-being. Benefits may also be gained through training and meaningful employment of community members.

11.2.5 Potential Project Effects by ODV

In the Revised Application, ODV identified the following potential effects due to Cariboo Gold.

11.2.5.1 Cultural Land Use and Cultural Heritage Practices

Effects to cultural land use and practices would include any changes in the ability of Xatśūll First Nation to use and enjoy their traditional territory through the restriction of the access to land and resources, any decrease in environmental conditions, an increase in pressure on public land and resource use by the Cariboo Gold workforce, or any changes to visual quality. ODV identified the potential for Cariboo Gold to cause reduced or changed access, including to public lands during construction, operations, and closure activities, as well as increased recreational use and tourism associated with the public land from the influx of workers. Cariboo Gold also has the potential to impact visual quality and the character of the Mine Site area through vegetation clearing, landform modification and addition of surface infrastructure. ODV acknowledged the possibility of Cariboo Gold causing interference to camping, gathering sites, and land-based cultural practices, including further alienation of trappers from their trap lines.

Effects to archaeological and heritage resources would include any damage to the integrity and context of archaeological, historical, or palaeontological sites or deposits if present through ground disturbances as well as any changes to access to archaeological, historical, or palaeontological sites or deposits if present. While the Cultural Land Use Study did not identify any historical or palaeontological sites within the Cariboo Gold footprint (several are located near the Mine Site area), there remains the possibility of chance find encounters where previously unknown heritage resources are discovered during Project activities.

11.2.5.2 Land Stewardship

Effects to land stewardship would include any changes in the ability of Xatśūll First Nation to maintain resources for cultural use as well as transfer cultural knowledge and maintain traditional living practices. This would include any change to stream flow or water quality in rivers or lakes in the area and any detrimental effects to wildlife species. ODV identified the potential for residual effects on songbirds and caribou, particularly during construction of the Mine Site, as well as the potential for direct and indirect mortality during construction. Additionally, activities at the Mine Site and Quesnel River Mill may create barriers that disrupt movement patterns for terrestrial wildlife and deposit additional dust that could affect harvesting. The effects to surface water from mine activities could include changes to the surface water and sediment quality in Jack of Clubs Lake, the Willow River, Lowhee Creek, and Rudy Creek. Additionally, the addition of treated effluent water to Rudy Creek and Lowhee Creek could result in an increase in streamflow to the downstream environment. Effects to vegetation could include the introduction of invasive species as well as loss from clearing activities. While ODV intends to minimize soil disturbance, there will still be residual effects to soil quality from soil compaction and dust accumulation. For groundwater, potential changes would arise from the act of groundwater removal which has limited potential to alter groundwater quality.

11.2.5.3 Economic Development and Opportunities

Effects to the economic development and opportunities for Xatśūll First Nation include the creation of employment opportunities and the training of personnel. Post mine closure, there will be a reduction in the demand for goods and services provided by local businesses and continued employment in the area will be dependent on other opportunities available at the time of closure with ODV or other employers.

11.2.5.4 Community Health and Safety

Effects to community health and safety for Xatśūll First Nation would include any change to the community and project activities that affect the availability of health, protection, emergency, or social infrastructure and services. Cariboo Gold has the potential to affect population health through changes in population, employment, income, and education during the extent of mine activities. Increases in population resulting from mine workers would add additional demand for protective and emergency services. Other effects to human health could include any changes to air quality or changes to food and sediment quality.

11.2.6 Proposed Key Mitigation Measures by ODV

In addition to the following best management practices, ODV identified the following key mitigation measures in the Revised Application:

- ODV plans to work with Xatśūll First Nation to develop a strategy that will effectively communicate mine-related activities to Xatśūll First Nation community members and inform Xatśūll First Nation of clearing or reclamation activities prior to commencement;
- There will be monitoring programs throughout all phases of Cariboo Gold and ODV will share the annual monitoring reports for air quality and water quality with Xatśūll First Nation;
- ODV will develop an archaeological chance finds procedure which is to be used by contractors and staff to contact Xatśūll First Nation if archaeological remains are observed at any time during Cariboo Gold activities; and,
- ODV will create a reclamation and closure plan that will establish site conditions to allow for realistic ecological targets, taking into consideration ecosystem function and wildlife habitat objectives. ODV has committed that revegetation will be ecosystem-based in approach.

11.2.7 Key Issues Raised

The following key issues were raised by the Xatśūll First Nation during Application review.

11.2.7.1 Interest in business, employment, and training opportunities

Xatśūll First Nation raised interests in the types of jobs available as some members have experience in mining. There has been interest expressed for education and job training, using Indigenous hiring practices, and being involved in the characterization of employment and economic baseline. Xatśūll First Nation has also expressed interest in developing experience and training for water technicians. ODV indicated that it intends to hire qualified individuals as well as provide training opportunities to those interested, including water related activities. Xatśūll First Nation also expressed that requirements or opportunities for Indigenous-owned supplier businesses need to be defined. Interest has also been expressed over contracting and joint venture opportunities. ODV intends to work with the Xatśūll Development Corporation to facilitate participation in Cariboo Gold.

11.2.7.2 Increase in non-Indigenous traffic and decreased access for community members to cultural sites

Concerns were raised regarding traffic travelling past the Xatśūll First Nation community and over access roads and increasing privatization preventing access to members of the community to cultural sites and conversely providing access to these same sites to non-members. There is also concern about the widening and lengthening of roads in general. ODV

has indicated that no upgrades to the Transportation Route are required for Cariboo Gold. The EAO also has proposed a Certificate condition to require mitigation on access management through the Construction Environmental Management Plan.

11.2.7.3 Indigenous land use and knowledge incorporation into additional studies

Xatśūll First Nation requested that cultural land use knowledge be considered in project studies. Xatśūll First Nation also raised the question of how indicators and thresholds for Indigenous cultural use would be incorporated into the assessment. ODV responded that it considered information provided by Xatśūll First Nation in project studies and use of such information will be discussed to ensure it is accurately reflected. Xatśūll First Nation has requested ODV have Xatśūll First Nation environmental monitors or guardians present when construction is occurring, including during the clearing of the transmission line right-of-way.

11.2.7.4 Cumulative effects and the impact of historical mining

Concerns were raised related to existing conditions not being reflective of pre-mining conditions as well as the scope of the cumulative effects assessment. Additional development in Xatśūll First Nation's territory can exacerbate existing effects as there are other industrial activities in the area including placer mining. There were also concerns regarding the effects of historical contamination and the responsibility of ODV and the Province to address legacy issues. ODV anticipates that soil reclamation will be a moderately successful mitigation measure, with the overall risk of soil loss to be minimal. The Province and ODV signed a Memorandum of Understanding in July 2022 to delineate the responsibility for reclamation of historical contamination. A Reclamation and Remediation Strategy is also being developed with the appropriate regulatory agencies to address the legacy issues of the contamination and assign responsibility for remediation. More information on the contaminated area is available in *Section 11.11* (Soils).

11.2.7.5 Water quality and quantity monitoring

Xatśūll First Nation would like to ensure that monitoring systems are used for water quality and water quantity. ODV indicated that it will develop a water quantity and quality monitoring program during permitting and share findings from studies being conducted with Xatśūll First Nation. ODV committed to conduct additional assessment work for groundwater quality prior to the post-closure passive care phase to determine toxicity of post-closure seepage water. For more information on effects to water quality and quantity see *Section 11.9* (Surface Water) and *11.8* (Groundwater). The EAO also has proposed a Certificate condition to require an Aquatic Effects Monitoring Plan.

11.2.7.6 Fish and aquatic habitat health

Xatśūll First Nation raised concerns over the sufficiency of the fish tissue sampling that was performed for Cariboo Gold. ODV clarified that the collection of fish from the Transmission Line area for tissue analysis was not conducted because the construction and operation of the Transmission Line and right-of-way is expected to be managed through a Construction Environmental Management Plan that will prevent or minimize the potential for water discharges at the outset. This will include addressing the potential contamination from construction materials and appropriate handling of fuels or other sources of hydrocarbons. Further concerns related to the assessment of phytoplankton, zooplankton, and periphyton, which ODV intends to address through the development of an Aquatic Effects Monitoring Plan which is to be developed with the Province, ENV and Xatśūll First Nation. Xatśūll First Nation brought forward concerns about the potential of storing mine contact water underground. In discussions with Xatśūll First Nation, ODV committed to re-evaluating water management infrastructure to make sure systems are suitable to handle contact water needs. For more information on effects to fish and aquatic habitat, see *Section 11.10* (Freshwater Fish). The EAO also has proposed a Certificate condition to require an Aquatic Effects Monitoring Plan.

11.2.7.7 Wildlife mortality

Xatśūll First Nation had concerns over the uncertainty in the assessment of direct mortality of wildlife caused by Cariboo Gold. In subsequent technical memos, ODV described the anticipated direct mortality for amphibians, ungulates, and

large carnivores to be primarily caused by construction in breeding habitats (only wetlands for amphibians) and wildlife-vehicle collisions and/or and increase in hunting mortality to be limited in extent. There is some expected indirect mortality associated with new road access that may facilitate access for predators, however this is also anticipated to be limited in extent and low magnitude. Xatśūll First Nation would also like all critical habitat for southern mountain caribou to be considered in further mitigation related to caribou. ODV has said that information will be updated and confirmed in the Caribou Mitigation and Monitoring Plan. For more information on effects to wildlife, see *Section 11.13* (Wildlife). The EAO also has proposed a Certificate condition to require mitigation for human-wildlife conflict through the Construction Environmental Management Plan and additional caribou mitigation through a Caribou Mitigation and Monitoring Plan.

11.2.7.8 Human health risk assessment

Xatśūll First Nation had concerns on community well-being, food security, substance abuse and safety of community members. Knowledge Keepers in the community expressed concerns regarding the cumulative effects of their community being situated amongst many industrial activities, including the proximity of Cariboo Gold. The Human Health Risk Assessment conducted for Cariboo Gold identified a potential elevated non-negligible risk to Indigenous receptors through exposure to cobalt (ingestion of moose meat), methylmercury and molybdenum (ingestion of fish), and manganese (ingestion of surface water). In response to these findings, ODV has committed to an environmental monitoring program for country foods to provide reassurances of cultural food quality and has committed to working with Xatśūll First Nation to develop this program. ODV also committed to generating a quarterly Human Health monitoring report summary that will be shared with Xatśūll First Nation. ODV acknowledged that a potential effect of Cariboo Gold is challenges for those that do not benefit from Cariboo Gold economically, as well as those moving to the community before they develop a support network, and those who perceive that their current lifestyle is being negatively affected which could result in increased mental health issues, domestic violence, or family breakdown. For more information on Human Health, see *Section 11.24* of this Report. The EAO also has proposed a Certificate condition to require a Human Health Monitoring and Management Plan, including to monitor country foods.

11.2.8 The EAO's and Xatśūll First Nation's Characterization of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on Xatśūll First Nation. The EAO's characterization of the expected residual effects of Cariboo Gold on Xatśūll First Nation is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 7: Summary of Residual Effects on Xatśūll First Nation and its Indigenous interests

Indigenous Interest	Assessment Rating*	Impact and Rationale
Changes to Cultural Land Use and Cultural Heritage Practices This includes the ability to access and safely use cultural land use areas, as well as the peaceful enjoyment of these practices.	Context (resilience): Moderate Magnitude: Medium Extent: Local Duration: Long-term Reversibility: Fully reversible to irreversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): High Uncertainty: Moderate Importance: High	**Xatśūll First Nation conclusion: Serious Impact** The context is considered neutral; the community may respond and adapt to the potential residual effect but may also experience loss in available land that would be used for cultural land use and cultural heritages practices. The magnitude of potential effects is expected to be medium because there are several other anthropogenic influences in the area which have affected the ability for Xatśūll First Nation to conduct cultural land use practices and cultural heritage practices. The extent would be local because the extent of vegetation clearing is limited physically and temporally but the presence of the mine could impact community members' practices in the local assessment area. The duration of effects would be long-term based on the time it takes for the regrowth of caribou specific habitat. Vegetation and habitat change is expected to be reversible depending on the success of mitigation strategies but could be irreversible for some effects to wildlife species at a population level, such as caribou. The effects are expected to be

Indigenous Interest	Assessment Rating*	Impact and Rationale
		continuous until habitat regrowth reaches sufficient maturity post-closure and would have an even effect on the human population. Despite detailed management plans, adaptive management, and monitoring to reduce the risk (high likelihood, major consequence) the risk remains high. There is a moderate uncertainty that the cause-effect relationship between Cariboo Gold and this Indigenous interest is well understood. Xatśūll First Nation has indicated the high importance of this interest.
Changes to Economic Development/Opportunities This could include a shortage of skilled workers due to an aging work force, and the implementation of a range of training initiatives, such as stay-in-school programs, scholarships, apprenticeships, and workplace literacy programs, that promote the building of educational and other capacities. Through training and work experience, the skills acquired through participation in mining can be transferred to other sectors of the economy, and to the local community economy, following mine closure. There is a potential in developing a joint-venture business. Joint ventures could be a way to develop local business capacity to prepare for and take advantage of the business opportunities related to mine development. Work opportunities also exist in exploration, development, operations, etc.	Context (resilience): High Magnitude: Low Extent: Beyond Regional Duration: Short-term Reversibility: Fully reversible Frequency: Once Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Moderate to High Importance: High	**Xatśūll First Nation conclusion: Moderate-to-Serious Impact** Negative residual changes to the economy are expected to occur at/after mine closure. Xatśūll First Nation has several economic development initiatives that develop and maintain economic opportunities within the community, promoting a high level of resilience. The magnitude of the effects was determined to be low, acknowledging that workers will have been aware of employment timelines. As the Xatśūll First Nation community does not live within the local assessment area, the extent was considered beyond regional. Potential effects were expected to be fully reversible through new job opportunities, but the effects would disproportionately affect members of the Xatśūll First Nation who are mine employees or family members of mine employees. While the likelihood of the mine closing is guaranteed at some point, the likelihood of the negative residual effects is anticipated to be lowered through anticipated employment and contracting opportunities, as well as planned mitigation measures. Overall uncertainty in the assessment of economic residual effects is moderate to high based on the uncertainty surrounding the broader economic context. Xatśūll First Nation indicated the high importance of this interest.
Changes to Land Stewardship This includes effects to wildlife, wildlife habitat, surface water quality and quantity, groundwater quality and quantity, freshwater fish, and vegetation, as well as the ability of Xatśūll First Nation	Context (resilience): Low Magnitude: Low to moderate Extent: Local Duration: Long-term Reversibility: Fully reversible to irreversible Frequency: Continuous Affected Populations: Even	**Xatśūll First Nation conclusion: Serious Impact** Residual effects were expected for wildlife, especially caribou. Land stewardship activities have been affected by the anthropogenic influences in the area (mining, forestry, and farming), which affects the ability of Xatśūll First Nation to practice certain land stewardship activities, making resilience to further changes low. The magnitude of potential effects from Cariboo Gold was expected to be low to moderate, with land stewardship activities in the Cariboo Gold area continuing, but potentially altering in areas with residual or immediate effects from Cariboo Gold. The extent was expected to be local and restricted to indirect effects to sites that overlap with project components, and areas

Indigenous Interest	Assessment Rating*	Impact and Rationale
to practice land stewardship activities.	Risk (likelihood and consequences): Moderate Uncertainty: Low to moderate Importance: High	immediately adjacent to or downstream from the Project Footprint. Reclamation activities were anticipated to restore disturbed areas wherever possible throughout the mine life, but the success of these activities and mitigation measures is unknown, making the duration long-term and reversibility fully possible to not possible (irreversible). Potential effects are expected to occur irregularly, dependent on the stewardship practice and Cariboo Gold activities. The risk has been determined to be moderate with a low likelihood based on Cariboo Gold being planned to minimize disturbance to land stewardship, however, would have a major consequence. There is a low to moderate uncertainty in the relationship between Cariboo Gold effects and land stewardship. Xatśūll First Nation indicated the high importance of this interest.
Changes to Community Health and Safety This includes the physical, emotional, and mental health and safety of all community members.	Context (resilience): Moderate Magnitude: Medium Extent: Beyond Regional Duration: Long-term/Permanent Reversibility: Partially reversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: High Importance: High	**Xatśūll First Nation conclusion: Moderate-to-Serious Impact** The community has a neutral resilience to imposed stresses and may be able to respond and adapt to potential residual effects. The magnitude of effects was anticipated to be medium, and the extent largely limited to the Mine Site, although some residual effects may affect the broader community. Most potential effects are expected to resolve at the closure of Cariboo Gold. Potential effects would be expected to occur continuously throughout construction and operations. There would be a disproportionate effect to community members who conduct activities near the Mine Site. The risk was assessed as moderate, with a low likelihood and a major consequence. There is a high level of uncertainty for community health and safety. Baseline data used for estimations of air quality risk were not taken from the local community, increasing uncertainty. Ongoing monitoring would increase certainty moving forward. Xatśūll First Nation indicated the high importance of this interest.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

It is the EAO's view that the conclusion on the impact to Xatśūll First Nation and its interests is best identified by the nation itself that would experience the impacts, and the EAO has chosen not to modify the conclusions above from those as stated by the nation.

11.2.9 Cumulative Effects Assessment

There are three existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold and Xatśūll First Nation interests: Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, and the Spanish Mountain Gold Project. This is in addition to regional forestry, mineral exploration, transportation, and placer mining activities that are ongoing in the region.

Xatśūll First Nation Knowledge Keepers shared that they have observed the health of various ecological features and areas within their traditional territory to have declined over recent years because of the cumulative impacts of surrounding industrial activities. The existing cumulative effects of land use and development in the region is substantial with respect to mining activities. This not only affects the quality and quantity of resources, but also dissuades community members from using and accessing these areas due to concerns around contamination and toxicity.

ODV identified the cumulative effects and mitigation strategies for Cariboo Gold, separated by individual valued components. Cumulative effects were not identified to affect cultural land use and cultural heritage practices based on limited project activities that would take place at the Quesnel River Mill, the Mine Site, and along the Transportation Route located within Xatśūll First Nation traditional territory. Adverse cumulative effects were not anticipated from

economic development and opportunities on Xatśūll First Nation as mitigation measures are expected to help address transition from post-closure conditions and effects related to increases in housing are expected in larger centres which would not cause effects to Xatśūll First Nation. Cumulative effects were expected related to land stewardship as there are identified residual effects to wildlife, freshwater fish, vegetation, soil, surface water, groundwater, infrastructure and services, air quality and acoustics identified. Cumulative effects were anticipated related to community health and well-being, also based on residual effects related to above stated Indigenous interests, which are valued, gathered, used, and consumed by the Xatśūll First Nation and are already impacted from current and past anthropogenic activities.

The impacts on Indigenous interests to Xatśūll First Nation are therefore expected to overlap cumulatively with other past, present, and foreseeable future projects and activities within the regional assessment area, in particular cultural land use and heritage practices and community health and well-being. Xatśūll First Nation concluded that the potential for overall cumulative effects to Xatśūll First Nation is considered a moderate-to-serious impact as a result of the effects of Cariboo Gold interacting with the effects of other past, present, and reasonably foreseeable future projects and activities.

11.3 Williams Lake First Nation

11.3.1 Introduction

Williams Lake First Nation, or the T'exelcemc people, are members of the Secwépemc (or Shuswap) people and have inhabited the lands surrounding Cariboo Gold for over 65,000 years. The community includes a growing population of over 800 registered members who live on reserve in Sugar Cane, in nearby Williams Lake, and around the world. One of the 17 Secwépemc nations forming Secwépemc ul'ecw, the greater stewardship land area extends from Shuswap Lake in the south, to Quesnel Lake in the north, and from Columbia-Kootenay Range in the east, to the Alexis Creek area in the west.

Prior to European contact, the Secwépemc people occupied all Secwépemc ul'ecw with a network of temporary camps and village sites surrounded by permanent winter villages. Through this network, the Secwépemc occupied the land through a web of interaction and connection with the land, people, and resources of Secwépemc ul'ecw. Seasonal use and location of habitation sites was based on the availability of resources and the seasonal round, which involved wide scale movement on the land between well-established hunting, fishing, plant harvesting, ceremonial, and trading sites. Cycles of salmon runs, migration of wildlife, ripening of berries and climate were integral to the cultural knowledge and survival of the Secwépemc. These cycles were well known to the Secwépemc and are recorded on the landscape through place names, stories and legends and passed on through the families by the oral tradition. Traditional ecological knowledge and land use protocols, passed down through family units, dictated the stewardship techniques and adaptive strategies to maintain the Secwépemc way of life. Though severely impacted by contact and the colonial experience, these land use patters remain largely intact today.

In July 2022, ODV and Williams Lake First Nation entered into a participation agreement relating to the development of Cariboo Gold.

11.3.2 Indigenous Interests

The Indigenous interests raised by Williams Lake First Nation during consultation and engagement activities included the following:

- Cultural Land Use and Cultural Heritage Practices: Concerns included the effects of ongoing development in their territory on existing habitation and gathering sites, subsistence, sacred places, ancestral sites, transportation routes and community well-being and recreation. Existing developments and on-going activities in the area have already affected the meaningful exercise of Section 35 Aboriginal and Treaty rights;
- Economic Development and Opportunities: Williams Lake First Nation was interested in capacity building and creating safe and empowering employment for the community. There is also interest in completing

environmental work by a Williams Lake First Nation-owned company as a means of building community capacity and improving community trust in information related to Cariboo Gold;

- Land Stewardship: Stewardship over Secwépemc ul'ecw is a central value of Secwépemc society which has strongly persisted to the present and includes the active management of the environment to ensure predictable and abundant sources of the plant and animal species relied upon for food, medicine, and material manufacture. Williams Lake First Nation was concerned about any aspects of Cariboo Gold that could impede land stewardship; and,
- Community Health and Safety: Secwépemc well-being is tied to the ability to carry out sociocultural activities, practices, and pursuits, including land use activities within their traditional territories, which includes the study area. It is particularly important for social cohesion and instilling respect for the land, respectful practice of land use activities for the management of resources, beliefs, norms and values, and customs and protocols around land use. Any aspects that compromise the safe access to the land for Williams Lake First Nation, in particular additional traffic, vehicle speeds, and increased presence of non-Indigenous harvesters was a concern.

11.3.3 Assessment Boundaries

The spatial assessment boundaries for each Indigenous interest were identified based on the local assessment area and local assessment area for valued components and Williams Lake First Nation traditional territory. Where there were multiple valued components, the largest area was selected. The assessment boundaries for cultural land use interests at both the local and regional assessment area were determined by the largest overlapping area of the air quality, water quality and wildlife local assessment areas. Land stewardship, economic development and community health and safety were assessed to the extent of Williams Lake First Nation's traditional territory which includes the Quesnel River Mill and a portion of the Transportation Route.

The temporal boundaries of assessment included construction, operations, closure, and post-closure. These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report. No administrative or technical boundaries were identified for the assessment of Indigenous interests.

11.3.4 Baseline Conditions by ODV

To inform the assessment of effects on Williams Lake First Nation, sources primarily included the Cultural Land Use Study which was jointly completed with Xatśūll First Nation in 2021. The study incorporated Indigenous Knowledge and was created to provide a permanent record of Xatśūll First Nation and Williams Lake First Nation Indigenous knowledge and land use in the area to support both communities in their assessment of the potential impacts of Cariboo Gold on the environment and health and well-being of the community. It was also intended to provide a decolonized approach for understanding and utilizing Indigenous knowledge of the area in this, and future environmental assessments. There have also been ongoing engagement discussions, which were summarized in *Chapter 13.3* of the Revised Application. Other information sources include the *Williams Lake First Nation website*, the *B.C. Assembly of First Nations (Williams Lake) website*, and *Indigenous and Northern Affairs Canada*.

Existing conditions were summarized for the identified Indigenous interests.

11.3.4.1 Cultural Land Use and Cultural Heritage Practices

Transportation routes and habitation sites were identified during the Cultural Land Use Study as integral to cultural land use and cultural heritage practices in the Williams Lake First Nation traditional territory and would have included a network of overland and water-based trails that connected villages, camps, procurement areas, important trade sites, and salmon fishing locations. Specific sites identified included an access corridor along the 500 Nyland Lake Road. Camping and gathering sites are used by Williams Lake First Nation throughout their traditional territory and include Maud Lake and the general Yanks Peak and Keithley Creek areas. Increased development in the area has made accessing sites and

transportation routes difficult and has introduced more access by non-Indigenous people. During early engagement, five subsistence sites important for vegetation gathering were identified in the region. Specifically, Knowledge Sharers/Keepers identified an area near Maud Lake for collecting Saskatoon berries, west of Nyland Lake for devil's club, and around Yanks Peak for balsam bark.

Cultural resource use areas included vegetation important to cultural activities and wildlife species such as caribou. Caribou in the area are considered endangered federally due to population declines and increased threats from forestry operations that cause habitat loss and degradation, predation by wolves and hunters, and forest fires that further reduce suitable habitat.

Fishing and trapping practices remain a substantial part of Williams Lake First Nation's culture and subsistence, particularly for chinook and sockeye salmon. Fishing practices have changed in recent years because of ongoing and historical water contamination and resource extraction projects and trapping lines have been disrupted by land privatization. ODV noted that there are no anticipated impacts to trapping areas or water quality near the Mine Site or Quesnel River Mill, but acknowledge that resource extraction projects, such as large-scale mining, small-scale placer-mining, logging, and urbanization, along with incidents such as the Mount Polley tailings dam failure, have all resulted in reduced access to water.

11.3.4.2 Land Stewardship

Williams Lake First Nation places a strong emphasis on environmental stewardship in their territory. The stewardship of the land is intrinsically linked not just to resource use and management, but to cultural and spiritual practices, transfer of knowledge, and the maintenance of culture. This in turn supports the health of the community. Williams Lake First Nation made it clear there is interest in maintaining resources for cultural use as well as for potential economic development in the future, with stewardship playing both an economic and spiritual role in supporting the Secwépemc way of life. Any impact to sacred or spiritual sites is a key concern, and while all natural areas within the nation's territory are considered sacred, 19 specific sacred sites were identified in the area through the Cultural Land Use Study and discussions with Knowledge Keepers.

Williams Lake First Nation signed onto the *First Nation Land Management Act* process and subsequently signed an Individual Agreement with Canada to develop their own Land Code, which came into effect on July 1, 2014.[15] The Land Code provides direction on how land management activities will be implemented and ensures transparency to members. The Land Code enables Williams Lake First Nation to pursue, negotiate and execute economic development opportunities and to develop and manage laws related to the land with community input and participation.

Based on previous site assessments, there were 20 areas within the local study area of Cariboo Gold that were identified as potential environmental concern for soil quality. The Cultural Land Use Study identified 43 registered contaminated sites. Most sites were located near waterways, particularly the Fraser River and Quesnel River, with at least three fish and spawning areas and habitats being identified. Williams Lake First Nation is interested in reclamation of soil after the closure of the mine to ensure the maintenance of cultural use.

11.3.4.3 Economic Development and Opportunities

Currently, the employment rate of the Williams Lake First Nation is lower than that of B.C. overall. Williams Lake First Nation maintains a strong community economy with businesses in various sectors including forestry, petroleum, sports, tourism, and retail. The Nation has several agreements in place that promote economic development and opportunities for the Williams Lake First Nation community including a Forest Consultation and Revenue Sharing Agreement (2017) with the Crown, and two agreements with the Province of B.C. related to the Mount Polley mine area. In July 2022, ODV and Williams Lake First Nation entered into a Participation Agreement to facilitate the development of the Cariboo Gold

[15] See *link*

Project. The agreement puts in place a process for Cariboo Gold to be developed and operated with the consent and support of Williams Lake First Nation. The Nation is interested in further economic opportunities and training that could lead to meaningful and long-term employment, while still protecting the health and safety of community members and the sustainability of natural resources.

11.3.4.4 Community Health and Safety

Williams Lake First Nation is serviced by the First Nations Health Authority which manages the delivery of Indigenous health programs and services in B.C. as well as the T'exelc Social Development department that supports the Williams Lake First Nation community through administering income assistance, facilitating training and education programs to promote healthy lifestyles, and liaising with other social services to help on-reserve families obtain resources and support. Health and community well-being for Williams Lake First Nation was identified as inextricably linked to the ability to carry out socio-cultural activities, practices, and pursuits. For the Nation to be healthy, the community must be able to uphold stewardship systems, customs, beliefs, and values. Continued access to transportation routes and cultural sites (for fishing, gathering, harvesting etc.) along with protection from encroachment of non-Indigenous people will play a substantial role in community well-being. Concerns were also raised regarding the protection of Indigenous women and girls, and the impact of addictions and substance abuse.

11.3.5 Potential Project Effects by ODV

In the Revised Application, ODV identified the following potential effects due to Cariboo Gold.

11.3.5.1 Cultural Land Use and Cultural Heritage Practices

Potential effects to cultural land use and cultural heritage practices could include any changes in the ability of Williams Lake First Nation to use and enjoy their traditional territory. ODV identified the potential for Cariboo Gold to cause reduced or changed access for members of Williams Lake First Nation, including to public lands, as well as increase recreational use and tourism associated with the public land from the influx of workers. ODV acknowledged the possibility of Cariboo Gold causing interference to camping, gathering sites, trap lines, and land-based cultural practices.

Potential effects to Archaeological and Heritage Resources could include any damage to the integrity and context of archaeological, historical, or palaeontological sites or deposits if present through ground disturbances as well as any changes to access to archaeological, historical, or palaeontological sites or deposits if present. While the Cultural Land Use Study did not identify any historical or palaeontological sites within the surface footprint of the project (several are located within the Mine Site Local Assessment Area), there remains the possibility of chance find encounters where previously unknown heritage resources are discovered during project activities.

11.3.5.2 Land Stewardship

Potential effects to land stewardship could include any changes in the ability of Williams Lake First Nation to maintain resources for cultural use as well as transfer Indigenous knowledge and maintain cultural living practices. This could include any change to stream flow or water quality in rivers or lakes in the area and any detrimental potential effects to wildlife species or their habitat, including:

- Effects on songbirds and caribou, particularly during construction of the Mine Site, as well as the potential for direct and indirect mortality during construction and operations;
- Activities at the Mine Site and Quesnel River Mill may create barriers that disrupt movement patterns for terrestrial wildlife and deposit additional dust that could affect harvesting;
- Potential effects to surface water from mine activities could include changes to the surface water and sediment quality in Jack of Clubs Lake, the Willow River, Lowhee Creek, and Rudy Creek. The addition of treated effluent water to Rudy Creek and Lowhee Creek could result in an increase in streamflow to the downstream environment;

- Potential effects to vegetation could include the introduction of invasive species as well as loss from clearing activities;
- While ODV intends to minimize soil disturbance, there will still potentially be residual effects to soil quality from soil compaction and dust accumulation; and,
- Potential changes could arise from the act of groundwater removal which has limited potential to alter groundwater quality.

11.3.5.3 Economic Development and Opportunities

Potential effects to the economic development and opportunities for Williams Lake First Nation include the creation of employment opportunities and the training of personnel. Post mine closure, there would be a reduction in the demand for goods and services provided by local businesses and continued employment in the area would be dependent on other opportunities available at the time of closure with ODV or other employers.

11.3.5.4 Community Health and Safety

Potential effects to community health and safety for Williams Lake First Nation would include any change to the community and project activities that affect the availability of health, protection, emergency, or social infrastructure and services. Cariboo Gold has the potential to affect population health through changes in population, employment, income, and education during the extent of mine activities. Increases in population resulting from mine workers would add additional demand for protective and emergency services. Other potential effects to human health could include any changes to air quality or changes to food and sediment quality.

11.3.6 Proposed Key Mitigation Measures by ODV

In addition to following best management practices, ODV identified the following key mitigation measures in the Revised Application:

- ODV plans to work with Williams Lake First Nation to develop a strategy that will effectively communicate mine-related activities to Williams Lake First Nation community members, including clearing or reclamation activities prior to commencement;
- There will be monitoring programs on-going throughout all phases of Cariboo Gold, and ODV will share the annual monitoring reports for air quality and water quality with Williams Lake First Nation;
- ODV will develop a chance finds procedure which is to be used by contractors and staff to contact Williams Lake First Nation if archaeological remains are observed at any time during Cariboo Gold activities; and,
- ODV will create a reclamation and closure plan that will establish site conditions to allow for realistic ecological targets, taking into consideration ecosystem function and wildlife habitat objectives. ODV has committed that revegetation will be ecosystem-based in approach.

11.3.7 Key Issues Raised

The following key issues were raised by the Williams Lake First Nation during Application review.

11.3.7.1 Interest in business, employment, and training opportunities

Williams Lake First Nation raised interests in the types of jobs available as some members have experience in mining. There has been interest expressed for education and job training, using Indigenous hiring practices, and being involved in the characterization of employment and economic baseline. Williams Lake First Nation has also expressed interest in developing experience and training for skilled jobs. ODV intends to hire qualified individuals as well as provide training opportunities to those interested including water related activities.

Williams Lake First Nation also expressed that requirements or opportunities for Indigenous-owned supplier businesses need to be defined. Interest has also been expressed over contracting and joint venture opportunities. ODV intends to work with the Williams Lake First Nation to facilitate participation in Cariboo Gold.

11.3.7.2 Increase in non-Indigenous traffic and decreased access for Williams Lake First Nation community members to cultural sites

Concerns were raised regarding traffic travelling past the Williams Lake First Nation community. Concerns have also been raised with respect to accessibility and transportation routes both for preventing access to land use areas and increasing non-community member access to cultural sites. There is concern over access roads and increasing privatization preventing access to members of the community to cultural sites and conversely providing access to these same sites to non-members. Williams Lake First Nation also expressed concern with respect to continued access to habitation sites (e.g., Maud Lake, Yanks Peak and Keithley Creek areas). There is also concern about the widening and lengthening of roads in general. ODV has indicated that no upgrades to the Transportation Route are required. A traffic and transportation study has been undertaken and the findings were discussed with Williams Lake First Nation (in *Appendix 1* of the Revised Application). The EAO also has proposed a Certificate condition to require mitigation on access management through the Construction Environmental Management Plan.

11.3.7.3 Indigenous land use and knowledge incorporation into the additional studies

Williams Lake First Nation requested that cultural land use knowledge be considered in project studies. Williams Lake First Nation has also raised the question of how indicators and thresholds for Indigenous cultural use would be incorporated into the assessment. ODV responded that it considered information provided by Williams Lake First Nation in project studies and use of such information would be discussed to ensure it is accurately reflected. ODV has also entered into an agreement with Williams Lake First Nation to help fund participation in the EA process including third party review of materials and incorporation of cultural knowledge into project planning. Williams Lake First Nation has requested ODV have Williams Lake First Nation environmental monitors or guardians present when construction is occurring, including during the clearing of the transmission line right-of-way.

11.3.7.4 Cumulative effects and the impact of historical mining

Williams Lake First Nation raised concerns related to existing conditions not being reflective of pre-mining conditions as well as the scope of the cumulative effects assessment. There are concerns that additional development in their territory can exacerbate existing effects as there are other industrial activities in the area such as placer mining. There were also concerns regarding the effects of historical contamination and the responsibility of ODV and the Province to address legacy issues. The Province and ODV finalized a Memorandum of Understanding to delineate the responsibility for reclamation of historical contamination, in July 2022. A Reclamation and Remediation Strategy is also being developed with the appropriate regulatory agencies to address the legacy issues of the contamination and assign responsibility for remediation. More information on the contaminated area is available in *Section 11.11* (Soils).

11.3.7.5 Water quality and quantity monitoring

Williams Lake First Nation would like to ensure that monitoring systems are in place for water quality and water quantity. ODV responded that it would continue to monitor water as part of the permitting process and develop a water quantity and quality monitoring program, sharing information and findings from studies being conducted with Williams Lake First Nation. ODV committed to conducting additional assessment work for groundwater quality prior to the post-closure passive care phase to determine toxicity of post-closure seepage water. For more information on effects to water quality and quantity see *Sections 11.9* (Surface Water) and *11.8* (Groundwater). The EAO also has proposed a Certificate condition to require an Aquatic Effects Monitoring Plan.

11.3.7.6 Fish and aquatic habitat health

Williams Lake First Nation raised concerns over the sufficiency of the fish tissue sampling that was performed for Cariboo Gold. ODV clarified that the collection of fish from the Transmission Line area for tissue analysis was not conducted because the construction and operation of the line and rights of way is expected to be managed through a Construction Environmental Management Plan that would prevent or minimize the potential for water discharges at the outset. This would include addressing the potential contamination from construction materials and appropriate handling of fuels or other sources of hydrocarbons. Further concerns were raised related to the assessment of phytoplankton, zooplankton, and periphyton, which ODV intends to address through the development of an Aquatic Effects Monitoring Plan which is to be developed with the Province, ENV and Williams Lake First Nation. In discussions with Williams Lake First Nation, ODV committed to re-evaluating water management infrastructure to make sure systems are suitable to handle contact water needs. For more information on effects to fish and aquatic habitat see *Section 11.10* (Freshwater Fish). The EAO also has proposed a Certificate condition to require an Aquatic Effects Monitoring Plan.

11.3.7.7 Wildlife mortality

Williams Lake First Nation had concerns over the uncertainty in the assessment of direct mortality of wildlife caused by Cariboo Gold. In subsequent technical memos, ODV described the anticipated direct mortality for amphibians, ungulates, and large carnivores to be primarily caused by construction in breeding habitats (only wetlands for amphibians) and wildlife-vehicle collisions and/or and increase in hunting mortality to be limited in extent. There is some expected indirect mortality associated with new road access that may facilitate access for predators, however this is also anticipated to be limited in extent and low magnitude. Williams Lake First Nation would like all critical habitat for Southern Mountain caribou to be considered. ODV has said that information will be updated and confirmed in the Caribou Mitigation and Monitoring Plan. For more information on effects to wildlife see *Section 11.13* (Wildlife). The EAO also has proposed a Certificate condition to require mitigation for human-wildlife conflict through the Construction Environmental Management Plan and additional caribou mitigation through a Caribou Mitigation and Monitoring Plan.

11.3.7.8 Human health risk assessment

Williams Lake First Nation had concerns on community well-being, food security, and the cumulative effects of their community being situated amongst many industrial activities, including the proximity of Cariboo Gold. The Human Health Risk Assessment conducted for Cariboo Gold identified a potential elevated non-negligible risk to Indigenous receptors through exposure to cobalt (ingestion of moose meat), methylmercury and molybdenum (ingestion of fish), and manganese (ingestion of surface water). In response to these findings, ODV committed to an environmental monitoring program for country foods to provide reassurances of traditional food quality and has committed to working with Williams Lake First Nation to develop this program. ODV also committed to generating a quarterly Human Health monitoring report summary that would be shared with Williams Lake First Nation. For more information, see *Section 11.24* (Human and Ecological Health). The EAO also has proposed a Certificate condition to require a Human Health Monitoring and Management Plan, including to monitor country foods.

11.3.8 The EAO's and William Lake First Nation's Characterization of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on Williams Lake First Nation. The EAO's characterization of the expected residual effects of the Cariboo Gold Mine on Williams Lake First Nation is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 8: Summary of Residual Effects on Williams Lake First Nation and its Indigenous interests

Indigenous Interest	Assessment Rating*	Impact and Rationale
Changes to Cultural Land Use and Cultural Heritage Practices This includes the ability to access and safely use cultural land use areas, as well as the peaceful enjoyment of these practices.	Context (resilience): Moderate Magnitude: Medium Extent: Local Duration: Long-term Reversibility: Fully reversible to irreversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): High Uncertainty: Moderate Importance: High	**Williams Lake First Nation conclusion: Serious Impact** Cultural land use and cultural heritage practices are expected to have a moderate resiliency as there are several other anthropogenic influences in the area which have affected the ability for Williams Lake First Nation to conduct cultural land use practices and cultural heritage practices. Medium levels of effects within a local extent are expected to cultural land use and cultural heritage practices based on the overlap in area of project activities and cultural practices where there would be changes to vegetation and access. Effects would be expected to be long-term depending on the success of mitigation strategies. Effects were expected to be fully reversible to irreversible as mitigation measures and reclamation are implemented. However, this is also dependent on continued or future effects and the ability of interests to recover prior to future disturbances. Residual effects were expected to affect members evenly. Risks to all Indigenous interests were considered moderate as all interests have been identified as high consequence to the nation, and consequences must reflect that. There is a moderate amount of uncertainty for the assessment of residual effects. The interactions between the project effect, historical impacts, and these concerns are fairly well understood. Williams Lake First Nation indicated the high importance of this interest.
Changes to Economic Development/Opportunities This could include a shortage of skilled workers due to an aging work force, and the implementation of a range of training initiatives, such as stay-in-school programs, scholarships, apprenticeships, and workplace literacy programs, that promote the building of educational and other capacities. Through training and work experience, the skills acquired through participation in mining can be transferred to other sectors of the economy, and to the local community economy, following mine closure. There is a potential in developing a joint-venture business. Joint ventures could be a way to develop local business capacity to prepare for and take advantage of the business opportunities related to mine development. Work opportunities also exist in exploration, development, operations, etc.	Context (resilience): High Magnitude: Low Extent: Beyond Regional Duration: Short-term Reversibility: Fully reversible Frequency: Once Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Moderate to High Importance: High	**Williams Lake First Nation conclusion: Moderate-to-serious Impact** Economic development and opportunities would have a moderate resiliency as the community is actively promoting, creating, and seeking economic opportunities for members through other avenues. Economic development was expected to have low levels of effect as timelines for employment will be communicated and transition support into project closure is to be supported by ODV (including employment alternatives). The extent of the economic development and opportunities would be beyond regional, as Williams Lake First Nation members live outside the regional assessment area boundaries. Employment would be gained or lost over the course of Cariboo Gold, and these effects could have influence beyond the region for demanded goods and services that may affect Williams Lake First Nation. Effects would be expected to be medium-term depending on the success of mitigation strategies, partnerships, and the life of the mine within the context of the broader economy (market). While positive economic development and opportunities may be continuous during the life of Cariboo Gold, the closure and post closure residual effects were considered to have a one-time effect. Economic development and opportunities could disproportionately impact members of the community who are directly employed by ODV or depend on presence of ODV employees on their existing businesses and services. Risks to all Indigenous interests were considered moderate as all interests have been identified as high consequence to the nation, and consequences must reflect that. Overall confidence in the assessment of economic residual effects was low to moderate based on the uncertainty surrounding the broader economic context. Williams Lake First Nation indicated the high importance of this interest.
Changes to Land Stewardship	Context (resilience): Low	**Williams Lake First Nation conclusion: Serious Impact**

Indigenous Interest	Assessment Rating*	Impact and Rationale
This includes effects to wildlife, wildlife habitat, surface water quality and quantity, groundwater quality and quantity, freshwater fish, and vegetation, as well as the ability of Williams Lake First Nation to practice land stewardship activities.	Magnitude: Low Extent: Local Duration: Long-term Reversibility: Fully reversible to irreversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	Land stewardship activities within Williams Lake First Nation territory would continue but may be altered to a low magnitude where they overlap with residual effects from the development, operation, and closure of the Quesnel River Mill and Transportation Route from wildlife sensory disturbance and changes to vegetation. Land stewardship effects were expected to be local and restricted to indirect effects to sites that overlap with project components and areas immediately adjacent to or downstream from Cariboo Gold. Effects would be expected to be long-term depending on the success of mitigation strategies. Effects were expected to be fully reversible to irreversible to Indigenous interests as mitigation measures and reclamation are implemented. However, this would be dependent on continued or future effects and the ability of interests to recover prior to future disturbances. Risks to all Indigenous interests were considered moderate as all interests have been identified as high consequence to the nation, and consequences must reflect that. There is a low uncertainty for the assessment of residual effects for land stewardship. The interactions between the project effects, historical impacts, and these concerns are fairly well understood. Williams Lake First Nation indicated the high importance of this interest.
Changes to Community Health and Safety This includes the physical, emotional, and mental health and safety of all community members.	Context (resilience): Moderate Magnitude: Medium Extent: Beyond Regional Duration: Long-term/Permanent Reversibility: Partially reversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: High Importance: High	**Williams Lake First Nation conclusion: Moderate-to-serious Impact** Community health and safety was expected to have a moderate resiliency based on adaptability to potential residual effects. It was expected to have a medium magnitude from changes to air, water, and country food quality, and effects would be primarily expected at the Mine Site and along the Transmission Line. Long-term effects could affect members not at the Mine Site (e.g., health and safety of family members). Effects would be expected beyond the regional level as Williams Lake First Nation community members live outside of the regional assessment area. Effects were expected to be partially reversible as mitigation measures and reclamation are implemented. However, this is dependent on continued or future effects and the ability of interests to recover prior to future disturbances. This is also dependent on the perceived health and safety of the community. Potential effects to community health and safety may have continuous effects, into post closure timelines. Effects to this interest would disproportionately affect those with underlying health conditions, and families with a strong reliance or preference for consumption of country foods. Risks to all Indigenous interests were considered moderate as all interests have been identified as high consequence to the Nation, and consequences must reflect that. There is high uncertainty for community health and safety. Ongoing monitoring would increase certainty moving forward. Williams Lake First Nation indicated the high importance of this interest.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

It is the EAO's view that the conclusion on the impact to Williams Lake First Nation and its interests is best identified by the nation itself that would experience the impacts, and the EAO has chosen not to modify the conclusions above from those as stated by the nation. However, the impact to Williams Lake First Nation is limited to the area near the Quesnel River Mill which overlaps with the nation's traditional territory. Although modifications to the Quesnel River Mill area are limited, tailings would be stored at this location, and potential impacts on water quality and community health and safety are of the most concern to the EAO.

11.3.9 Cumulative Effects Assessment

There are three existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Williams Lake First Nation's interests: Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, and the Spanish Mountain Gold Project. This is in addition to regional forestry, mineral exploration, transportation, and placer mining activities that are ongoing in the region.

Williams Lake First Nation Knowledge Sharers/Keepers observed the health of various ecological features and areas within their traditional territory to have declined over recent years due to the cumulative impacts of surrounding industrial activities. The cumulative effects of land use and development in the region is substantial with respect to mining activities. This not only affects the quality and quantity of resources, but also dissuades community members from using and accessing these areas due to concerns around contamination and toxicity.

ODV identified the cumulative effects and mitigation strategies for Cariboo Gold, separated by individual valued components. Cumulative effects were not identified to impact cultural land use and cultural heritage practices based on limited project activities that will take place at the Quesnel River Mill and along the Transportation Route located within Williams Lake First Nation traditional territory. Cumulative effects were not anticipated from economic development and opportunities on Williams Lake First Nation as mitigation measures were expected to help address transition from post-closure conditions and effects related to increases in housing were expected in larger centres which would not cause effects to Williams Lake First Nation. Cumulative effects were expected related to land stewardship as there are identified residual effects to wildlife, freshwater fish, vegetation, soil, surface water, groundwater, infrastructure and services, air quality and acoustics identified. Cumulative effects were anticipated related to community health and well-being, also based on residual effects related to above Indigenous interests, which are valued, gathered, used, and consumed by Williams Lake First Nation and are already impacted from current and past anthropogenic activities.

The impacts on Indigenous interests to Williams Lake First Nation were expected to overlap cumulatively with other past, present, and foreseeable future projects and activities within the regional assessment area, in particular cultural land use and cultural heritage practices and community health and well-being. Williams Lake First Nation concluded that the potential for cumulative effects to Williams Lake First Nation is considered moderate-to-serious as a result of the effects of Cariboo Gold interacting with the effects of other past, present, and reasonably foreseeable future projects and activities.

11.4 Nazko First Nation

A description of this Nation and a summary of the effects is provided in *Section 6.2.1* of this Report.

11.4.1 Potential Project Effects by ODV

Effects to Nazko First Nation were assessed for the small portion of Nazko First Nation's territory that overlaps with Cariboo Gold. ODV identified four potential effects to Nazko First Nation and its interests:

- Potential air quality residual effects, limited to the end of the Transportation Route which overlapped with Nazko First Nation's territory, were identified by ODV to include increases in air contaminant concentrations such as nitrogen dioxide and particulate matter from traffic. These potential increases were found to yield potential effects either below or equal to/slightly above ambient air quality guidelines and would be fully reversible once Cariboo Gold activities are complete. Effects to air quality, including mitigation measures and proposed Certificate conditions, are described in further detail in *Section 11.6* (Air Quality).
- Potential vegetation and cultural effects were assessed by ODV to include loss or alteration of plant species of interest, communities of interest, wetland functions and ecosystems. Effects would be limited to the Transmission Line right-of-way and were anticipated to be low in magnitude based on the small area of clearing. Loss and alteration of plants valued for traditional use were considered reversible by ODV through mitigation and

reclamation. Effects to vegetation and cultural effects generally are further detailed in Section 11.12 (Vegetation) and Section 11.26 (Culture) in this Report.

- Potential effects to freshwater fish were identified by ODV to include the loss of riparian habitat along the Transmission Line right-of-way. Low lying riparian vegetation along the Transmission Line right-of-way would be retained and the effect would be partially-reversible as riparian habitat would be allowed to grow back once the Transmission Line is decommissioned. Fish populations were identified as having high resiliency to a relatively small and temporary decrease of available habitat. Effects to freshwater fish generally are further detailed in Section 11.10 (Freshwater Fish) of this Report.
- Potential effects to land and resource use were identified by ODV to be limited to the Transmission Line and Transportation Routes. Increased traffic and resulting reduced or changed access was predicted to be infrequent and short-term on public land and resource use and only affect the overall experience and enjoyment of the land and resources, not the function or integrity. Effects to land and resource use generally are further detailed in Section 11.16 (Land and Resource Use) of this Report.

11.4.2 Key Issues Raised and the EAO's Conclusions

No issues were identified by Nazko First Nation related to potential effects to Nazko First Nation or its interests from Cariboo Gold. Because of the limited area of potential effect and considering the EAO's analysis and having regard to the proposed conditions (which would become legally binding if a Certificate is issued), the EAO is of the view that Cariboo Gold would not have significant adverse effects on Nazko First Nation or its interests.

11.5 Tŝilhqot'in National Government

A description of this Nation and a summary of the effects is provided in Section 6.2.2 of this Report.

11.5.1 Potential Project Effects by ODV

ODV assessed potential effects from Cariboo Gold on Tŝilhqot'in National Government (TNG) for the portion of the Transportation Route from Quesnel to the Quesnel River Mill along Quesnel Hydraulic Road which crosses TNG's Engagement Zone B. This Transportation Route is to be used exclusively by workers and personnel and will not receive traffic related to hauling activity. This portion of the Transportation Route does not overlap with any other surface components of Cariboo Gold, including the Mine Site, the Quesnel River Mill (Quesnel River Mill) or the Transmission Line.

ODV identified changes to two potential effects on TNG and its interests:

- Potential adverse air quality effects associated with increased personal vehicle traffic along the Transportation Route, all of which are below or equal to/slightly above ambient air quality guidelines and considered fully reversible once Cariboo Gold activities are complete. Additional information on air quality, including mitigation measures and proposed Certificate conditions, can be found in Section 11.6 (Air Quality).
- Potential positive employment and economic effects associated with Cariboo Gold. Additional information on employment and economy can be found in Section 11.18 (Employment and Economy).

11.5.2 Key Issues Raised and the EAO's Conclusions

No key issues were identified by TNG related to potential effects to TNG or its interests from Cariboo Gold. The EAO does not anticipate any adverse effects on TNG or its interests associated with Cariboo Gold based on the Province's understanding of the history and nature of TNG's interests in the area of Cariboo Gold and Cariboo Gold's potential effects. Because of the limited area of potential effect, and with no issues or additional information provided by TNG, the EAO's analysis concluded that, with the implementation of the proposed conditions (which would become legally binding in the event that a Certificate is issued), Cariboo Gold would not have significant adverse effects on TNG or its interests.

11.6 Air Quality

11.6.1 Summary

Maintenance of air quality is essential for the protection of human health, vegetation, soil, water quality and wildlife. Air quality was identified as a key concern by Lhtako Dené Nation, Xatśūll First Nation, Williams Lake First Nation, Northern Health, Interior Health, ENV, the public and the District of Wells.

The main contaminants assessed as potential concerns by ODV were sulphur dioxide, carbon monoxide, nitrogen dioxide, total suspended particulate, PM_{10}, and $PM_{2.5}$ in the air from Cariboo Gold activities. These are concerns related specifically to effects to human health, which are discussed in more detail in *Section 11.24* (Human and Ecological Health) of this Report. Local particulate matter concentrations are also influenced by existing human sources in the area such as from wood-burning stoves, open and backyard burning, unpaved road dust and combustion emission sources, as well as events such as wildfires. ODV based the air quality modelling on data from the nearby city of Quesnel due to existing data limitations in Wells.

ODV described mitigation measures that would reduce some of the potential effects to air quality, and the EAO assessed the potential effects to air quality from changes in the concentrations of sulphur dioxide, carbon monoxide, nitrogen dioxide, total suspended particulates, PM_{10}, and $PM_{2.5}$, and the following key issues were identified by reviewers through review of the air quality assessment: uncertainty around baseline conditions and effects to community well-being.

To address key issues related to air quality, the EAO has proposed the following Certificate condition:

- Air Quality Condition: requiring continuous air quality monitoring data in the District of Wells and additional mitigation measures.

Additionally, as identified in the *Regulatory Coordination Plan*, a permit would be required under the *Environmental Management Act* to authorize discharge of air contaminants. This permit would authorize and set conditions on air emissions sources, including fugitive dust, and require air quality monitoring. This permit would also require a detailed Fugitive Dust Management Plan. The *Mines Act* permit could also include requirements related to air quality on the Mine Site. Reviewers from ENV indicated that there would be a risk of significant incremental increases in total suspended particulates, PM_{10}, and $PM_{2.5}$ concentrations from Cariboo Gold, but that this risk can be minimized with appropriate monitoring, management and response to events and concerns.

Considering the EAO's analysis and having regard to the proposed conditions (which would become legally binding if a Certificate is issued), the EAO is of the view that Cariboo Gold would not have significant adverse effects on air quality.

The effects on air quality from Cariboo Gold are expected to overlap cumulatively with other past, present, and reasonably foreseeable future projects and activities within the region as well as baseline conditions from human sources in the local assessment area. The potential for cumulative effects from these projects and activities is considered moderate in consideration of extensive past, current, and planned activities in the region such as other mining and forestry. However, the contribution of effects to air quality from Cariboo Gold itself to cumulative effects in the region is considered not significant.

11.6.2 Assessment Boundaries

The spatial boundaries for the air quality assessment included a local assessment area which encompassed the Mine Site and Quesnel River Mill. The local assessment area near the Mine Site extended 2.5 km beyond Cariboo Gold's project footprint to the north, west and south and extended to the east to include Barkerville Historic Town and Park. The local assessment area for the Quesnel River Mill was 5 km by 5 km centred on the Quesnel River Mill site. The regional assessment area included a 20 km by 20 km square centred on the Mine Site and Quesnel River Mill.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.6.3 Baseline Conditions by ODV

The baseline air quality conditions in the local assessment area were assessed in *Chapter 7.2* of the Revised Application by ODV and are summarized here.

The air quality conditions in the Cariboo Gold area are, at baseline, influenced by various industrial, commercial, residential, and recreational activities that occur in the region. Active logging and mining occur near the District of Wells and are sources of particulate emissions from material and ground handling and combustion emissions. Local residential areas such as the District of Wells, New Barkerville, Likely and recreational cabins are also sources of combustion emissions, including fine total suspended particulates, PM_{10}, and $PM_{2.5}$, from unpaved roads, wood and pellet stoves, heaters, generators, and recreational vehicles.

As local baseline studies were limited, ODV characterized the baseline using available monitoring data from ENV in nearby Quesnel, B.C. ODV selected the Quesnel Senior Secondary School air quality monitoring station for measurements on $PM_{2.5}$, inhalable particular matter (PM_{10}), nitrogen dioxide and sulphur dioxide measurements and Kelowna College for carbon monoxide measurements. The baseline total suspended particulates, PM_{10}, and $PM_{2.5}$ data were screened for fire and dust events and these periods were removed from the dataset. The baseline ambient air quality concentrations for $PM_{2.5}$ based on the Quesnel baseline data exceeded the current 24-hour and annual B.C. ambient air quality objectives.

11.6.4 Potential Project Effects by ODV

The effects of Cariboo Gold on air quality were modelled during construction and operations using the time periods representing the worst-case emissions for each phase. Baseline values were added to the maximum model predicted values from Cariboo Gold to present the total cumulative air contaminant concentrations compared to the current B.C. ambient air quality objectives.

ODV identified that Cariboo Gold activities would affect air quality through the generation and atmospheric transport of emissions from fugitive dust, equipment from surface and underground operations, and from Mine Site and Quesnel River Mill processing operations. ODV identified the following potential effects in *Chapter 7.2* of the Revised Application:

- Increased sulphur dioxide and carbon monoxide concentrations: ODV predicted that these would increase due to Cariboo Gold, but that concentrations – both from Cariboo Gold and cumulative (project + baseline) – would remain below B.C. ambient air quality objectives for both construction and operations.
- Increased nitrogen dioxide concentrations during both construction and operations: These increases would be primarily due to combustion sources such as generators, diesel equipment, propane heating, and the use of explosives during underground mining activities at the Mine Site. Short-term nitrogen dioxide concentrations would increase above objectives near the Mine Site and near the Quesnel River Mill. Without mitigation, the cumulative (project + baseline) maximum 1-hour concentrations were predicted to be near or above the B.C. ambient air quality objectives for construction and operations at both the Mine Site and Quesnel River Mill. However, throughout the review of the Application, ODV created design changes to reduce the nitrogen dioxide levels in the District of Wells such as moving the ventilation exhausts further from town. These changes resulted in a substantial decrease in predicted nitrogen dioxide levels, with now no exceedances of the B.C. ambient air quality objectives predicted throughout construction and operations.
- Increased total suspended particulates and PM_{10} concentrations: ODV predicted that 24-hour cumulative (project + baseline) total suspended particulates and PM_{10} concentrations would be near or exceeding the B.C. ambient air quality objectives at the Mine Site and in the District of Wells for the construction scenario, around Cariboo Gold's

project footprint, including the area near the Island Mountain Portal, the Mine Site, along the haul roads, at Bonanza Ledge, in the District of Wells for the operations scenario, and near the Quesnel River Mill disturbance boundary. Additionally, following the design changes submitted during the final phase of the environmental assessment, the aboveground trucking of ore from the Cow Portal through Wells during the first four years of operations would result in an increase of emissions of total suspended particulates, PM_{10}, $PM_{2.5}$, and diesel exhaust. This would include exceedances at the sensitive receptors of the baseball diamond in the District of Wells during construction and the baseball diamond in Wells, Jack of Clubs Lake Access, and Wells Elementary School (for PM_{10} only) during operations. However, following these first four years, overall emissions would be reduced by moving haul trucks underground and removing the B-road haul route option. The dominant driver of predicted total suspended particulates and PM_{10} concentration exceedances from Cariboo Gold was fugitive dust from haul roads, material handling and construction activities.

- Increased $PM_{2.5}$ concentrations: ODV predicted that $PM_{2.5}$ concentrations would be low and below the B.C. ambient air quality objectives for all project-only modelling scenarios, and ODV predicted that cumulative (project + baseline) $PM_{2.5}$ concentrations are near or above the B.C. ambient air quality objectives for both the 24-hour and annual averaging period. This is due to the 98th percentile ambient baseline considered in this assessment resulting in a predicted exceedance of the 24-hour and annual ambient air quality objectives. Dominant sources for $PM_{2.5}$ at the Mine Site would be fugitive dust from underground mining and non-road equipment, material handling activities released at the two portals and the Mosquito exhaust ventilation raise, as well as on-road equipment and unpaved road dust from activities. At the Quesnel River Mill, dominant sources for $PM_{2.5}$ would be the exhaust fans and the dry stack building fan, as well as fugitive dust from material dumping at the dry stack tailings conveyor.

During review of the Application, ENV (the ministry primarily responsible for managing air emissions) indicated that it is unlikely that Cariboo Gold would directly cause a significant number of $PM_{2.5}$, PM_{10}, and total suspended particle air quality objective exceedances and that "given the information provided, experience from previous projects and the uncertainty in both the model and local baseline and that there will be significant incremental increases in total suspended particulates, PM_{10}, and $PM_{2.5}$ concentrations from the proposed project, possible negative impacts from total suspended particulates, PM_{10}, and $PM_{2.5}$ on the environment and community cannot be ruled out. However, risk can be minimized with an effective fugitive dust management plan that contains appropriate monitoring, management and responses to events and concerns." The fugitive dust management plan would be a requirement of the *Environmental Management Act* permit.

Air quality interactions during the closure phase were anticipated to be minor compared to those during the construction and operations phases. Negligible interactions were anticipated during the post-closure phase.

11.6.5 Proposed Mitigation Measures by ODV

Given the potential for air quality exceedances, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Select equipment with low emissions, such as Tier 4 generators and engines that meet the latest applicable Canada emissions standards and guidelines;
- Equipment would be turned off when not in use, to avoid unnecessary idling of motors;
- Ventilation systems for the underground mine would be designed to dilute and exhaust diesel emissions and blasting fumes and would maintain compliance with B.C. mining regulations;
- Use of vapour recovery units at fuel and chemical storage tanks;

- Topsoil, overburden, and waste rock stockpiles and storage areas would be designed and managed to minimize emission of dust;
- Use of dust suppression measures to mitigate the dust generation potential along the unpaved roads, work areas, and storage piles as needed;
- Roads would be regularly maintained and kept in good repair;
- Use of emission control measures on point sources (concentrator and Quesnel River Mill) and transfer point emissions (e.g., dust collectors, scrubbers); and,
- Electric and automated underground equipment and haul trucks would be used where possible to reduce air (and noise) emissions.

11.6.6 Key Issues Raised

The following key issues were raised by members of the Technical Advisory Committee.

11.6.6.1 Elevated baseline conditions

ENV and Northern Health were concerned that while baseline air quality information was gathered from Quesnel for modelling purposes, Quesnel may not be representative of the District of Wells area. This led to high uncertainty in the accuracy of the air quality modelling. ENV requested additional pre-construction baseline work at approved monitoring locations to better understand the effects of Cariboo Gold on the District of Wells.

ODV committed to implementing a continuous ambient air quality monitoring program and will continue to engage with ENV in this regard. In response to these concerns, the EAO proposed a Certificate condition that would require ODV to implement a continuous ambient air quality monitoring program prior to construction.

11.6.6.2 Effects to human health and community well-being

Northern Health was very concerned that given nitrogen dioxide and $PM_{2.5}$ and PM_{10} are non-threshold pollutants (i.e., there is no safe level of exposure) and that PM_{10} is associated with short-term health effects, a more accurate characterization of local conditions and project effects was needed. Small increases in air pollution in an already compromised airshed would negatively affect health since dose-response relationships are not necessarily linear, especially when more than one pollutant is elevated and the effects from climate change, wildfire, and dust would continue to threaten local air quality. Given that pollutant concentrations were predicted to be above the B.C. ambient air quality objectives in the District of Wells and near sensitive receptors, this became a serious concern for Northern Health. These concerns, as they relate to effects to human health, are discussed further in *Section 11.24* (Human and Ecological Health).

Northern Health also raised that changes to air quality would affect overall community well-being if conditions were particularly poor given the close proximity of Cariboo Gold to the District of Wells. Potential poor visibility, respiratory irritations and other issues caused by poor air quality would affect overall quality of life and enjoyment in the area. Tourism may also be affected by poor air quality. These concerns, as they relate to community health and well-being, are discussed further in *Section 11.23* (Community Health).

ENV noted some of the same concerns, particularly given the project design change during the Effects Assessment phase to add a haul route through the town of Wells for the first four years of operations. ENV noted that additional particulate matter would be diesel particulate which has additional health concerns because of its toxicity. Additionally, brake and tire wear would be a substantial component of road dust and with the proximity of the road to the town this may be of concern. The proposed four-year mining phase would have different impacts than those in the previously assessed modelling exercise and increases uncertainty. ENV noted that while it is unlikely that the increased vehicle traffic would have a significant negative effect on long-term sulphur dioxide, PM_{10} or $PM_{2.5}$ concentrations, it would be an increase

from the current community baseline. These changes will also need to be considered in the context of the fugitive dust management plan during permitting and how to manage highway dust by haul trucks as the vehicles move through Wells, as well as the decrease of overall emissions by moving haul trucks underground and removing the B-road haul route option following the first four years.

To mitigate some of these concerns, ODV proposed to move the main ventilation portal outside of the District of Wells to the hill side south of the Mine Site Complex to reduce nitrogen dioxide exceedances. This required a substantial change to the modelling as ODV re-routed the ventilation of the underground mine to make this new vent the main exhaust of the mine. Updated model results indicated that this would greatly reduce nitrogen dioxide from Cariboo Gold in the District of Wells. These design changes are captured in the proposed Certificate Project Description. Additional mitigation measures were also recommended for inclusion by ENV, and these were captured in the proposed air quality condition by the EAO. These recommendations included the use of equipment which limits emissions of nitrogen oxides; the use of electrified vehicles and equipment on site; to reduce or restrict use of sources of nitrogen dioxide and total suspended particulates, PM_{10}, and $PM_{2.5}$ such as gas fired heaters and other combustion sources following completion of the transmission line; and to conduct surface blasting when meteorological conditions support good contaminant dispersion.

11.6.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on air quality. In addition to the mitigation measures proposed by ODV, an air quality Certificate condition was also proposed by the EAO to mitigate these effects, requiring ODV to implement a continuous ambient air quality monitoring program prior to construction and other mitigation measures related to air quality.

The EAO's characterization of the expected residual effects of Cariboo Gold on air quality is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 9: Summary of Residual Effects for Air Quality

Residual Effect	Assessment Rating*	Significance and Rationale
Increases in sulphur dioxide and carbon monoxide Sulphur dioxide and carbon monoxide concentrations would increase due to Cariboo Gold, but project and cumulative (project + baseline) concentrations would remain below B.C. ambient air quality objectives for all averaging periods.	Context (resilience): High Magnitude: Low Extent: Local Duration: Medium-term Reversibility: Fully reversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: High Importance: High	**Not significant** Baseline sulphur dioxide and carbon monoxide concentrations have been influenced by existing anthropogenic sources and air contaminant concentrations were assumed by ODV to be well below B.C. ambient air quality objectives based on use of data from nearby Quesnel and Kelowna. The effects on sulphur dioxide and carbon monoxide concentrations from Cariboo Gold would be restricted to the Mine Site and Quesnel River Mill project footprint and Transportation Routes and would be low at receptors outside of these areas. Sulphur dioxide and carbon monoxide emissions from Cariboo Gold in the Mine Site and Quesnel River Mill areas would be produced for the duration of the construction and operations phases, and substantially reduced emissions were expected to occur during the closure phase of Cariboo Gold. Sulphur dioxide and carbon monoxide concentrations would be produced on a regular basis throughout construction and operations and anticipated to return to baseline levels once construction and operations activities cease. It is expected that these effects would be evenly distributed and affect all populations equally in the airshed. The likelihood of effects would be medium, and the consequences are minor (low magnitude with local extent) for sulphur dioxide and carbon monoxide which led to a low assessment of risk overall. There is a high level of uncertainty in the assessment based on the lack of local baseline data provided. Air quality generally was identified as a highly

Residual Effect	Assessment Rating*	Significance and Rationale
		important concern by Lhtako Dené Nation, Williams Lake First Nation, Xatśūll First Nation, and the residents of Wells.
Increases in nitrogen dioxide Short-term nitrogen dioxide concentrations are predicted to increase near the Mine Site, the Mosquito and Cow Exhaust Ventilation Raises, in Wells, and near the Cariboo Gold project boundary at Quesnel River Mill. Cumulative (project + baseline) nitrogen dioxide concentrations are near or above the B.C. ambient air quality objectives for the 1-hour averaging period. Dominant sources would be generators, diesel equipment, propane heating, and the use of explosives during underground mining activities.	Context (resilience): Moderate Magnitude: Low Extent: Local Duration: Medium-term Reversibility: Fully reversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: High Importance: High	**Not significant** Baseline nitrogen dioxide concentration were influenced by anthropogenic sources in the region, including traffic along Highway 26, but were considered below the current B.C. ambient air quality objectives. Very few anthropogenic sources occurred near the Quesnel River Mill. The magnitude of the effect was considered low due to being predicted below B.C. ambient air quality objectives, following project design changes. The effect would be primarily restricted to local areas near the Mine Site, the Mosquito exhaust ventilation raise, in the District of Wells, and near the Cariboo Gold boundary at Quesnel River Mill. Nitrogen dioxide emissions would be produced continuously for the duration of construction and operations and reduced during the closure phase and anticipated to return to baseline levels once construction and operations activities cease. It is expected that the effects of increased nitrogen dioxide would be evenly distributed and affect all populations equally in the airshed. The likelihood of effects would be low, and the consequence would be moderate, which led to a low assessment of risk overall for nitrogen dioxide. There is a high level of uncertainty in the assessment based on the lack of local baseline data provided. Air quality generally was identified as a highly important concern by Lhtako Dené Nation, Williams Lake First Nation, Xatśūll First Nation, and the residents of Wells.
Increases in total suspended particulates, PM_{10}, and $PM_{2.5}$ Total suspended particulates, PM_{10}, and $PM_{2.5}$ concentrations are predicted to increase around the Mine Site footprint, haul roads, Bonanza Ledge, in Wells, and near the Cariboo Gold project boundary at Quesnel River Mill. Predicted cumulative (project + baseline) 24-hour total suspended solids, PM_{10} and $PM_{2.5}$ concentrations are near or exceeding the B.C. ambient air quality objectives at the Mine Site and in Wells during construction, around the Cariboo Gold project footprint including the area near the Island Mountain Portal, the Mine Site, along the haul roads, Bonanza Ledge, and in Wells during operations. Predicted $PM_{2.5}$ concentrations from Cariboo Gold would be low and below the B.C. ambient air quality objectives for all modelling scenarios but near or above	Context (resilience): Low Magnitude: High Extent: Local Duration: Medium-term Reversibility: Fully reversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: High Importance: High	**Not significant but high uncertainty** Baseline total suspended particulates, PM_{10}, and $PM_{2.5}$ concentrations have been influenced by anthropogenic sources such as wood-burning appliances, open and backyard burning, paved and unpaved road dust and combustion emission sources which are typical of communities in B.C. Baseline total suspended particulates, PM_{10}, and $PM_{2.5}$ concentrations measured in nearby Quesnel were already generally high or above current B.C. ambient air quality objectives, depending on the total suspended particulates, PM_{10}, and $PM_{2.5}$ type and averaging period. Total suspended particulates, PM_{10}, and $PM_{2.5}$ were predicted to be above the ambient air quality objectives and restricted to around the Mine Site footprint, haul roads, Bonanza Ledge waste rock storage facility, in the District of Wells, and near Cariboo Gold boundary at Quesnel River Mill. The effect along the Transportation Route would be restricted to near Highway 26 and 500 Nyland Lake Road. Total suspended particulates, PM_{10}, and $PM_{2.5}$ emissions from Cariboo Gold in the Mine Site and Quesnel River Mill area would be produced continuously for the duration of construction and operations, reduced during the closure phase, anticipated to return to baseline levels once construction and operations activities cease. Increases in total suspended particulates, $PM_{2.5}$, and PM_{10}, which were high already at baseline, would negatively affect health and community well-being (covered in more detail in the chapters on human and community health), with a disproportionate effect on residents with underlying health conditions such as asthma, the elderly or individuals who are pregnant. The likelihood and consequences were predicted to be medium and moderate, respectively, for total suspended particulates, $PM_{2.5}$, and PM_{10}, leading to a moderate risk rating. There is an overall high level of uncertainty in the assessment based on the lack of local baseline data provided. Air quality generally was identified as a highly important concern by Lhtako Dené Nation, Williams Lake First Nation, Xatśūll First Nation, and the residents of Wells.

Residual Effect	Assessment Rating*	Significance and Rationale
for some cumulative (project + baseline) scenarios.		
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.6.8 Cumulative Effects Assessment

ODV conducted a cumulative effects assessment on air quality, provided in *Chapter 7.2.2* of the Revised Application. ODV identified two existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold if air contaminants or fugitive dust from these projects disperse in a manner that affects the same locations: Bonanza Ledge Phase II Reclamation and Mosquito Creek Reclamation. ODV anticipated that air emissions from both reclamation projects would be minor, transient, temporary, and controlled using best available technology and best management practices, and would not materially affect the magnitude, extent, duration, reversibility, consequence, and risk described for Cariboo Gold. ODV determined that past, present, and reasonably foreseeable future projects and activities within the region would not overlap with air quality effects from Cariboo Gold in a way that regulatory thresholds would be exceeded.

Considering the lack of interaction with past, present, and reasonably foreseeable future projects , the mitigation proposed, and existing regulatory standards requirements regulating industrial activities, the EAO is of the view that there would not be cumulative adverse effects to air quality.

11.7 Greenhouse Gas Emissions

Each environmental assessment must consider the project's greenhouse gas (GHG) emissions and the potential effects of those emissions on the Province being able to meet its legislated emission reduction targets. The Province's *Climate Change Accountability Act* (formerly the *Greenhouse Gas Reduction Targets Act*) establishes targets for reducing provincial GHG emissions.

ODV assessed Cariboo Gold's predicted GHG emissions in *Chapter 8.0* of the Revised Application using emissions factors and methods required under the 2016 B.C. *Greenhouse Gas Industrial Reporting and Control Act*. Cariboo Gold, if approved, would generate GHGs from fossil fuel combustion associated with construction and mining activities, as well as indirectly through the use of electricity. Total direct project GHG emissions were estimated to be 54,613 tonnes (t) carbon dioxide equivalent (CO_2e) during construction and 525,688 t CO_2e cumulative total during operations. Maximum annual direct GHG emissions during operations were anticipated to be 38,880 t CO_2e /year in the first year of operations, which is greatly due to the use of diesel generators required prior to the completion of the Transmission Line connecting the Mine Site to the B.C. Hydro power grid.

Following construction of the Transmission Line by the third year of operations, the maximum annual direct GHG emissions were estimated to be 38,240 t CO_2e/year in Year 3, with average predicted annual direct GHG emissions estimated to be 32,454 t CO_2e/year between Year 2 and Year 16. Indirect GHG emissions associated with consumption of B.C. Hydro grid electricity were estimated to be an average of 5,187 t CO_2e/year during operations.

Cariboo Gold was expected to have modest effects on carbon sinks, as much of the development would occur either underground or on land previously disturbed by mining activities. Clearing at the Mine Site is expected to have minimal effect on forest carbon sinks, and no land clearing activities would be expected at the Quesnel River Mill. Further, revegetation of previously disturbed areas at the Mine Site would occur following reclamation, potentially offsetting any required clearing. Construction of the Transmission Line would require the most amount of vegetation clearing, removing up to 62,400 t of stored carbon. A return of the corridor to a net carbon sink would not be expected until the Transmission Line is decommissioned, and a full-sized forest allowed to regrow.

ODV considered mitigation measures which would reduce GHG emissions, including increasing energy efficiency, switching fuel, constructing energy-efficient buildings, and increasing renewable energy source use. Reducing GHG emissions was considered in project design, by using an ore sorter at the Mine Site to reduce the number of haul trucks to the Quesnel River Mill and the use of electricity at the Mine Site once the Transmission Line would be constructed. ODV also plans to use a fully electric road-header to develop large mine portals and declines and is actively investigating the use of other electrified underground equipment.

Under the *Climate Change Accountability Act*, the Province has committed to reducing total provincial GHG emissions to 40 percent below 2007 levels by 2030 (38,800,000 t CO_2e /year) and 60 percent below 2007 levels by 2040 (25,900,000 t CO_2e /year). Direct emissions from Cariboo Gold in 2030 were estimated to be 33,886 t CO_2e /year, which represents 0.087 percent of the 2030 target. Including both direct and indirect GHG emissions, Cariboo Gold would represent 0.102 percent of the 2030 target.

Depending on the timeline for achieving full operation of Cariboo Gold, and assuming a 16-year operating period, Cariboo Gold would potentially still be operating in 2040, at which time its direct emissions would be 0.131 percent of the 2040 target, and direct and indirect emissions would be 0.152 percent of the 2040 target. In either 2030 or 2040, these are modest emission effects at the provincial scale and should not significantly affect the ability of the Province to meet the 2030 or 2040 targets. Operations would be expected to be completed well before 2050, so Cariboo Gold would be unlikely to have an effect on the 2050 target.

11.7.1 Key Issues Raised

The following key issue was raised by the Climate Action Secretariat during Application review.

11.7.1.1 Greenhouse gas reporting

The Climate Action Secretariate under ENV noted that Cariboo Gold would likely have a total amount of attributable emissions greater than 10,000 t CO_2e/year, and therefore would be considered a reporting operation under the Greenhouse Gas Emission Reporting Regulation under the *Greenhouse Gas Industrial Reporting and Control Act*. Cariboo Gold would also likely be eligible to participate in the *CleanBC Industrial Incentive Program* and the *CleanBC Industry Fund*. The Province is currently developing its Net-zero new industry policy, which may have implications for Cariboo Gold despite its plan to cease operations prior to 2050. Further policy details will be available by early 2024.

11.7.2 The EAO's Assessment and Conclusions

Although Cariboo Gold would be unlikely to have a significant effect on the Province's ability to meet its commitments under the *Climate Change Accountability Act*, every contribution counts, and so the EAO has proposed the following Certificate condition to the Ministers if a Certificate is issued:

- Greenhouse Gas Reduction Plan – this plan would require mitigation measures and monitoring of GHG emissions from Cariboo Gold as well as a requirement to explore opportunities to reduce GHG emissions as technology is developed.

Additionally, as identified in the *Regulatory Coordination Plan*, the following management plans will be developed for Cariboo Gold as part of permitting: Fugitive Dust Control Plan and Waste (Refuse and Emissions) Management Plan.

Considering the EAO's analysis and having regard to the proposed conditions (which would become legally binding in the event that a Certificate is issued), the EAO is of the view that Cariboo Gold would not significantly affect the Province's ability to meet its commitments under the *Climate Change Accountability Act* or have a significant effect on carbon sinks in the region.

11.8 Groundwater

11.8.1 Summary

A clean and abundant groundwater system and water supply supports healthy communities, safe municipal drinking water, and ecosystems, including vegetation and wildlife habitat. Lhtako Dené Nation, Williams Lake First Nation, and Xatśūll First Nation also all identified the importance of groundwater in this role in their cultural land use studies, consultation, and engagement.

The main issue discussed was potential effects to groundwater quality and quantity that may result from Cariboo Gold. These changes may occur due to underground mine dewatering, operation of potable water supplies and changes to water quality due to water seepage from historical and Cariboo Gold mine workings. ODV predicted that Cariboo Gold could reduce the water quality of the town of Wells' drinking water supply following closure if not mitigated. ODV described mitigation measures that would reduce the potential effects to groundwater, including the commitment to develop a new drinking water supply source for the town of Wells or otherwise mitigate the movement of underground mine water following closure to maintain water quality at the drinking water source.

Key issues raised by reviewers related to the drinking water supply for the town of Wells and the proposed work camp, and changes to groundwater levels and groundwater regime due to dewatering of the mine underground shafts and tunnels (including historical features), post-closure flooding of and discharge from underground mine shafts and tunnels, and discharge of groundwater that has been in contact with mine features.

The EAO assessed the potential effects to groundwater (including changes to groundwater quantity and groundwater quality) given the proposed mitigation measures and proposed Certificate conditions that would require ODV to find and develop a new groundwater supply for the town of Wells or otherwise mitigate the movement of underground mine water following closure to maintain water quality at the drinking water source and require mitigation measures for effects to groundwater during construction. Additionally, as identified in the *Regulatory Coordination Plan*, management plans will be developed for Cariboo Gold as part of permitting, including an environmental management system, a metal leaching/acid rock drainage management plan, and a water management plan. Given the assessment, mitigation measures, and proposed conditions, the EAO found that there would not be a significant adverse effect to groundwater.

11.8.2 Assessment Boundaries

The spatial boundaries for the groundwater assessment (*Figure 12*) included a local assessment area, encompassing the Mine Site (including the watersheds of the Willow River and Slough Creek) and the Quesnel River Mill (not including West Unnamed Creek). The Mine Site groundwater regional assessment area (which is the same as the surface water local assessment area) included an 875 km^2 large drainage area of the Willow River. The Quesnel River Mill groundwater regional assessment area comprises the drainage area of the Quesnel River upstream of the confluence with Beaver Creek (a surface area of 459 km^2). The Transmission Line and the Transportation Routes were not included in the assessment of groundwater.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.8.3 Baseline Conditions by ODV

The baseline groundwater conditions in the region were assessed in *Chapter 7.5* of the Revised Application by ODV and are summarized here. The hydrogeology existing conditions were evaluated to construct conceptual-level hydrogeological models of the Mine Site and Quesnel River Mill local assessment areas and regional assessment areas. The regional groundwater system was characterized using a variety of groundwater information sources such as published reports, recent baseline field studies, and information provided by Indigenous nations and other stakeholders. ODV stated that

existing conditions within the local assessment area have been heavily modified from a long history of mining in the region; historical underground mine workings and open pits have the potential to be currently acting as hydrogeological controls, influencing groundwater levels and flows in the area.

Groundwater quantity and quality field studies were completed to inform and augment the groundwater quantity and quality existing conditions data. The program included hydraulic testing and analysis, manual and high-frequency water level measurements, and information from the *B.C. Groundwater Wells and Aquifers* database for groundwater users in the local assessment areas. A total of 112 boreholes/monitoring wells were tested, and 249 hydraulic tests were completed to determine the groundwater regime and groundwater quality and inform the mine groundwater model. Groundwater quality samples were taken on a quarterly basis from monitoring wells and groundwater seepage locations.

Mine Site

At the Mine Site, four historical mines operated intermittently between the 1930s through the 1980s, leaving over 180 km of underground workings. More recent mine workings also exist from the Bonanza Ledge Site (which started operation in 2014), which is located just four km southeast from the Cariboo Gold Mine Site Complex and is presently dewatered. Historical underground mine workings (Cariboo Gold Quartz Mine, Island Mountain Mine, Aurum Mine, and Mosquito Creek Mine) were assumed to be hydraulically connected within their individual extents. At several locations, groundwater seepage has been observed from near surface mine workings.

Diffuse seepage was also identified from the historical tailings deposit in the District of Wells, and it ultimately flows to Jack of Clubs Lake (see *Figure 12*). The historical mill tailings are composed of an up to 12 m thick deposit of processed mill tailings from the historical underground mining activity. In 2017 and 2018, samples were obtained from this seepage and submitted for laboratory analysis. The historical mill tailings showed some results above Contaminated Sites Regulation standards for metals.

Groundwater quality in the deeper Wells aquifer is typically within Contaminated Sites Regulation standards (except for total dissolved solids and arsenic), which is particularly relevant since the current town water well providing drinking water to the community is located in this deep aquifer. All 13 samples from the District of Wells monitoring well collected from 2017 to 2020 had arsenic concentrations above the Contaminated Site Regulation drinking water standard. It is not clear if the current arsenic levels in the deeper Wells aquifer are based on natural occurrence or contamination from historical underground mine workings, but it was predicted that Cariboo Gold could increase arsenic levels in this aquifer post-closure without mitigation.

The field measurements showed a relatively stable groundwater flow system with some minor year-to-year variations. The Mine Site hydrogeological conceptual model can be described as a mountain-valley hydrogeological system which has been altered by the historical and ongoing mining processes. The Jack of Clubs valley has a deep and shallow groundwater aquifer system which is separated by low permeability zones. In general, groundwater flow follows the local topography, from higher mountain areas to lower lying areas such as the valley floor and Jack of Clubs Lake. The old mine workings act as hydrogeological controls in the area, influencing groundwater flow in a generally downward gradient.

The groundwater quality assessment at the Mine Site mainly focused on seepage from mine openings which tends to have lower total dissolved solids and trace metal concentrations compared to the water quality observed in the deeper flooded workings. This seepage from shallow groundwater is probably driven by more local surface water infiltrating into the ground and therefore has lower residence time in the ground. The groundwater quality in the shallow aquifer system had the highest concentration of trace metals.

Quesnel River Mill

The Quesnel River Mill local assessment area has four historical mining pits. At the Quesnel River Mill site, groundwater seepage is captured in a system of seepage collection ponds and ditches and, when water quality allows, released to the environment, or returned to either the tailings storage facility or the main zone pit. Three of the historical underground

workings have connections to surface. These portals act to depressurize the local bedrock, even though direct connection with groundwater levels in monitoring wells has not been definitively established. A local groundwater well provides potable water for the existing Quesnel River Mill facilities and acts as a local groundwater sink.

The Quesnel River Mill site is located on a bedrock plateau with a steep downward decline towards the Quesnel River. Groundwater levels in general follow local topography and are located close to ground surface with expected shallow flow through weathered bedrock. Groundwater recharge happens in upland areas and the local groundwater shows seasonal variation. The water levels in the Quesnel River tailings storage facility drive the local groundwater regime. The recoverable seepage from the Quesnel River tailings storage facility is collected in ponds, while the non-recoverable seepage eventually reports to either Rudy Creek to the north or it flows southward to the main zone pit which acts as a local groundwater sink. Contact water collected in the Main Zone Pit outflows to a nearby creek and eventually to the Quesnel River. Based on surface water data, a groundwater plume originating from the Quesnel River tailings facility is expected in the Rudy Creek watershed, however due to the limited groundwater monitoring there the plume's physical extent and chemical characteristics are unknown. These gaps and how they may relate to groundwater mitigations are being addressed through an amendment of the *Environmental Management Act* permit.

11.8.4 Potential Project Effects by ODV

Groundwater modelling and water quality modelling studies were conducted by ODV to inform the assessment of potential effects. The majority of the area of the Mine Site Complex, Quesnel River Mill, and Bonanza Ledge Waste Rock Storage Facility are located on previously disturbed sites and thus effects were considered against the existing water quantity and quality conditions. ODV identified several potential effects, including:

Mine Site

- Change in baseflow in local streams and Jack of Clubs Lake due to mine activities: alterations of groundwater flow and levels due to underground dewatering and the water supply well in turn affecting baseflows in surface water;
- Reduction in water quality of groundwater due to contamination from contact with underground mine water;
- Reduction in water quality at District of Wells community water supply well during post-closure: once re-flooded after closure, underground mine water could mix with water in the Wells aquifer, and without mitigation, water pumped from the District of Wells community water supply well could contain up to 10 percent underground mine water; and,
- Increased surface water runoff and reduced groundwater infiltration due to project activities and post-closure surface alterations such as liners.

Quesnel River Mill

- Increased surface water runoff and reduced groundwater infiltration due to project activities and post-closure surface alterations such as liners;
- Groundwater quality changes due to tailings storage facility seepage: the predicted composition of seepage shows elevated concentrations at some locations for some constituents (sulphate, antimony, arsenic, cobalt, selenium, nickel and manganese above drinking guidelines, and concentrations of ammonia, total cyanide, copper, nitrite, and selenium above aquatic life standards) during pre-mining and operations; and,
- Converting the tailings storage facility from conventional to dry stack is expected over time (years) to drain the pore water from the facility and hence reduce seepage to the Rudy Creek drainage; while this will likely cause a small reduction in baseflow in Rudy Creek, it is also expected to improve water quality in that creek.

11.8.5 Proposed Mitigation Measures by ODV

In addition to following best management practices and B.C.'s Environmental Mitigation Policy, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Reduce the mine activity footprint and locate infrastructure on brownfield sites and implement erosion control measures;
- Locate infrastructure outside the historical mine footprint where possible on previously disturbed areas and implement erosion control measures;
- Treat pumped groundwater from the underground mine prior to discharging to the environment;
- Monitor, pump and treat seepage originating from Quesnel River Tailings Storage Facility and Filtered Stack Tailings Storage Facility interception wells to avoid exceedances of applicable guidelines and/or criteria and use liners where feasible;
- Cover and line historical and Cariboo Gold Mine waste material and treat seepage during operations;
- Maintain post-closure perimeter ditching to capture seepage and route it to the closure drainage systems;
- Remove salvageable materials, equipment, and hazardous materials during operations and at closure, following proper material handling and storage protocols;
- Cement all backfill in underground workings to reduce chemical loading;
- Search for an alternative, reliable, and safe water supply source for the town of Wells, with a backup mitigation plan in place to install a hydraulic containment and/or conduct pumping of underground mine workings water;
- Preserve groundwater infiltration through minimal vegetation clearing and placing infrastructure on previously disturbed areas; and,
- Pipe sewage to treatment systems prior to being discharged to drainage galleries and design the system according to the Municipal Waste Regulation.

It is anticipated that the use of mainly previously disturbed sites, particularly those with historical mining activities and deposits, following reclamation, would improve long-term effects on groundwater.

11.8.6 Key Issues Raised

The following key issues were raised during review of the Application by the Technical Advisory Committee, Indigenous nations, the Community Advisory Committee, and the public.

11.8.6.1 Drinking water in Wells

Northern Health, Interior Health, ENV, Lhtako Dené Nation, the District of Wells, and the public raised concerns about the existing quality of drinking water, particularly due to increased levels of arsenic and sulphate either naturally or from historical mining, in the District of Wells aquifer as well as the need for additional drinking water for the proposed work camp. Northern Health also raised concerns about potential existing or future groundwater users that do not use the existing town water supply, how the safety of the drinking water supply is communicated to them, and how the finding of the historical-mine-influenced Wells aquifer is communicated to well drillers and well pump installers who may be hired to work in the District of Wells.

The existing groundwater quality is affected by the historical tailings and waste rock that currently exist in the area of the proposed Cariboo Gold Mine Site. The responsibility of the clean-up of the historical tailings is discussed further in *Section 11.11* (Soils) of this Report.

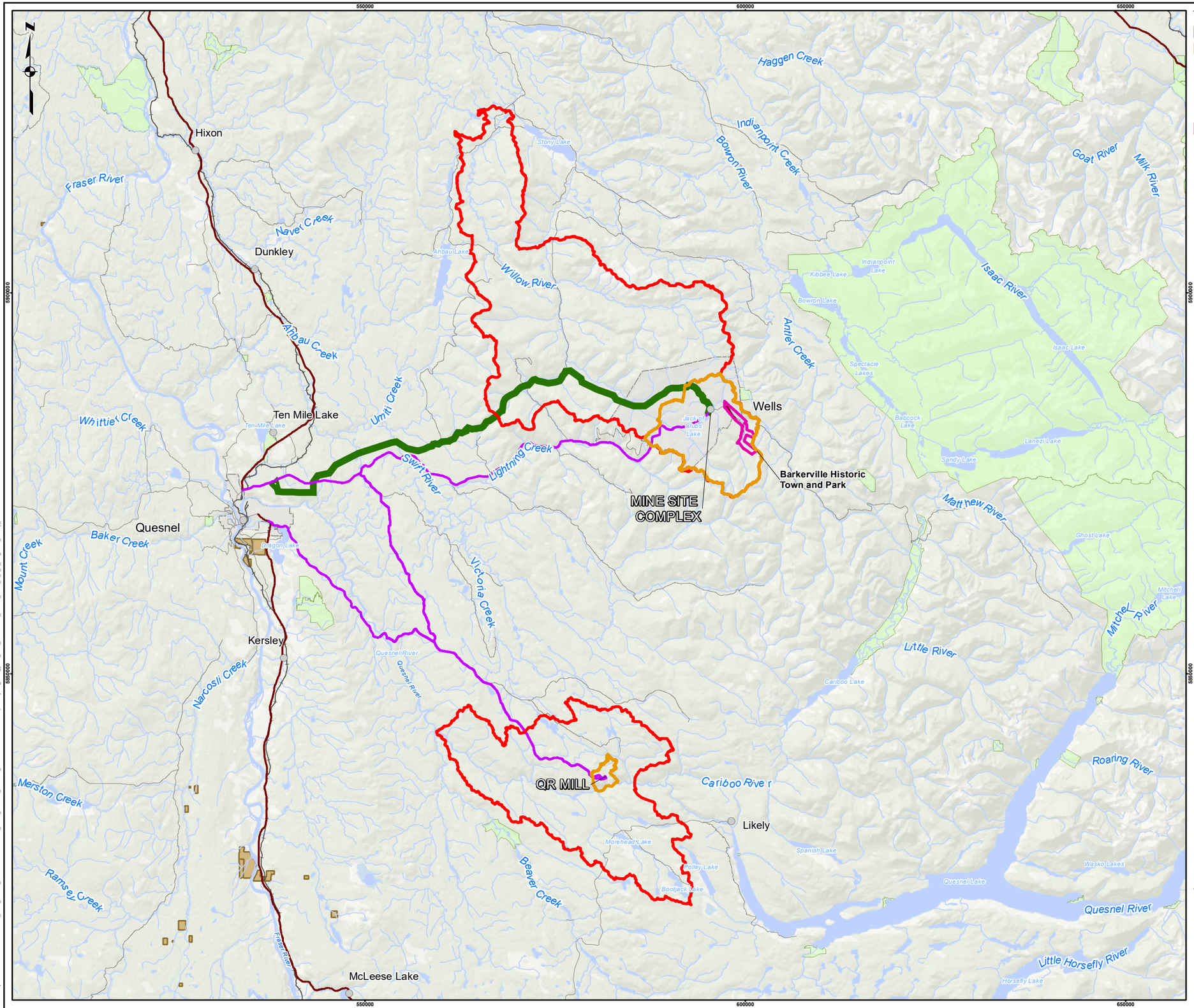
In response, ODV committed to searching for an alternative, reliable, and safe water supply source for the town of Wells, which ideally would not require extensive water treatment. If/when found, ODV would assist with the construction of the infrastructure needed for this water supply in conjunction with the District of Wells and required permits and give it to the District of Wells as a long-term, sustainable solution. If this cannot be found, ODV would be required to mitigate the movement of underground mine water following closure to maintain water quality at the drinking water source, as the community water supply is predicted to already be capturing mine influenced water from the flooded historical underground works. This commitment is captured in a proposed condition by the EAO, under the Drinking Water Plan.

The EAO also worked with the District of Wells and Northern Health to find ways to communicate the safety of the public drinking water supply to residents and potential groundwater users. The EAO proposed a Public Information condition to require ODV to provide the results of groundwater and drinking water monitoring to the public.

11.8.6.2 Changes to water quantity and quality, flows and surface-groundwater interactions

Lhtako Dené Nation, Interior Health, the MOF, and EMLI raised concerns that the new underground workings could cause changes to groundwater levels and flows due to dewatering of the mine underground shafts and tunnels (including historical features), post closure flooding of and discharge from underground mine shafts and tunnels, and the water quality and quantity following discharge of groundwater that has been in contact with mine features. There could also be changes to surface-groundwater interactions. Interior Health also was concerned about the monitoring and management of drinking water for the QR Mill based on groundwater quality interactions.

In response, ODV updated the groundwater models and provided responses to concerns, as documented in the *Issues Tracking Table*. ODV also committed that seepage quantity monitoring and additional hydraulic modelling will be provided during the permitting phase, which the EAO captured as a follow-up commitment to ENV and EMLI. Management plans, such as the Metal Leaching/Acid Rock Drainage Management Plan (which would include a requirement for seepage water quality monitoring) and a water management plan, would also be developed during the permitting phase.



LEGEND

- HYDROGEOLOGY REGIONAL ASSESSMENT AREA
- HYDROGEOLOGY LOCAL ASSESSMENT AREA
- TRANSMISSION LINE ROUTE
- TRANSPORTATION ROUTES
- TOWN
- MUNICIPALITY BOUNDARY
- BARKERVILLE HISTORIC TOWN AND PARK
- INDIAN RESERVE
- PARK/PROTECTED AREA
- WATERBODY
- WATERCOURSE
- HIGHWAY
- ROAD
- RAILWAY

REFERENCE(S)

1.WATER FEATURES, TRANSPORTATION FEATURES OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. CITIES/TOWNS, INDIAN RESERVES AND PARK/PROTECTED AREAS OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. BASE SOURCE: ESRI, GARMIN, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM Zone 10N

0 10 20
1:500,000 KILOMETERS

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

GROUNDWATER - ASSESSMENT AREAS

REV.	DESCRIPTION	DATE	INITIALS
0	FINAL - APPROVED	2021-07-15	J.L.
0	FINAL - REVIEWED	2021-07-15	D.C.
0	FINAL	2021-07-15	C.C.
A	DRAFT	2021-06-11	J.P.

PROJECT NO.	PHASE	REV.	FIGURE
1774160	41500/1506	0	**20**

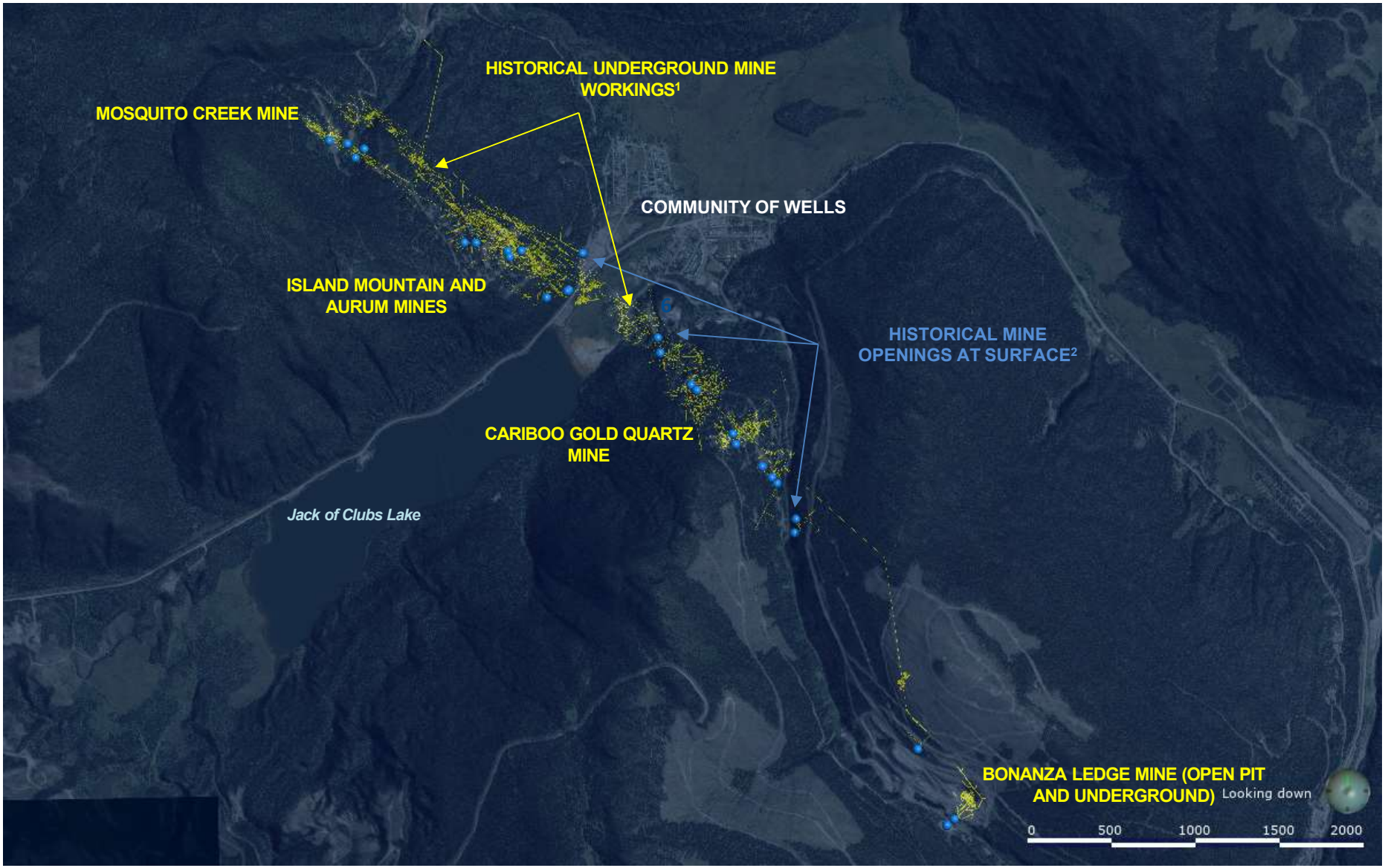
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

Y:\burnaby\CAD-GIS\Client\BGM\BGM_Cav_Mtn99_PROJECTS\1774160_BGM_Cariboo_Gold\02_PRODUCTION\MXD\Report\Hydrogeology\EA_Rev_0\1774160_41500_1506_7_5_3_Regional_Study_Areas.mxd

Figure 20: Map – Overview of Cariboo Gold Mine and Quesnel River Mill assessment areas for groundwater



[1] – Received 04-16-2020 from BGM [IM_Workings.zip]

[2] – Received 2017 from BGM [AditsShafts.zip]

BARKERVILLE GOLD MINES LTD.

CARIBOO GOLD PROJECT

OSISKO DEVELOPMENT

YYYY-MM-DD	2021-06-09
PREPARED	SR
DESIGNED	SR
REVIEWED	NGG
APPROVED	JL

HISTORICAL UNDERGROUND MINE WORKINGS IN THE MINE SITE AREA

PROJECT NO.	PHASE	REV.	FIGURE
177416001	41500/1514	0	21

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

1 in

Figure 21: Historical Underground Mine Workings in the Mine Site Area

11.8.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on groundwater quality and quantity.

The EAO's characterization of the expected residual effects of the Cariboo Gold Mine on groundwater is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding in the event that a Certificate is issued).

Table 10: Summary of Residual Effects for Groundwater

Residual Effect	Assessment Rating*	Significance and Rationale
Changes to groundwater quantity Changes in groundwater flow patterns and groundwater levels due to underground mine workings dewatering and water supply well pumping during construction and operations; changes in groundwater flow due to changes in seepage from Quesnel River Tailings Storage Facility and Filtered Stack Tailings Storage Facility; and changes in groundwater flow patterns and groundwater levels due to underground flooding and surface discharge after mine closure.	Context (resilience): High Magnitude: Low to medium Extent: Local Duration: Long-term Reversibility: Fully reversible to irreversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Low to Moderate Uncertainty: Low to moderate Importance: High	**Not significant** The baseline adequate condition of the groundwater quantity and the ability of it to recover led to this conclusion of high resilience. The magnitude for groundwater quantity effects ranges from low to high since the residual effects vary relative to existing conditions from negligible to high from effects such as reduction of discharge to creeks. Effects to groundwater quantity would be limited to where groundwater dewatering or pumping occurs, which is limited to the local assessment area. Although groundwater pumping would occur mainly during construction and operations, recovery and re-calibration of the groundwater system would continue into closure and post-closure. Effects to groundwater quantity would be expected to be fully reversible in most instances into closure/post-closure. An exception that would be irreversible is the flooding of underground mine workings causing permanent changes to the groundwater system. Disturbance to groundwater flow patterns from pit dewatering, the tailings storage facility, and other mine workings would be continuous throughout the construction, production, and post-closure phases. It was expected that effects to groundwater quantity would affect all users equally. The changes in the groundwater system would be expected to occur (medium likelihood), although the consequence would be minor (low to medium magnitude and local extent). This led to a rating of low to moderate risk. Effects of groundwater dewatering, facility construction, and potential discharges to the environment are well understood from existing mining operations and the uncertainty in the assessment is low to moderate. Groundwater resources have been identified as high importance by the participating Indigenous nations, community members, the public, local governments, and provincial agencies.
Changes to groundwater quality Changes in groundwater quality could occur due to underground mine workings dewatering and supply well pumping during construction and operations; changes in groundwater quality due to changes in seepage from Quesnel River Tailings Storage Facility and Filtered Stack Tailings Storage Facility; and changes in groundwater quality due to underground flooding	Context (resilience): Low Magnitude: Low to medium Extent: Local Duration: Long-term Reversibility: Partially reversible to irreversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Moderate to high Importance: High	**Not significant** The baseline condition of the groundwater quality is considered low due to existing drinking water that does not meet B.C. drinking water quality guidelines for arsenic and sulphate at all times. The magnitude for groundwater quality effects from Cariboo Gold ranges from low to moderate given the mitigation proposed to prevent project related effects to groundwater. Effects to groundwater quality would be restricted to where groundwater dewatering or pumping occurs, which is restricted to the local assessment area. Although groundwater pumping would occur mainly during construction and operations, recovery and re-calibration of the groundwater system would continue into closure and post-closure. Residual effects could persist into closure and post-closure. Effects to groundwater quality would be expected to be partially reversible in some instances and irreversible in the case of groundwater discharging from the flooded underground workings. Effects to groundwater quality from pit dewatering, the tailings storage facility, and other mine workings would be continuous throughout the construction, operations, and post-closure phases. It was expected that effects to groundwater quality would affect all populations equally. The changes in the groundwater system would be expected to occur (medium likelihood), and the low to moderate magnitude and

Residual Effect	Assessment Rating*	Significance and Rationale
and surface discharge after mine closure.		local extent ratings led to a consequence of moderate. This led to a rating of moderate risk. There is a moderate to high level of uncertainty in the groundwater determinations based on the data provided, the analytical techniques, and assumptions of treatment effectiveness used to support the assessment. Effects of groundwater dewatering, facility construction, and potential discharges to the environment are well understood from existing mining operations. Groundwater resources have been identified as high importance by the participating Indigenous nations, community members, the public, local governments, and provincial agencies.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.8.8 Cumulative Effects Assessment

There are two existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold groundwater – Bonanza Ledge Phase II Reclamation and Mosquito Creek Reclamation – as well as regional forestry, mineral exploration, transportation, and placer mining activities that are ongoing in the region.

ODV identified the potential residual effects on groundwater that were carried forward into the cumulative effects assessment: changes to groundwater quantity and quality at the Mine Site due to underground workings, waste rock piles and the operation of a potable water supply well, and changes to groundwater quantity and quality at the Quesnel River Mill due to construction and operation of the Filtered Stack Tailings Storage Facility. ODV indicated that the dewatering and flooding of the underground workings at Bonanza Ledge Phase II and Mosquito Creek have been factored into the groundwater predictions for Cariboo Gold as part of the modelling, and so no additional cumulative effects are predicted, and no additional mitigation measures were identified.

Past and current projects have been addressed in the existing conditions and modelling and are therefore not further considered in the cumulative effects assessment. However, there is a moderate to high level of uncertainty in the groundwater determinations including the uncertainty in the ability to differentiate between historical and future mining impacts at the Mine Site and Quesnel River Mill. The impact of historical mining operations on water quality will be further discussed through permitting processes with ENV and EMLI.

Considering the lack of substantial interaction with past, present, and reasonably foreseeable future projects, the mitigation measures, as well as further discussions on water quality through permitting processes with ENV and EMLI, the EAO is satisfied that there would be no significant cumulative adverse effects for groundwater quantity or quality.

11.9 Surface Water

11.9.1 Summary

Clean and abundantly available surface water supports aquatic life and ecosystems to survive and thrive and ensures communities who depend on this valuable resource can prosper and thrive. Lhtako Dené Nation, Williams Lake First Nation, and Xatśūll First Nation also all identified the importance of surface water in this role in their cultural land use studies and consultation and engagement.

ODV assessed the potential effects to surface water quantity and quality that may result from Cariboo Gold. These effects could include increases in erosion and sedimentation, alterations to the channel of creeks and rivers, alteration of drainage pathways and drainage areas, and reduction in stream flows due to groundwater pumping. For water quality, this could also include changes to groundwater and surface water interactions causing reductions in water and sediment quality. ODV proposed mitigation measures that would reduce the potential effects to surface water.

Key issues raised by reviewers included potential effects to water quantity due to diversion or collection of run-off and groundwater pumping, increased erosion and sedimentation, alteration of drainage pathways and drainage areas, and effects to water quality from a local and regional perspective due to changes in water composition from interaction with mine components and water treatment effluent, and changes in sediment load and composition during construction of bridges and diversion channels and during high flow conditions such as freshet. ENV noted that even after the proposed treatment, some parameters (cadmium, lead, nickel, silver, and zinc) would likely exceed B.C. water quality guidelines for the protection of aquatic life. Further assessment work would be required to determine if site-specific conditions are such that detrimental effects are likely; this detailed work will be conducted in permitting.

The EAO proposed Certificate conditions to require erosion and sediment control measures as part of the Construction Environmental Management Plan and require ODV to monitor aquatic effects through an Aquatic Effects Monitoring Plan. Additionally, as identified in the *Regulatory Coordination Plan*, management plans would be required for Cariboo Gold as part of permitting, including an environmental management system, surface erosion prevention and sediment control plan, metal leaching/acid rock drainage management plan, and a water management plan that includes monitoring and mitigation of any effluent discharged to the environment.

The EAO assessed the potential effects to surface water given the proposed mitigation measures, additional permits, and proposed Certificate conditions that would require ODV to implement mitigation measures for effects to surface water and found that there would not be a significant adverse effect to surface water.

11.9.2 Assessment Boundaries

The spatial boundaries for the surface water local assessment area included the Mine Site and Quesnel River Mill, with the footprints of the physical infrastructure of Cariboo Gold, areas that drain (via surface drainage) into the area of activity, and downstream areas with the potential to experience effects from Cariboo Gold. These were shown in *Chapter 7.4* of the Revised Application.

The regional assessment area was defined by the most downstream point at which Cariboo Gold effects could occur and was bounded by a natural transition watershed boundary. For the Mine Site, this included Slough Creek, Jack of Clubs Creek, Williams Creek, Lowhee Creek, and the Willow River watershed. For the Quesnel River Mill, this included the Rudy Creek watershed and a portion of the Quesnel River watershed. The regional assessment area encompassed the area where effects from other activities in the region combine with Cariboo Gold related effects. The Transmission Line and the Transportation Routes were not included in the regional assessment area.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.9.3 Baseline Conditions by ODV

The baseline surface water conditions in the region were assessed in *Chapter 7.4* of the Revised Application by ODV and are summarized here.

The regional surface water conditions were characterized using a variety of surface water information sources such as published reports, recent baseline field studies, and information provided by Indigenous nations. Existing conditions within the Mine Site and Quesnel River Mill local assessment areas have been heavily modified from a long history of mining in the region, with historical underground mine workings and open pits having the potential to act as drainage features, influencing groundwater levels and surface water flows. At the Mine Site, four historical mines operated intermittently between the 1930s and the 1980s, leaving over 180 km of underground workings. ODV provided information on more recent mine workings such as from the Bonanza Ledge Site (which began operating in 2015) located four km southeast of Wells. At the Quesnel River Mill, Kinross Gold opened a mine in 1995, Barkerville Gold Mines acquired the property in 2010, and ODV acquired the property in 2020.

Existing regional surface water quantity and quality reports were also reviewed by ODV. Five hydrometric monitoring stations were installed near the Mine Site and four continuous flow monitoring stations were installed near the Quesnel River Mill, and these were monitored between 2016 and 2018. The measured values at the Mine Site and Quesnel River Mill were used to characterize the existing surface water quantity conditions, including peak and low flows. Additional information relating to the characterization of existing hydrologic conditions is provided in the Revised Application Appendices *7.4-1* and *7.4-2* for the Mine Site and Quesnel River Mill, respectively.

To understand existing surface water quality baseline, 42 sampling locations were selected for either monthly, quarterly, or semi-annual sampling from 2015 to 2021 at the Mine Site in local streams and Jack of Clubs Lake. Sediment quality was measured at 32 of these locations. Around the Quesnel River Mill, seven stations were selected, and water was sampled either quarterly or semi-annually from 2015 to 2021. The baseline water and sediment quality data were compiled and summarized in the Revised Application Surface Water Quality Existing Condition Report (Appendix *7.4-3*), and the data were compared against B.C. guidelines.

Near the Mine Site in Jack of Clubs Lake, the water quality showed stratification in summer and mixing in fall and spring with a decrease in pH and increase in electric conductivity and total dissolved solids with increasing depth. In the north-east of the lake closest to the historical tailings deposit, sulphate levels were higher. Some metal values were above B.C. and Canadian guidelines as well (such as for aluminum, iron, copper, and zinc). In local creeks such as Lowhee Creek, major ion concentrations and metals tended to be higher in the headwaters than in other nearby creeks because Lowhee Creek receives mine-affected water. Some exceedances of guidelines were observed throughout the watershed, such as for aluminum and iron.

Lake **stratification** refers to the process of development of layers of water in lakes based on changes in density at different depths in the lake, based in part on varying temperature.

At the Quesnel River Mill, the surface water quality was slightly to moderately alkaline and well oxygenated. Major ions and nutrients were generally low, and high hardness was encountered in Geoff Creek, Rudy Creek, and Creek #2. The water was more alkaline in 2016 compared to 2018. Major ion concentrations were generally higher in summer and fall, and metals concentrations tended to be higher in the spring. Most water concentrations were found to be below B.C. and Canadian water quality guidelines, with some exceptions: some metals (e.g., total aluminum, total chromium, dissolved copper, total iron, total selenium), sulphate, and total ammonia.

The sediment quality data were compared against B.C. Working Sediment Quality Guidelines for the protection of freshwater aquatic life. At the Mine Site, the sediment collected from Jack of Clubs Lake consisted mostly of silt, and in creeks it was sandy. The total organic carbon was highest in creeks and decreased throughout the watershed to the output of the lake. Concentrations of metals in the lake sediment exceeded B.C. Sediment Quality Guidelines for arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc due to the historical tailings deposits. For Lowhee Creek, Emory Gulch, and Stouts Gulch, most samples had metals concentrations below guidelines, with some exceptions for arsenic, copper, iron, and nickel. From Williams Creek, samples showed exceedances for arsenic, cadmium, copper, iron, lead, nickel, silver, and zinc.

At the Quesnel River Mill, the sediment was mostly comprised of silt and sand and the sediment quality data showed higher total organic carbon and nutrient concentrations in Rudy Creek. Chromium and nickel exceeded the lower sediment quality guidelines at all stations. Other combinations of metals (e.g., arsenic, cadmium, copper, selenium) also exceeded the lower or upper sediment quality guidelines at different stations.

11.9.4 Potential Project Effects by ODV

ODV identified the following potential effects from Cariboo Gold at one or both of the Mine Site and Quesnel River Mill:

- Increased erosion and sedimentation and alterations to channel morphology of creeks and rivers, due to activities such as vegetation and land clearing, soil extraction, and road construction and upgrades;
- Alteration of drainage pathways and drainage areas, changes in surface water flow, and changes in sediment load and composition (scouring and undercutting and sedimentation processes) during construction of bridges and diversion channels;
- Reduction in stream flows due to groundwater pumping;
- Increase in surface water flows, specifically due to increased erratic surface water runoff events after storms and during snowmelt;
- Alteration to groundwater and surface water interactions in general;
- Reduction in sedimentation and surface runoff due to revegetation during reclamation and closure;
- Changes in surface water and sediment quality from construction of channels, ponds, and sumps; treated effluent discharge from Mine Site, QR Mill Site, and the Bonanza Ledge Site; seepage from bulk storage and mine waste stockpiles; breaches of ponds and dikes; and post-closure seepages from waste rock and underground workings; and,
- Increase in pH in various reaches of creeks and rivers.

These potential effects were identified to occur primarily during construction and operations when facilities are being constructed and water is diverted and pumped. During closure and post-closure, some effects to surface water quantity and quality could persist as the site is decommissioned and reclaimed and passive treatment systems are planned to take over.

11.9.5 Proposed Mitigation Measures by ODV

In addition to following best management practices and B.C.'s Environmental Mitigation Policy, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Reduce the mine activity footprint and locate infrastructure on brownfield sites and implement erosion control;
- Locate infrastructure outside the historical mine footprint on previously disturbed areas;
- Construct a water treatment plant for removal of any contaminants such as iron, arsenic, trace metals, and nitrogen and ammonium compounds at the Mine Site Complex, combined with a new water treatment plant at the Bonanza Ledge Site and use of a new water treatment plant at the Quesnel River Mill Site;
- Construct and manage contact and non-contact water, and discharge source separation systems for potentially and non-potentially acid generating sources;
- Treat groundwater pumped from underground workings to meet treatment targets before discharge to the surface water environment;
- Construct the Jack of Clubs Lake discharge diffuser;
- Remove water from existing Tailings Storage Facility at the Quesnel River Mill, treat before discharge into Rudy Creek, and use filtered stack tailings methods;
- Implement aquatic effects monitoring programs in the receiving environment to confirm the lack of adverse effects on aquatic life and to inform adaptive management;

- Cover and line historical and Cariboo Gold Mine waste material and treat seepage during operations; and,
- Implement the Construction Environmental Management Plan to minimize indirect or direct deposition of concrete, concrete fines, and/or concrete wash or contact water associated with construction activities to nearby watercourses.

ODV anticipated that following reclamation, the use of mainly previously disturbed sites, particularly those with historical mining activities and deposits, would reduce long-term effects to surface water through the reclamation of contaminated waste rock disturbed by Cariboo Gold.

11.9.6 Key Issues Raised

The following key issues were raised during review of the Application by the Technical Advisory Committee and Indigenous nations.

11.9.6.1 Effects on surface water flows

Lhtako Dené Nation indicated that ODV had not provided adequate quantitative information regarding the amount of flow reduction, or expected minimum flow needs, and lake water levels due to water withdrawal and was concerned that there would be effects on surface water flows.

ODV responded that water withdrawal volumes would be set during the permitting stage of Cariboo Gold to minimize effects to aquatic environments at the Mine Site, and that no active withdrawal of water from surface watercourses and waterbodies would occur throughout construction, operations, and closure. Drainage from areas occupied by mine facilities would be managed as contact water and ultimately returned to the environment after treatment. Groundwater extraction would occur to facilitate underground mining. Part of this water would be used in the concentrator at the Mine Site Complex, and part would be treated and discharged to the environment. The assessment of the effects on surface water quantity at the Mine Site was based on the predictions from the water balance that reflects the Mine Site water management plan and incorporates groundwater withdrawal and changes to the configuration of the catchments. At the Quesnel River Mill site, there would be no active withdrawal of water from surface watercourses and waterbodies throughout construction, operations, and closure.

As the water withdrawal limits, discharge, and other water management infrastructure will be further discussed through permitting processes and management plans with ENV and EMLI, the EAO has not proposed any Certificate conditions related to surface water quantity.

11.9.6.2 Effects on surface water quality from discharge and seepage

Concerns were raised by Lhtako Dené Nation, Williams Lake First Nation, Xatśūll First Nation, and ENV regarding potential effects on surface water quality due to proposed discharges of treated effluent into local water systems such as Jack of Clubs Lake and Lowhee Creek. Approximately 2.65 million tonnes of flotation mill tailings were deposited historically into the northeastern end of Jack of Clubs Lake near its outlet into the Willow River, filling approximately 30 ha of the original lake area. Lhtako Dené Nation asked whether the effects of these legacy tailings on the water quality of Jack of Clubs Lake and Willow River have been included in the Mine Site effects assessments. Additional discharges to Lowhee Creek, identified in the project design changes during the Effects Assessment phase, were also a concern, given the effects to

Lowhee Creek from previous mining activities at Bonanza Ledge Mine as well as the maintenance of flows in Lowhee Creek.

In response, ODV indicated that all discharges will meet regulatory requirements, and the influence of the legacy tailings on current water and sediment quality in Jack of Clubs Lake was considered in the surface water assessment, the freshwater fish assessment, and the human health and ecological risk assessment. ENV indicated that although regulatory requirements may be met, it would not necessarily meet protective thresholds in the receiving environment, presenting a risk. ENV was concerned that the current effluent discharge limits in place for the Bonanza Ledge site have not prevented the exceedance of B.C. water quality guidelines in Lowhee Creek and Stouts Gulch in recent years, and thus merit reassessment with updated water quality modeling to set limits at permitting that will achieve B.C. water quality guidelines in the receiving environment. ODV indicated that it is not authorized to discharge to Stouts Gulch and the exceedances are not from ODV's operations. The uncertainty associated with project effects could be addressed with an improved water balance and water quality model prior to the permitting stage. Further details of these would be discussed further in the review of the *Environmental Management Act* permitting process.

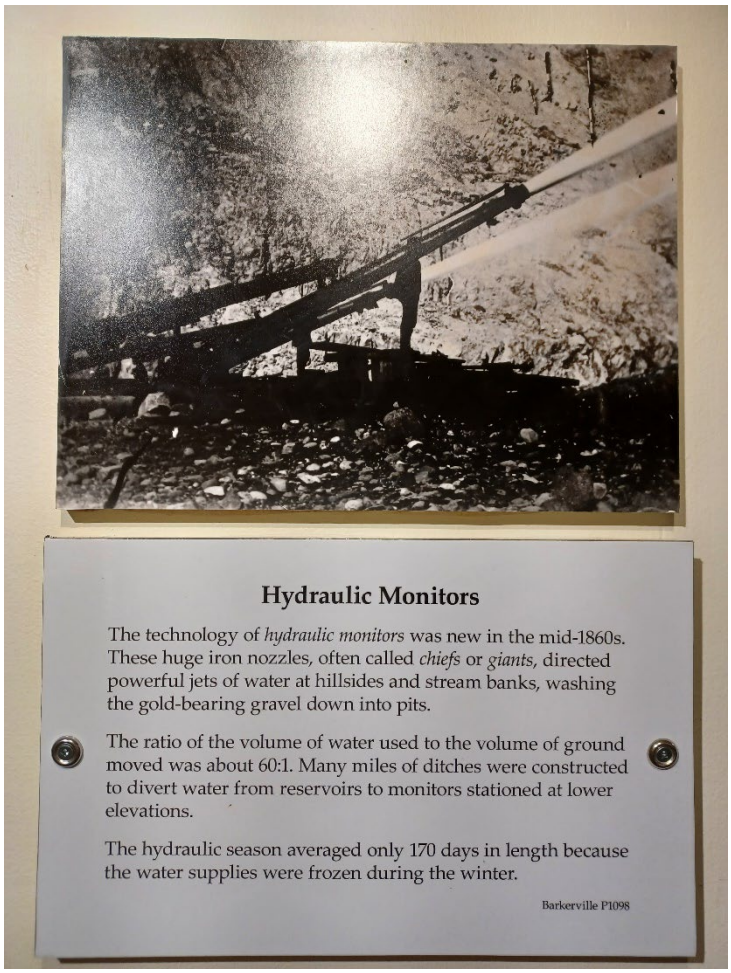


Figure 22: Example of historical mining activities in areas such as Lowhee Creek using hydraulic monitors. Photo credit: Barkerville Historic Town and Park.

Lhtako Dené Nation also expressed concern that ODV indicated that following closure of the mine, active water management activities would have ceased and shallow seepage from stockpiles would be collected by perimeter ditching and passively conveyed to the receiving environment through the closure drainage systems. Lhtako Dené Nation requested that ODV provide a monitoring and mitigation plan for leachate that could bypass the perimeter ditches.

ODV described that all proposed waste rock stockpiles and contact water ditches and channels at the Mine Site would be lined to prevent infiltration of contaminated water in the environment during operations. During closure, waste rock stockpiles would be covered to limit infiltration of precipitation water in the stockpiles (and thus ultimately limit seepage out of the piles) and prevent leaching of contaminants through surface runoff and the runoff collected by perimeter ditches in the closure and post-closure phases. Given that the waste rock stockpiles would be lined and covered at closure, negligible seepage out of the piles was expected. Any potential consequences of seepage will be included in the monitoring and mitigation plan, which will be developed during permitting with EMLI and ENV.

The EAO has proposed Certificate conditions requiring ODV to manage sediment and erosion through the Construction Environmental Management Plan and requiring ODV to monitor aquatic effects through an Aquatic Effects Monitoring Plan. Water quality of effluent, discharge limits, and other aspects of water quality will be further discussed through permitting processes with ENV and EMLI.

11.9.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that the Cariboo Gold Mine would result in residual adverse effects on surface water.

The EAO's characterization of the expected residual effects of Cariboo Gold on surface water is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 11: Summary of Residual Effects for Surface Water

Residual Effect	Assessment Rating*	Significance and Rationale
Changes to surface water quantity This effect would include changes in surface water quantity, including from alteration to drainage pathways and drainage areas.	Context (resilience): High Magnitude: Low to high Extent: Local Duration: Long-term Reversibility: Fully reversible to irreversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low to moderate Importance: High	**Not significant** The adequate baseline condition of surface water quantity and the ability to recover led to this conclusion of high resilience. The magnitude of effects to surface water quantity ranges from low to high since the residual effects vary relative to existing conditions and vary in reduction/increase of discharge to creeks. Effects to surface water quantity would be limited locally to smaller reaches of the watershed system. Surface water quantity changes would occur mainly during construction and operations phases. Effects to surface water quantity were expected to be fully reversible in most instances into closure/post-closure, except for the flooding of underground mine workings causing potentially permanent (irreversible) changes to the drainage of the receiving surface water system. Disturbance of surface water flow from diversion and effluent streams would be continuous throughout the construction, operations, and closure phases. It was expected that effects to surface water quantity would affect all populations similarly. The changes in surface water systems have a high likelihood to occur, although the relative amount is local in extent with variable magnitude and thus the consequence would be moderate. This led to a rating of moderate risk. Effects of surface water flow alterations due to facility construction and other activities and potential discharges to the environment are well understood from existing mining operations and the uncertainty in the assessment is low to moderate. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the water sources in their traditional land use studies as highly important in this region, in particular how water supports life in general.
Changes to surface water quality This effect would include changes in surface water quality due to changes in seepage from Quesnel River Tailings Storage Facility, Filtered Stack Tailings Storage Facility, and discharge from waste rock piles, drainage, and effluent from the Quesnel River Tailings Storage Facility, and flooded underground workings.	Context (resilience): Moderate Magnitude: Low to high Extent: Local Duration: Long-term Reversibility: Partially reversible to irreversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Moderate to high Importance: High	**Not significant** The baseline condition of the surface water quality and the as of yet relatively unknown effectiveness of mitigation measures and ability to recover led to this conclusion of moderate resilience to recover. The magnitude for effects to surface water quality ranges from low to high as predicted by modelling provided in the Application. Water quality guideline exceedances occurred in Lowhee Creek during the abnormally high flow event during freshet in 2023. Effects to surface water quality would be limited locally to smaller reaches of the watershed system, including Jack of Clubs Lake. Surface water quality changes would persist into closure and post-closure. Effects to surface water quality were expected to be partially reversible in some instances and irreversible for water discharging from (inadvertently leaking) stockpiles and mine-affected water. Effects to surface water quality from effluent streams would be continuous throughout the construction, operations, and post-closure phases. It was expected that effects to surface water quality would affect all populations similarly. The changes in surface water systems were expected to have a high likelihood to occur, although the relative amount is local in extent and low to medium in magnitude, thus the consequence would be moderate. This led to an overall rating of moderate risk. There is a moderate to high level of uncertainty in the surface water determinations based on the data provided, the analytical techniques, and assumptions of treatment effectiveness used to support the assessment. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the water sources

Residual Effect	Assessment Rating*	Significance and Rationale
		in their traditional land use studies as highly important in this region, in particular how water supports life in general.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.9.8 Cumulative Effects Assessment

There are two existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold surface water: Bonanza Ledge Phase II Reclamation and Mosquito Creek Reclamation. There are also historical mining operations, regional forestry, mineral exploration, transportation, and placer mining activities that are ongoing in the region.

ODV identified the potential residual effects on surface water that were carried forward into the cumulative effects assessment: changes to water quantity and quality; however, ODV did not identify any effects that would act cumulatively with the effects in the same watersheds as Cariboo Gold.

Past and current projects have been addressed in the existing conditions and modelling and are therefore not further considered in the cumulative effects assessment. There is a moderate to high level of uncertainty in the surface water determinations including the uncertainty in the ability to differentiate between historical and future mining impacts at the Mine Site and Quesnel River Mill, as well as the local area being highly mineralized, leading to high levels of some constituents at baseline. The impact of historical mining operations on water quality will be further discussed through permitting processes with ENV and EMLI.

Considering the lack of substantial interaction with present and reasonably foreseeable future projects, the existing historical impacts of mining, as well as further discussions on water quality through permitting processes with ENV and EMLI, the EAO is satisfied that although there are existing effects on surface water from contamination, Cariboo Gold would not contribute to significant cumulative adverse effects for surface water.

11.10 Freshwater Fish and Habitat

11.10.1 Summary

A healthy and thriving fish population is an important part of the ecosystem and supports the health of communities and local wildlife. Lhtako Dené Nation, Williams Lake First Nation, and Xatśūll First Nation all identified the importance of healthy fish populations for their consumption and cultural well being.

The potential effects identified by ODV included adverse effects to fish, fish habitat, and aquatic resources (such as the benthic invertebrate community and periphyton) that may result from Cariboo Gold. These changes could occur as a result of project related activities, such as powerline construction, and in-stream works, such as bridge construction or repair as well as from changes to water and sediment quality from Cariboo Gold. ODV described mitigation measures that would reduce the potential effects.

Key issues raised by reviewers related to the potential for land and water management activities to affect water quality and fish habitat, general effects of historical and new mining activities on fish distribution and abundance, and fish consumption and harvest by Indigenous people.

The EAO assessed the potential for effects to freshwater fish and found that there could potentially be an increase in selenium in fish tissue that may present a risk to fish health but would not be a significant adverse effect to freshwater fish.

11.10.2 Assessment Boundaries

The spatial boundaries for the freshwater fish assessment were the same as the surface and ground water assessments and included a local assessment area which encompassed the Mine Site (including the watersheds of the Willow River and Slough Creek), Quesnel River Mill (including Rudy Creek of Maud Creek watershed and tributaries south of the Quesnel River Mill), 100 m upstream and 500 m downstream of the Transmission Line water crossings, and 50 m upstream and downstream from upgraded access roads. The Mine Site regional assessment area (which was the same as the surface water regional assessment area) included the Willow River watershed upstream of the confluence with Stephanie Creek. The Quesnel River Mill regional assessment area (which was the same as the surface water regional assessment area) included Maud Creek watershed and its confluence to the Quesnel River and the Quesnel River upstream from its confluence with Beaver Creek. The regional assessment area also included a one km area upstream and downstream of the Transmission Line.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.10.3 Baseline Conditions by ODV

The baseline freshwater fish conditions in the region were assessed in *Chapter 7.9* of the Revised Application by ODV and are summarized here.

The description of existing conditions of freshwater fish and fish habitat in the region was based on a variety of information sources such as published reports, recent baseline field studies, and information provided by Indigenous nations. Freshwater fish-related Indigenous and local knowledge was acquired and considered by ODV, especially regarding species of Indigenous cultural use and value. It is known that Jack of Clubs Lake and other local lakes were an important food source for Indigenous people in the area, especially for salmonids. The Fraser River salmon river run remains important; however, more recent concerns over water quality remain with regard to harvesting and consuming fish.

Freshwater fish field surveys were conducted in the local and regional assessment areas in the fall of 2016, in the spring, summer, and fall of 2018, and in the spring of 2019. Around the Transmission Line, fish surveys were conducted in the summer of 2020 and the summer of 2021. Additional surveys were added as mine plans changed, and some were specifically designed to address data gaps on fish presence or absence and fish species distribution. Surveys carried out included spawning surveys, reconnaissance (presence/absence), Resources Information Standards Committee site cards, fish community, fish habitat assessment procedures, and end of fish use (which studies when a stream site goes from fish-bearing to non-fish-bearing). Fish habitat assessments were carried out based on historical data and survey data to determine habitat suitability, productive capacity, areal density of fish, biomass estimate and rationale for fish-bearing status. Habitats were designated as either critical, important, or marginal suitability. Fish tissue was analyzed and compared against guidelines for aquatic health.

Watershed fish-bearing reaches and their habitat ratings were summarized and 'excellent' spawning habitat was identified in two watersheds (the Willow River watershed and Williams Creek watershed – see Figure 20) in a total of three reaches. Rainbow Trout (*Oncorhynchus mykiss*), Longnose Sucker (*Catostomus catostomus*), White Sucker (*Catostomus commersonii*), and Lake Chub (*Couesius plumbeus*) were observed spawning in the Willow River and Williams Creek. The majority of reaches (25) were considered marginal, with poor spawning habitat. Two sites were considered to have no migration habitat but were considered fish-bearing because the locations have perched culverts that, if rectified, could provide fish habitat. Overwintering habitat was found in three watersheds in a total of ten reaches. There were 14 reaches that were too shallow, lacked flow, or had no pools that would allow overwintering. A more detailed description of fish habitat and spawning can be found in *Chapter 7.9* of the Revised Application.

Fish species near the Mine Site included the following salmonid species: Rainbow Trout, Bull Trout (*Salvelinus confluentus*), Mountain Whitefish (*Prosopium williansoni*), Lake Trout (*Salvelinus namaycush*), and Pygmy Whitefish (*Prosopium coulteri*). Three sucker species were also present: Largescale Sucker (*Catostomus macrocheilus*), Longnose Sucker, and White Sucker. Other fish captured are Slimy Sculpin (*Cottus cognatus*), Burbot (*Lota lota*), Lake Chub, Longnose Dace (*Rhinichthys cataractae*), and Redside Shiner (*Richardsonius balteatus*).

At the Quesnel River Mill site, Chinook Salmon (*Oncorhynchus tshawytscha*) were present in the lower reaches of Maud Creek. Velocity barriers and steep gradients in Maud Creek prevented upstream migration. The Quesnel River Watershed is one of the main producers of Sockeye Salmon (*Oncorhynchus nerka*) in the Fraser River system and supports large runs of Sockeye Salmon as well as Chinook Salmon and Coho Salmon (*Oncorhynchus kisutch*), as well as Rainbow Trout and Dolly Varden (*Salvelinus malma*). A velocity barrier located outside the City of Quesnel is a barrier to Pink Salmon (*Oncorhynchus gorbuscha*). During the 2019 surveys, fish were identified in the project area in Rudy Creek, and Maud Creek, which are tributaries of the Quesnel River, and Sandy Lake. The most common fish species captured was Rainbow Trout in both Rudy Creek and Maud Creek. Only Lake Chub was captured in Sandy Lake. Along the Transmission Line, there were 19 watercourse crossings identified with confirmed fish presence. The most common fish species in these crossings were Rainbow Trout, Bull Trout, Slimy Sculpin, Longnose Sucker, and Redside Shiner.

Baseline benthic aquatic resources were assessed in the watersheds of Jack of Clubs Creek, Jack of Clubs Lake, Lowhee Creek, Stouts Gulch, Williams Creek, Willow River, and Quesnel River. The dietary water quality guideline for selenium was exceeded in benthic invertebrate tissues from the middle and south end of the Jack of Clubs Lake. The phytoplankton and zooplankton communities were assessed in Jack of Clubs Lake, Unnamed Lake, and Sandy Lake.

11.10.4 Potential Project Effects by ODV

ODV assessed potential effects to freshwater fish and its subcomponents (fish, fish habitat, and aquatic resources) by project phase and related activities, including:

- Direct mortality to fish;
- In-stream habitat and riparian habitat loss or alteration;
- Reduction to surface water quality resulting in effects on fish, fish habitat, and aquatic resources; and,
- Change to surface water quantity resulting in effects to fish and fish habitat.

At the Mine Site, in-stream works could cause direct mortality to fish, eggs, benthic invertebrates, or larvae. No in-stream fish habitat loss or habitat loss to benthic invertebrates was anticipated since construction of the mine would occur on an existing disturbed area. Some machine operations near streams could cause some habitat loss due to bank erosion and increased sedimentation into watercourses. Surface flows could be affected by in-stream works, effluent discharge to Jack of Clubs Lake and Lowhee Creek, and dewatering of underground mine works. These changes in flows could reduce pools that fish use for overwintering and alter sediment loads in spawning and rearing habitat. The increase in workforce during the various mine phases could also increase recreational fishing, which may affect fish populations.

At the Quesnel River Mill, there were no anticipated changes that would cause fish mortality; however, an increase in work camp population could increase the pressure from recreational fishing. Since there were no watercourses identified within the footprint and no construction of water works are planned, no fish habitat loss or impacts to benthic invertebrates was expected. Aquatic resources may be affected, however, due to water quality changes since treated effluent is planned to be released into Rudy Creek. An increase in flow was expected in Rudy Creek when the existing Tailing Storage Facility is dewatered, and the treated effluent is discharged into Rudy Creek.

Although there are no new roads proposed along the Transmission Line corridor, some roads may need upgrading and require in-stream work. No loss to fish habitat or aquatic resources was anticipated since infrastructure would be placed outside riverbeds and existing road infrastructure would be used. Some riparian habitat clearing would be required for the

Transmission Line installation, potentially causing a change in cover, food production and shade. During Transmission Line construction, there is the potential for mobilization of fine materials which could affect water quality and thus aquatic resources and fish habitat through increased suspended sediment and deposition. Changes in water temperature could occur through changes to riparian vegetation, and water quantity is not expected to be affected by Transmission Line construction.

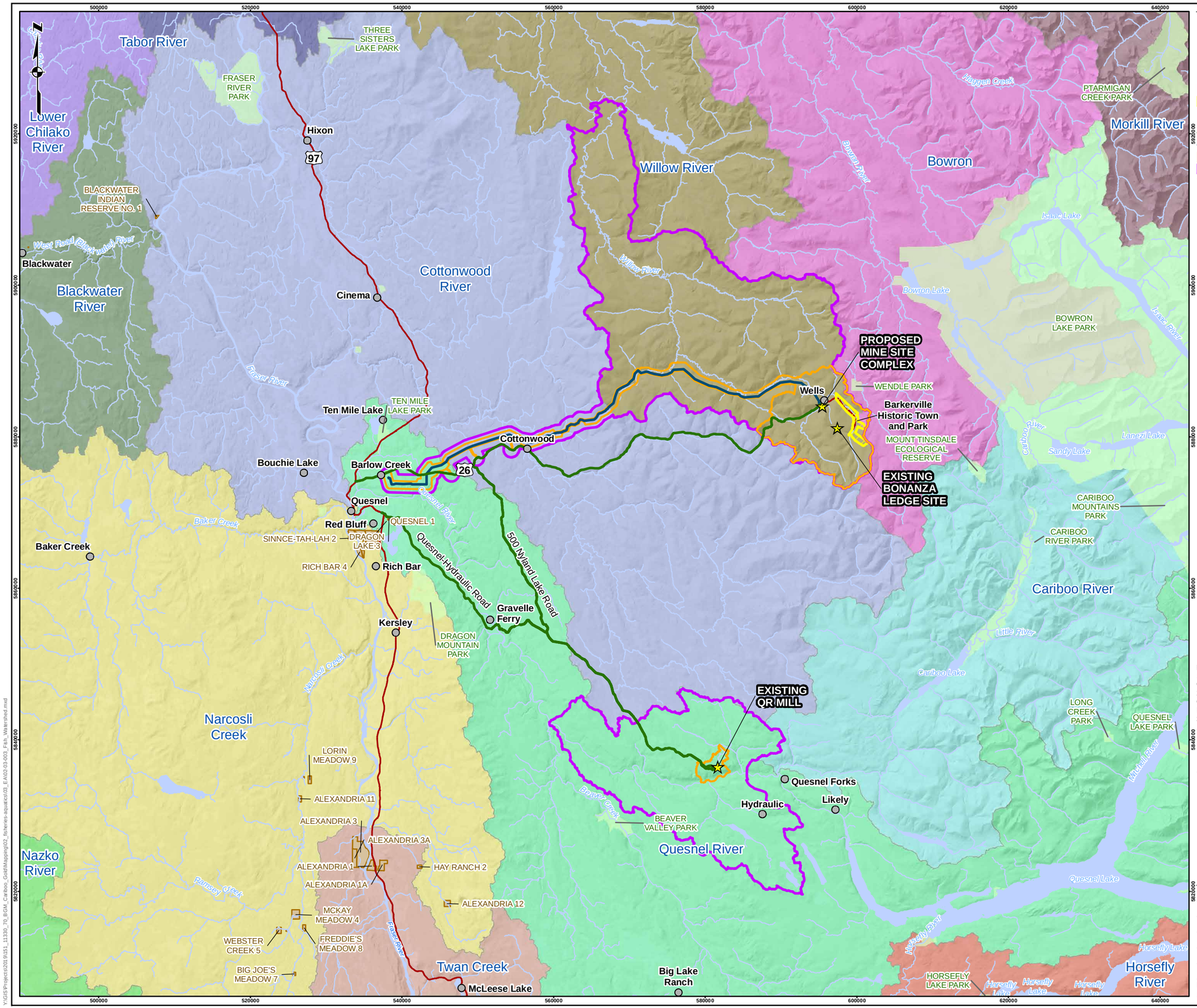
The potential effects to freshwater fish, fish habitat, and aquatic resources were identified to occur primarily during construction and operations, when mine project related construction activities and treated effluent discharge could potentially affect watercourses. During closure and post-closure, freshwater fish, fish habitat, and aquatic resources could be affected by decommissioning of some project-related infrastructure. Following reclamation, ODV anticipated that the use of mainly previously disturbed sites, particularly those with historical mining activities and deposits, would reduce long term effects to freshwater fish.

11.10.5 Proposed Mitigation Measures by ODV

In addition to following best management practices and B.C.'s Environmental Mitigation Policy, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Conduct in-stream work during applicable timing windows to protect fish;
- Conduct in-stream work in the dry or during low flows to reduce risk to fish or fish habitat;
- Retain a qualified environmental professional to conduct a fish salvage, if needed;
- Maintain water flows in Lowhee Creek by discharging water through a water treatment plant at the Bonanza Ledge Site;
- Manage riparian areas according to recommended management and buffer zone setbacks and work practices;
- Avoid going through watercourses, including wetlands, with heavy equipment without regulatory agency approval;
- Restrict debris entering the high-water mark without regulatory agency approval;
- Store chemicals, fuel, and equipment away from watercourses;
- Control sediment erosion at culverts projects and maintain fish passage;
- Prohibit recreational fishing for all employees and contractors on site;
- Aquatic effects monitoring programs will be conducted in the receiving environment to confirm the lack of adverse effects on aquatic life and to inform adaptive management;
- Prohibit use of off-road recreational vehicles at project sites; and,
- Deter access once roads are no longer in use.

As identified in the *Regulatory Coordination Plan*, the following management plans related to freshwater fish would also be developed for Cariboo Gold as part of permitting: fuel management and spill contingency plan, surface erosion prevention and sediment control plan, construction environmental management plan, water management plan, and a discharge management plan.

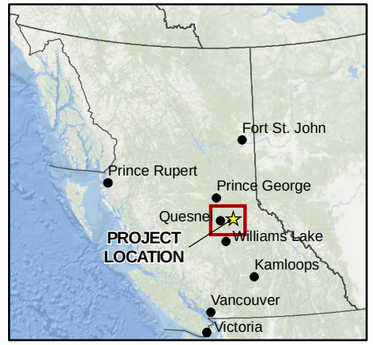


LEGEND

- POPULATED COMMUNITY
- HIGHWAY
- ROAD
- WATERCOURSE
- WATERBODY
- FIRST NATION RESERVE
- BARKERVILLE HISTORIC TOWN AND PARK
- PROPOSED PROJECT INFRASTRUCTURE LOCATION
- PROPOSED TRANSPORTATION ROUTE
- PROPOSED TRANSMISSION LINE ROUTE
- FRESHWATER FISH LOCAL ASSESSMENT AREA
- FRESHWATER FISH REGIONAL ASSESSMENT AREA

WATERSHED GROUPS

- BLACKWATER RIVER
- BOWRON
- CARIBOO RIVER
- COTTONWOOD RIVER
- HORSEFLY RIVER
- LOWER CHILAKO RIVER
- MORKILL RIVER
- NARCOSLI CREEK
- NAZKO RIVER
- QUESNEL RIVER
- TABOR RIVER
- TWAN CREEK
- WILLOW RIVER



REFERENCE(S)

1.WATER FEATURES, TRANSPORTATION FEATURES OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. CITIES/TOWNS, INDIAN RESERVES, FEDERAL LANDS AND PARK/PROTECTED AREAS OBTAINED FROM BC MINISTRY OF FORESTS, LANDS NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM Zone 10N

0 10 20 30
1:500,000 KILOMETRES

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

SPATIAL BOUNDARIES AND WATERSHEDS FOR FISH ASSESSMENTS

REV.	DESCRIPTION	DATE	INITIALS
A		2021-07-08	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	23

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Y:\GIS\Projects\2021\151_11330_70_BGM_Cariboo_Gold\Mapping\02_fisheries-aquatics\03_EA\02-03-003_Fish_Watershed.mxd

Figure 23: Map – Spatial boundaries and watersheds for freshwater fish and surface water assessments

11.10.6 Key Issues Raised

The following key issues were raised during review of the Application by the Technical Advisory Committee and Indigenous nations.

11.10.6.1 Changes to Surface Water Quality

Lhtako Dené Nation, Xatśūll First Nation, Williams Lake First Nation, ENV, Interior Health, the MOF, and EMLI raised concerns regarding the potential for project-related land and water management activities to affect water quality and fish habitat, including land based and in-stream activities such as clearing, regrading, and construction of bridges, the Transmission Line, and other in-stream works. Concerns regarding the effects of effluent affecting fish, particularly through selenium bioaccumulation, was noted.

In response, ODV indicated that additional clarification will be provided during permitting and upon receipt of data from supplementary studies regarding the Transmission Line alignment. The EAO has recorded this as a follow-up commitment, which will be communicated to EMLI, ENV, and the Ministry of Land, Water, and Resource Stewardship (WLRS) for their permitting processes.

Interior Health and Northern Health raised concerns regarding the likelihood that the local streams within the regional assessment area could be contaminated (for example, by the historical tailings area via groundwater). This was also a focus of discussion with the MOF's Contaminated Sites Group and Northern Health and is discussed in more detail *Sections 11.11* (Soils) and *11.24* (Human Health). Water management and effects to water quality are discussed in more detail in *Sections 11.9* (Surface Water) and *11.8* (Groundwater).

In response, ODV indicated that the likelihood of changes to water quality are high; however, the risk and consequence are low since the cause-effect relationship is well understood and sufficient data are available to support the assessment. ENV requested that ODV provide a better understanding of selenium bioaccumulation in Jack of Clubs Lake at permitting under the *Environmental Management Act* to better understand whether the predicted increases in aqueous selenium concentrations will lead to effects to fish or their consumers.

11.10.6.2 Fish Distribution in the Environment

MOF, Xatśūll First Nation, and Williams Lake First Nation raised concerns regarding the general and cumulative effects of historical and new mining activities on fish distribution and abundance, especially along the Transmission Line. Xatśūll First Nation and Williams Lake First Nation requested additional fish distribution and abundance surveys to compare existing and future conditions. Lhtako Dené Nation remained concerned that fish habitat in connecting waters may be disturbed.

In response to these concerns, ODV described that the level of sampling was determined by the low risk or limited disturbance of the Transmission Line to fish and fish habitat. The EAO has forwarded the request for additional fish and aquatic monitoring during permitting in the watercourses along the Transmission Line route to ENV, EMLI and MOF.

11.10.7 The EAO's Assessment of Residual Effects

After considering the proposed mitigation measures and conditions, the EAO concludes that Cariboo Gold would result in residual adverse effects on freshwater fish.

The EAO's characterization of the expected residual effects of Cariboo Gold on freshwater fish is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding in the event that a Certificate is issued).

Table 12: Summary of Residual Effects for Freshwater Fish

Residual Effect	Assessment Rating*	Significance and Rationale
Effects on fish	Context (resilience): Moderate	Not significant

Residual Effect	Assessment Rating*	Significance and Rationale
At the Mine Site, in-stream works could cause direct mortality to fish, eggs, or larvae. Additionally, recreational fishing pressure may increase at this site. At the Quesnel River Mill, there were no anticipated changes that would cause fish mortality; however, an increase in camp population could increase the pressure from recreational fishing.	Magnitude: Medium Extent: Regional Duration: Short-term Reversibility: Fully reversible Frequency: Once or irregular Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	The baseline condition of fish in the local assessment area has been influenced by historical contamination from mining activities and other anthropogenic disturbances. The relatively unknown ability to recover from additional anthropogenic and natural disturbances led to this conclusion of moderate resilience. The magnitude of residual effects for fish population changes would be medium, especially if mitigation measures are not implemented adequately. Effects on fish would extend further downstream from where project activities are carried out, but within the regional assessment area. For effects on fish, the duration would be temporary such as through offsetting established prior to disturbance of fish habitat or temporary water diversion activities. Effects to fish would be reversible if stream restoration takes place successfully and subsequent re-populating programs are executed successfully. Effects would occur once or several times due to activities such as in-stream works or other mine activities. Effects on fish would be disproportionately experienced by Indigenous nation members who rely on fish as a food source. The effects on fish are expected to occur with a medium likelihood, although the relative amount is regional and the magnitude is medium, thus the consequence would be moderate. This led to a rating of moderate risk. Effects during facility construction, in-stream works, and potential discharges to the environment are well understood from existing mining operations, and thus the uncertainty in the assessment is low. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the fish in their traditional land use studies as highly important in this region, related to traditional uses.
Effects on fish habitat This effect includes the loss or alteration of riparian habitat along watercourses throughout Cariboo Gold area, and the changes in watercourses and loss of fish habitat for functions such as protection, spawning, and rearing. Some machine operations near streams at the Mine Site could cause some habitat loss due to bank erosion and increased sedimentation into watercourses.	Context (resilience): Moderate Magnitude: Low to medium Extent: Regional Duration: Long-term Reversibility: Fully reversible to irreversible Frequency: Once or irregular Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	**Not significant** The baseline condition of fish habitat in the local assessment area has been influenced by historical contamination from mining activities and other anthropogenic disturbances. The relatively unknown ability to recover from additional anthropogenic and natural disturbances led to this conclusion of moderate resilience. The magnitude for riparian habitat loss is low to medium since the residual effects are very localized. Effects on fish habitat would extend further downstream from where project activities are carried out, but within the regional assessment area. Some effects to fish habitat would be reversible if stream restoration takes place and is successful. Effects would occur once or several times due to activities such as in-stream works or other mine activities. Effects on fish habitat would likely be experienced evenly across human populations. The effects on fish habitat are expected to occur with a medium likelihood, although the relative amount is regional and the magnitude is low to medium, thus the consequence would be moderate. This led to a rating of moderate risk. Effects during facility construction, in-stream works, and potential discharges to the environment are well understood from existing mining operations and the uncertainty in the assessment is low. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the fish in their traditional land use studies as highly important in this region, related to traditional uses.
Effects on aquatic resources This effect includes the changes in water quality causing a decrease in aquatic resources and fish population health. Surface flows could be affected by in-	Context (resilience): Moderate Magnitude: Medium Extent: Regional Duration: Long-term Reversibility: Fully reversible Frequency: Continuous	**Not significant** The baseline condition of aquatic resources in the local assessment area has been influenced by historical contamination from mining activities and other anthropogenic disturbances. The relatively unknown ability to recover led to this conclusion of moderate resilience. The magnitude of residual effects on aquatic resources changes would potentially be medium. Effects on aquatic resources would extend further downstream from where project activities are carried out, but within the regional assessment area. For effects on aquatic resources, the duration would be temporary such as through temporary water diversion activities and long-term due to long-term effects on water quality throughout the life of Cariboo Gold. Effects to

Residual Effect	Assessment Rating*	Significance and Rationale
stream works, effluent discharge to Jack of Clubs Lake, Lowhee Creek, and Rudy Creek, and dewatering of underground mine works.	Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low to moderate Importance: High	aquatic resources would be reversible if stream restoration takes place and is executed successfully. Effects would occur once or several times due to activities such as in-stream works or other mine activities. Effects on aquatic resources would likely be experienced evenly across human populations. The effects on aquatic resources are expected to occur with a medium likelihood, although the relative amount is regional and the magnitude is medium, thus the consequence would be moderate. This led to a rating of moderate risk. Effects during facility construction, in-stream works, and discharges to the environment are well understood from existing mining operations and the uncertainty in the assessment is low to moderate. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the aquatic ecosystems in their traditional land use studies as highly important in this region, in particular how water supports life in general, and the traditional uses.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.10.8 Cumulative Effects Assessment

Past and current projects have been addressed in the existing conditions and modelling and are therefore not further considered in the cumulative effects assessment. The cumulative effects assessment is based on the regional assessment area. There are two existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with the freshwater fish in the region – Bonanza Ledge Phase II Reclamation and Mosquito Creek Reclamation – as well as regional forestry, mineral exploration, transportation, and placer mining activities that are ongoing in the region.

ODV identified the potential residual effects on freshwater fish that were carried forward into the cumulative effects assessment: effects on fish habitat from riparian habitat loss or alteration along the Transmission Line, and effects on freshwater fish habitat due to changes in surface water quantity at the Mine Site and Quesnel River Mill. ODV's cumulative effects assessment concluded that when taking mitigation measures into account, no residual cumulative effects were identified.

The baseline condition of aquatic resources in the local assessment area has been influenced by historical contamination from mining activities and other anthropogenic disturbances. Considering the connection to historical mining activities, present and reasonably foreseeable future projects, the EAO notes that Cariboo Gold would not contribute significantly to existing cumulative adverse effects for freshwater fish.

11.11 Soils

11.11.1 Summary

Healthy soils support healthy ecosystems, including vegetation and wildlife habitat. Lhtako Dené Nation, Williams Lake First Nation, and Xatśūll First Nation all identified the importance of soils in this role in their traditional land use studies.

ODV assessed the potential effects to soil, including decreases in soil quality, soil quantity and terrain stability, and described mitigation measures that would reduce the potential effects to soils. The main issue discussed during review of the Application was the historical contaminated area near the proposed Mine Site area from previous mining activity. This issue has been the subject of many discussions between Northern Health, EMLI, and MOF's Crown Contaminated Sites Program. In addition, the Construction Environmental Management Plan, a Certificate condition proposed by the EAO, would require mitigation measures related to soil erosion and sedimentation and a second proposed condition would require ODV to describe any actions it will take towards remediation of the contaminated area through an End Land Use Plan.

Given the assessment, mitigation measures, proposed conditions, and additional management plans required through permitting, the EAO found that there would not be a significant adverse or cumulative effect to soils.

11.11.2 Assessment Boundaries

The spatial boundaries for the soils assessment included a local assessment area which encompassed the Mine Site, Quesnel River Mill, and Transmission Line (plus a 1 km buffer) and the Transportation Routes (plus a 500 m buffer). The regional assessment area included a 10 km buffer around all project components.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.11.3 Baseline Conditions by ODV

The baseline soil conditions in the region were assessed in *Chapter 7.6* of the Revised Application by ODV and are summarized here.

The region was characterized as having a variety of soil types with anthropogenic deposits including talus and processed deposits from historical placer mining. Historical tailings and waste rock generated from the former Island Mountain and Cariboo Gold Quartz Mines are located within the proposed Mine Site. The majority of Cariboo Gold's footprint is located on previously disturbed sites.

ODV conducted soil mapping within the local assessment area and rated the suitability of the soils for use in reclamation as well as terrain stability. The majority of the soil mapped was identified as stable and having poor surface reclamation suitability (primarily due to pH and high coarse fragment content) but good to fair subsurface reclamation suitability.

11.11.4 Potential Project Effects Identified by ODV

In the Application, ODV identified the following potential effects due to Cariboo Gold:

- Loss of ecologically viable soil quantity: a total of 14.9 ha of ecologically viable soil is anticipated to be disturbed, with 2.1 ha at the Mite Site lost, which supports vegetation and ecosystems;
- A total of 99,313 m^3 of topsoil and 83,623 m^3 of subsoil will require salvage, not including previously disturbed soils or mine wastes, which are not included in the totals;
- Change in soil quality parameters: alteration is anticipated to include soil compaction and rutting, dust accumulation, mixing or blending of soils, soil contamination, soil acidification and eutrophication (excessive richness of nutrients), and the creation of anoxic (depletion of oxygen) conditions which can decrease the ability of this soil to support vegetation and ecosystems; and,
- Change in terrain stability: including changes to slope, draining, and hydrology and can increase safety risks and alter habitat for vegetation and wildlife.

These effects were predicted to occur primarily during construction, when land clearing and site preparation occur, with some site preparation and movement of soil stockpiles continuing during operations. Closure and post-closure could include some effects to soils as buildings are dismantled and the site decommissioned and reclaimed.

The majority of the Mine Site (including the Bonanza Ledge Site and Waste Rock Storage Facility) and Quesnel River Mill would be located on previously disturbed sites and thus effects were considered to be less than activities that occur on undisturbed sites. The Transmission Line would be constructed on existing forest roads and clearings to the extent possible.

11.11.5 Proposed Mitigation Measures by ODV

In addition to following best management practices and B.C.'s Environmental Mitigation Policy, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Salvage and stockpile separately mineral topsoil, subsoil, and organic materials;
- Soil stockpiles to be stabilized and re-vegetated to prevent erosion from wind and water;
- No traffic on un-salvaged areas during operations;
- Assessment and remediation of any spills or releases to be implemented immediately;
- Blasting and crushing to occur underground in Phase 2 of operations;
- A dust suppression system on the crusher to be used to reduce fugitive dust emissions; and,
- Risks of changes to terrain stability, including explosions, landslides, water surges, pit-wall failures, and avalanches will be evaluated throughout the life of Cariboo Gold.

As identified in the *Regulatory Coordination Plan*, the following management plans will be developed for Cariboo Gold as part of permitting: soil management plan (covering soil stripping, handling, stockpiling, and management of stockpiled soils); reclamation and closure plan (incorporating soil handling, stockpiling and reuse); surface erosion prevention and sediment control plan; and waste (refuse and emissions) management plan, including a fugitive dust control plan.

Following reclamation, ODV anticipated that the use of the previously disturbed sites as proposed, particularly those with historical mining activities and deposits, would improve soil quality compared to baseline.

11.11.6 Key Issues Raised during Application Review

The following key issue was raised by the Technical Advisory Committee and Indigenous nations.

11.11.6.1 Historical contamination and reclamation of brownfield sites

Historical tailings and waste rock generated from the former Island Mountain and Cariboo Gold Quartz Mines (in operation from 1933 to 1967) are located within the proposed Mine Site Complex area, which is within the District of Wells and on the shoreline of Jack of Clubs Lake. These tailings include high levels of arsenic, cobalt, cadmium, and lead in the soils/sediment and arsenic, cobalt, iron, nickel, and sulphate in groundwater.

ENV investigated the Wells tailings site in the late 1980s and early 1990s with a focus on residential properties and the town baseball diamond. Remediation at the time included capping in place or excavating the contaminated surface soils and relocating these soil to the tailings beach area and backfilling with clean soil. The Cariboo Union Board of Health conducted two community surveys in Wells, to assess the extent of human exposure to lead and arsenic, reporting findings to the community in 1993.

In 2008, the CCSP prioritized the vacant Crown land site for further investigation. A preliminary human health risk assessment in 2011 identified that certain areas of the site may be associated with potential unacceptable health risks and recommended additional human health risk assessment work. Where this investigation indicated potential human health risks, seven caution signs were installed in 2012. Observed and reported evidence of human activities within the contaminated tailings areas was the basis for installing the caution signs. By 2022, two of these signs had been taken down. At the request of Northern Health in June 2023, the caution signs were replaced with larger signs with updated text and installed at three additional locations: the District of Wells' tourist pullout, at the pathway entering Williams Meadow and Creek walking trails, and an additional tailings shore area sign.

CCSP retained SLR Consulting Ltd. in 2021 to evaluate potential issues with implementing remediation, potential solutions, and additional work needed to advance remedial planning. In August 2022, at the request of Northern Health, the scope of the data gap assessment was expanded to have this review include the findings of the human health risk assessment that was included in ODV's initial environmental assessment Application (which did not include an assessment of arsenic and similar metals), and this review was provided to Northern Health. Based on available health risk documentation and evidence of site usage and exposure potential, Northern Health deemed the site a health hazard in December 2023 under the *Public Health Act*. Northern Health's Chief Medical Health Officer then began to work with CCSP to better understand and manage the health risks at the site, recommending improved access control, risk communication, monitoring, and assessment. In June 2023, Northern Health also issued a *health hazard advisory* for Jack of Clubs Lake tailings and the Visitor Centre shorelines, advising the public to avoid contact with sandy areas and sediment in wading areas along the impacted shorelines.

CCSP has initiated a detailed site investigation, background assessments, and a drinking water standards applicability study. These will inform a detailed human health and ecological risk assessment which, in turn, will inform remedial options and solutions. SLR Consulting Ltd. is also currently working on a risk communication plan to increase awareness about the contamination at the site and potential associated risks.

Discussions during this environmental assessment process included which parties would be responsible for different aspects of clean-up of the historical contamination, how this would be required (such as through permits or agreements), and if ODV would be involved in any future research projects. An agreement was developed through the "*Memorandum of Understanding between the Province, Barkerville Gold Mines Ltd. and Osisko Development Corp*., regarding exposed tailings adjacent to Jack of Clubs Lake" (signed July 11, 2022). The EAO has created a *table* outlining the roles of various parties in the management of contaminated sites. ODV has also committed to collaborating with the Province on the remediation effort, and if Cariboo Gold proceeds, contributing to the physical remediation efforts as well. One factor in ODV's decision to propose the Mine Site Complex so close to Wells was to locate it within the historical waste rock area, which would require ODV to remove the contaminated waste rock through construction where excavation is required for Cariboo Gold and assist with the clean-up effort. The effects of this contamination, and if Cariboo Gold may change groundwater flows, also became a subject of discussion. This is discussed further in *Sections 11.8* (Groundwater), *11.9* (Surface Water), and *11.24* (Human Health).

The EAO has included a proposed a Certificate condition requiring ODV to describe any actions that ODV will contribute to the remediation efforts in an End Land Use Plan. With the work of the Crown Contaminated Sites Program, EMLI, Northern Health, and ENV, and the participation of ODV in the remediation effort, the EAO anticipates the groundwater supply and awareness of the health hazards of the site to be overall improved for the District of Wells through the development of Cariboo Gold.

11.11.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on soils.

The EAO has proposed two Certificate conditions related to soils: the Construction Environmental Management Plan, which would require mitigation measures related to soil erosion and sedimentation during construction and ODV must describe any actions related to remediation of the contaminated area through the End Land Use Plan.

The EAO's characterization of the expected residual effects of Cariboo Gold on soils is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 13: Summary of Residual Effects for Soils

Residual Effect	Assessment Rating*	Significance and Rationale
Loss of soil quantity A total of 12.4 ha of ecologically viable soil is anticipated to be disturbed, with 2.1 ha at the Mine Site lost, which supports vegetation and ecosystems. Most of the Cariboo Gold footprint is previously disturbed.	Context (resilience): High Magnitude: Low Extent: Limited Duration: Long-term Reversibility: Fully reversible Frequency: Irregular Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Low Importance: Moderate	**Not significant** The baseline condition of soil quantity and the ability to recover as well as adapt to erosional forces led to this conclusion of high resilience. A small amount (2.1 ha) of soil loss is expected but given the previously-disturbed state of most of the Cariboo Gold footprint, the magnitude is expected to be low. Effects to soil quantity would be limited to where soil disturbance occurs, which is limited to the Cariboo Gold footprint. Although soil disturbance would occur mainly during construction and operations, recovery and reclamation of soil quantity would continue into closure and post-closure. Effects to soil quantity are expected to be fully reversible following reclamation. Soil removal and disturbance would primarily occur during construction, with some continuing into operations, closure, and post-closure, although it would occur irregularly. It is expected that effects to soil quantity would affect all populations similarly. The loss and disturbance of soil is expected to occur (high likelihood), although the amount is small and restricted to the Cariboo Gold footprint, thus the consequence would be minor. This led to an overall risk rating of low. Effects to the loss of soil quantity are well understood from existing mining operations and the uncertainty in the assessment is low. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the loss of soils in their traditional land use studies as moderately important in this region.
Loss of soil quality Alteration is anticipated to include soil compaction and rutting, dust accumulation, admixing, soil contamination, soil acidification and eutrophication, and the creation of anoxic conditions which can decrease the ability of this soil to support vegetation and ecosystems.	Context (resilience): Low Magnitude: Low Extent: Limited Duration: Long-term Reversibility: Fully reversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Low Importance: Moderate	**Not significant** At baseline, there are concerns regarding soil quality due to historical contamination, leading to a low rating for resilience. It is not expected that changes to soil quality will occur unless additional remediation occurs of the contaminated area, leading to a low magnitude of effect predicted. Effects to soil quality would be restricted to where soil disturbance occurs within the Cariboo Gold footprint. Although soil disturbance would occur mainly during construction and operations, recovery and reclamation of soil quality would continue into closure and post-closure. Effects to soil quality are expected to be fully reversible following reclamation. The potential for changes to soil quality due to dust accumulation and compaction would occur continuously throughout operations. It is expected that effects to soil quality would affect all populations similarly. The loss and disturbance of soil is expected to occur (high likelihood), although the amount is limited and thus the consequence would be minor (low magnitude and limited extent). This led to an overall risk rating of low. Effects of soil compaction and dust accumulation to soil quality are well understood from existing mining operations and the uncertainty in the assessment is low. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the loss of soils in their traditional land use studies as moderately important in this region, in particular how soil contamination may affect vegetation and wildlife.
Loss of terrain stability This effect includes changes to slope, draining, and hydrology and can increase safety risks and alter habitat for vegetation and wildlife.	Context (resilience): High Magnitude: Low Extent: Limited Duration: Long-term Reversibility: Fully reversible Frequency: Irregular Affected Populations: Even	**Not significant** The baseline condition of the terrain stability was assessed as stable and the ability to adapt to erosional forces led to this conclusion of high resilience. Terrain stability is predicted to remain consistent with baseline conditions with mitigation measures, leading to a low magnitude effect. Effects to terrain stability would be limited to where soil disturbance occurs within the Cariboo Gold footprint. Although soil disturbance would occur mainly during construction and operations, recovery and reclamation of terrain would continue into closure and post-closure. Effects to terrain stability are expected to be fully reversible following reclamation. Soil removal and disturbance would primarily occur during construction, with some continuing into operations, closure, and post-closure, although it would occur irregularly. It is expected that effects to soils would affect all populations similarly. The loss and disturbance of soil is

Residual Effect	Assessment Rating*	Significance and Rationale
	Risk (likelihood and consequences): Low Uncertainty: Low Importance: Moderate	expected to occur (high likelihood), although the amount is limited and thus the consequence would be minor (low magnitude and limited extent). This led to an overall low risk rating. Effects of changes to terrain stability are well understood from existing mining operations and the uncertainty in the assessment is low. Terrain stability was identified by the Community Advisory Committee as moderately important to the safety of the town of Wells.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.11.8 Cumulative Effects Assessment

There are three existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold: Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, and a telecommunications facility in Wells. Historical mining operations, regional forestry, mineral exploration, transportation, and placer mining activities are also ongoing in the region.

ODV identified the potential residual effects on soils that were carried forward into the cumulative effects assessment: direct loss of soil quantity, change to soil quality through compaction and dust accumulation, and change in terrain stability. The potential cumulative effects identified by ODV included an additional 2.1 ha of new surface disturbance (with potential soil loss), whereas the remaining effects occur on previously disturbed sites. Overall, Cariboo Gold's contribution to cumulative effects to loss of soil quantity or quality following the mitigation measures were characterized by ODV as low to medium, limited to the Cariboo Gold footprint and reversible. ODV determined that past, present, and reasonably foreseeable future projects and activities in the region would not overlap with Cariboo Gold-related changes in soils in a way that the regulatory thresholds would be exceeded.

Considering the lack of substantial interaction with past, present, and reasonably foreseeable future projects , the mitigation proposed, bylaws and existing regulatory standards requirements regulating industrial activities, as well as the agreement between ODV, EMLI, and the MOF's Contaminated Sites Group, the EAO is of the view that there is currently a significant effect of contaminated soils due to the historical tailings; given the agreement of ODV to work with EMLI, Northern Health, and the MOF's Contaminated Sites Group on the remediation of this site, the EAO is satisfied that Cariboo Gold would not contribute to additional cumulative adverse effects for soils and may provide a positive benefit to the contribution to remediation.

11.12 Vegetation and Plant Communities

11.12.1 Summary

Plant species, including provincially or federally listed plant species, plant communities and wetlands are important to the function of natural ecosystems. They also provide habitat for wildlife, maintain biodiversity, and support human activities, such as traditional uses and recreational activities. Lhtako Dené Nation, Williams Lake First Nation, and Xatśūll First Nation all identified the importance of vegetation in this role in their traditional land use studies.

ODV assessed the potential effects to vegetation, including changes to plant species diversity, plant community diversity, and wetland area and function, and described mitigation measures that would reduce the potential effects to vegetation.

The following key issues were identified by reviewers of the vegetation assessment:

- Increased disturbance to vegetation communities due to location of the Transmission Line north of Highway 26;
- Whitebark pine surveys required prior to construction in Cariboo Gold footprint;
- Clear direction needed for vegetation management during maintenance of the Transmission Line;

- Identification of goals of reclamation of vegetation and ecosystems needed;
- Wetland functional assessments needed prior to construction to understand existing wetland functions; and,
- Protection of Lhtako Dené berry picking sites near 500 Nyland Lake Rd.

To address the potential effects on vegetation, the EAO has proposed the following conditions:

- Construction Environmental Management Plan – this plan would require mitigation measures to reduce the spread of invasive plants for all project components and areas of disturbance;
- End Land Use Plan – this plan would require ODV to identify the habitats and ecosystems planned for restoration following post-closure and reclamation (note that reclamation would be covered primarily under a *Mines Act* permit);
- Environmental Effects Management Plan – this plan would require mitigation measures to reduce effects on vegetation and require pre-construction whitebark pine surveys; and,
- Air Quality Management Plan – this plan would require mitigation measures to reduce dust on vegetation.

The effects on vegetation from Cariboo Gold were anticipated by ODV to overlap cumulatively with other past, present, and reasonably foreseeable future projects and activities within the regional assessment area, in particular forestry. The potential for cumulative effects from these projects and activities is considered moderate in consideration of extensive past, current, and planned activities such as forestry. However, Cariboo Gold is not anticipated to contribute cumulatively with other activities to the effects on vegetation in the region.

Given the assessment, mitigation measures, and proposed conditions, the EAO found that there would not be a significant adverse or cumulative effect to vegetation.

11.12.2 Assessment Boundaries

The spatial boundaries for the vegetation assessment included a local assessment area which encompassed the Mine Site, Quesnel River Mill, and Transmission Line (plus a 1 km buffer) and the Transportation Routes (plus a 500 m buffer). The regional assessment area included a 10 km buffer around all project components.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.12.3 Baseline Conditions by ODV

The baseline vegetation conditions in the region were assessed in *Chapter 7.7* of the Revised Application by ODV and are summarized here.

Cariboo Gold would be located in the Fraser Plateau (characterized by low-lying areas such as wetlands, lakes, and streams with additional moisture from being in low mountain ranges, and Douglas-fir forests being common) and Columbia Highlands (characterized by intense precipitation during fall to early spring, and sub-boreal spruce forests and Engelmann spruce forests being common) ecoregions. The region has seen much anthropogenic disturbance from mining and forestry; for example, since 1956, 24 percent of the local assessment area and 31 percent of the regional assessment area has been previously logged. Numerous wildfires have also been documented in the regional assessment area between 1922 and 2018.

ODV's technical team conducted vegetation mapping across the regional assessment area to map, describe and classify ecosystems, ecological communities at risk, wetlands, old-growth forests, riparian ecosystems, plant species at risk, traditional use plants, and invasive and non-native plant species. The following information was provided:

- Provincially or federally listed plants and lichens and traditionally used plants:
    - Twenty-five occurrences of two plant species at risk (blue-listed at the provincial level) were identified, with 22 located in the local assessment area,
    - One whitebark pine (*Pinus albicaulis*) proposed critical habitat polygon intersects with the local assessment area near the Mine Site, and there are no historical records of whitebark pine in the regional assessment area. Whitebark pine is blue-listed in B.C. and is listed as endangered on Schedule I of the federal *Species at Risk Act*,
    - A total of 119 traditional use plant species were identified as potentially occurring in the regional assessment area, and,
    - Two culturally-modified trees were identified in the regional assessment area, with one located close to the Cariboo Gold footprint;
- Habitat for provincially or federally listed plants and lichens, provincially listed ecological communities and traditionally used plant communities:
    - In the regional assessment area, 87,622.2 ha (29 percent) consists of provincially-listed ecological communities (primarily Douglas-fir - interior spruce/falsebox and Douglas-fir – interior spruce/thimbleberry ecosystems),
    - Three mature birch tree stands were identified in the local assessment area near the Quesnel River Mill, outside the Cariboo Gold footprint,
    - Lhtako Dené Nation identified twenty-three plant and berry harvesting sites in the region, with one noted along the 500 Nyland Road,
    - Xatśūll First Nation identified five vegetation collection sites in the region – the locations of these were not described in terms of distance to project infrastructure,
    - Williams Lake First Nation identified four vegetation collection sites in the region – the locations of these were not described in terms of distance to project infrastructure,
    - Intermediate forests are the most common ecosystem group, occupying 19,063.6 ha (53.5 percent) of the local assessment area and 171,733.3 ha (57.0 percent) of the regional assessment area. Wet forests account for the second-highest proportion at 6,328.9 ha (17.8 percent) of the local assessment area and 57,313.2 ha (19.0 percent) of the regional assessment area,
    - Old forests (over 80 years old) cover 2,867.0 ha (8.0 percent) of the local assessment area and 11,289.9 ha (3.7 percent) of the regional assessment area. Old Growth Management Areas cover 3,693.5 ha (10.4 percent) of the local assessment area and 35,833.9 ha (11.9 percent) of the regional assessment area,
    - Approximately 470 ha (1.3 percent) within the local assessment area and 6,193 ha (2.1 percent) within the regional assessment area have been designated as wildlife tree retention areas, and,
    - Riparian communities constitute 39 ecosystem units and are uncommon in the region. These communities occupy 642.1 ha (1.8 percent) of the local assessment area and 15722.6 ha (5.2 percent) of the regional assessment area;
- Thirty-five invasive and non-native plant species were documented in the local assessment area; and,

- Wetlands occupied 2,104.7 ha (5.9 percent) of the local assessment area and 13,416.0 ha (4.5 percent) of the regional assessment area. Hybrid white spruce/horsetails swamp was the most common wetland type, occupying 664.2 ha (1.9 percent) of the local assessment area and 3,585.9 ha (1.2 percent) of the regional assessment area.

Due to climate change, the region is predicted to be warmer and wetter, with mean annual temperatures rising by five degrees from historical averages and precipitation increasing by 113 mm, although summers are predicted to be drier. The drier summer will likely result in an increase in the number and severity of wildfires, and a decrease in the ice and snow cover in winter. This may lead to the loss of forest habitats and wetlands, and a change in the hydrology of the region, and an overall change in forest composition.

11.12.4 Potential Project Effects by ODV

ODV identified the following potential effects on vegetation due to Cariboo Gold:

- Loss of occurrences of provincially or federally listed plants and lichens, and traditionally used plants through vegetation removal;
- Introduction and/or spread of invasive and non-native plant species;
- Loss or alteration of habitat for provincially or federally listed plants and lichens, provincially listed ecological communities and traditionally used plants due to vegetation removal, dust deposition, edge effects and fragmentation, and alteration of hydrological connectivity;
- Loss or alteration of wetland distribution and function due to surficial disturbances (e.g., soil stripping, soil compaction and/or rutting, vegetation removal), alteration of hydrological connectivity, dust effects, and introduction and/or spread of invasive and non-native plant species; and,
- Loss or alteration of ecosystem function due to surficial disturbances, edge effects and fragmentation, alteration of hydrological connectivity, dust effects, and introduction and/or spread of invasive and non-native plant species.

The majority of the Mine Site (including the Bonanza Ledge Site Waste Rock Storage Facility) and Quesnel River Mill are located on previously disturbed sites and thus effects were considered to be less than activities that occur on undisturbed sites. The Transmission Line is proposed to be constructed on existing forest roads and clearings where possible.

These effects would occur primarily during construction, when land clearing and site preparation occur, with some site preparation and movement of soil stockpiles continuing during operations. During operations, dust generated from the use of haul roads could also affect plant communities.

Closure and post-closure could include some minor and temporary effects to vegetation from the effects of dust, erosion, or spread of non-native/invasive species from the movement of machinery. Progressive reclamation is planned to occur throughout these phases though, leading to the restoration of disturbed plant communities.

11.12.5 Proposed Mitigation Measures by ODV

In addition to following best management practices and B.C.'s Environmental Mitigation Policy, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Reduce the amount of vegetation clearing to the smallest area possible and avoid unnecessary vegetation clearing, using previously disturbed sites to the extent possible;

- Maintain well-marked restriction zones and/or buffers around provincially and federally listed plant and lichen habitats and provincially listed ecosystems, as well as communicate to all personnel the requirements to limit disturbance to these areas;
- Develop additional mitigation measures where listed plant populations are identified in the vegetation clearing areas (e.g., Transmission Line access route), as part of Cariboo Gold-specific vegetation management plan and may include collection and transplant of the affected population;
- Clean all vehicles and equipment arriving at or traveling between project locations to remove vegetation or other organic debris;
- Undertake re-vegetation using plant materials suitable for the local region and during the appropriate growing season and conditions;
- Implement and maintain appropriate setback and buffer distances from wetland features;
- Install erosion and sediment control measures immediately during construction; and,
- Seed and establish vegetation cover on soil stockpiles to exclude weed establishment.

11.12.6 Key Issues Raised

The following key issues were raised during review of the Application by the Technical Advisory Committee and participating Indigenous nations.

11.12.6.1 Means to reduce effects associated with the location of Transmission Line route

MOF raised concerns regarding the location of the Transmission Line north of Highway 26 when there is an existing Transmission Line along the highway. Using this new route increases effects on vegetation and ecosystems and overlaps Old Growth Management Areas (approximately 5 ha). ODV conducted an analysis to consider all of the factors in choosing a Transmission Line route, including environmental, economic, and technical considerations[16], and the chosen route was chosen to take advantage of as much existing infrastructure and disturbance (such as forestry roads) as possible as well as respond to concerns regarding the location of burial sites identified by Lhtako Dené Nation. The EAO has proposed a Certificate condition that would require ODV to implement the proposed mitigation measures related to old growth forests in the Environmental Effects Management Plan.

11.12.6.2 Need for completion of Whitebark pine pre-construction surveys

The EAO identified that whitebark pine surveys in all areas of the Cariboo Gold footprint had not been completed at the time of the Application. ODV described that the target whitebark pine survey conducted in 2020 followed provincial standards and was conducted in an area that represents the closest whitebark pine suitable habitat. ODV has also committed to conducting additional pre-construction surveys for whitebark pine in the mapped whitebark pine proposed critical habitat polygon, within the Cariboo Gold footprint. The EAO added this commitment to the proposed condition Environmental Effects Management Plan.

11.12.6.3 Implementation of vegetation management during maintenance of Transmission Line

Xatśūll First Nation and Williams Lake First Nation identified that clear directions to contractors working during operations need to be provided to ensure that shrubs and herbaceous species are maintained along the Transmission Line to break up sight-lines for wolves and other predators. ODV agreed that these mitigation measures should be included in a

[16] See *ODV Technical Memo 5*

management plan. The EAO added these commitments to the proposed condition requiring an Environmental Effects Management Plan.

11.12.6.4 Measurements to ensure end land use goals and reclamation are achieved

Lhtako Dené Nation and MOF raised concerns that the assessment endpoints for effects on vegetation, including how it will be known if these communities have recovered following reclamation, were not clearly identified in the Application.

ODV provided additional detail around monitoring requirements and performance standards that will inform both the monitoring through the Environmental Effects Management Plan and the End Land Use Plan (both proposed Certificate conditions by the EAO). ODV identified that the primary targeted end land use for Cariboo Gold's reclaimable land are forest ecosystems, representative of pre-mined ecosystems, that support wildlife including southern mountain caribou. Secondary target end land uses, where appropriate, will also include Indigenous nations current and traditional use, hunting, trapping, commercial forestry, outdoor recreation, and future industrial activity. One of the reclamation goals is to re-establish pre-disturbance ecological communities capable of supporting traditional use plants.

11.12.6.5 Adequacy of wetland functional assessments

Lhtako Dené Nation and MOF identified that wetland functional assessments were not conducted as part of the development of the Application, which would make it difficult to understand what the effects of Cariboo Gold were on wetland function without baseline information. ODV committed to determining the requirement for wetland functional assessments as part of the permitting phase and engaging with Indigenous nations and regulators to make the determination. This commitment was captured by the EAO as a potential condition within the Environmental Effects Management Plan.

11.12.6.6 Protection of berry picking sites

Lhtako Dené Nation raised a concern regarding the protection of berry picking sites along 500 Nyland Lake Forest Service Road. ODV responded that it understands the importance of continued access along the 500 Nyland Lake Forest Service Road to Lhtako Dené Nation, and that the 500 Nyland Lake Forest Service Road is part of the Transportation Route and feasible alternatives to this route are not available. ODV committed that there would be no reduction in public access to this area from Cariboo Gold operations. ODV will also implement dust control mitigation measures along this road as required.

The EAO included this concern in the Environmental Effects Management Plan, which would require ODV to include mitigation measures for these sites.

11.12.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on vegetation.

As identified in the *Regulatory Coordination Plan*, the following management plans will be developed for Cariboo Gold as part of permitting: invasive plant management plan; reclamation and closure plan; vegetation management plan, including strategies for mitigating effects to rare plants; and a waste (refuse and emissions) management plan, including a fugitive dust control plan.

The EAO's characterization of the expected residual effects of Cariboo Gold on vegetation is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding in the event that a Certificate is issued).

Table 14: Summary of Residual Effects for Vegetation

Residual Effect	Assessment Rating*	Significance and Rationale
Loss of plant species of interest Vegetation removal would primarily occur along the Transmission Line, with one provincially listed plant population (Heller's notchwort) proposed for removal within the Cariboo Gold footprint. Reclamation following mine closure is intended to recover and reduce the loss of plant species.	Context (resilience): High Magnitude: Low Extent: Limited Duration: Long-term Reversibility: Partially reversible Frequency: Once and continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Low Uncertainty: Moderate Importance: High	**Not significant** Vegetation in the region consists mainly of previously disturbed ecosystems and intermediate forests and the resilience of vegetation in this region was considered high. Only one provincially-listed plant population is proposed for removal, leading to a low magnitude effect. Effects to plant species would be restricted to where vegetation disturbance occurs, the Cariboo Gold footprint. Although vegetation disturbance would occur mainly during construction and operations, re-establishment of pre-disturbance habitats to support listed plant species and traditionally used plants would take decades beyond reclamation. Recovery of existing plant species of interest was considered partially reversible because following reclamation, plant species will be re-established although for some species, this may not be successful. Vegetation removal would primarily once occur during construction. Dust accumulation on vegetation and edge effects would also occur continuously during operations. Effects on traditional use plants where dust may accumulate would be disproportionately experienced by Indigenous nation members. The loss and disturbance of vegetation was expected to occur (high likelihood), although the consequence would be minor (low magnitude and limited extent). This led to an overall low risk rating for changes to plant species of interest. There was a low level of uncertainty in the vegetation assessment based on the data provided and the well-understood relationship of plant species and disturbance, although edge effects, changes to hydrology, and where dust would accumulate introduces additional uncertainty. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the loss of traditional use plants in their traditional land use studies as highly important in this region, in particular how dust accumulation would affect traditional use sites.
Loss of plant communities of interest Vegetation removal would primarily occur along the Transmission Line. Because the Cariboo Gold footprint included a 50 m buffer to account for edge effects and other disturbance, it was expected to include effects to nearby plant communities. Reclamation following mine closure is intended to recover and reduce the loss of plant communities.	Context (resilience): High Magnitude: Low Extent: Limited Duration: Long-term Reversibility: Partially reversible Frequency: Once and continuous Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Moderate Importance: High	**Not significant** Vegetation in the region consists mainly of previously disturbed ecosystems and intermediate forests and the resilience of vegetation in this region was considered high. A small amount of old growth forest would be removed, leading to a low magnitude of effect. Effects to plant communities would be restricted to where vegetation disturbance occurs, which would be limited to the Cariboo Gold footprint. Although vegetation disturbance would occur mainly during construction and operations, re-establishment of pre-disturbance plant communities would take decades beyond reclamation. Recovery of existing plant communities of interest was considered partially reversible because, following reclamation, some plant communities will be re-established, although for some other plant communities this may not be successful. Vegetation removal would primarily occur during construction. Dust accumulation on vegetation communities and edge effects would also occur continuously during operations. It is expected that effects to plant communities would affect all human populations similarly. The loss and disturbance of vegetation was expected to occur (high likelihood), although the amount would be limited and thus the consequence would be minor. This led to a low risk rating for changes to plant communities of interest. There was a low level of uncertainty in the vegetation assessment based on the data provided and the well-understood relationship of plant species and disturbance, although edge effects, changes to hydrology, and where dust would accumulate introduces additional uncertainty. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the loss of traditional use plants in their traditional land use studies as highly important in this region, so plant communities supporting traditional use plants and habitat for plant and wildlife species of interest are also considered high importance.
Loss of wetland function	Context (resilience): Low Magnitude: Medium	**Not significant**

Residual Effect	Assessment Rating*	Significance and Rationale
This effect would include wetland distribution and function due to surficial disturbances (e.g., soil stripping, soil compaction and/or rutting, vegetation removal), alteration of hydrological connectivity, dust effects, and introduction and/or spread of invasive and non-native plant species. There would be a loss of wetland communities at the Mine Site and at access roads to the Transmission Line and alteration along the Transmission Line itself.	Extent: Limited Duration: Long-term Reversibility: Partially reversible Frequency: Once and continuous Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Moderate Importance: High	Wetlands are sensitive ecological communities that are easily adversely affected and the resilience of wetlands in this region was considered low. A small amount of wetland removal was predicted; however, the ability to recover all wetland functions is uncertain. For this reason, the magnitude of effect to wetland function is considered medium. Effects to wetland function would be limited to where vegetation disturbance occurs, which would be restricted to the Cariboo Gold footprint. Although vegetation disturbance would occur mainly during construction and operations, re-establishment of pre-disturbance wetland function would take several decades or more to recover beyond reclamation. Recovery of existing wetlands was considered partially reversible as not all functions are possible to recover. Vegetation removal would primarily occur during construction. Dust accumulation on vegetation and edge effects would also occur continuously during operations. It is expected that effects to wetland function would affect all human populations similarly. The loss and disturbance of vegetation was expected to occur (high likelihood), although the consequence would be minor (medium consequence with limited extent). This led to a low risk rating for changes to wetland function. There was a low level of uncertainty in the vegetation assessment based on the data provided and the well-understood relationship of plant species and disturbance, although edge effects, changes to hydrology, and where dust would accumulate introduces additional uncertainty. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the loss of traditional use plants in their traditional land use studies as highly important in this region, so changes to wetlands functioning as a support for traditional use plants and habitat for plant and wildlife species of interest is also considered high importance.
Loss of ecosystem function This effect would include the loss or alteration of ecosystem function due to surficial disturbances, edge effects and fragmentation, alteration of hydrological connectivity, dust effects, and introduction and/or spread of invasive and non-native plant species. Reclamation following mine closure is intended to recover and reduce the loss of ecosystems.	Context (resilience): High Magnitude: Low Extent: Limited Duration: Long-term Reversibility: Partially reversible Frequency: Once and continuous Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Moderate Importance: High	**Not significant** Vegetation in the region consists mainly of previously disturbed ecosystems and intermediate forests and the resilience of ecosystem functions in this region was considered high. The magnitude of the loss of ecosystem function due to Cariboo Gold is expected to be low. Effects to ecosystems would be restricted to where vegetation disturbance occurs within the Cariboo Gold footprint. Although vegetation disturbance would occur mainly during construction and operations, re-establishment of ecosystem function would take decades beyond reclamation to reach a life stage able to support the habitats for listed plant species and traditionally used plants. Recovery of existing ecosystems was considered partially reversible due to some ecosystem functions being difficult to restore. Vegetation removal would primarily occur during construction, dust accumulation on vegetation and edge effects would also occur continuously during operations. It is expected that effects to ecosystems would affect all human populations similarly. The loss and disturbance of ecosystem functions were expected to occur (high likelihood), although the consequence would be minor (low magnitude and limited extent). This led to a low risk rating for changes to ecosystems. There was a low level of uncertainty in the vegetation assessment based on the data provided and the well-understood relationship of plant species and disturbance, although edge effects, changes to hydrology, and where dust would accumulate introduces additional uncertainty. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the loss of traditional use plants in their traditional land use studies as highly important in this region, so changes to ecosystems that support traditional use plants and habitat for plant and wildlife species of interest is also considered high importance. The Province and local municipalities identified the protection of ecosystems as highly important.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.12.8 Cumulative Effects Assessment

ODV conducted a cumulative effects assessment on vegetation, provided in *Chapter 7.7* of the Revised Application.

ODV identified three existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold, including Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, a telecommunications facility in Wells, as well as recreation use, fishing, forestry, mineral exploration, transportation, trapping, and placer mining activities that are ongoing in the region. Natural disturbances such as wildfire, pests, and climate change could also affect vegetation cumulatively with project effects.

Residual effects were identified for all four subcomponents of vegetation: plant species of interest, plant communities of interest, wetland function, and ecosystems. Therefore, all four were assessed further for potential cumulative effects.

In addition to Cariboo Gold effects, additional vegetation loss or alteration could occur with the identified activities and natural disturbances identified. There could be additive effects from hydrological changes, edge effects, additional dust deposition, and predicted climate change effects. ODV identified the following potential cumulative effects in the regional assessment area:

- Up to six additional provincially-listed species are likely located in areas of forestry activity and individual locations may be affected by regional activities;
- Cariboo Gold, combined with the identified activities, could result in the following changes in the regional assessment area:
    - A 21.1 percent change in provincially listed ecological communities, mainly forest;
    - A 6.5 percent change to wetland communities;
    - A 24.2 percent change in natural ecosystems;
    - A 1.1 percent change to old forests;
    - A 7.5 percent change to parkland and subalpine communities; and,
    - A 4.0 percent change to riparian communities.

Through the proposed Certificate conditions requiring an Environmental Effects Management Plan and a Construction Environmental Management Plan, ODV would be required to monitor for effects to vegetation.

The potential for cumulative effects from these projects and activities is considered moderate in consideration of extensive past, current, and planned activities such as forestry. However, the contribution of effects on vegetation from Cariboo Gold itself to cumulative effects in the region is considered not significant.

11.13 Wildlife and Habitat

11.13.1 Summary

Wildlife is inherently important and important to the function of natural ecosystems, maintains biodiversity, and supports human activities such as traditional hunting. Lhtako Dené Nation, Williams Lake First Nation, and Xatśūll First Nation all identified the importance of the following wildlife species as a food source, of cultural significance, or related to hunting and trapping: marten, lynx, fisher, fox, squirrel, deer, moose, beaver, caribou, elk, black bear, grizzly bear, geese, grouse, muskrat, and rabbit.

ODV assessed the current state of wildlife populations and wildlife habitat in the region, conducting surveys such as: amphibian breeding, breeding birds, northern goshawk call-playbacks, bat acoustic, remote cameras, and winter wildlife tracks. ODV assessed the potential impacts to wildlife and wildlife habitat and proposed mitigation measures to mitigate these effects.

The key issues raised by reviewers included a request for additional pre-construction surveys for wildlife habitat features prior to construction, concerns regarding the potential effects to southern mountain caribou, bats, fisher, and amphibians, and recovery of wildlife habitat following closure of the mine.

The EAO assessed the potential effects to wildlife and proposed Certificate conditions requiring ODV to conduct additional pre-construction wildlife habitat surveys, implement mitigation measures related to caribou, bats, and fisher, and develop an End Land Use Plan which would describe the goals of wildlife habitat reclamation. Given the assessment, mitigation measures, and proposed conditions, the EAO found that there would not be a significant adverse effect to wildlife.

The effects on wildlife from Cariboo Gold are expected to overlap cumulatively with other past, present, and reasonably foreseeable future projects and activities within the regional assessment area, in particular forestry. The potential for cumulative effects from these projects and activities was considered moderate in consideration of extensive past, current, and planned activities such as forestry. However, the contribution of effects on wildlife from Cariboo Gold itself to cumulative effects in the region is considered not significant.

11.13.2 Assessment Boundaries

The spatial boundaries for the wildlife assessment included a local assessment area which encompassed the Mine Site, Quesnel River Mill, Transmission Line, and the Transportation Routes, plus a 1 km buffer. For most wildlife, the regional assessment area included a 10 km buffer around all project components. For grizzly bear, the regional assessment area was based on the local grizzly bear population unit, and for southern mountain caribou the regional assessment area was based on the Barkerville caribou herd boundary. MOF is primarily responsible for managing wildlife and wildlife habitat within the Cariboo Region, within which Cariboo Gold would be located.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.13.3 Baseline Conditions by ODV

The baseline wildlife conditions in the region were assessed in *Chapter 7.8* of the Revised Application by ODV and are summarized here.

Cariboo Gold would be located in a mountainous area, and most wildlife species here are adapted to survive in or avoid deep snow. Forestry and mining have been the main economic drivers in the area, leading to widespread wildlife habitat disturbance in the region.

ODV selected specific species and groups of wildlife species as indicators for this assessment based on factors such as likelihood of interaction of Cariboo Gold with the species in the local assessment area, regulatory requirements (such as species at risk), results from engagement with Indigenous nations, the public, government agencies, and other interested parties, and the value of ensuring regional biodiversity. The list of species, including species groups, was confirmed in the Cariboo Gold *Application Information Requirements*.

ODV conducted the following field surveys: amphibian breeding surveys, breeding bird surveys, northern goshawk call-playback surveys, bat acoustic surveys, remote camera surveys, and winter wildlife track surveys. Incidental wildlife or wildlife habitat observations were also recorded.

For southern mountain caribou, ODV identified provincially-designated wildlife habitat areas (areas identified by the Province as critical for species of concern) including 190,234 ha in the regional assessment area and 846 ha in the local assessment area. Southern mountain caribou are currently designated as threatened under the federal *Species at Risk Act*

and recommended as endangered by Canada[17] and are red-listed by the Province[18]. The Barkerville southern mountain caribou herd is a subpopulation of this group, and in 2021, the Barkerville southern mountain caribou herd was indicated to be decreasing[19] as it had declined by 26 percent in the last 8 years (88 to 65 individuals from 2012 to 2020). At baseline, 69 percent of the core habitat is disturbed (with 36 percent protected) and 93 percent of matrix habitat for this herd is disturbed (with 16 percent protected). Additional habitat (90,796 ha of course habitat and 101,357 ha of matrix habitat) in the herd boundary is proposed for protection by the Province. During field surveys for Cariboo Gold, southern mountain caribou were observed 19 times at the Mine Site, and 63 times along Highway 26. Winter track surveys in the regional assessment area were conducted, with both moose and caribou being detected, although the numbers appeared to be lower during the winter season.

ODV also recognized ungulate winter ranges (areas identified by the Province as having habitat that meets the winter habitat requirements of ungulates); two ungulate winter ranges were identified in the regional assessment area, for a total of 24,476 ha of designated habitat for mule deer.

The local assessment area contains a high amount (8,657 ha or 70 percent) of optimal suitability grizzly bear habitat at baseline, although no provincially designated wildlife habitat areas for grizzly bear were identified in the local assessment area. These habitats are distributed across the local assessment area at varying elevations, providing habitats of different seasonal importance. ODV noted, however, that the provincial grizzly bear habitat data has not been updated recently to reflect the lowered habitat suitability of areas of disturbance, including where the Mine Site and Transmission Line are proposed.

Road density is an important measure of disturbance to grizzly bear and southern mountain caribou habitat, since increased linear developments can increase hunting pressure, access for predators, and other types of sensory disturbance. ODV indicated that the current road density which includes paved and unpaved roads within the local assessment area is 3.4 km/km^2.

ODV consulted background resources to identify karst and historical mining features in the local assessment area which may provide winter hibernacula or summer roosting habitat for bats and conducted acoustic bat surveys at these features. ODV identified seven different bat species during surveys conducted in the local assessment area (the most frequently detected being a federal species at risk bat species: little brown myotis). Through these surveys, ODV identified five existing potential bat hibernacula within the local assessment area, located in the Cariboo Gold footprint as designed in the original Application. The Cariboo Gold design was later changed due to concerns regarding bats (see *Section 11.13.6.3*).

Due to climate change, the region is predicted to become warmer and wetter, with mean annual temperatures rising by five degrees from historical averages and precipitation increasing by an estimated 113 mm, although summers are predicted to be drier. The drier summer will likely result in an increase in the number and severity of wildfires, and a decrease in the ice and snow cover in winter. This may lead to the loss of forest habitats and wetlands, which would lead to a loss of these as wildlife habitat. Warmer winter temperatures may also lead to an increase in mountain pine beetle infestations, further affecting forested habitats. Denning periods for mammals that hibernate, such as bears, may be less successful due to reduced snowpack and cover with climate change.

[17] Environment and Climate Change Canada. (2014). Recovery Strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. viii + 103 pp

[18] BC Conservation Data Center (2021c). Conservation Status Ranks. *Link*. Accessed May 2021

[19] Province of British Columbia. (2021j). Caribou Herd Locations for BC. Caribou Recovery Website. BC Geographic Warehouse. *Link*

11.13.4 Potential Project Effects by ODV

ODV identified that Cariboo Gold may affect wildlife by the loss of wildlife species of interest or alteration of wildlife habitat, vegetation removal, soil disturbances, edge effects, fragmentation, alteration of habitat connectivity, fugitive dust, and introduction of invasive species.

The potential effects identified by ODV included:

- Loss or disturbance of wildlife habitat, including:
    - Up to five potential bat hibernacula (although following consultation with WLRS/MOF and the District of Wells and changes to project design and mitigation, two would no longer be disturbed; one would experience temporary sensory disturbance during construction; one would experience sensory disturbance for the life of Cariboo Gold; and one would be permanently removed),
    - Up to 39.5 ha (0.1 percent) of optimal grizzly bear habitat along the Transmission Line and access roads and 19.5 ha at the Mine Site,
    - Up to 61.29 ha of high or low elevation critical caribou habitat (57.42 ha at the Mine Site and 3.8 ha at the Transmission Line), and 218.9 ha of matrix habitat (96.1 ha at the Mine Site and 122.8 ha at the Transmission Line), and,
    - Up to 20.3 ha of amphibian breeding ponds (16.2 ha at the Mine Site and 4.1 ha at the Transmission Line);
- Sensory disturbance to wildlife, or the current levels of light, noise, dust, or human presence that causes a change in wildlife behaviour;
- Disruption to movement, or the change to regular wildlife movement patterns, for foraging, migration, or other reasons;
- Direct mortality, or the mortality of wildlife individuals from collisions or disturbance from project infrastructure or activities, such as roadkill; and,
- Indirect mortality and attractants, including from project activities that led to issues such as increased hunting pressure or poaching, predator movements, or human-wildlife conflicts.

The majority of the Mine Site (including the Bonanza Ledge Site) and Quesnel River Mill are located on previously disturbed sites and thus effects were considered to be less than activities that occur on undisturbed sites. The Transmission Line is proposed to be constructed on existing forest roads and clearings where possible although does transverse through southern mountain caribou habitat. ODV indicated that there would be no increase in road density from Cariboo Gold as no new roads would be constructed off the Mine Site or outside of the Transmission Line right-of-way.

Although the effects of habitat alteration would occur primarily during construction, when land clearing and site preparation occur, sensory disturbance, disruption to movement, direct mortality, and indirect mortality would occur during operations due to noise, dust, and traffic movements.

Closure and post-closure could include temporary effects to vegetation from the effects of dust, erosion, or spread of non-native/invasive species from the movement of machinery. Progressive reclamation would occur throughout these phases though, leading to the restoration of disturbed wildlife habitat.

11.13.5 Proposed Mitigation Measures by ODV

In addition to following best management practices and B.C.'s Environmental Mitigation Policy, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Use existing disturbance areas for new infrastructure where possible and minimize habitat disturbance overall;
- Conduct additional field surveys for sensitive wildlife habitat features prior to construction and final siting of new project infrastructure;
- Prevent bats from accessing portals during the winter and following closure;
- Develop wildlife education program for employees, contractors, and site visitors to increase awareness of protection of wildlife, including no feeding or hunting of wildlife;
- Establish protocols to reduce the risk of wildlife-human conflicts;
- Minimize traffic to reduce sensory disturbance;
- Prevent wildlife entrapment in mine facilities such as sediment control ponds and roads;
- Manage chemical hazards and attractants;
- Conduct pre-clearing surveys for bird nests and other wildlife habitat features;
- Develop site-specific clearing and maintenance prescription in partnership with MOF and Indigenous nations; and,
- Develop detailed management plans including adaptive management.

Full details of mitigation measures for wildlife are provided in the Revised Application in *Table 7.8-12*. As identified in the *Regulatory Coordination Plan*, the following management plans related to wildlife would be developed for Cariboo Gold as part of permitting: wildlife management plan, including a caribou mitigation and monitoring plan; traffic control plan; construction environmental management plan; and reclamation and closure plan.

11.13.6 Key Issues Raised

Technical Advisory Committee and Indigenous nations raised the following key issues related to wildlife.

11.13.6.1 Pre-construction surveys for wildlife habitat features

Wildlife habitat surveys were not completed in all areas of the Cariboo Gold footprint prior to the development of the Application, and reviewers from Lhtako Dené Nation and MOF were concerned that features such as bird nests, bat maternal roosting sites, denning sites, mineral licks, wildlife trees, and snake hibernacula were not identified prior to the design of project components. ODV confirmed that pre-construction surveys for wildlife habitat features would be completed, and Cariboo Gold design incorporates enough flexibility to adjust for features found. Where it cannot be avoided, appropriate timing windows for tree clearing, setbacks for wildlife habitat features identified, and artificial replacement habitat will be used.

These mitigation measures have been included in a Certificate condition proposed by the EAO, the Environmental Effects Management Plan, which would also be consulted on with MOF and Indigenous nations.

11.13.6.2 Effects on southern mountain caribou

Cariboo Gold would have potential effects on southern mountain caribou, including habitat disturbance along the Transmission Line, increased access to caribou habitat leading potentially to increased hunting pressure and mortality for caribou from wolves, caribou habitat fragmentation primarily due to the location of the Transmission Line, and sensory disturbance to caribou during construction and maintenance. Due to the decreasing population of the Barkerville caribou

herd, and the status of southern mountain caribou, these adverse effects would represent a potential significant effect if not mitigated. Reviewers from WLRS indicated as well that ODV's assessment of effects on the Barkerville caribou herd was based on data available prior to 2019, after which the herd boundary was expanded. Data from this boundary expansion were not available to ODV at the time of this environmental assessment, however.

ODV proposed several mitigation measures to reduce the adverse effects to the Barkerville caribou herd, including using existing disturbance areas and roads for the Transmission Line route, providing wildlife education to employees and contractors, and minimizing traffic to reduce disturbance along the Transportation Route. Additional mitigation measures were recommended by the Technical Advisory Committee and Lhtako Dené Nation, including adhering to timing windows to avoid sensitive caribou calving periods, managing access for hunters and predators, and managing noise in caribou habitat.

ODV has had discussions with MOF that indicated ODV will incorporate maintenance of vegetation within the Transmission Line right-of-way beyond standard practice of BC Hydro in key sensitive areas, to minimize line of site for predators along the right-of-way and to minimize impacts to caribou movement across and along the right-of-way. Reviewers from WLRS remained concerned that the Transmission Line route would bisect an important travel corridor for caribou to calving grounds and provided additional concerns in *a letter* (dated February 15, 2023). Caribou are vulnerable to predation when in close proximity to linear features and a section of the Transmission Line is located within caribou habitat, although outside high and low elevation critical habitat. The additional maintained linear clearing has the potential to increase predator movements and access, which could increase the indirect mortality effects on this small caribou herd. Even though the Transmission Line would be required to be decommissioned following the end of operations at Cariboo Gold, adequate restoration would take longer.

The EAO has proposed a condition requiring ODV to develop and implement a Caribou Mitigation and Monitoring Plan, in consultation with EMLI, MOF, and Indigenous nations, to monitor and mitigate effects from Cariboo Gold on caribou, and which requires the implementation of the proposed and additional recommended mitigation measures. A caribou mitigation and monitoring plan would be an additional requirement under any future *Mines Act* permits, regulated by EMLI.

11.13.6.3 Effects on bats

During Application review, MOF raised concerns about the up to five potential bat hibernacula proposed for removal during construction, noise, and light disturbance to another bat hibernacula near the Island Mountain portal, and the potential use of newly-constructed mine portals by bats as new hibernacula. Through discussions with MOF and changes to project design, ODV reduced the number of hibernacula permanently removed to one, with one temporarily disturbed and one disturbed over the life of Cariboo Gold, agreed to use mitigation measures to reduce light and noise disturbance at the Island Mountain portal, considered creation of artificial bat hibernacula, and suggested ways to reduce the potential for bats to enter in and roost in the new portals. Reviewers from WLRS were concerned that the effectiveness of artificial bat hibernacula is highly uncertain, and offsetting mitigation will be necessary.

These mitigation measures have been captured by the EAO in the Environmental Effects Management Plan, a proposed Certificate condition, including monitoring of any artificial bat hibernacula and offsetting measures as appropriate.

11.13.6.4 Effects on fisher

The Cariboo Gold local assessment area contains 10,088 ha of high and moderate suitability fisher habitat, which would be enough for >100 female home ranges. MOF raised concerns as this region is one of the last strongholds in the province for fishers. Fishers rely on large tracts of older seral stage forest. MOF recommended that ODV complete an analysis of fisher habitat using the *Fisher Habitat Model* to determine the location and suitability of fisher habitat. Where an active fisher den or resting tree is identified, ODV should implement mitigation measures including establishing a no-work zone 3 ha in size encompassing the identified habitat feature, not carry out forestry activities within 500 m of a den during the

critical breeding season of March 1 - June 15, implement an access management plan, and reduce attractants to reduce mortality to predators such as fisher.

These mitigation measures have been captured by the EAO in the Environmental Effects Management Plan, a proposed Certificate condition.

11.13.6.5 Recovery of wildlife habitat post-reclamation

The EAO's environmental assessment guidance stipulates that the baseline conditions are described as current day conditions, and proponents are required to reclaim the area of disturbance to an equal to or better state than current conditions. Lhtako Dené Nation requested that ODV additionally incorporate assessment endpoints based on reference sites that have not been subject to over 100 years of anthropogenic degradation.

For this reason, the EAO has proposed a Certificate condition which would require ODV to develop an End Land Use Plan, in consultation with Indigenous nations, EMLI, and MOF, which would describe the goals of reclamation of the areas of disturbance, including the type, extent, and state of wildlife habitat recovery.

11.13.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concluded that Cariboo Gold could result in residual adverse effects on wildlife.

The EAO proposed the following Certificate conditions to reduce potential adverse effects to wildlife:

- Construction Environmental Management Plan – this plan will require mitigation measures to manage access to project areas;
- End Land Use Plan – this plan will identify the wildlife habitats and ecosystems planned for restoration following post-closure and reclamation;
- Environmental Effects Management Plan – this plan will require mitigation measures to reduce effects on wildlife (including specifically on fisher and bats) and require additional pre-construction wildlife habitat surveys; and,
- Caribou Mitigation and Monitoring Plan – this plan will require mitigation measures to reduce effects on and support the conservation, protection, and recovery of southern mountain caribou and monitor the effectiveness of mitigation measures.

Additionally, as identified in the *Regulatory Coordination Plan*, the following management plans related to wildlife would be developed for Cariboo Gold as part of permitting: wildlife management plan, including a caribou mitigation and monitoring plan; traffic control plan; construction environmental management plan; and reclamation and closure plan.

The EAO's characterization of the expected residual effects of Cariboo Gold on wildlife is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 15: Summary of Residual Effects for Wildlife

Residual Effect	Assessment Rating*	Significance and Rationale
Effects on amphibians Loss or disturbance of up to 20.3 ha of amphibian breeding ponds (16.2 ha at the Mine Site and 4.1 ha at the Transmission Line).	Context (resilience): Low Magnitude: Low to medium Extent: Local Duration: Long-term Reversibility: Partially reversible	**Not significant** Amphibians are somewhat resilient to changes in habitat in that they can use other features; however, they do have site fidelity, specific habitat requirements, and include some species of conservation concern, characteristics considered to have low resilience to change. Suitable reproductive habitat for western toad is found in the local assessment area and would be reduced through construction of the Transmission Line. Effects would be limited to the local assessment area. Although wildlife habitat disturbance would occur mainly during construction and operations, re-establishment

Residual Effect	Assessment Rating*	Significance and Rationale
	Frequency: Irregular Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Low Importance: High	of plant communities and ecosystems, including wetlands, could take decades beyond reclamation to reach a life stage able to support wildlife habitat. Effects to amphibian habitat were expected to be partially reversible following reclamation; however, full recovery of some wildlife habitat features (such as wetlands) would not be certain. Although wildlife habitat removal and alteration would primarily occur during construction, disturbance through maintenance of the Transmission Line and operational noise or lights would occur throughout operations multiple times. It is expected that effects to amphibians would affect human populations similarly. The loss and disturbance of amphibian habitat and sensory disturbance would be expected to occur (medium to high likelihood), the consequence would be minor for amphibians (low to medium magnitude with local extent). This led to a low risk rating for effects to amphibians. There was a low level of uncertainty in the wildlife assessment based on the data provided and the well-understood relationship of most wildlife species and disturbance. Amphibians were identified as highly important by several groups working to conserve these species.
Effects on songbirds Effects include loss of forest and wetland habitat, sensory disturbance that causes a change in wildlife behaviour, and disruption to movement for foraging, migration, or other reasons.	Context (resilience): Low Magnitude: Low Extent: Local Duration: Medium- to long-term Reversibility: Partially to fully reversible Frequency: Irregular Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Low Importance: High	**Not significant** Songbirds are moderately resilient to changes in habitat in that they can use other features; however, they do have some site fidelity, specific habitat requirements, and include some species of conservation concern characteristics considered to have low resilience to change. Forest removal would be limited and, with reclamation, effects on songbird habitat were anticipated to be low overall. Effects would be limited to the local assessment area. Although wildlife habitat disturbance would occur mainly during construction and operations, re-establishment of plant communities and ecosystems, including wetlands, could take decades beyond reclamation to reach a life stage able to support wildlife habitat. Sensory disturbance from traffic and mining operations noise would continue through to the end of operations. Effects to songbird habitat were expected to be fully reversible following reclamation; however, full recovery of some wildlife habitat features (such as wetlands) would not be certain. Effects to sensory disturbance were expected to be fully reversible. Although wildlife habitat removal and alteration would primarily occur during construction, disturbance through maintenance of the Transmission Line and operational noise or lights would occur throughout operations multiple times. It is expected that effects to songbirds would affect human populations similarly. The loss and disturbance of wildlife habitat and sensory disturbance would be expected to occur (medium to high likelihood), although the amount would be limited and thus the consequence would be minor for songbirds (low magnitude and local extent). This led to a low risk rating for effects to these species. There was a low level of uncertainty in the wildlife assessment based on the data provided and the well-understood relationship of most wildlife species and disturbance. Songbirds were identified as highly important by several groups working to conserve these species.
Effects on raptors Effects include loss of forest and wetland habitat, sensory disturbance that causes a change in wildlife behaviour, disruption to movement for foraging, migration, or other reasons, and potential mortality	Context (resilience): Low Magnitude: Low Extent: Local Duration: Medium- to long-term Reversibility: Fully reversible Frequency: Irregular Affected Populations: Even	**Not significant** Raptors are sensitive to changes in their breeding territory from human disturbance, with an overall low resilience to changes. Forest removal would be limited and with reclamation, effects on raptor habitat was anticipated to be low magnitude overall. Effects would be limited to the local assessment area. Although wildlife habitat disturbance would occur mainly during construction and operations, re-establishment of raptor forested habitat could take decades beyond reclamation to reach a life stage able to support wildlife habitat. Sensory disturbance from traffic and mining operations noise would continue through to the end of operations. Mortality risk associated with the Transmission Line would also occur throughout operations. Effects to raptor habitat were expected to be fully reversible following reclamation. Effects to sensory disturbance and mortality risk were also expected to be fully reversible. Although wildlife habitat removal and alteration would primarily once occur during construction,

Residual Effect	Assessment Rating*	Significance and Rationale
from collisions with transmission lines.	Risk (likelihood and consequences): Low Uncertainty: Low Importance: Moderate	disturbance through maintenance of the Transmission Line and operational noise or lights would occur irregularly throughout operations. It is expected that effects to raptors would affect human populations similarly. The loss and disturbance of wildlife habitat and sensory disturbance would be expected to occur (medium to high likelihood), although the amount would be limited and thus the consequence would be minor for raptors (low magnitude and local extent). This led to a low risk rating for effects to raptors. There was a low level of uncertainty in the wildlife assessment based on the data provided and the well-understood relationship of most wildlife species and disturbance. Although raptors were not specifically identified by any groups as specifically important, some populations of these species are of conservation concern and so were identified as moderately important.
Effects on bats Removal of one bat hibernaculum and disturbance of two others was anticipated, which could have population-level effects on endangered bat species.	Context (resilience): Low Magnitude: High Extent: Local Duration: Medium- to long-term Reversibility: Partially reversible Frequency: Irregular Affected Populations: Even Risk (likelihood and consequences): High Uncertainty: High Importance: High	**Not significant, high uncertainty** Federally-endangered bats are found in the local assessment area and are considered very sensitive to changes in their habitat. Removal of one bat hibernaculum and disturbance of two others was anticipated, which could have population-level effects on endangered bat species, considered a high magnitude effect. ODV identified the magnitude as medium and does not agree that it would have a potential population-level effect. Effects would be limited to the extent of the local assessment area. Although wildlife habitat disturbance would occur mainly during construction and operations, re-establishment of bat habitat could take decades beyond reclamation to reach a life stage able to support wildlife habitat. Sensory disturbance from traffic and mining operations noise would continue through to the end of operations. Effects to wildlife habitat were expected to be fully reversible following reclamation; however, full recovery of some wildlife habitat features (such as bat hibernacula) is not certain. Although wildlife habitat removal and alteration would primarily occur once during construction, disturbance through maintenance of the Transmission Line and operational noise or lights would occur irregularly throughout operations. It is expected that effects to bats would affect human populations similarly. The likelihood of effects would be high for bats, and the consequence would be major as Cariboo Gold may affect these species at a population level (high magnitude). This led to a high risk rating for effects to these species. Due to the disagreement in magnitude, it is noted that ODV does not agree with this high risk rating. Habitat use by bats and the ability for bats to use different hibernacula is not well understood and so the uncertainty was considered high. Bats were identified as highly important by several groups working to conserve these species.
Effects on ungulates (excluding caribou) Effects include loss of habitat, sensory disturbance, disruption to movement, and direct or indirect mortality.	Context (resilience): High Magnitude: Low Extent: Local Duration: Medium- to long-term Reversibility: Fully reversible Frequency: Irregular to regular Affected Populations: Disproportionate Risk (likelihood and consequences): Low Uncertainty: Low	**Not significant** Ungulates (excluding caribou) are considered to have a high natural resilience to disturbance and can adapt to some disturbances to habitat. The populations in this region are not considered at risk. Forest removal would be limited and, with reclamation, effects on ungulate (excluding caribou) habitat were anticipated to be low magnitude overall. Effects would be limited to the extent of the local assessment area. Although habitat disturbance would occur mainly during construction and operations, re-establishment of wildlife habitat could take decades beyond reclamation to reach a life stage able to support wildlife. Sensory disturbance from traffic and mining operations noise would continue through to the end of operations. Disturbance to movement and mortality risk associated with the Transmission Line and Transportation Routes would occur throughout operations. Effects to ungulate habitat were expected to be fully reversible following reclamation. Effects to sensory disturbance and mortality risk were also expected to be fully reversible. Although wildlife habitat removal and alteration would primarily occur once during construction, disturbance through maintenance of the Transmission Line and operational noise or lights would occur irregularly throughout operations. Increased disturbance to movement and mortality risk along the Transportation Routes would occur regularly throughout

Residual Effect	Assessment Rating*	Significance and Rationale
	Importance: High	operations. Indigenous nations have traditionally hunted ungulates, and the recovery or maintenance of these species is of high cultural importance, therefore, Indigenous nations would be affected to a greater extent. The loss and disturbance of wildlife habitat and sensory disturbance would be expected to occur (medium to high likelihood), although the consequence would be minor (low magnitude and local extent) for ungulates. This led to a low risk rating for effects to these species. There was a low level of uncertainty in the wildlife assessment based on the data provided and the well-understood relationship of most wildlife species and disturbance. Ungulates were identified as highly important by Indigenous nations, related to traditional and current use.
Effects on southern mountain caribou Effects include the loss of up to 60.1 ha of high or low elevation critical caribou habitat (56.3 ha at the Mine Site at the existing Bonanza Ledge Mine and 3.8 ha at the Transmission Line), and 218.9 ha of matrix habitat (96.1 ha at the Mine Site and 122.8 ha at the Transmission Line). The majority of this habitat is located at the existing Bonanza Ledge Mine and is already disturbed. To the extent possible, the Transmission Line would be sited where there is existing disturbance from existing forestry roads and cut blocks. Effects also include sensory disturbance, disruption of movement, and direct mortality from collisions or from increase in access from predators.	Context (resilience): Low Magnitude: High Extent: Regional Duration: Medium- to long-term Reversibility: Partially reversible to irreversible Frequency: Irregular to regular Affected Populations: Disproportionate Risk (likelihood and consequences): Medium Uncertainty: High Importance: High	**Not significant, with high uncertainty** Southern mountain caribou are at risk and are considered very sensitive to changes in their habitat, sensory disturbance, disturbance to movement, and mortality risk, leading to a low resilience. As this species is sensitive to habitat changes, sensory disturbance, and mortality risk, this could still have population-level effects, leading to a high magnitude. Because effects could extend to the entire herd, the extent was considered regional. Although wildlife habitat disturbance would occur mainly during construction and operations, re-establishment of wildlife habitats could take decades beyond reclamation to reach a life stage able to support wildlife. Sensory disturbance from traffic and mining operations noise would continue through to the end of operations. Disturbance to movement and mortality risk associated with the Transmission Line and Transportation Routes would occur throughout operations. Effects to wildlife habitat were expected to be fully reversible following reclamation; however, full recovery of some wildlife habitat features (such as lichen) and recovery of the herd based on the effects would not be certain. Mitigation on the transmission line that could limit predator movements would not be expected to be effective until well after closure and the effect of continued predator access during transmission line existence could mean that the potential effect of caribou population declines during this time may not be reversible. Effects to sensory disturbance and mortality risk were also expected to be fully reversible. Although wildlife habitat removal and alteration would primarily once occur during construction, disturbance through maintenance of the Transmission Line and operational noise or lights would occur irregularly throughout operations. Increased disturbance to movement and mortality risk along the Transportation Routes would occur regularly throughout operations. Indigenous nations have traditionally hunted southern mountain caribou and the recovery or maintenance of this species is of high cultural importance, therefore, Indigenous nations would be affected to a greater extent. The likelihood of effects would be medium for southern mountain caribou, and the consequence would be moderate (medium magnitude and regional extent) as Cariboo Gold may affect this species at a herd level. This led to a medium risk rating for effects to southern mountain caribou. There was a low level of uncertainty in the wildlife assessment based on the data provided and the well-understood relationship of most wildlife species and disturbance. The unknown effectiveness of mitigation measures for southern mountain caribou and the need for long-term monitoring and adaptive management, however, led to high uncertainty of the effect to this species. Reviewers from WLRS were of the view that the effects on southern mountain caribou would be potentially significant. Southern mountain caribou were identified as highly important by the Indigenous nations and the Province.
Effects on large carnivores (including grizzly bears) Less than 0.1 percent of the grizzly habitat	Context (resilience): Low Magnitude: Low to medium Extent: Local	**Not significant** Grizzly bears are sensitive to habitat fragmentation, in particular an increase in road density, and human disturbance, leading to a low resilience. Based on the removal of less than 0.1 percent of the grizzly bear habitat in the local assessment area, the magnitude of effect would be low. Sensory disturbance and mortality risk to grizzly

Residual Effect	Assessment Rating*	Significance and Rationale
in the local assessment area is predicted for removal (39.5 ha of optimal grizzly bear habitat along the Transmission Line and access roads), sensory disturbance, disruption to movement, and increase in attractants.	Duration: Medium- to long-term Reversibility: Fully reversible Frequency: Irregular to regular Affected Populations: Disproportionate Risk (likelihood and consequences): Low Uncertainty: Low Importance: High	bears along the Transmission Line and Transportation Routes would potentially affect this species at a sub-population level. Effects would be limited to the extent of the local assessment area. Although wildlife habitat disturbance would occur mainly during construction and operations, re-establishment of wildlife habitat could take decades beyond reclamation to reach a life stage able to support wildlife. Disturbance to movement and mortality risk associated with the Transmission Line and Transportation Routes would occur throughout operations. Effects to large carnivore habitat were expected to be fully reversible following reclamation. Effects to mortality risk were also expected to be fully reversible. Although wildlife habitat removal and alteration would primarily once occur during construction, disturbance through maintenance of the Transmission Line and operational noise or lights would occur irregularly throughout operations. Increased disturbance to movement and mortality risk along the Transportation Routes would occur regularly throughout operations. Indigenous nations have traditionally hunted grizzly bears and the recovery or maintenance of this species is of high cultural importance, therefore, Indigenous nations would be affected to a greater extent. The loss and disturbance of wildlife habitat and sensory disturbance would be expected to occur (medium to high likelihood), although the amount would be limited and thus the consequence would be minor (low to medium magnitude with local extent) for large carnivores, including grizzly bear. This led to a low risk rating for effects to these species. There was a low level of uncertainty in the wildlife assessment based on the data provided and the well-understood relationship of most wildlife species and disturbance. Grizzly bears were identified as highly important by Indigenous nations.
Effects on medium carnivores (including wolverines) and furbearers (including fisher) Effects include loss of habitat, sensory disturbance, disruption to movement, and increase in attractants.	Context (resilience): Low Magnitude: Low Extent: Local Duration: Medium- to long-term Reversibility: Fully reversible Frequency: Irregular to regular Affected Populations: Disproportionate Risk (likelihood and consequences): Low Uncertainty: Low Importance: High	**Not significant** Medium carnivores and furbearers are somewhat resilient to changes in habitat in that they can use other features; however, they do have site fidelity, specific habitat requirements, and include some species of conservation concern, characteristics considered to have low resilience to change. Medium carnivores are also sensitive to habitat fragmentation, in particular an increase in road density, and human disturbance. Forest removal would be limited and, with reclamation, effects on medium carnivore and furbearer habitat were anticipated to be low magnitude overall. Effects would be limited to the extent of the local assessment area. Although wildlife habitat disturbance would occur mainly during construction and operations, re-establishment of wildlife habitat could take decades beyond reclamation to reach a life stage able to support wildlife. Sensory disturbance from traffic and mining operations noise would continue through to the end of operations. Disturbance to movement and mortality risk associated with the Transmission Line and Transportation Routes would occur throughout operations. Effects to wildlife habitat were expected to be fully reversible following reclamation. Effects to sensory disturbance were expected to be fully reversible. Although wildlife habitat removal and alteration would primarily occur once during construction, disturbance through maintenance of the Transmission Line and operational noise or lights would occur irregularly throughout operations. Increased disturbance to movement and mortality risk along the Transportation Routes would occur regularly throughout operations. It is expected that effects to medium carnivores and furbearers would affect Indigenous nations disproportionately due to reduced trapping. The loss and disturbance of wildlife habitat and sensory disturbance would be expected to occur (medium to high likelihood), although the consequence would be minor (low magnitude and local extent) for medium carnivores and furbearers. This led to a low risk rating for effects to these species. There was a low level of uncertainty in the wildlife assessment based on the data provided and the well-understood relationship of most wildlife species and disturbance. Medium carnivores and furbearers were identified by Indigenous nations as highly important to traditional and current use.

Residual Effect	Assessment Rating*	Significance and Rationale
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.13.8 Cumulative Effects Assessment

ODV conducted a cumulative effects assessment on wildlife, provided in *Chapter 7.8* of the Revised Application.

ODV identified three existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold, including Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, and a telecommunications facility in Wells, as well as recreation use, fishing, forestry, mineral exploration, transportation, trapping, harvesting, and placer mining activities that are ongoing in the region. Natural disturbances such as wildfire and climate change could also affect wildlife cumulatively with project effects.

In addition to effects from Cariboo Gold, additional habitat loss or alteration could occur with the identified activities and natural disturbances identified. There could be additive effects from hydrological changes, edge effects, additional dust deposition, and predicted climate change effects.

ODV identified the following potential cumulative effects to wildlife:

- Loss or disturbance to wildlife habitat in the local assessment area, including:
    - Up to 102 ha of optimal amphibian breeding habitat (30 ha from Cariboo Gold),
    - Up to 3755 ha of optimal songbird breeding habitat (96 ha from Cariboo Gold),
    - Up to 1558 ha of optimal forest birds and raptors habitat (100 ha from Cariboo Gold),
    - Up to 4808 ha of loss or alternation to bat hibernacula, foraging habitat, or roosting habitat (185.9 ha from Cariboo Gold), though due to lack of larger-scale information on bat habitat suitability the numbers are considered uncertain,
    - Up to 8494 ha of high and low elevation southern mountain caribou habitat (60 ha from Cariboo Gold), and up to 46,426 ha of matrix habitat (219 ha from Cariboo Gold),
    - Up to 3,504 ha of ungulate winter habitat (0 ha from Cariboo Gold),
    - Up to 49,153 ha of optimal grizzly bear habitat (110 ha from Cariboo Gold),
    - Up to 58,932 ha of optimal medium carnivore habitat (287 ha from Cariboo Gold), and,
    - Up to 2,648 ha of furbearer habitat (37 ha from Cariboo Gold);
- Increased direct or indirect mortality of amphibians, caribou, ungulates (non-caribou), and medium and large carnivores from vegetation clearing, vehicle collisions, or other activities;
- Increased sensory disturbance to bats and southern mountain caribou; and,
- Increased disturbance to movement for southern mountain caribou, medium carnivores, furbearers, and grizzly bear – the current road density in the regional assessment area is 1.1-1.9 km/km^2 (with no predicted increase in road density from Cariboo Gold).

The potential cumulative, regional effects on habitat and sensory disturbance to bats and southern mountain caribou were noted as particular high risk to these species by ODV. The overall level of cumulative habitat disturbance to caribou in Barkerville as well as the indirect mortality from the increased available movement for predators already exceeds the federal recommendations at baseline.

The potential for cumulative effects from these projects and activities is considered moderate in consideration of extensive past, current, and planned activities such as mining and forestry. Given the current state of the populations of bats and southern mountain caribou, the contribution of effects on wildlife from Cariboo Gold itself to cumulative effects in the region is considered not significant but with high uncertainty for habitat alteration and sensory disturbance to bats and habitat alteration and indirect mortality for southern mountain caribou. For the remaining wildlife species and groups, the contribution of effects from Cariboo Gold was considered not significant.

11.14 Effects on Biophysical Factors that Support Ecosystem Function

Each environmental assessment must consider the effects on biophysical factors that support ecosystem function. ODV identified the following potential biophysical factors important to the regional ecosystem function:

- Habitats supporting ecosystem function, specifically old forests and wetlands that support species diversity and habitat for species at risk;
- Habitat patches that support wildlife movement and species diversity for songbirds, raptors, bats, amphibians, southern mountain caribou, large and medium carnivores, and furbearing animals;
- Natural disturbance regimes (such as wildlife, flooding, and pests) that maintain some ecosystems, biodiversity, and regeneration;
- Structural complexity which can create unique habitats for vegetation and wildlife;
- Hydrologic patterns which support the transfer of sediment and nutrients to downstream habitats;
- Nutrient cycling which allows nutrients to move from soils to plants and wildlife, and back to soils;
- Purification services from wetlands which can support filtration of chemicals;
- Biotic interactions which can support species relationships, including those that are symbiotic, predatory, competitive, mutualistic, and parasitic, contributing to species diversity;
- Population dynamics which can allow for a diversity of life stages of species; and,
- Genetic diversity which supports vegetation and wildlife populations' ability to react and adapt to external pressures.

ODV predicted that Cariboo Gold would result in the loss of wetland communities at the Mine Site and Transmission Line as well as alter wetland functions along the Transmission Line. Wetland functions would be moderately altered in their ability to re-establish even with mitigation measures and reclamation. There would also be a loss of soils quality due to compaction, which may also influence wetland function, around the Mine Site and Quesnel River Mill. The re-establishment of wetlands purification ecosystem services is expected to be moderately altered even with the implementation of mitigation measures and reclamation.

Ecosystem function relates to the different physical, chemical, and biological components of an ecosystem (for example, vegetation, water, soil, atmosphere, and biota) and how they operate and interact with each other within ecosystems and across ecosystems. The function of an ecosystem depends upon the long-term integrity of its physical, chemical, and biological elements.

Ecosystem services are the many and varied benefits to humans provided by the natural environment and from healthy ecosystems.

In the regional assessment area, ODV predicted that Cariboo Gold would remove 0.8 percent of old growth forests and change the structure of mature forests and riparian areas along the Transmission Line route, and habitat fragmentation would increase with the creation of the Transmission Line. Biotic interactions may be changed as a result of fragmentation particularly along the Transmission Line and route which bisects mature forest and riparian areas. In particular as potential changes to southern mountain caribou, other ungulates, and predators.

Riparian habitats were also predicted to be altered along the Transmission Line. Hydrologic pattern changes to surface water and effects on water quality and quantity were predicted as water from the Quesnel River Mill and Mine Site are discharged into Rudy Creek, Lowhee Creek, and Jack of Clubs Lake and via groundwater pattern changes to Lowhee Creek, Watson's Gulch, Emory Gulch, and Upper Mosquito Creek. Nutrient cycling changes could affect habitat for amphibians, southern mountain caribou, bats, and furbearing mammals.

11.14.1 Key Issues Raised

No issues were raised with ODV's assessment of potential effects specifically to ecosystem functions. Effects on old growth forests and wetland functions are discussed in more detail in *Section 11.12* (Vegetation).

11.14.2 The EAO's Assessment and Conclusions

The EAO's view is that Cariboo Gold would result in negative residual effects to wetland functions, old forest habitats, wildlife habitat fragmentation, and changes to water quality and quantity. Effects to these valued components have been assessed in more detail in *Sections 11.12* (Vegetation), *11.13* (Wildlife), *11.9* (Surface Water), and *11.8* (Groundwater). However, in terms of the effect on ecosystem functions in the region, the EAO is of the view that Cariboo Gold would have a negligible to low effect regionally, and this is not considered significant.

11.15 Potential Changes to Cariboo Gold Caused by the Environment

ODV assessed the risk of environmental effects on Cariboo Gold by examining the likelihood and severity of the effects from physical environmental changes, seismic events, landslides, water surges, and avalanches. ODV also assessed the potential effects of climate change, including from increased temperatures, drought, changing winter conditions, extreme precipitation events and pluvial flooding, extreme wind and storm activity, and wildfires. The hazards identified and examined differed between project components and phases. The effects of adverse weather not linked to climate change were discussed in the assessment of malfunctions and accidents (see *Section 11.27* of this Report).

ODV identified the key potential effects of environmental events as:

- Drought: These events could affect groundwater recharge in the Wells Aquifer. If a new water supply is not secured for the District of Wells, groundwater pumping would need to occur when the underground workings are flooded post-closure to prevent mine water from further affecting the community water supply. Acid drainage and contamination could occur if drought conditions persisted long enough to affect the condition and effectiveness of engineered covers over tailings or waste facilities. Successful re-vegetation and reclamation would not occur if plant species chosen cannot thrive in changing climate conditions long-term; and,
- Extreme precipitation: These events could cause the discharge of sediment and contaminants (such as metals) from tailings and management facilities or waste rock stockpiles, and affect water and sediment quality, human health, aquatic resources, fish and fish habitat, and land and resource use. De-stabilization of soils could cause erosion and release of tailings/contaminants into downstream water. Potential leaching of contaminants from the Mine Site into the groundwater could also occur, affecting the Wells Aquifer and the water supply for the District of Wells. The waste cover system could also be destabilized and leach contaminants during extreme precipitation. There would also be risk of damage to water treatment facilities, water conveyance systems, and treatment ponds. Disruption of water treatment infrastructure could lead to flooding and water quality deterioration in effluent water.

Climate change trends in the Cariboo region have predicted warmer temperatures and increased drought, extreme weather events and wildfires. The temperature is projected to increase 3.9 °C by 2051-2080. An increase is also projected for all seasons individually, and both the minimum and maximum temperatures of the year. Increases in temperature would cause decreases in the annual number of freeze-thaw cycles. Precipitation is projected to increase generally, although snow cover is predicted to decrease, and the incidence of heavy snowfalls and snowstorms would be lower. The frequency and magnitude of extreme precipitation events and pluvial flooding is predicted to likely increase. Flooding risk from local precipitation remains a hazard with a low likelihood of occurrence. Increased severity of storms in the region is predicted, where the balance of moisture supply between precipitation and evapotranspiration (primarily driven by temperature) would decrease. Extreme wind and storm activity would mean an increase in mean wind speed during winter, decrease in intensity of summer extreme winds and an increase in number of lightning strikes. High fuel availability may be an indicator of a higher likelihood of future wildfires. Wildfires could burn twice as much per year by the end of the century as burned in the recent past.

ODV identified the following potential effects of these climate change predictions on Cariboo Gold:

- Wildfires pose the risk of burning surrounding vegetation thereby creating an inhospitable condition for reclamation;
- Dust could be further increased due to warmer temperatures;
- Damage could occur to water treatment facilities, water conveyance systems, and treatment ponds from wildfire;
- Increased wildfires would increase the risk to air quality, human health, and safety, and GHG emissions;
- Increased hazards could directly or indirectly affect the health and safety of workers and affect emergency vehicle access; and,
- Hazards causing power outages would increase use of generators and GHG emissions.

ODV has proposed to consider the effects of climate change further during the closure and post-closure phases of Cariboo Gold. The EAO has included this in a proposed condition to monitor GHG emissions and recommended that ODV revisit the vulnerability and risk assessments and the control measures considered as new information becomes available (e.g., updated climate projections, changes to operating parameters and/or local conditions) at a minimum every five years.

11.15.1 Key Issues Raised

The following key issues were identified by reviewers through review of the effects of the environment during Application review.

11.15.1.1 Consideration of temporary closures

The EAO raised the issue that ODV did not thoroughly contemplate the scenario of if the mine was temporarily closed, and these environmental effects occurred. ODV proposed additional mitigation measures to include which ones would be required during temporary closures, such as during care and maintenance periods. The mitigation measures addressed effects of a changing climate on specific project components, and how it would affect care and maintenance more generally. ODV also noted that the mine emergency response plan, a plan which will be required under the *Mines Act* permit, would apply to all project components and phases, including temporary closures.

The EAO proposes a Certificate condition to require ODV to develop and implement a Care and Maintenance Plan, which would describe what mitigation measures and conditions would apply or be modified in the event of a care and maintenance (i.e., temporary closure) period.

11.15.1.2 Effects on emergency health services

Northern Health expressed concerns about the potential effects of Cariboo Gold on existing emergency health services and pressures on healthcare. ODV also identified that hazards from climate change could block access, which could include access by emergency response vehicles. ODV noted that the mine emergency response plan, a plan which would be required under the *Mines Act* permit, would apply to all project components and phases.

The EAO has proposed Certificate conditions that would also require emergency response planning through the Construction Environmental Management Plan and that would require ODV to develop and implement mitigation measures related to effects on emergency response in the District of Wells, including evacuation procedures for workers, in a Community Effects Management Plan.

11.15.2 The EAO's Assessment and Conclusions

To address key issues related to the effects of the environment, the EAO has proposed the following conditions related to effects of the environment on Cariboo Gold to the Ministers if a Certificate is issued:

- Care and Maintenance Plan, which would require ODV to develop a plan for which mitigation measures would apply or need to be modified in the case of a temporary closure;
- Community Effects Monitoring Plan, which would require ODV to develop and implement mitigation measures related to effects on emergency response for workers and evacuation procedures;
- Construction Environmental Management Plan, including emergency response procedures;
- Greenhouse Gas Reduction Plan, which would require mitigation measures and monitoring of GHG emissions from Cariboo Gold as well as a requirement to explore opportunities to reduce GHG emissions as technology is developed; and,
- Public Information condition, which would require ODV to maintain a website to ensure the public has access to monitoring data reports associated with the Cariboo Gold and other public information regarding Cariboo Gold such as contact information.

After considering the proposed mitigation measures and Certificate conditions proposed (which would become legally binding in the event that a Certificate is issued), the EAO concludes the effects of the environment would likely pose a low risk to Cariboo Gold during construction and operations due to the short duration of these phases (excluding evolving climate change trends during the up to 15-year period in which Cariboo Gold would have to be substantially started if a Certificate is issued).

The EAO concludes the effects of the environment would pose risks over the long-term with respect to the adverse effects of Cariboo Gold during closure and post-closure, particularly on groundwater and surface water. Long-term concerns related to climate change might influence when ODV would be released from its obligations under a *Mines Act* permit. The EAO is satisfied that the effects of the environment would not have significant adverse effects on Cariboo Gold.

11.16 Land and Resource Use

11.16.1 Summary

Land and resource use is important to understand as Cariboo Gold might affect private property, tenured land and resource use, public land and resource use, parks and protected areas, lighting, and viewscapes.

ODV identified the potential effects of Cariboo Gold to be the direct loss and displacement of private property; indirect disturbances to members of the public, surrounding communities, and Indigenous nations due to changes in noise,

vibration, air quality, surface water, fisheries, landscape and viewshed; changes in traffic and access; and changes in lighting and visual resources. ODV also described mitigation measures that would reduce these potential effects to land and resource use.

Reviewers identified the following key issues: overlap of old growth management areas by the proposed Transmission Line; loss or displacement of public and private lands; changes to views from the town of Wells; increased pressure on public lands and resources due to increased use; increase in real estate values (affecting affordability); and increased light pollution particularly with respect to effects on residents of Wells and Indigenous nations.

To address potential effects to land and resource use, the EAO has proposed the following Certificate conditions:

- End Land Use Plan, to describe the goals of reclamation and final land use;
- Construction Environmental Management Plan, including an access management plan;
- Community Effects Monitoring Plan, to monitor and mitigate social and economic effects; and,
- Environmental Effects Management Plan, to monitor and mitigate effects on Old Growth Management Areas.

Given the assessment, mitigation measures and proposed conditions, the EAO found that there would not be significant adverse effects on land and resource use.

11.16.2 Assessment Boundaries

The spatial boundaries for the land and resource use local assessment area included a 250 m buffer around all project components and the following:

- Mine Site, including ODV offices, camp, Bonanza Ledge Site, the District of Wells, Barkerville Historic Town, and Park and New Barkerville for general land use and light;
- Quesnel River Mill site and transportation route from the Mine Site along Highway 26 and the 500 Nyland Lake Road for light;
- An 8 km viewing distance from the Mine Site for visual quality;
- A 1 km viewing distance along the Transportation Routes for visual quality;
- A 3 km viewing distance from the Transmission Line for visual quality; and,
- A 5 km viewing distance from the Bonanza Ledge and Quesnel River Mill sites for visual quality.

The regional assessment area included:

- For contemporary land use, a 1 km buffer around all project components, including Barkerville Historic Town and Park;
- For light, a 5 km radius from the lighting local assessment area; and,
- For visual resources, the regional assessment area is subjective and was based on the geographic extent of direct and indirect visual effects from Cariboo Gold, considering viewing distances, and visual elements of the landscape.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). Temporal boundaries for land and resource use also considered seasonal differences (i.e., summer vs. winter) as well as daytime and nighttime scenarios. These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

Management of visual resources on Crown Lands follow the B.C. provincial policy as per the *Forest and Range Practices Act* and MOF manages the B.C. Visual Resource Management program providing guidance on visual quality with the Province.

11.16.3 Baseline Conditions by ODV

ODV described baseline conditions for land and resource use in *Chapter 7.11* of the Revised Application and is summarized here. The assessment identified the following resources in the area:

- Parks and protected areas: Barkerville Historic Town and Park (Government of Canada National Historic Site and Heritage Property and Park), the Chee Kung Tong Building (National Historic Site), Cottonwood House Historic Park (Provincial Historic Site), Wendle Park (part of the Bowron Lake Provincial Park system), Bowron Lake Provincial Park, and the South Quesnel Neighbourhood Park;
- Recreation and tourism: summer and winter trails which provide recreation opportunities, tourist destinations such as the town of Wells, Barkerville, and Bowron Lakes, seven registered trails, and four legal objectives for buffered trails near the Mine Site;
- Mining and exploration: 19 mineral occurrences near the Mine Site and Transmission Line, 5 past producers near the Transportation Routes and Quesnel River Mill, and 510 existing mineral tenures and mining leases near Cariboo Gold;
- Forestry and timber resources: Old Growth Management Areas overlapping the Cariboo Gold footprint, 14 active forestry tenures near Cariboo Gold, and 6 active Occupant Licenses to Cut overlapping the Transmission Line and Quesnel River Mill areas;
- Hunting, trapping, and fishing: 5 outfitter certificate areas and 15 traplines;
- Agriculture and rangelands: 2 Agriculture Land Reserve areas fall near the Transportation Routes and 6 range tenures;
- Land ownership, tenures, and licenses: 494 private land parcels near the Mine Site (most are in the District of Wells with remainders in rural areas outside of the District of Wells), 127 private land parcels near the Transmission Line, and 795 private land parcels along the Transportation Routes, 22 municipal and 3 federal owned parcels near the Mine Site, and 61 Crown tenures near the Mine Site, 6 along the Transmission Line and 56 along the Transportation Routes; and,
- Water rights, approvals and restrictions: 4 water reserves/restrictions and 5 unlicensed groundwater wells near the Mine Site; 5 current water rights licenses, no active water approvals, 1 water reserve/restriction and 10 unlicensed groundwater wells near the Transmission Line; 46 current water rights licenses, 2 active water approvals, 5 water reserves/restrictions and 1 licensed groundwater well near the Transportation Routes, and 1 diversion for a work camp from Geoff Creek and 1 water reserve/restriction on Geoff Creek near the Quesnel River Mill.

Figure 24: Bowron Lake Provincial Parks is well known for its paddling circuit. Photo credit: B.C. Parks.

View opportunities near the town of Wells are valued and scenic landscapes and are important for recreation and tourism in the area. Four Visually Sensitivity Units overlap the Mine Site, and most are classified with a high importance to viewers. There are 29 viewpoints along the Transportation Route along Highway 26, mostly within the District of Wells. Approximately 43 km of the Transportation Route along Highway 26 overlaps with Visually Sensitive Units and contains 10 viewpoints near Wells along Jack of Clubs Lake.

Visually Sensitivity Units are locations on the landscape that correspond to the view an observer would see from a given viewpoint and are each ranked based on sensitivity to human-made visual alteration. They are designated by the B.C. Visual Resource Management program run by MOF.

The effects of lighting (also referred to as 'light trespass') can also cause adverse visual effects for residents, and the 'sky quality' (or ability to see the night sky) is another indicator of effects on visual resources. The existing ODV Wells work camp had the highest measured light trespass. Winter conditions can also affect the sky quality (e.g., clouds, ice crystals) and winter sky quality measurements were lower than those taken during summer conditions. Two other baseline monitoring locations in the District of Wells were affected by lighting and had lower measured sky quality.

11.16.4 Potential Project Effects by ODV

ODV identified the following potential effects to land and resource use due to Cariboo Gold:

- Private land and resource use:
    - Direct loss or displacement due to Cariboo Gold footprint and associated activities, and,
    - Indirect disturbance associated with change in environmental conditions (noise, vibration, air quality, and landscape/viewshed);
- Tenured and public land and resource use:
    - Direct loss or displacement due to Cariboo Gold footprint and associated activities,
    - Direct loss or disruption of access due to Cariboo Gold activities and traffic,
    - Indirect disturbance associated with a change in environmental conditions including noise, vibration, air quality, and landscape/viewshed, and,
    - Change in recreation and tourism experience due to increased workforce (includes family and friends visiting the area) and associated use of public lands and resources;
- Parks and protected areas:
    - Indirect disturbance associated with a change in environmental conditions (noise, air quality and landscape/viewshed) on Barkerville,
    - Disruption of access to other parks and protected areas along the Transportation Routes due to Cariboo Gold traffic, and,
    - Change in parks and protected areas experience due to increased workforce (includes friends and family visiting the area) and associated use of parks and protected areas;
- Lighting: Increase in light trespass from baseline conditions; and,
- Visual Resources: Change to visual resources and loss of visual quality from baseline conditions.

These effects were predicted by ODV to occur during the construction, operations, closure, and post-closure phases.

11.16.5 Proposed Mitigation Measures by ODV

In addition to following best management practices, management plans and mitigation policies, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Prohibit trapping, hunting, and fishing and use of off-road or recreational vehicles for personal use for all employees and contractors on site or while commuting to and from ODV sites;
- Lock gates at all ODV properties when there are no active operations at the properties;
- Discuss with affected forest tenure holders regarding project schedule, tenure access and required harvesting activities to mitigate potential conflicts;
- Contact mining tenure holders, discuss potential effects associated with access and tenure activities, and develop appropriate mitigation measures as required;
- Place signage on recreational trails and public roads if there are potential conflicts with project activities;
- Use noise reduction and operations scheduling at noise sensitive locations and times where appropriate to limit disruption to sensitive receptors;
- Progressively reclaim disturbed land, including revegetating roads to blend with surrounding ecosystems and culverts will be removed and fill material will be used to create irregular mounds and ridges consistent with surrounding terrain to reduce access;
- Implement and enforce a traffic control plan that takes into consideration concerns raised by the community;
- Create and support a tourism and recreation committee, with representatives from Wells businesses, Barkerville, and relevant recreation clubs that may be affected by Cariboo Gold;
- Use dust suppression measures;
- Use low profile equipment, structures, berms, and planting vegetation to decrease visibility;
- Use structure surface treatments (e.g., non-reflective surfaces and colours) and vegetation as screening to blend infrastructure in with the natural surroundings and reduce visibility;
- Locate Transmission Line structures, to the extent practicable, to take advantage of existing screening offered by topography and/or vegetation;
- Turn off portable lighting equipment when not in use; and,
- Limit emission of light skywards by using lighting equipment that produce sober and uniform light and would not produce emissions over 90 degrees.

11.16.6 Key Issues Raised

The following key issues were raised by the Technical Advisory Committee, members of the public, the Community Advisory Committee and the EAO:

11.16.6.1 Overlap of Transmission Line with old growth management and visually sensitive areas

MOF expressed concern that the Mine Site and the first 1.8 km of the Transmission Line are in a 'Retention Visual Quality Objective' polygon, and that infrastructure should be screened by vegetation where possible as the area is visually sensitive. MOF also identified that a permanent Old Growth Management Area is overlapped by the Transmission Line by

approximately 4 ha and suggested the Transmission Line and associated accesses be re-routed along the existing highway and roads to minimize disturbance to rare old growth areas.

ODV responded that effects are expected to the permanent Old Growth Management Areas regardless of the mine because of forest harvesting however, best management practices and conventional harvesting and silviculture practices are expected to target the re-establishment of plant communities of interest. ODV also proposed to limit vegetation clearing to the extent possible. Post-closure, the reclamation and naturalization of the Mine Site would occur over time as native vegetation matures. Although the viewshed along Jack of Clubs Lake would change with the Mine Site, the overall experience of tourists and recreational users in the area associated with the change in landscape and viewshed would be related to their expectation of solitude and closeness to nature. ODV plans to maintain on-going communication with the community in Wells and other stakeholders regarding project activities, identifying potential issues in a timely manner and ensuring a collaborative process is implemented to address comments and concerns.

The EAO has proposed Certificate conditions to respond to these concerns, including an Environmental Effects Management Plan (requiring ODV to implement monitoring and mitigation related to old growth forests), an End Land Use Plan (identifying and implementing the end land use objectives following closure of the mine in consultation with Indigenous nations, MOF, EMLI and the District of Wells), and a Public Information condition (requiring ODV to maintain a website to ensure the public has access to monitoring and safety data reports associated with Cariboo Gold and other public information regarding Cariboo Gold such as contact information).

11.16.6.2 Loss/displacement of public and private lands

MOF identified that the proposed water delivery system from the Mine Site to Jack of Clubs Lake would affect approximately 700 m of buffered trail and approximately 7 ha of Lakeshore Management Zone and approximately 0.2 ha of Riparian Reserve Zone. This may cause the entirety of the buffered trail to become isolated and unusable as one end of the trail would begin at the Mine Site. MOF prefers that minimal vegetation is removed and that sedimentation of waterbodies is avoided.

Although this section of the trail would be effectively removed, ODV additionally responded by proposing limited vegetation clearing in the area of the Mine Site and placing signage on recreational trails where there is the potential for conflicts with project activities. ODV will also create and support a tourism and recreation committee, with representatives from Wells businesses, Barkerville, and relevant recreation clubs that may be affected by Cariboo Gold. Reclamation and reforestation would be planned and implemented with a focus on re-establishing pre-disturbance plant communities. ODV will also implement environmental management plans so best management practices are followed to mitigate erosion and sediment from entering nearby waterbodies.

The EAO has proposed Certificate conditions requiring an End Land Use Plan to identify and implement end land use objectives following closure of the mine in consultation with Indigenous nations, MOF, EMLI and the District of Wells as well as biannual community meetings as part of the Community Effects Management Plan to understand impacts such as this to the community.

11.16.6.3 Changes to lighting and views in the District of Wells

Stantec Inc. (Stantec; third party consultant contracted by the EAO) raised questions with ODV's characterization of the town of Wells having a high resilience to increased lighting and believes the assumed high resilience based on historical stresses is over-estimated. Residents of Wells and Indigenous nations have also expressed concern over changes in lighting.

ODV responded to these concerns by proposing mitigation measures at the Mine Site and moving more infrastructure underground through project design changes. During construction, closure, and post-closure phases, ODV would turn off portable lighting equipment when not in use. Lighting would be planned to provide the level of light required for worker safety and equipment security while minimizing light spillover during the operations phase. Other measures ODV would

undertake include reducing building paint contrast levels by using finishes with low reflectance levels and colours that match natural landscapes, where possible, and structures on the site will be dark in color to absorb light reflection. ODV would also limit clearing and retain as much vegetation as possible to provide visual screens. The emission of light towards the sky would be limited by using lights that produce a low and uniform lighting that would meet operational lighting needs and would not exceed angles above 90 degrees.

The EAO included these commitments to reducing light pollution in the District of Wells in a proposed Certificate condition requiring ODV to develop and implement a Community Effects Management Plan.

11.16.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on land and resource use.

To address potential effects to land and resource use, the EAO has proposed the following Certificate conditions:

- End Land Use Plan, to describe the goals of reclamation and final land use;
- Public Information, to require ODV to provide information regarding project phases and public safety to the public;
- Community Effects Management Plan, to require mitigation measures related to light trespass; and,
- Environmental Effects Management Plan, to monitor and mitigate effects on old growth management areas.

The EAO's characterization of the expected residual effects of Cariboo Gold on land and resource use is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 16: Summary of Residual Effects on Land and Resource Use

Residual Effect	Assessment Rating*	Significance and Rationale
Loss or displacement of private property This includes the anticipated direct loss or displacement due to Cariboo Gold project footprint and associated activities and increase in real estate values, affecting affordability.	Context (resilience): Low to moderate Magnitude: Medium Extent: Local Duration: Long-term Reversibility: Irreversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: Moderate	**Not significant** The baseline condition of private property in the area is influenced by existing industry and a variety of other land uses. It is expected that private property would have low to moderate resilience to imposed stresses and can adapt to the predicted changes. Residual effects are expected to have a medium magnitude compared to prior conditions and be local in scale. The residual effect would last throughout all project phases and continue into closure. Loss or displacement of private property would be irreversible and considered continuous throughout Cariboo Gold phases. Specific populations, such as the residents in Wells, would be affected disproportionately by the loss of private property or the decrease in affordability of private property. The likelihood of the effect would be high based on the understanding of project activities. Consequences are predicted to be moderate for loss or displacement of private property due to the medium magnitude and local extent. This led to an overall assessment of moderate risk. There is a low level of uncertainty associated with the loss or displacement of private property as these effects are well-understood from other industrial projects. The effect of loss or displacement of private property has been identified as moderately important to the communities and residents within the local assessment area.
Loss or displacement of tenured land and resource use This includes direct loss or displacement	Context (resilience): Moderate Magnitude: Medium Extent: Local Duration: Long-term	**Not significant** The baseline condition of tenured land and resource use in the area is influenced by existing industry and a variety of other land uses. It is expected that tenured land and resource use would have moderate resilience to imposed stresses and can adapt to the predicted changes. Residual effects are expected to have a medium magnitude

Residual Effect	Assessment Rating*	Significance and Rationale
due to Cariboo Gold project footprint and associated activities.	Reversibility: Irreversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: Moderate	compared to prior conditions and be local in scale. The residual effect would last throughout all project phases. Loss or displacement of tenured land and resource use would be irreversible and considered continuous throughout Cariboo Gold phases. Specific populations, such as tenure holders from forestry, mining, or trapping, would be affected disproportionately by the loss of tenured lands. The likelihood of the effect would be high based on the understanding of project activities. Consequences are predicted to be moderate for loss or displacement of tenured land and resource use due to the medium magnitude and local extent. This led to an overall assessment of moderate risk. There is a low level of uncertainty associated with the loss or displacement of tenured land and resource use as these effects are well-understood from other industrial projects. The effect of loss or displacement of tenured land and resource use has been identified as moderately important to the communities and residents within the local assessment area.
Reduced/changed access on contemporary land and resource use This includes the direct loss or disruption of access to parks and protected areas and other public lands due to Cariboo Gold activities and traffic.	Context (resilience): High Magnitude: Medium Extent: Local Duration: Long-term Reversibility: Partially reversible Frequency: Regular and irregular Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Moderate Importance: Moderate	**Not significant** The baseline condition of access on contemporary land and resource use in the area is influenced by existing industry and a variety of other land uses. It is expected that access on contemporary land and resource use would have high resilience to imposed stresses and can likely adapt to the predicted changes. Residual effects are expected to have a medium magnitude compared to prior conditions and be local in scale. The residual effect would last throughout all project phases at a minimum. Reduced access on contemporary land and resource use may be partially reversible based on reclamation efforts and post-closure removal of some infrastructure. The change to access on contemporary land and resource use is expected to occur at both specific periods during construction and irregular intervals during operations. The effect of reduced access on contemporary land and resource use would be felt evenly throughout the populations in the area. The likelihood of the effect would be high based on the understanding of project activities. Consequences are predicted to be moderate for reduced access on contemporary land and resource use due to the medium magnitude and local extent. This led to an overall assessment of moderate risk. There is a moderate level of uncertainty associated with the reduced access on contemporary land and resource use as these effects are well-understood from other industrial projects. The effect of reduced access on contemporary land and resource use has been identified as moderately important to the communities and residents within the local assessment area.
Decrease in environmental conditions for contemporary land and resource use This includes indirect disturbance associated with a change in environmental conditions including noise, vibration, air quality, and landscape/viewshed.	Context (resilience): Moderate Magnitude: Low Extent: Regional Duration: Long-term Reversibility: Partially reversible Frequency: Regular and irregular Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: Moderate	**Not significant** The baseline condition of environmental conditions for contemporary land and resource use in the area is influenced by existing industry and a variety of other land uses. It is expected that environmental conditions for land and resource use would have moderate resilience to imposed stresses and can adapt to the predicted changes in traffic and noise. Residual effects are expected to have a low magnitude compared to prior conditions and be regional in scale as regional populations are known to come to the area and use the lands and resources for recreation and enjoyment. The residual effect would last throughout all project phases. Decreased environmental conditions for land and resource use may be partially reversible based on reclamation efforts and post-closure removal of some infrastructure. The change to environmental conditions for land and resource use is expected to occur at both specific periods during construction and irregular intervals during operations. The effect of decreased environmental conditions for land and resource use would be felt evenly throughout the populations in the area. The likelihood of the effect would be high based on the understanding of project activities. Consequences are predicted to be moderate for decreased environmental conditions for land and resource use due to the low magnitude and regional extent. This led to an overall assessment of moderate risk. There is a low level of uncertainty associated with the decreased

Residual Effect	Assessment Rating*	Significance and Rationale
		environmental conditions for land and resource use as these effects are well-understood from other industrial projects. The effect of decreased environmental conditions for land and resource use has been identified as moderately important to the communities and residents within the local assessment area.
Increased pressure on public land and resource use by project workforce This includes the change in parks and protected areas experience due to increased workforce (includes friends and family visiting the area) and associated use of parks and protected areas, as well as increased fishing and hunting pressure on resources.	Context (resilience): Moderate Magnitude: Low Extent: Regional Duration: Long-term Reversibility: Partially reversible Frequency: Regular Affected Populations: Even Risk (likelihood and consequences): Low Uncertainty: Moderate Importance: Moderate	**Not significant** The baseline condition of pressure on public land and resource use by the workforce in the area is influenced by existing industry and a variety of other land uses. It is expected that pressure on public land and resource use by the Cariboo Gold workforce would have moderate resilience to imposed stresses and can adapt to the predicted changes in land use pressure. Residual effects are expected to have a low magnitude compared to prior conditions and be regional in scale, given restrictions on use of recreational vehicles and fishing by workers by ODV. Regional populations are known to come to the area and use the lands and resources for recreation and enjoyment. The residual effect would last throughout all project phases at a minimum. Increased pressure on public lands and resources may be partially reversible based on reclamation efforts and post-closure removal of some infrastructure. The change to pressure on public land and resources is expected to occur at specified periods, such as during construction. The effect of increased pressure on public land and resource use would be felt evenly throughout the populations in the area. The likelihood of the effect would be low based on the understanding of project activities. Consequences are predicted to be moderate due to the low magnitude and regional extent. This led to an overall assessment of low risk. There is a moderate level of uncertainty associated with the increased pressure on public land and resource use as these effects are well-understood from other industrial projects, but it is unclear how the population and associated land uses will change due to Cariboo Gold. The effect of increased pressure on public land and resource use has been identified as moderately important to the communities and residents within the local assessment area.
Decrease in enjoyment and experience for contemporary land and resource use This includes a decrease in enjoyment/experience for contemporary land and resource use due to change in landscape.	Context (resilience): Moderate Magnitude: Low Extent: Regional Duration: Long-term Reversibility: Partially reversible Frequency: Continuous Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Moderate Importance: High	**Not significant** The baseline condition of enjoyment/experience for contemporary land and resource use in the area is influenced by existing industry and a variety of other land uses. It is expected that enjoyment of the land and resources would have moderate resilience to imposed stresses. Residual effects are expected to have a low magnitude compared to prior conditions and be regional in scale. Regional populations are known to come to the area and use the lands and resources for recreation and enjoyment. The residual effect would last throughout all project phases at a minimum. Loss of enjoyment and use of some areas, particularly along the Transmission Line, would be permanent. The Transmission Line would follow a corridor north of Highway 26, along forest service roads or other disturbed areas where possible. The effect would be continuous throughout all phases of Cariboo Gold. A decrease in enjoyment of land and resources would be felt evenly throughout the populations in the area. The likelihood of the effect would be medium based on the understanding of project activities. Consequences are predicted to be moderate due to the low magnitude and regional extent. This led to an overall assessment of moderate risk. There is a moderate level of uncertainty associated with the decrease in enjoyment of land and resources as these effects are well-understood from other industrial projects, but it is unclear how the population and associated land uses will change due to Cariboo Gold. The effect of a decrease in enjoyment of land and resources has been identified as highly important to the communities and residents within the local assessment area.

Residual Effect	Assessment Rating*	Significance and Rationale
Change in lighting from Mine Site This effect includes the increase in light trespass from project infrastructure.	Context (resilience): Low Magnitude: Medium Extent: Local Duration: Long-term Reversibility: Partially reversible Frequency: Regular Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: Moderate	**Not significant** The baseline condition of lighting in the area is affected by existing industry and a variety of other land uses. Lighting conditions would have low resilience to imposed stresses from the Mine Site due to current dark night skies experienced by the residents of Wells. Residual effects would have a medium magnitude compared to prior conditions and be local in scale. The residual effect would last through construction and operations when lighting is used. The effect would be regular throughout construction and operations when lighting is used. Change in lighting due to the Mine Site would disproportionately affect the nearby communities. The likelihood of the effect would be high based on the understanding of project activities and proximity to Wells. Consequences would be moderate due to the medium magnitude and local extent. This led to an overall assessment of moderate risk. There is a low level of uncertainty associated with the change in lighting as these effects are well-understood from other industrial projects. The effect of a change in lighting due to the Mine Site has been identified as moderately important to the communities and residents within the local assessment area.
Change in visual resources This effect includes the loss of visual quality and changes to visual resources from project infrastructure, primarily the Transmission Line, the Mine Site Complex building, and the access roads.	Context (resilience): Moderate Magnitude: High Extent: Local Duration: Long-term Reversibility: Partially reversible and irreversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	**Not significant** The baseline condition of visual resources in the area is influenced by existing industry and a variety of other land uses. It is expected that visual resources would have moderate resilience to imposed stresses. Residual effects are expected to have a high magnitude compared to prior conditions and be local in scale due to changes occurring within sight of Cariboo Gold infrastructure, in particular the services building. Where partially reversible effects would be absent post-closure, the irreversible residual effects would last throughout all project phases and beyond. The effect would be continuous throughout all phases of Cariboo Gold. Change in visual resources is expected to be felt disproportionately by residents of Wells and those who come to visit/or are not residents but are regular users of the area. The likelihood of the effect would be high based on the understanding of project activities. Consequences are predicted to be moderate due to the high magnitude and local extent. This led to an overall assessment of moderate risk. There is a low level of uncertainty associated with the change in visual resources as these effects are well-understood from other industrial projects. The effect of a change in visual resources has been identified as highly important to the communities and residents within the local assessment area.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.16.8 Cumulative Effects Assessment

ODV conducted a cumulative effects assessment on land and resource use for the residual adverse effects identified, as detailed in *Chapter 7.11* of the Revised Application. ODV identified eight existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold: Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, Telecommunications Facility in Wells, Mt. Polley Copper Mine, as well as regional recreation use, forestry, mining, and transportation activities.

The reduced and changed access for land and resource activities in the region have the potential to result in increased traffic in Wells. All activities identified as potentially acting cumulatively would increase traffic, although ODV indicated that these were captured in traffic numbers considered in its assessment.

The anticipated change in the number of workers at the Mine Site using local lands and resources could interact cumulatively with workers associated with Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, forestry,

mining, and transportation in the local assessment area. There also is a predicted influx of tourists due to Cariboo Gold. ODV will continue to monitor potential issues associated with Cariboo Gold through the Community Effects Management Plan and Community Monitoring Committee established with the District of Wells.

The Mt. Polley Mine is anticipated to be also operating during construction of Cariboo Gold and the additional workforce in the area may contribute to the change in environmental conditions from tourism and recreation traffic; however, ODV considered the potential cumulative effect in the region to be negligible. The magnitude of the effects would depend on the number of workers in the area at any given time and the ability of Cariboo Gold to identify issues and develop specific mitigation measures that address community concerns.

Through the EAO's proposed Certificate conditions, ODV would be required to develop and implement monitoring plans to mitigate and monitor potential adverse effects to land and resource use throughout Cariboo Gold's lifecycle.

The EAO identified that the effects on land and resource use would be expected to overlap cumulatively with other past, present, and foreseeable future projects and activities within the regional assessment area. The potential for cumulative effects from these projects and activities is considered moderate in consideration of extensive past, current, and planned activities. However, the contribution of effects on land and resource use from Cariboo Gold itself to cumulative effects in the region is considered not significant.

11.17 Infrastructure and Services

11.17.1 Summary

Well-functioning infrastructure and services allow communities to serve their populations and provide health and social care and benefits to those populations. ODV identified potential effects from Cariboo Gold to community infrastructure and services, transportation infrastructure, and housing and accommodation and described mitigation measures that would reduce these potential effects.

The main issues discussed by reviewers were potential effects to the District of Wells based on increased traffic, demand for utilities, demand for housing and accommodations, effects on community safety, and cumulative effects.

To address concerns raised, the EAO proposed Certificate conditions requiring ODV to manage traffic and access through the Construction Environmental Management Plan, hold biannual community meetings, and monitor effects on the region through a Community Effects Management Plan.

The EAO then assessed the potential effects to infrastructure and services given ODV's assessment, the proposed mitigation measures, and proposed Certificate conditions. Given these measures, the EAO found that there would not be a significant adverse effect to infrastructure and services.

The effects on infrastructure and services were expected to overlap cumulatively with other past, present, and foreseeable future projects and activities within the local and regional assessment areas, in particular related to increased traffic in the District of Wells and demand for housing. The EAO concluded that potentially moderate, likely not significant, cumulative effects could occur to infrastructure and services as a result of the effects of Cariboo Gold interacting with the effects of other past, present, and reasonably foreseeable future projects and activities.

11.17.2 Assessment Boundaries

The spatial boundaries for the infrastructure and services assessment included a local assessment area (including the District of Wells, Barkerville Historic Town and Park, the City of Quesnel, Indigenous nations communities and reserves, Cariboo Regional District Electoral Area C and a 250 m buffer around project components in Cariboo Regional District Electoral Area F) and a regional assessment area (including the area between Williams Lake and Prince George and parts of the traditional territory of Indigenous Nations of Lhtako Dené Nation, Xatśūll First Nation, Williams Lake First Nation,

Nazko First Nation and Tsilhqot'in National Government, and Cariboo Regional District Electoral Areas A, B, C, D, and F and Regional District of Fraser Fort George Electoral Areas A, C, D, and E).

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.17.3 Baseline Conditions by ODV

The baseline conditions for infrastructure and services were assessed by ODV in *Chapter 7.12* of the Revised Application and are summarized here.

Utilities in the regional and local assessment areas include water, sewer, electricity, communications, natural gas, and waste management. Accessibility throughout the areas varies by community and some users are on private wells and septic systems rather than public utilities. The capacity of water utilities in the regional assessment area, except for in the District of Wells, is sufficient to meet the existing demand and future growth. Quesnel has water capacity to accommodate population growth because of a 20 percent population decline from 2014-2019. The District of Wells water system has several challenges related to capacity, age, and quality of infrastructure, including proximity of water and sewer lines to each other. The water system was found to be operating at or above capacity and cannot accommodate additional demand as this affects water supply to businesses and residences and fire water supply. All systems in the regional assessment area meet water quality guidelines for most parameters with the exceptions of manganese and iron in groundwater in the District of Wells. Similar to the water system in the regional assessment area, the capacity of the sewer systems, apart from the District of Wells, is sufficient to meet existing demand and future growth. The District of Wells sewage system was found to be operating at capacity, the sewage lagoon is not in compliance with provincial regulations, and discharge is continuous.

With regards to waste management, Prince George, Quesnel, and Williams Lake provide waste collection services and have arrangements with landfills to take their waste. The District of Wells, Barkerville and rural areas have access to transfer stations managed by regional districts where waste is then transferred to a regional landfill. There are no major capacity issues related to waste management. The City of Quesnel and the Cariboo Regional District operate an unlined landfill serving the City of Quesnel, the Cariboo Regional District, the District of Wells, and surrounding areas; it cannot take liquid waste. The transfer station in the local assessment area at Wells cannot easily be increased in size as it its bound by the lake, a slope, and the highway.

There is currently enough electricity supply to meet demand; however, there are some concerns regarding supply for future growth. There is no backup power source for the District of Wells and the Cariboo Regional District Electoral Area C and outages are more frequent than in other areas. An existing powerline from the Likely area provides service to the Quesnel River Mill site.

Natural gas is supplied to most of the regional assessment area by Fortis BC. Natural gas is not supplied to the District of Wells as the services stops at Frost Road along Highway 26, approximately 55 km west of the District of Wells.

There is varying availability of communication services within the regional assessment area. Cell service was recently established by Telus in the District of Wells in spring 2022. Services in most areas include telephone, cell service, internet, cable, and satellite television.

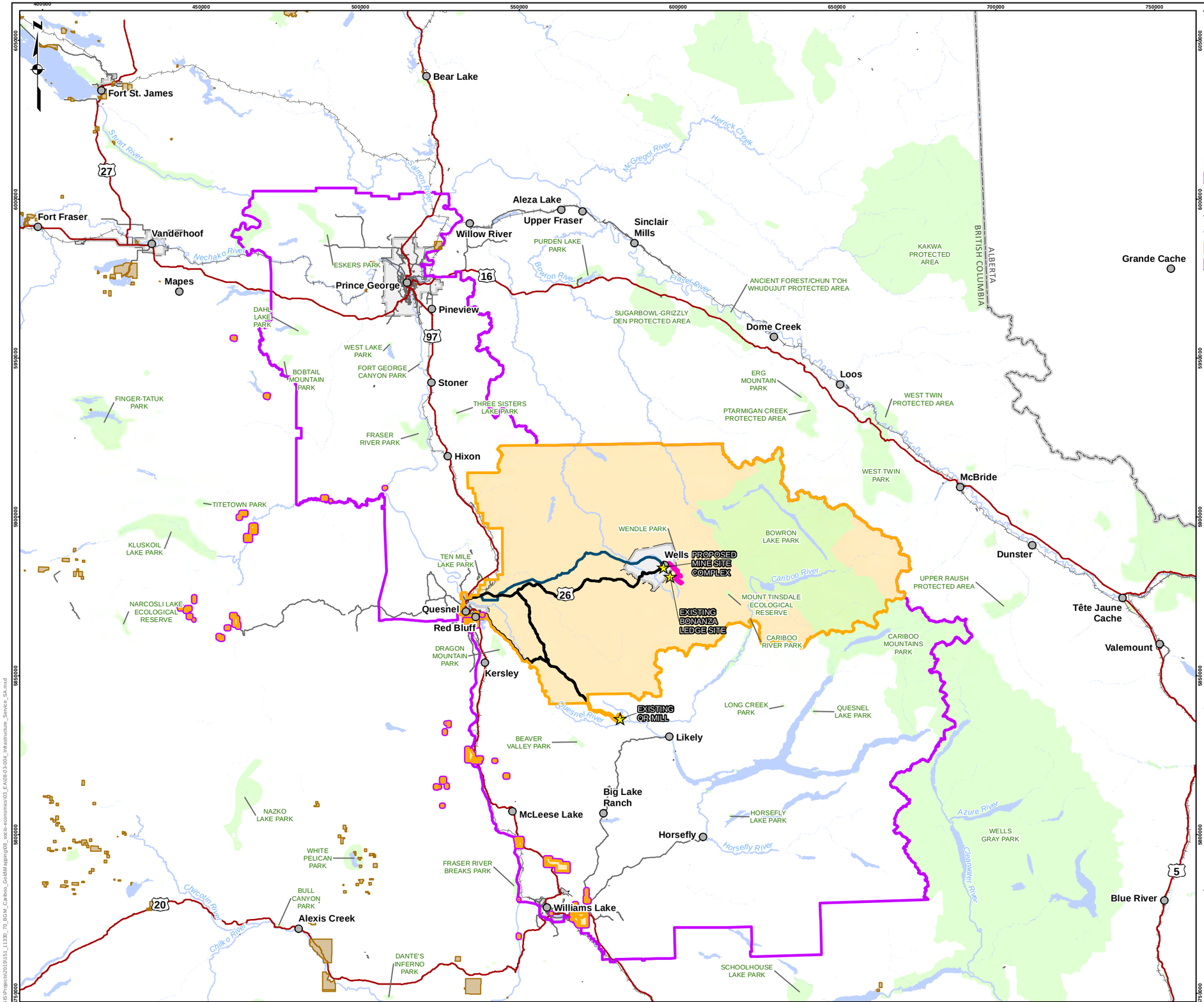
The District of Wells encompasses local sites focused on outdoor activities such as hiking, fishing, snowmobiling, skiing, and camping. Facilities in the District of Wells also include a fitness centre in the community building, the Sunset Theatre, art galleries, shops, restaurants, and historic sites (many are only fully open during summer months). Between Quesnel and Wells, there are opportunities for outdoor activities at the Troll Ski Resort.

Within the regional assessment area, there are four School Districts. The Mine Site would be located in School District 28. Enrollment in School Districts 57, 28 and 27 have all been decreasing and were projected to continue decreasing over the next decade. Most schools are operating at or near capacity and cannot accommodate students outside their catchment; however, Wells-Barkerville Elementary in the District of Wells and Barlow Creek Elementary are located closest to Cariboo Gold, and both can handle increases in enrollment. There is a higher proportion of Indigenous students in the regional assessment area, compared to the broader provincial average. The University of Northern B.C., College of New Caledonia and Thompson Rivers University serve the region, and prior to COVID-19, daycare facilities were at or near capacity.

Road, air, and rail transportation options are available in the region and provide access to local and regional sites, as well as for businesses, residents, and international markets. The main east and west highways are Highway 16, Highway 26 (Quesnel to Barkerville), Highway 20, and the Chilcotin Bella Coola Highway (Williams Lake to Bella Coola). Highway 26 is a primary route for traffic to and from the Mine Site connecting Quesnel to Wells, Barkerville and other small communities along Highway 26 and provides access to Bowron Lakes area. Highway 97 is the key north south corridor in the region and one of the major north-south highways in B.C., intersecting with Highway 16 in Prince George. Access to the Quesnel River Mill site would be from Highway 26 via the 500 Nyland Lake Road. Most highways and roadways in the region are maintained by the Ministry of Transportation and Infrastructure, while some resource roads are maintained by resource companies (including ODV), or MOF.

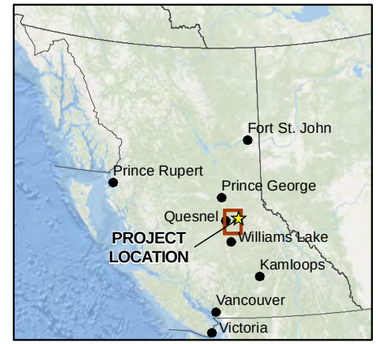
Road transportation services in the region include inter-community and other commercial bus services, transit, health related services and ODV shuttle services. Transit services are provided to residents in and in the surrounding areas of Prince George, Quesnel, and Williams Lake with intermittent service to and from the District of Wells. Health Connections provides communities with non-emergency transportation for medical appointments through Northern Health. This service runs from Prince George to Vancouver with stops in Quesnel and Williams Lake. ODV provides a shuttle service for employees from Quesnel to the Mine Site in Wells with a designated pick-up spot in Quesnel. Airports are located in Prince George (international), Quesnel (regional) and Williams Lake (regional). CN Rail travels through Prince George to Port of Prince Rupert and from Prince George to Quesnel and Williams Lake. Via Rail service is available from Jasper to Prince George and Prince Rupert and CN Rail has the capacity to handle increased demand on these rail lines.

The region has a range of housing types including single family detached and semi-detached homes, apartments, row housing, and moveable dwellings. Emergency and non-market housing is available including emergency and transition housing and/or support services, non-market subsidized housing, and seniors housing. Hotels, motels, bed and breakfasts, campgrounds and trailer parks provide temporary and short-term accommodations. Recent years have seen increases in demand and prices as well as shortages in housing types wanted or needed by residents and temporary workers. Rentals are mostly available in Quesnel and the surrounding area with some rentals available in Cariboo Regional District Electoral Area C (mostly single-family homes). There are limited rental accommodations in the District of Wells and demand regularly exceeds supply.



LEGEND

- POPULATED COMMUNITY
- MUNICIPALITY BOUNDARY
- HIGHWAY
- ROAD
- RAILWAY
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- FIRST NATION RESERVE
- BARKERVILLE HISTORIC TOWN AND PARK
- PROPOSED PROJECT INFRASTRUCTURE LOCATION
- PROPOSED TRANSPORTATION ROUTE
- PROPOSED TRANSMISSION LINE ROUTE
- INFRASTRUCTURE AND SERVICES LOCAL ASSESSMENT AREA
- INFRASTRUCTURE AND SERVICES REGIONAL ASSESSMENT AREA



REFERENCE(S)

1. TRAILS, WATER FEATURES, ROADS, MUNICIPAL BOUNDARY, PARK/PROTECTED AREAS, BARKERVILLE HISTORIC TOWN/PARK, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
2. HILLSHADE DERIVED FROM LIDAR DATA FLOWN BY MCELHANNAY CONSULTANTS LTD. JUNE 27, 2016.
3. BASE DATA SOURCE: ESRI, GEOBASE, NRCAN, AND THE GIS USER COMMUNITY.
4. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM ZONE 10N

0 10 20 30 40 50
1:1,200,000 KILOMETRES

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

INFRASTRUCTURE AND SERVICES ASSESSMENT AREAS

REV.	DESCRIPTION	DATE	INITIALS
A		4/21/2022	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	25

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

Y:\GIS\Projects\2019\151_11330_70_BGM_Cariboo_GoldMapping\08_socio-economics\03_EA\08-03-004_Infrastructure_Service_SA.mxd

Figure 25: Map – Infrastructure and services assessment areas

11.17.4 Potential Project Effects by ODV

ODV identified the following potential effects infrastructure and services due to Cariboo Gold:

- Increase in demand for utilities, education, daycare services, and community recreation facilities and use areas;
- Traffic volumes would increase, potentially increasing collisions and associated issues (e.g., parking, dust, etc.) in the District of Wells;
- In migration/commuting and/or movement of workers may increase the use of airports and local transportation services;
- Transportation of construction supplies may result in increased use of railways;
- Increase in demand for housing (affecting supply and prices), temporary accommodations, and emergency housing;
- During closure, traffic may be significantly reduced and there may be reduced use of airports and local transportation;
- Closure of work camps may increase demand for waste management sites;
- Mine closure may reduce demand for education and daycare services and community recreation facilities and use areas; and,
- Following closure, a decrease in the need for housing and job loss may increase the demand for temporary, emergency, and subsidized housing.

11.17.5 Proposed Mitigation Measures by ODV

In addition to following best management practices, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Inform regional communities and residents regarding project phase timing, employment numbers, duration, and changes in requirements from phase to phase;
- Inform workers coming in from outside the region about community infrastructure, services, and housing in the area to make informed decisions regarding moving to the area;
- Work with a community monitoring committee and the District of Wells to monitor mitigation effectiveness and implement adaptive mitigations required;
- Work with the District of Wells to upgrade the existing water and sewer systems;
- Work with the District of Wells to enhance electricity service to Wells and the surrounding area;
- Inform school districts about anticipated numbers of students as early as possible, as well as of closure timing;
- Inform Quesnel, the District of Wells, the Cariboo Regional District, and Indigenous nations regarding timing of project related phases, duration, and number of workers to aid in planning regarding use of facilities in the area;
- Upgrade forest service roads so they are suitable for project related uses;
- Work with the Ministry of Transportation and Infrastructure to move the 50 km/h speed limit so that access to the Mine Site Complex would be located within that zone;
- Build a highway bypass in Wells to prevent mine traffic from traveling through the community;

- Move workers via shuttle bus to limit personal vehicles on site and along Transportation Routes;
- Provide access to mental health services for workers while at camp and while off shift; and,
- Use ODV-owned accommodation in Wells for workers to reduce demand on temporary accommodations.

11.17.6 Key Issues Raised

The following key issues were raised by the Technical Advisory Committee, members of the public, the Community Advisory Committee and the EAO.

11.17.6.1 Increased demand for housing and accommodations

Northern Health expressed concern with potential increases in the need for emergency housing during construction, operations, and post-closure periods, as well as cumulative effects associated with increased demand for housing and what repercussions may exist for vulnerable groups. The EAO raised the issue of limited available housing, specifically for early childcare educators to support increased daycare requirements.

ODV responded that it would provide housing for all direct workers at camps at the Mine Site and Quesnel River Mill and incoming workers will be apprised of the housing situation in the area before they are hired. ODV will also work with the District of Wells to upgrade water and sewer infrastructure which will facilitate the development of housing in the community.

The EAO has proposed a Certificate condition requiring ODV to hold biannual community meetings and implement a Community Effects Management Plan to ensure a percentage of the Cariboo Gold workforce would come from the local assessment area and worker camps would be used to house the majority of workers.

11.17.6.2 Effects on transportation infrastructure

The EAO and the District of Wells sought information about how ODV will ensure employees favour the shuttle bus over personal vehicles, how personal vehicle use will be restricted, and whether there would be sufficient parking space available for those taking the shuttle. The public expressed concern over effects from increased traffic in Wells (e.g., dust, idling, and parking).

ODV has addressed this by designing Cariboo Gold so that a new highway bypass would be built in Wells so that Cariboo Gold related traffic does not travel through the community during Phase 2 of Operations. Furthermore, ODV will ensure workers, contractors, and sub-contractors have a copy of the Traffic Control Plan and are aware of key transportation related bylaws or regulations in Wells. ODV will move workers to site by shuttle bus so that there are limited personal vehicles in the area.

The EAO has proposed a Certificate condition requiring ODV to hold biannual community meetings and develop and implement a Construction Environmental Management Plan and a Community Effects Management Plan which includes these measures as requirements.

11.17.6.3 Effects on community safety

Previous mining in the area has resulted in old infrastructure not being secured (e.g., portals, shafts, buildings, etc.) and waste rock and tailings being deposited within the District of Wells which limits activities, infrastructure, and other development. There has also been concern raised over potential leaching from tailings into local water sources. ODV will also work cooperatively with the District of Wells, Northern Health, and EMLI to work towards addressing these issues.

The EAO has proposed a Certificate condition requiring ODV to develop and implement a Community Effects Management Plan and hold biannual community meetings to develop plans in consultation with the District of Wells and Northern Health to monitor public health and safety and report the results to the public and to provide information to

residents and visitors regarding historical contamination and infrastructure. ODV would also be required to monitor mitigation effectiveness and implement adaptive mitigations as required.

11.17.6.4 Effects on drinking water supply

Although ODV has committed to finding and installing a new drinking water supply well or mitigating the effects of post-closure groundwater quality for the District of Wells, Northern Health reviewers were concerned that the change in drinking water well draw down may change the quality of the drinking water for some users, if they are not using the District's water supply (for example, if they have private wells). There also may be different operational needs (such as sampling regimes or water treatment needed) for the District of Wells with the new water supply well, as well as the new work camp may increase or change water demands. Northern Health recommends that the District of Wells implement a bylaw to discourage drilling of private wells into the aquifer.

The EAO has provided Northern Health's recommendation to the District of Wells. ODV has committed to working with the District of Wells, through their agreement, to search for a new drinking water supply and assist with the construction of a new well and associated infrastructure, if a new water source is found. The effects of Cariboo Gold on groundwater are discussed further in *Section 11.8* (Groundwater) and addressed further in the Drinking Water Plan proposed Certificate condition.

11.17.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in the following residual adverse effects on infrastructure and services: increased traffic in Wells and increased demand for housing and accommodations.

The EAO has proposed Certificate conditions requiring ODV to develop and implement a Community Effects Management Plan, a Drinking Water Plan, a Public Information Plan, and a Construction Environmental Management Plan to manage traffic, access, and public safety.

The EAO's characterization of the expected residual effects of Cariboo Gold on infrastructure and services is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 17: Summary of Residual Effects to Infrastructure and Services

Residual Effect	Assessment Rating*	Significance and Rationale
Increased traffic in Wells Traffic volumes would increase, potentially increasing collisions and associated issues (e.g., parking, dust, etc.) in the District of Wells. In-migration/ commuting and/or movement of workers may increase the use of airports and local transportation services. Transportation of construction supplies may result in increased use of railways. During closure, traffic may be significantly reduced and there may be	Context (resilience): Moderate Magnitude: Medium Extent: Regional Duration: Medium-term Reversibility: Fully reversible Frequency: Irregular Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	**Not significant** Recent years have seen annual increases in traffic in Wells due to existing resource extraction in the area and leading to a moderate resilience to change. Traffic in Wells will not be mitigated completely through reliance on shuttle services (e.g., additional construction vehicles), so the magnitude of the effect is considered medium. Increased traffic in Wells may extend beyond the local assessment area due to commuters from the regional assessment area. Increased traffic could occur into operations and closure. Traffic would likely revert to pre-project conditions post-closure. Traffic pattern effects are expected to occur at irregular intervals. Traffic in Wells is expected to affect the population evenly. Increased traffic would be expected to occur (high likelihood), causing congestion and other associated effects thus the consequence would be moderate (medium magnitude and regional extent). This led to a moderate risk rating for effects of increased traffic in Wells. There is a low level of uncertainty in the traffic determination due to the population changes with Cariboo Gold being uncertain. This issue is highly important to residents of Wells.

Residual Effect	Assessment Rating*	Significance and Rationale
reduced use of airports and local transportation.		
Increased demand for housing and accommodations An increase in demand for housing (affecting supply and prices), temporary accommodations, and emergency housing would occur. Following closure, a decrease in the need for housing and job loss may increase the demand for temporary, emergency, and subsidized housing.	Context (resilience): Moderate Magnitude: Medium Extent: Local to Regional Duration: Long-term Reversibility: Partially reversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate to High Uncertainty: Low Importance: High	**Not significant** Due to existing resource extraction activities in the area, recent years have seen an increase in demand and prices, as well as shortages, in housing types wanted or needed by residents and temporary workers. There are limited rental accommodations in the District of Wells and demand regularly exceeds supply in Wells. Although Cariboo Gold workers will all be provided camp accommodation, additional housing demand will occur for families and associated services to the mine., resulting in a medium magnitude effect. Increased demand for housing is expected to extend locally to regionally, including workers that will commute from the regional assessment area. Increased demand for housing will likely extend beyond construction to accommodate operational phase staff. The construction of new homes and accommodations is not fully reversible and may continue to have effects on housing dynamics. Demand for housing is expected to be continuous and is expected to potentially affect members of the population who may be renters, or low-income earners, more than others. Increased demand for housing would be expected to occur (medium likelihood), affecting renters and low-income individuals, and the consequence would be moderate to high (medium magnitude with local to regional extent). This led to a moderate risk rating for effects of increased demand for housing in Wells. There is a low level of uncertainty in the demand for housing determinations. This issue is important to residents of Wells.
* *Note*: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.17.8 Cumulative Effects Assessment

ODV conducted a cumulative effects assessment on infrastructure and services, provided in *Chapter 7.7.12* of the Revised Application. ODV identified 15 existing and reasonably foreseeable projects and activities anticipated in the area, three of which that have the potential to act cumulatively with Cariboo Gold (Mosquito Creek Reclamation, Mt. Polley Copper Project, and West Coast Olefins Ethylene).

The potential for cumulative effects from these projects and activities is considered moderate due to the proximity of Cariboo Gold to pre-existing projects and activities and the number of anticipated workers for these projects contributing to both an increase in traffic and demand for housing in the local assessment area and regional assessment area. Past, present, and reasonably foreseeable projects and activities were identified for inclusion in the cumulative effects assessment are from a variety of sources including municipal, regional, provincial, and federal government agency and company websites.

Residual effects were identified after the application of mitigation measures. Cariboo Gold-related traffic would result in increased traffic and associated issues in Wells (e.g., dust, idling, parking). In-migration would increase demand for housing.

The potential for cumulative effects from these projects and activities is considered moderate in consideration of extensive past, current, and planned mining activities. However, the contribution of effects on infrastructure and services from Cariboo Gold itself to cumulative effects in the region is considered moderate but not significant.

11.18 Employment and Economy

11.18.1 Summary

A healthy economy and high employment levels allow communities to grow and serve their population well. ODV assessed the potential effects to changes in employment and economy (including economic activity, employment, and effects on wages) and described mitigation measures that would reduce the potential effects to employment and economy.

The following key issues were identified by reviewers through review of employment and economy: the effect of Cariboo Gold on local tourism and the effect on employment and economy after mine closure. To address these issues, the EAO proposed a Certificate condition to require ODV to develop and implement a Community Effects Management Plan. ODV has also committed to creating a Community Involvement Plan with the District of Wells.

The EAO then assessed the potential effects to employment and economy given ODV's assessment, the proposed mitigation measures, and the proposed Certificate condition. Given these measures, the EAO found that there would not be significant adverse effects to employment and economy.

11.18.2 Assessment Boundaries

The employment and economy local assessment area included where most of Cariboo Gold workforce would be expected to reside, where labour, goods, and services would be sourced, and where most direct project effects (population change, employment, business opportunities, and training opportunities, etc.) would be expected to occur. Generally, it included the District of Wells, Barkerville Historic Town and Park the City of Quesnel, the City of Prince George, the City of Williams Lake, and nearby Indigenous nations communities. The boundary of the employment and economy regional assessment area included the Cariboo Development Region, which is comprised of the Cariboo Regional District and the Regional District of Fraser Fort George.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). Cariboo Gold components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.18.3 Baseline Conditions by ODV

Communities in the region have a history of resource development and, as a result, have experienced the associated positive and negative effects on employment and economy arising from the boom-and-bust cycles that often accompany resource development. This resource development has supported the economy and has involved the development of infrastructure and services specific to these resource activities or to support the workforce associated with the activity as well as the broader community.

11.18.4 Potential Project Effects by ODV

Cariboo Gold would have several effects to the economic activity of the region, most particularly during the construction and operations phases. Among the positive effects, Cariboo Gold would create new employment opportunities for local and regional residents, and generate revenue for local, provincial, and federal governments.

Assuming increased economic activity to be a positive effect, ODV's view was that there would be few negative effects from Cariboo Gold on employment and the economy. ODV considered their commitments to local hiring, training, and education of residents, and implementation of the other mitigation measures identified, including a Socio-economic Monitoring Program, and found that negative residual effects on employment and economy were not anticipated during construction and operations.

11.18.5 Proposed Mitigation Measures by ODV

ODV plans to develop local hiring, training, education, and procurement policies. ODV will also work with the District of Wells to develop tourism complementary to mining operations and monitor the effects through a Socio-economic Monitoring Program.

11.18.6 Key Issues Raised

The following key issues related to employment and economy were raised by the District of Wells, members of the public, the Community Advisory Committee and the EAO.

11.18.6.1 Effect of the mine on tourism

The area near the mine is described by the public and the Community Advisory Committee as valuable for its natural qualities and views. Values related to the perception of the region as remote, peaceful, and wild were often found throughout Cariboo Gold's public engagement activities. Concerns about the effects on the level of traffic in the District of Wells, including the potential for an overlap between construction and operations mine traffic and peak times for tourism-related traffic were raised by several reviewers, including the District of Wells, the public and the Community Advisory Committee. The Community Advisory Committee also raised concerns about the negative impact of mining on the tourism economy of Wells due to loss of accommodation facilities to exclusive use by ODV. The Community Advisory Committee used provincial and regional tourism research to measure the economic impact on the Wells, Barkerville and Bowron region and estimated a negative effect to the tourism economy.

ODV responded to these concerns by developing a strategy to manage pressures on recreation and tourism in the local area due to increased population and visitors. ODV has also provided funding to local organizations such as Island Mountain Arts and the Barkerville Historic Town. ODV would implement project-specific mitigation measures, and ODV's Community Development Initiatives that show, collectively, ODV's plan to protect and enhance tourism and recreation in the local area while minimizing the effect of an increase in traffic during the construction and operations phases of Cariboo Gold. The EAO has also proposed Certificate conditions that would require access management and traffic management plans for construction and a Community Effects Management Plan and for ODV to hold biannual community meetings.

11.18.6.2 Effect on employment and economy after mine closure

While negative economic effects for the mine post-closure were found to be minimal by ODV, concerns were raised by Northern Health and the public during public engagement about the risks to employment in the region in the long-term, particularly after mine closure. Northern Health expressed concern that fluctuating commodity prices and potential fluctuations in employment rates could result in job instability, such as what occurred when the nearby Bonanza Ledge Site entered a care and maintenance phase in June 2022. Local service providers, seasonal workers, and long-term job security were highlighted as needing special attention.

ODV responded that it would provide financial planning, job search support, enhanced mental health support, and other supports to workers that could facilitate the transition to another position or put them in a better position from which to handle job cessation. The EAO has also proposed a Certificate condition that would require ODV to develop and implement a Community Effects Management Plan and hold biannual community meetings.

11.18.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual effects on employment and economy following mine closure, including loss of employment and decreases in revenue for the Province, local government, and local businesses.

The EAO's characterization of the expected residual effects of Cariboo Gold on this valued component is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 18: Summary of Effects on Employment and Economy

Residual Effect	Assessment Rating*	Significance and Rationale
Loss of employment opportunities for local and regional residents This effect would occur following mine closure, as employees of Cariboo Gold no longer would have employment.	Context (resilience): Moderate Magnitude: Low Extent: Regional Duration: Short-term Reversibility: Fully reversible Frequency: Once Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	**Not significant** The communities and residents in the region have dealt with cyclical resource activities in the past and have other forms of employment developed through this cyclical nature; however, the emotional and financial toll of losing work can increase vulnerability leading to moderate resilience. Workers would be aware of the timeline of their employment and would have been provided with support by ODV to facilitate transition to alternate employment, leading to a low magnitude of impact. The effect would extend to areas where workers are based, which is regional. The effect would be short-term following the closure of Cariboo Gold. The community would likely recover as it has in the past. ODV would work with interested parties to develop a Community Effects Management Plan (which has been initially developed as a Socio-economic Plan in the Application by ODV) that would contain a feedback mechanism so that input regarding actual effects can help identify areas where adaptive management may be required. Job loss would occur following closure. It is likely that all populations would be affected in a similar manner. The consequence is moderate (low magnitude and regional extent), and the likelihood is high, which led to a moderate assessment of risk for this effect. There is a low level of uncertainty in the assessment of risk based on the data provided by ODV. Employment was identified as important to the District of Wells and the Community Advisory Committee.
Decrease in revenue for local, provincial, and federal governments from Cariboo Gold as well as opportunities for local businesses This effect would occur following mine closure, as local businesses may have fewer local opportunities or sales.	Context (resilience): Moderate Magnitude: Low Extent: Regional Duration: Short-term Reversibility: Fully reversible Frequency: Once Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	**Not significant** The communities and residents in the region have dealt with cyclical resource activities in the past and have other forms of revenue developed through this cyclical nature; however, the emotional and financial toll of losing work can increase vulnerability leading to moderate resilience. Because the effects of closure would be known in advance, but that it may lead to changes to local businesses, the magnitude is considered low. The effect would extend to the regional area. The effect would be short-term following the closure of Cariboo Gold. The business and local government would likely recover as it has in the past. ODV would work with interested parties to develop a Socio-economic Monitoring Program that would contain a feedback mechanism so that input regarding actual effects can help identify areas where adaptive management may be required. Loss of revenue would occur following closure. It is likely that all populations would be affected in a similar manner. The consequence is moderate (low magnitude and regional extent), and the likelihood is high, which led to a moderate assessment of risk for this effect. There is a low level of uncertainty in the assessment of risk based on the data provided by ODV. The economy was identified as important to the District of Wells and the Community Advisory Committee.
* *Note*: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.18.8 Cumulative Effects Assessment

There are several existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold. Although there would be several projects ongoing at the time of closure, none of the larger projects have closure dates consistent with that of Cariboo Gold. For recreation, forestry, mineral exploration, placer mining, and transportation, employment at any given time in the future is difficult to predict and specific information regarding the numbers of workers that would be hired or whose employment would cease at the same time as closure of Cariboo Gold is not available.

The potential for socio-economic cumulative effects is considered moderate by the EAO given the negative effects of resource development on employment and economy arising from the boom-and-bust cycles that historically are known to occur in regions with substantial resource development. However, given the potential positive effects anticipated for the duration of Cariboo Gold, the proposed conditions by the EAO and mitigation measures by ODV, the EAO assesses that there would not be significant cumulative effects on employment and economy in the region.

11.19 Consistency with Land Use Plans

Under the B.C. *Land Act* (1996), a Land Use Objectives Regulation was established in 2010 that sets the legal direction for forestry activities under the *Forest and Range Practices Act* (2002) and contains objectives and maps for biodiversity, wildlife trees, old growth forest, critical habitat for fish, community areas of special concern, lakes, riparian areas, mature birch retention, grasslands, recreational values (scenic areas, recreation trails), and high-value wildlife habitat. Land use planning sets the strategic direction which guides sustainable resource stewardship and management of provincial public land and waters that meets economic, environmental, social, and cultural objectives. In other words, land use planning sets high-level direction and helps define 'what' can occur 'where' on the land base.

Cariboo Gold falls within the bounds of three existing land use plans: the *Cariboo-Chilcotin Land Use Plan* (CCLUP; 1995) and the *Quesnel Sustainable Resource Management Plan* (SRMP) and the *District of Wells Official Community Plan* (2010, and currently being updated). The Quesnel SRMP is one of seven sustainable resource management plans for the Cariboo Region and addresses the strategies and targets of the CCLUP on an area-specific basis through detailed objectives and strategies. The CCLUP was established in 1994 to balance the environment and economy in the Cariboo-Chilcotin region and describes access to timber for the local forest industry; certainty for mining, ranching, and tourism industries; conservation and recreation objectives for natural values; economic and social stability; and increased opportunities for growth and investment throughout the region. Legal objectives of the CCLUP include the protection of birch areas for Indigenous nations, buffered train areas, critical habitat for fish, grassland benchmark areas, grizzly bear habitat, high-value wetlands for moose, lakeshore management classes, old growth management areas, scenic areas, and Secwépemc Nation traditional territory.

The predominant land use activities in the Cariboo region include forestry, agriculture and ranching, mineral exploration and mining, transportation, energy, and recreational activities. In recent years, the region experienced several major disturbances including numerous large-scale wildfires and flooding, and significant beetle infestations.

The District of Wells Official Community Plan is currently in the process of being updated, planned to be completed in late 2023. The goal of the District of Wells Official Community Plan is to "accommodate, encourage and guide community development in Wells in a manner that will enhance the quality of life and respect the natural environment, give equal consideration to social, aesthetic, cultural and economic effects, with the overall objective of developing a stable community of between 500 to 1000 year-round residents." The plan consists of a set of broad social, economic, and environmental objectives, with each objective being accompanied by a series of specific policies that outline actions intended to guide District Council when considering land use bylaws in the community plan area. In 2021, the District of Wells launched an Official Community Plan update that is intended to guide the community to 2040. The update included engaging with the local community to identify values and priorities for the future of Wells. The *updates to the District of Wells Community Plan* have been delayed primarily due to concerns raised by the public and within the District of Wells Council regarding the proposed land use map and proposed Heavy Industrial Zone, instead of the current Open Space/Parkland Zone located within the District boundaries along the shoreline of Jack of Clubs Lake, where the Mine Site Complex for Cariboo Gold would be located. Many comments from the community included opposition to heavy industry within the townsite and adjacent to residences, as well as the updated plan focused too much on serving the interests of the mine, including allowing the Mine Site Complex to be proposed within the townsite. Two town council members have indicated their view that building major above-ground major infrastructure so close to the townsite will tilt the balance heavily towards industry.

As part of the development of the updated plan, two community surveys were conducted in Wells to determine the priorities and values of the town. There were 110 responses to one survey and 35 to the other. The top three ideas that residents identified they would like Wells to be known for are: 1) A diverse community with a mix of industrial workers, creative professionals, and tourism opportunities, 2) a self-sustaining and healthy community, and 3) a community recognized for creativity, heritage, and the arts. Most residents identified the 1930's mining town aesthetic as a priority to preserve and maintain in feel for future buildings. In terms of housing, the primary concerns were a lack of supply, in particular for rental availability and seasonal tourism workers. Water and sewer capacity and standards were identified as the primary infrastructure concerns, as well as the need for a new or upgraded school and a majority of residents agreed that major industry should be a contributor to improving the public infrastructure and utilities in Wells. The leading environmental concern was the protection of drinking water sources from contamination. The survey also included a session with school aged children to identify their priorities which outdoor recreation opportunities as well as increasing the number children and children-focused activities.

In B.C., municipalities have the authority to adopt official community plans through *Local Government Act*. This allows local governments to exercise authority over land use in the plan area, although this does not provide authority over resource extraction. Mineral processing, however, is considered a potential authorized land use.

As part of Application development for Cariboo Gold, ODV reviewed land use management plans and local government information to identify management objectives which may be affected by the proposed mine. These objectives included economic security for resource extraction industries and tourism, the acknowledgement of Indigenous territories, the preservation of protected areas and the management of key resources.

ODV identified that Cariboo Gold has the potential to change the contemporary use of the lands occupied by and adjacent to the Cariboo Gold project area. The land and resource use potentially affected by Cariboo Gold would include protected areas and parks, recreation and tourism, mining and exploration, forestry, and timber resources, hunting and trapping, fishing, agriculture and rangelands, and land ownership, tenures and licenses which are all priorities of existing regional management plans.

It is the EAO's perspective that Cariboo Gold is consistent with the CCLUP and the Quesnel SRMP; however, the District of Wells Official Community Plan and Zoning Bylaw would require updates to include a Heavy Industrial Zone for the mine site, and Cariboo Gold is not consistent with this current plan. This is currently the subject of consideration during the update to the District of Wells Official Community Plan.

11.19.1 Key Issues Raised

The following key issues were identified by technical reviewers, the Community Advisory Committee, the public and Indigenous nations.

11.19.1.1 Effects on old growth management areas

Concerns were raised by MOF that the Transmission Line for Cariboo Gold would cross Old Growth Management Areas, which are important in the maintenance of old growth forests and wildlife habitat. ODV clarified that the evaluation and selection of routes for the Transmission Line was based on an analysis method that considered Old Growth Management Areas as a factor in the decision on the Transmission Line route.

Further detailed information regarding Old Growth Management Areas is provided in *Section 11.12* (Vegetation). The EAO has proposed a Certificate condition that would require ODV to implement proposed mitigation measures related to old growth forests in the Environmental Effects Management Plan.

11.19.1.2 Effects on tourism

Concerns were raised by the Community Advisory Committee over the effect Cariboo Gold would have on the priorities of the District of Wells Official Community Plan, primarily focused on balancing the promotion of tourism, arts, and culture as a focus for the community while supporting mining and other economic drivers.

Assessment of effects to tourism can be found in more detail in *Section 11.18* (Employment and Economy) and effects to arts and culture can be found in *Section 11.26* (Culture). The EAO has proposed a Certificate condition that would require ODV to consult with the community and develop and implement a Community Effects Management Plan.

11.19.1.3 Access to additional recreation opportunities

During review of the Application, it was proposed by the Forest Practices Board promoting regional recreation plans that the proposed Transmission Line corridor could be used to increase recreational access to the area; however, this would cause additional disturbance to southern mountain caribou habitat, and this suggestion was not examined further through this Environmental Assessment.

11.19.2 The EAO's Assessment and Conclusions

The EAO has considered the potential for Cariboo Gold to affect the objectives of the CCLUP, the Quesnel SRMP, and the District of Wells' current Official Community Plan. However, the draft updated District of Wells Official Community Plan does not currently support the location of the Mine Site Complex as proposed. Cariboo Gold is not expected to have an adverse effect to the overall objectives of these land use plans as currently ratified.

11.20 Disproportionate Effects on Distinct Human Populations

Human and community well-being effects can be experienced as an individual, household, family, social/cultural group, community, or across generations. Effects may be experienced differently, and at different times, by individuals and groups within a community or region. The purpose of this assessment is to apply a *Gender-Based Analysis Plus* lens to the understanding of potential effects.

What are disproportionate effects?
Projects can affect certain groups of people differently, and they can affect some people in more than one way.

What or who are sensitive populations?
Some people cannot tolerate exposure to substances or chemicals as well as others. We call these groups of people sensitive populations. They can include, but are not limited to, pregnant and nursing women, children, and older adults.

ODV was required to assess the potential effects of Cariboo Gold that may be experienced disproportionately by different human populations. The EAO has then considered this further through the effects assessment process. This information will allow decision makers to understand whether the any specific human populations would be better or worse off as a result of Cariboo Gold.

The Cariboo Regional District has higher average and median ages than overall in B.C. The population is aging with limited population growth and a shrinking workforce-age population. The percentage of males and females in the Cariboo Regional District is 51 and 49 percent, respectively. The employment rate is approximately five percent higher amongst males than females, and the region has a higher percentage of low-income earners than B.C. overall. However, in 2021, the unemployment rate in the District of Wells was 38 percent, higher than the regional average.

A much higher percentage of the population in the region identifies as Indigenous and is increasing more rapidly in this region than in B.C. overall. At the same time, a much lower percentage of the population in the region is comprised of visible minorities and is slowly increasing compared to that of B.C.

The population in the District of Wells was 217 in 2016. From 2016 data, the population of Wells was about 51 percent male and 48 percent female. The average age of males and females was 46 and 42.7, respectively, resulting in an average age of 44.4 overall. The demographics of the District of Wells varied with percentages of the population as follows: aged 65 and over at 18 percent, aged 19 and under at 20 percent, people identifying as Indigenous at 6.5 percent, people identifying as visible minority at less than one percent, and married and living common-law population at 57.9 percent. Of 60 families, 91.7 percent were couples, and 8.3 percent were single parents. The average family size was 2.4. Of the 110 private households in the District of Wells, 36 were without children, 23 were with children, and 36 were one person.

ODV indicated that 75 percent of the Cariboo Gold workforce would be hired from the local assessment area where qualified workers were available and the remainder would come from outside this area, and that those currently working for ODV would likely transition to working on Cariboo Gold. The workforce for Cariboo Gold was estimated to be an average of 200 workers during construction, peaking at 273, and 488 during operations. All work camps for construction and operations would be exclusively for workers and would not accommodate couples or families. Employees who are not local to the area would be provided with accommodation in the camps. Workers would have to leave the camps when on days off or off rotation. During operations, workers would be housed in a 200-person camp within the Mine Site in the District of Wells. With the Mine Site camp, based on a 14 days on/14 days off workforce rotation schedule, the population of Wells might be about 470 individuals at any one time (although some will live within the District of Wells), potentially doubling the 2016 population of Wells of 217. Workers would be able and encouraged to leave camp when off-shift to create local economic benefits from spending and purchasing goods and services. The subpopulations of Wells would change substantially. There would become a much higher percentage of working age adults present in the community which could include a high percentage of adult males, reducing the percentage of the Wells population that would be comprised of children and young adults, and older adults who are no longer working.

ODV identified the following potential residual negative effects that may affect distinct human populations:

- Human health effects would be disproportionately experienced by those with underlying health conditions, and those who consume higher quantities of fish, have higher exposure to sediment, or consume water from the District of Wells;
- Children and young adults may be disproportionately affected by changes in the characteristics of the population of Wells, and risks to human health;
- Adults who are not working or not benefiting from Cariboo Gold (such as those who do not benefit from the opportunities offered by Cariboo Gold, and who face increased challenges due to increases in the cost of living in the community) may be disproportionately affected economically;
- Residents of Wells who live in closer proximity to mine infrastructure and activities would be disproportionately affected by disturbance and adverse effects from noise and vibration, light, dust and vehicle traffic, and the changes to the viewscape in Wells;
- Cariboo Gold could strain emergency health, health, and social services in Quesnel, and have direct or indirect negative effects on vulnerable populations;
- Residents in the Cariboo Regional District may experience positive economic effects, and negative effects (associated with the Transmission Line and Transportation Routes) from Cariboo Gold; and,
- Directly or indirectly, some residents of Wells may experience positive economic benefits from Cariboo Gold.

ODV reported that Cariboo Gold could also pose challenges to individuals including those:

- Who may not adjust well to living in a camp environment or working longer shifts;

- Who do not make positive lifestyle choices with their increased income (e.g., who choose to engage in drug or alcohol abuse or activities such as prostitution);
- Affected by project associated stresses whether it be a worker at the jobsite, family members at home dealing with the household while the worker is away, or those moving to the community without a support network; and,
- Whose current lifestyle, perceived or otherwise, is being negatively affected, which could result in increased mental health issues, violence, or family breakdown.

ODV proposes to develop a community involvement plan that outlines the process it would follow to meet its commitments to maximize the positive economic benefits of Cariboo Gold to communities, including:

- Working with the District of Wells to upgrade water and sewer infrastructure with sufficient capacity to support the development in town;
- Encouraging workers, while at site, to participate in the Wells Volunteer Fire Brigade and develop a mutual aid agreement with the Brigade;
- Working with the District of Wells and local residents to identify ways in which the mine can help promote tourism in the area;
- Supporting/funding initiatives such as a sustainable workforce initiative, Wells Barkerville culture and recreation repairs and upgrades donation, District of Wells official community plan update, Barkerville Heritage Trust, and the Wells Community Foundation; and,
- Supporting the arts in the District of Wells by continuing to work closely with Wells' arts-related stakeholders and organizations to discuss benefits that can be provided by ODV to support the arts sector and arts infrastructure.

ODV also proposes to develop a community involvement plan that outlines the process it will follow to meet its commitments to maximize the positive economic benefits of Cariboo Gold to communities, and which includes a community and stakeholder concerns and issues monitoring plan.

11.20.1 Key Issues Raised

The Technical Advisory Committee raised the following key issue.

11.20.1.1 Effects on women and vulnerable groups

Northern Health and the EAO raised the issue regarding Cariboo Gold's potential to disproportionately effect women who have traditionally realized fewer economic benefits from mining projects and may be potentially affected to a greater extent by social effects of camp workers. Northern Health felt that the incorporation of community engagement, particularly regarding women and vulnerable groups, remained very general in the Revised Application. Northern Health requested that the Community Effects Management Plan (a proposed condition by the EAO) include monitoring for socio-economic effects in consideration of the disproportionate impacts on women and diverse groups, including community-based and community-supported monitoring, and anonymized reporting mechanisms, especially regarding vulnerable groups.

ODV responded by reaffirming its commitment to utilizing gender-based analysis and intersectionality (GBA+) to assess any effects of corporate policies, community development initiatives and to monitor and evaluate the Cariboo Gold phases to maintain the commitment to gender equity. In response to concerns, ODV added a *detailed GBA+ analysis* into the Revised Application including a list of gender-sensitive mitigations revised based on reviewer feedback. The EAO also included mitigation measures related to the gender-based concerns raised by Northern Health in the Community Effects Management plan proposed condition.

11.20.2 The EAO's Assessment and Conclusions

The following valued components were assessed by the EAO as having potentially disproportionate effects on different populations:

- Acoustics: Residents from the District of Wells and Indigenous nations within the local assessment area are expected to be affected to a greater extent by increases in noise;
- Air quality: Portions of the population with underlying medical conditions or the very young may be affected to a greater extent by increased dust;
- Culture: Indigenous nations' use of traditional use plants where there is a likelihood of adverse effects would be affected to a greater extent by adverse effects to vegetation;
- Infrastructure and services: Increased demand for housing would disproportionately affect members of the population who are renters or low-income earners;
- Land and resource use: Residents in and near the District of Wells would be affected by the loss of private property and/or tenured lands, increases in light trespass, and changes in the viewscape; and,
- Wildlife: Indigenous nations have traditionally hunted southern mountain caribou, other ungulates, and grizzly bear, and the recovery or maintenance of these species is of high cultural importance, therefore, Indigenous nations would be affected to a greater extent by adverse effects to these species.

ODV proposes to develop a strategic monitoring program that sets out an approach to monitoring and managing the potential social and economic effects of Cariboo Gold, with a specific focus on community health and well-being, community safety, community development and housing, economic diversification, community feedback mechanisms, and monitoring of social and economic outcomes as a measure of mitigation and management effectiveness.

The EAO has also proposed the following related Certificate condition:

- Community Effects Management Plan – ODV must develop and implement a plan to manage socio-economic effects of Cariboo Gold, including the issues to be monitored, camp and worker policies, and require mitigation measures. This condition also requires ODV to hold biannual community meetings so that information can be provided to ODV on effects from Cariboo Gold in the nearby communities and social and economic effects can be addressed.

After considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued), the EAO concludes that there are unlikely to be significant adverse effects on distinct human populations.

11.21 Effects on Current and Future Generations

The potential effects on current and future generations must be considered in every environmental assessment. This information allows decision makers to understand whether the current and future environment, people and communities would be better or worse off because of Cariboo Gold. The result of this analysis provides decision makers with greater insight into the sustainability of Cariboo Gold, particularly how it may protect the environment and foster a sound economy and well-being of British Columbians and their communities.

ODV provided a summary of effects on current and future generations in *Chapter 18.0* of the Revised Application, which is summarized here. ODV incorporated key inputs from stakeholder groups to align with B.C.'s sustainable development goals by integrating the following sustainable practices into Cariboo Gold:

- Economic opportunities: including contracting local and regional services and ensuring sustainable resource use;

- Social and cultural: designing a project that facilitates physical activity, community connection, housing affordability, food security, cultural diversity, and accessibility to services;
- Environmental: reducing greenhouse gas emissions, implementing mitigation measures that support the resilience of the natural environment, protecting landscapes and maintaining wildlife corridors and habitat; and,
- Land uses: using practices that support existing land use and that ensure efficient movement of people, goods, and services.

ODV anticipated that Cariboo Gold, if approved, would be expected to have positive residual effects on current Indigenous and non-Indigenous generations during its lifetime, including employment, additional labour income and local procurement. Future generations would experience both positive and adverse residual effects because of population dynamics and economic investment. It is ODV's perspective that Cariboo Gold would contribute to community development initiatives such as the *Cariboo Regional District Strategic Plan* and the *B.C. Economic Plan* through equitable hiring practices, providing competitive wages and supporting employee training.

ODV also anticipates a drawback of benefits at the time of mine closure. The community may not be able to sustain required services due to a decrease in the working age population at mine closure. As well, local employment opportunities for local and regional residents would cease.

11.21.1 Key Issues Raised

The following key issues were raised during review of the Cariboo Gold Application by the Technical Advisory Committee, Indigenous nations, Community Advisory Committee, and the public.

11.21.1.1 Effects on human health

Northern Health raised concerns about the proximity of Cariboo Gold to the District of Wells and the effectiveness and confidence in air quality mitigation measures. The effects from air quality issues on sensitive populations could have longstanding effects on the well being of human populations through reduced health capacity, damage to physical and mental well being, as well as an increased dependence on medical services. More information related to human health concerns and proposed mitigations can be found in *Section 11.24* (Human and Ecological Health).

11.21.1.2 Effects on water quality and quantity

Northern Health and the public raised concerns about the potential effects of Cariboo Gold's operations on surface water quality and groundwater quality, which supports community needs, traditional Indigenous use, and ecosystem requirements. Lhtako Dené Nation was also concerned that Cariboo Gold would affect water quantity which may have direct and indirect effects on fish and fish habitat. Effects to fish could compromise the ability of current and future generations of the Lhtako Dené Nation to maintain traditional harvesting rights and important cultural practices. More information related to water quality concerns and impacts to Lhtako Dené Nation's Indigenous interests can be found in *Sections 11.9* (Surface Water), *11.8* (Groundwater), and *11.1* (Lhtako Dené Nation).

11.21.1.3 Effects on employment and economy

The Community Advisory Committee and the public raised concerns about the effects Cariboo Gold may have on tourism, an important economic component in the area. Northern Health expressed concerns that the closure of the mine may have numerous residual and lasting economic effects on communities. Indigenous nations and the community surrounding Cariboo Gold have expressed both interest in the economic benefits that have the potential to bolster the community and provide financial support to future generations. However, there has also been significant concern over how Cariboo Gold could further damage access to traditional resources for current and future generations of the Indigenous nations, and the character of the town for current and future residents of Wells. More information related to

potential effects to community health and employment and economy can be found in *Sections 11.23* (Community Health) and *11.18* (Employment and Economy).

11.21.2 The EAO's Assessment and Conclusions

After considering proposed mitigation measures and Certificate conditions (which would become legally binding in the event that a Certificate is issued), the EAO concludes that Cariboo Gold would have generally positive effects on local employment and the economy associated with the development of Cariboo Gold for future generations. The potential effects on human health and water quality and quantity, and additional mitigation measures and proposed conditions, are assessed in more detail in *Sections 11.24* (Human and Ecological Health), *11.9* (Surface Water), and *11.8* (Groundwater). After mitigation, the EAO concludes that there are unlikely to be significant adverse effects on current and future populations.

11.22 Acoustics

11.22.1 Summary

The potential changes to noise (i.e., unwanted sound) were assessed as part of the Cariboo Gold Environmental Assessment. The assessment also covered vibration, as well as natural sounds and sounds created by people and their activities. ODV assessed the potential effects to changes in noise (including changes in noise levels, increase in noise from construction and operations, low frequency noise from construction and operations, and noise and vibration from blasting) and described mitigation measures that would reduce the potential effects to noise.

Reviewers, including noise expert consultants at Stantec (on behalf of the EAO), members of the public and the Community Advisory Committee raised concerns regarding the potential effects of noise on community health and well-being from an increase in noise, the timing and effectiveness of mitigation measures, and the cumulative effects associated with increases in noise from all existing activities in the region. The Community Advisory Committee was particularly concerned about the effects of noise on mental health of residents in the community.

To address key issues related to noise, the EAO has proposed a Certificate condition which would limit project noise contribution to 40 decibels above ambient (dBA) baseline at the nearest occupied dwelling. Additionally, as identified in the *Regulatory Coordination Plan*, the following management plans will be developed and implemented by ODV and regulated by permitting agencies: construction environmental management plan and a noise monitoring plan.

The EAO then assessed the potential effects to acoustics given ODV's assessment, proposed mitigation measures, proposed Certificate conditions, and additional management plans that would be developed for Cariboo Gold as part of permitting. Given these measures, the EAO found that there would not be a significant adverse effect to noise levels.

11.22.2 Assessment Boundaries

The spatial boundaries for the acoustics assessment included a local assessment area of 1.5 km extending from the Cariboo Gold footprint and a regional assessment area extending 3 km from the Cariboo Gold footprint. The assessment also included temporal boundaries, defined based on the timing and duration of the potential effects from activities associated with Cariboo Gold. The assessment covered the major phases of construction, operations, and closure, and considered daytime (07:00 to 22:00) and nighttime (22:00 to 07:00) hours of construction, operations, and closure. These project components and anticipated duration of activities are described in more detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.22.3 Baseline Conditions by ODV

The baseline acoustic conditions in the region were assessed in *Chapter 7.3* of the Revised Application by ODV and are summarized here.

Existing conditions were studied within the assessment area, and a baseline noise study was undertaken to determine noise levels near Cariboo Gold. Conditions were found to be dependant on proximity to local roadways and highway traffic. Noise levels varied and were generally louder during the day (28 A-weighted decibels (dBA) and 49 dBA) versus nighttime levels (26 dBA and 47 dBA), due to a decrease in traffic at night. While roadways were found to be the largest contributor, there were also several industrial, commercial, residential, and recreational sources of noise in the area near Cariboo Gold.

11.22.4 Potential Project Effects by ODV

ODV identified the following potential effects from Cariboo Gold:

- Increase in audible and low-frequency noise during construction and operations; and,
- Increase in noise and vibration from blasting.

ODV identified that the highest predicted sound levels for audible and low-frequency noise would be less than regulatory guidelines set by Health Canada[20]. These effects were identified to occur at specific times based on the different project phases. Activities during the construction phase such as road construction, building construction, earthworks, blasting and processing would have the potential to generate noise and vibration. During operations, exhaust portals, surface activities such as the filtered stack tailings storage facility, concentrate conveyer and various moving equipment, and transportation of goods and ore would also generate noise. The closure phase would have the potential to generate noise, similar to levels observed during the construction phase. The post-closure phase was not anticipated to generate additional noise.

ODV is committed to limiting the Mine Site Complex equivalent sound level over a 1-hour duration to 40 dBA. This would be the sound level attributable to Cariboo Gold over and above the current (ambient) noise levels and would be measured at the location of the nearest receptor. Assuming ambient sound levels in Wells are approximately 40 dBA, the contribution from Cariboo Gold to an increase in sound levels would be 3 dBA. This is because sound is measured in the logarithmic scale, and a doubling of sound levels (40 dBA ambient + 40 dBA Project contribution) increases sound by 3 dBA. ODV indicated that this increase of 3 dBA would be weakly perceptible to the human ear.

ODV assessed the effects of the project design changes submitted during the final phase of the environmental assessment and noted that there would be no change from the numbers presented in the Revised Application.

ODV's assessment indicated that there was a good understanding of the cause and effect relationship between Cariboo Gold and the change in acoustics, and sufficient data was available to support the assessment. The effectiveness of the selected mitigation measures was considered by ODV to be moderate to high.

11.22.5 Proposed Mitigation Measures by ODV

In addition to following best management practices and B.C.'s Environmental Mitigation Policy, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Physical mitigation (barriers, silencers, or blast mattress);
- Design of blasts by an engineer to minimize blast vibration through blast design (slower timing of ignition of explosive);
- Use of electronic detonators and emulsion explosives to have better performance and control over blasting techniques;

[20] Health Canada. (2017a). Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise. *Link*

- Selection of quieter technology;
- Model and use ongoing monitoring to follow-up on potential issues; and,
- Adherence to WorkSafeBC Regulations to reduce effects to workers on the Mine Site.

11.22.6 Key Issues Raised

The following key concerns and issues were raised during review of the Cariboo Gold Application by the Technical Advisory Committee, Indigenous nations, the Community Advisory Committee, and the public.

11.22.6.1 Effect of increased traffic and noise on community health and well-being

The Community Advisory Committee, Northern Health, and members of the public raised concerns that the increase in noise and vibration during the various project phases would have a significant effect on human health and community well-being, including on mental health. This noise could result from an increase in traffic and potential blasting. Compliance of ODV's noise output with local by-laws and provincial and federal regulations was also raised as a concern by the Community Advisory Committee and members of the public, given the noise effects which occurred during the exploration phase of Cariboo Gold, which affected members of the community. The Community Advisory Committee also was concerned that the baseline was measured while exploration drills were running near Wells.

Figure 26: Road header – drill planned to be used instead of blasting for Cariboo Gold where feasible.

Northern Health was concerned about the adverse health effects associated with sleep disturbance due to night-time noise. Health Canada suggests outdoor levels of no more than 45 dBA and 60 dBA for continuous noise sources and discrete noise events caused by construction activities respectively, as recommended by World Health Organization.

Health Canada and the Environmental Code of Practice for Metal Mines guidelines indicate that increasing noise and vibration could potentially increase the risk of health effects, and Health Canada suggests that two most common community reactions are complaints and annoyance.

In response to these concerns, the EAO proposed a condition that would limit project-related noise to 40 dBA above ambient baseline, with measurements of baseline occurring again prior to construction. ODV has also committed to developing a Noise Management and Monitoring Plan to mitigate adverse changes to the acoustic environment. The EAO also proposes to limit the number of haul trucks to 25 round trips per day.

11.22.6.2 Timing of mitigation measures for potential blasting activities

Noise experts from Stantec Inc., a third party consultant contracted by the EAO, identified concerns that the mitigation measures for blasting noise and vibration did not indicate the time (e.g., daytime or nighttime) for planned blasting activities during the construction and operations phases. ODV explained that blasting would not be necessary for construction. ODV intends to use road header technology to cut through rock. If blasting is required for construction, it would be during the daytime between the hours of 9:00 to 17:00. Blasting associated with operations would occur underground approximately between the hours of 6:00 and 18:00.

The EAO has included this timing commitment of blasting as a mitigation measure in the proposed Certificate conditions.

11.22.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on acoustics.

In addition to the mitigation measures proposed by ODV, two Certificate conditions were also proposed by the EAO to mitigate these effects: limit project-related noise in the District of Wells to 40 dBA above ambient baseline and limit any blasting to daylight hours.

The EAO's characterization of the expected residual effects of Cariboo Gold on acoustics is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 19: Summary of Residual Effects for Acoustics

Residual Effect	Assessment Rating*	Significance and Rationale
Increase in audible and low-frequency noise Although the highest predicted sound levels by ODV for audible and low-frequency noise would be less than regulatory thresholds set by Health Canada, there will also be a requirement of ODV maintaining 40 dBa above ambient baseline in the town of Wells to prevent additional effects.	Context (resilience): Low Magnitude: Low Extent: Local Duration: Medium-term Reversibility: Fully reversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Low Uncertainty: Low Importance: High	**Not significant** A study of baseline conditions within the local assessment area and regional assessment area found that existing noise levels are low, varying from 28 dBA to 49 dBA in the daytime and 26 dBA to 47 dBA in the nighttime. Considering the existing low noise levels, the resilience of nearby communities to an increase is rated as low. Cariboo Gold's contribution to the acoustic environment would be below the regulatory guidelines set by Health Canada. Potential effects would be limited to the local assessment area. Acoustic effects would not last beyond project closure. Once project-related noise sources cease to exist, the noise levels in the local assessment area would return to levels similar to baseline conditions. Since project-related noise sources are generally constant, the effect was considered continuous. Residents of the District of Wells that are sensitive to noise, businesses that would be affected directly by increased noise, and members of Indigenous nations that peacefully enjoy the use of land near Cariboo Gold would be disproportionately affected. With the limit of 40 dBA above ambient baseline in the District of Wells, residual effects have a low to medium likelihood of occurring. With mitigations, the consequence of residual effects is considered to be minor (low magnitude and local extent). The risk of the effect of an increase in audible noise and low-frequency noise was therefore determined to be low. Predictive computer modelling and analytic methodology was used to quantify potential changes in noise levels at receptors within the assessment area from activities associated with Cariboo Gold. There is a low level of uncertainty in the acoustics assessment based on the data provided. Since communities are located very close to the Mine Site Complex (e.g., District of Wells), the importance was considered high.
Increase in noise and vibration from blasting Activities during the construction phase may include blasting which would have the potential to generate noise and vibration.	Context (resilience): Low Magnitude: Low Extent: Local Duration: Medium-term Reversibility: Fully reversible Frequency: Irregular Affected Populations: Disproportionate Risk (likelihood and consequences): Low Uncertainty: Low	**Not significant** A study of baseline conditions within the local assessment area and regional assessment area found that existing noise levels are low, varying from 28 dBA to 49 dBA in the daytime and 26 dBA to 47 dBA in the nighttime. Considering the existing low noise levels, the resilience of nearby communities to an increase is rated as low. Cariboo Gold's contribution to the acoustic environment would be below the regulatory guidelines set by Health Canada. Potential effects would be limited to the local assessment area. Acoustic effects would not last beyond project closure. Once blasting-related noise and vibration sources cease to exist, the noise and vibration levels in the local assessment area would return to levels similar to baseline conditions. If blasting occurs, it would be irregular, occurring at sporadic intervals during construction and operations. Residents of the District of Wells that are sensitive to noise and vibration, businesses that would be affected directly by increased noise, and members of Indigenous nations that peacefully enjoy the use of land near Cariboo Gold would be disproportionately affected. With limiting any potential blasting to daytime hours only, residual effects have a low to medium likelihood of occurring. With mitigations, the consequence of residual effects is considered to be

Residual Effect	Assessment Rating*	Significance and Rationale
	Importance: High	minor (low magnitude and local extent). The risk of the effect of an increase in noise and vibration due to blasting was therefore determined to be low. Predictive computer modelling and analytic methodology was used to quantify potential changes in noise levels at receptors within the assessment area from activities associated with Cariboo Gold. There is a low level of uncertainty in the acoustics assessment based on the data provided. Since communities are located very close to the Mine Site Complex (e.g., District of Wells), the importance was considered high.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.22.8 Cumulative Effects Assessment

ODV identified five projects that are existing and reasonably foreseeable and that have the potential to act cumulatively with Cariboo Gold: Bonanza Ledge Phase II Reclamation located approximately 4 km away from Cariboo Gold; Mosquito Creek Reclamation located approximately 6 km away from Cariboo Gold; and mineral exploration, placer mining and transportation activities, which are further away from Cariboo Gold.

Assuming these projects comply with 40 dBA limits within their local assessment area of 1.5 km, their effect at Cariboo Gold receptors was estimated by ODV to be below 30 dBA. The contributions of the other projects are expected to be below 30 dBA due to increased setbacks of 4 km or more. ODV then estimated that the overall cumulative effect at Cariboo Gold receptors to be significantly below the average ambient level of 35 dBA. Given this, the cumulative effects on noise were considered by ODV to be negligible.

The EAO agrees with ODV's assessment and given effective implementation of the proposed Certificate conditions and mitigation measures, the EAO is satisfied that there would be no significant cumulative adverse effects to noise in the area.

11.23 Community Health

11.23.1 Summary

The potential effects on community health were assessed as part of the Cariboo Gold environmental assessment, including the potential effects on local and regional health infrastructure and services, as well as population health. The predicted positive effects from Cariboo Gold included social and economic benefits, including increased employment, income, local spending, training and education opportunities, population maintenance or growth, and higher tax revenues. The District of Wells and Cariboo Regional District would receive tax revenue from ODV for Cariboo Gold, while the City of Quesnel would not. Negative effects anticipated from Cariboo Gold included issues related to hospital emergency room use, family health, mental health and addictions, increased challenges for vulnerable populations, and increased sexually transmitted and other communicable diseases.

Factors not considered in this chapter include the following: residual adverse effects to human health in the District of Wells (covered in *Section 11.24* (Human and Ecological Health); residual adverse effects involving disturbance from mine infrastructure and activities in Wells (e.g., noise, light, and changes in viewscape) (covered in *Section 11.22* (Acoustics) and *Section 11.16* (Land and Resource Use)); malfunctions and accidents (covered in *Section 11.27* (Risks of Malfunctions and Accidents); and the employees in the work camps not considered to be a part of the population of Wells (covered in *Section 11.18* (Employment and Economy)).

Key issues raised by reviewers related to the risks to emergency services in the District of Wells, health and protection services in Quesnel, effects to the characteristics in the District of Wells from a substantial increase in the population or transient workforce, and the social and economic effects to residents of the area that do not directly benefit from Cariboo

Gold. To address the potential effects on community health, the EAO has proposed a Community Effects Monitoring Plan, a condition to monitor and mitigate social and economic effects of Cariboo Gold.

Given the assessment, mitigation measures, and proposed conditions, the EAO found that there would not be a significant adverse effect or cumulative effect to community health.

11.23.2 Assessment Boundaries

The spatial boundaries for the assessment of effects to community health included a local assessment area which encompassed the Mine Site, Quesnel River Mill, and Transmission Line (plus a 1 km buffer) and the Transportation Routes (plus a 500 m buffer). The regional assessment area included a 10 km buffer around all project components.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.23.3 Baseline Conditions by ODV

The baseline community health conditions in the region were assessed in *Chapter 7.15* of the Revised Application by ODV and are summarized here.

The region has been heavily affected by mining activities and local industrial development over the years. This has likely affected community health resources in the area. Overall compared to B.C.'s average, the population in the assessment area is growing at a slower pace, the percentage of older people is higher compared to the working age population, the percentage of the Indigenous population is higher, the percentage of visible minority groups is lower, and marital status is comparable.

The factors affecting health included income, education, employment, physical environment, and deprivation. Based on Statistics Canada census data, the District of Wells was found to have the lowest community well-being index score in the region (except for Regional District Fraser Fort George Electoral Area E) for income, education, housing conditions and labour force activity. Closer to Quesnel, the percentage of those satisfied or very satisfied with their life was slightly higher than the rest of the province, and there was a stronger sense of belonging to the community than for people in B.C. in general. A lower percentage of males and females perceived their health as being good or excellent and in general there was a higher level of perceived stress. A higher percentage of individuals were overweight or obese, current smokers or heavy drinkers compared to the average in B.C. The percentage of those with a regular healthcare provider was similar to B.C. The District of Wells also scored high for residential instability and economic dependency.

What does **deprivation** mean?

This term is used in social health assessments and describes the inequality or relative disadvantage for one group or individual compared to the local community or society.

Residents of the District of Wells were found to access most of their health services in Quesnel, 80 km or approximately a one-hour drive away, where there is a full range of health services available. At the time of this Report, a nurse practitioner currently provides a primary care clinic in the District of Wells one day per month and that service could be expanded in the future if the demand increases. Most social services were based in Quesnel with access provided to residents of the District of Wells through virtual means. There were no health services identified in the immediate area of the Quesnel River Mill, which is approximately 60 or 90 km and about one or more hours drive from Quesnel on resource roads, depending on the route (i.e., to Quesnel, or to Highway 26 then Quesnel).

Ground ambulances are based in Quesnel and the District of Wells. Air ambulance service from other areas of B.C. is available as needed (the closest helicopter with night capability is based in Kamloops). In remote rural areas such as the

District of Wells, staff retention was identified as a problem as paramedics often take a position for six months to complete their initial requirements and then transfer to another location. There can be issues if there are overlapping calls or not enough paramedics to staff the ambulances.

It was found that Quesnel had two ambulances staffed by four full-time and ten on-call staff which provide basic life support service. The District of Wells station had one ambulance staffed by one on-call paramedic. As there was only one paramedic, the paramedic can not transport patients and a ground or air ambulance would attend and complete the transfer. From 2016 to 2020, the District of Wells ambulance station responses ranged from 42 to 194 a year. Emergency Health Services and the Wells Volunteer Fire Brigade do not have a mutual aid agreement. Efforts in the District of Wells are underway to hire an additional paramedic. The District of Wells ambulance station has also faced challenges related to infrastructure (e.g., water restrictions and building upgrades needed). B.C. Emergency Health Services has responded to a small number of ODV calls in the District of Wells, however they have to be escorted on the Mine Site and cannot do underground work, so an injured party would have to be brought to surface.

Challenges to volunteer fire department staff recruitment included that many staff work away from home and cannot respond to local fires. The Wells Volunteer Fire Brigade serves the District of Wells, Barkerville and surrounding areas and responds to 10 to 15 fires per year. The Wells Volunteer Fire Brigade currently has 10 members, but 15 to 17 members are needed to ensure adequate coverage. It can only respond to exterior structure service, and additional training would be needed for interior fire fighting. The Wells Volunteer Fire Brigade relies on help from the Quesnel Fire Department, Barkerville, and grants to operate. The District of Wells firehall needs repair or replacement and faces funding challenges. The Wells Volunteer Fire Brigade and ODV are discussing needs and areas where they can work together.

11.23.4 Potential Project Effects by ODV

The assessment of effects from Cariboo Gold on community health included potential effects to health infrastructure and services as well as population health. ODV found that Cariboo Gold may:

- Negatively affect community access to health or social services due to the additional demand associated with an increased population;
- Decrease access to housing due to an increase in population;
- Decrease accessibility to healthy food through availability or increase access due to employment;
- Decrease family health, increase mental health and addictions, increase challenges for vulnerable populations, and increase sexually transmitted and other communicable diseases; and,
- Positively affect the community through increased employment, income, local spending, training and education opportunities, population maintenance or growth, and tax revenues.

Mining and other resource development has generally been associated with an increased demand on health care infrastructure and services and adverse effects on population health. It was anticipated that the negative effects on health infrastructure and services from Cariboo Gold would be focused on increased emergency room use, as workers would not likely be high users of general health services, and the negative effects on population health would focus on changes to family health, mental health, addictions and general community well-being, increased challenges for vulnerable populations, and increased sexually transmitted and other communicable diseases. Generally, effects were anticipated to be focused on the beginning of construction and end of operations when population, employment and income change would be most notable. Northern Health was also concerned by its experience that non-occupational, non-urgent injuries make up a majority (as much as 90 percent) of health care demands in a camp environment.

ODV noted that increased funding from the Province for health infrastructure and services from increased population in the area would likely not be immediate, and while higher tax revenues may help local governments improve services, this would also not likely be immediate. Health care funding and resource allocations are based on resident populations, and

health care services are designed to meet the needs of permanently residing taxpayers in local health areas. The Cariboo Gold workers occupying the Mine Site camp in the District of Wells and Quesnel River Mill camp during the 16-year operations phase would be treated as a transient workforce. If those workers are from the local health areas in which the camps are located, they would be part of the resident population and would not contribute to a project-related population increase. ODV assumes that 75 percent of the Cariboo Gold workforce would be hired from the local assessment area.

As a positive effect, resource development would provide social and economic benefits to local communities including increased employment, income, local spending, training and education opportunities, population growth, and tax revenues, thereby enabling municipalities to support existing or develop new infrastructure and services. For some individuals, the benefits would help offset issues they are currently facing (e.g., if they are trained for a higher paying job) and, potentially, reduce their reliance on social services and infrastructure in the community.

11.23.5 Proposed Mitigation Measures by ODV

In addition to following best management practices, ODV identified the following key mitigation measures and committed to their implementation through project design, procedures, and management plans:

- Develop and implement a local hire policy and work with local service providers to provide training opportunities for local residents;
- Develop policies that would help encourage potential employees to seek employment at Cariboo Gold including equal employment opportunity, Indigenous employment, employment of under-represented groups, codes of conduct, workplace safety programs, and cultural training and awareness programs. Development would include discussions with those groups potentially addressed in the policies and plans;
- Provide employee assistance programs and benefits, including career planning, employee counselling, financial planning, family support, transition planning, a pension plan, and group insurance benefit plans to encourage employment with Cariboo Gold;
- Implement a holistic worker health and well-being program to focus on physical, mental, cultural, and social health;
- Inform communities in the region and local governments as early as possible regarding anticipated timing of each project phase, employee numbers, and duration, as well as the change in requirements from phase to phase;
- Work with vulnerable groups currently under-represented to understand how they can be more involved in Cariboo Gold and how potential effects of Cariboo Gold on their interests can be addressed;
- Inform workers joining from outside the region of the situation regarding community infrastructure, services, and housing in the area so that they can make an informed decision about moving to the area;
- Develop orientation packages for incoming workers with information about the community, services and amenities, recreation opportunities, key community contacts, local businesses, community groups, and volunteer opportunities;
- Create a positive and respectful camp environment through a “One Team, One Company, One Family’’ approach;
- Develop a Socio-economic Management Plan in consultation with local and regional governments, agencies, and residents;
- Develop and implement plans to address key areas that affect community health including health and safety, recruitment including a local hire policy, training and education, procurement including local procurement, traffic management, drug and alcohol use, anti-bullying and harassment, ethics, communicable diseases, as well as

others that may be identified as being required. These plans will integrate approaches and recommendations from a number of best practice sources including Northern Health Authority *Best Management Guides for Industrial Camps*;

- Develop a Health and Medical Services Plan, including project information, description of infrastructure, on-site programs and services and collaboration, communication and problem solving, and provide it to the health authorities in advance of construction for review; and,
- Develop a Community Monitoring Committee to help finalize mitigation measures and help identify and address project-related effects that may occur and any adaptive management that may be required, in consultation with local communities and governments.

11.23.6 Key Issues Raised

The following key issues were raised during review of the Application by the Technical Advisory Committee, Indigenous nations, the Community Advisory Committee, and the public.

11.23.6.1 Effects on Emergency Health Services

Northern Health, Interior Health and the residents of the District of Wells raised concerns that the existing emergency health services locally would not be sufficient to respond to Cariboo Gold and non-Cariboo Gold incidents because of the population increase and any potential overlapping incidents. This would require responders to be dispatched from other locations and strain emergency services and other patient care services. It was noted that any incident that results in multiple casualties, even less than five, could push local hospitals beyond capacity and require a coordinated response with health care centres across the region. In response, ODV has committed to providing on-site emergency medical response services and use services in Quesnel for any incident requiring hospitalization. Additionally, ODV noted that as health care is funded on a per capita basis based on local population, funding to the area will eventually be increased to match the population increase that results from Cariboo Gold. ODVs commitment to mitigating the effect to existing health services is captured in the proposed condition requiring a Health and Medical Services Management Plan.

11.23.6.2 Effects on Policing Services

Residents of the District of Wells expressed concerns over managing additional strain put on the police services from the increase in the population. There was particular concern regarding Cariboo Gold employees or contractors within the community when off-duty, which may lead to a need for an increase in police services. ODV has committed to strict management of employees and enforcing ODVs code of conduct for both employees and contractors, which is captured in the proposed condition requiring a Community Effects Management Plan. In addition, there will be biannual community meetings created to help identify and address issues that may arise.

11.23.6.3 Effects on Fire Fighting Services

Concerns were raised regarding the potential for an incident at the mine overwhelming the local community fire fighting capacity. In response, ODV described the mine rescue/fire fighting resources that would be stationed at site and reiterated that the Wells Volunteer Fire Department would not be obligated to attend incidents at the Mine Site. The Wells Volunteer Fire Department and ODV are continuing to discuss needs and areas where they can work together.

11.23.6.4 Effects on Social Services

Considering existing conditions, Northern Health was concerned there would be social effects in the District of Wells and Quesnel from Cariboo Gold, particularly for vulnerable population groups. The Cariboo Gold workforce would largely be transient (i.e., workers will have to leave camps in Wells and at the Quesnel River Mill when on off rotation or will commute daily). It is anticipated that 75 percent of the workforce would be from the region, and it is anticipated that a higher percentage of the Cariboo Gold workforce would be male and within the prime working age. The EAO proposed a condition in the Certificate which includes the development and implementation of a Community Effects Management

Plan to monitor effects to the community and require a minimum workforce, where available and qualified, from the region. The EAO also proposed a condition to require ODV to report monitoring information on a public website and provide a mechanism for complaints by the public to be responded to.

11.23.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on community health.

The EAO has proposed Certificate conditions requiring ODV to develop and implement a Community Effects Management Plan, a Public Information Plan, and a Construction Environmental Management Plan to manage traffic, access, and public safety.

The EAO's characterization of the expected residual effects of Cariboo Gold on community health is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding in the event that a Certificate is issued).

Table 20: Summary of Residual Effects on Community Health

Residual Effect	Assessment Rating*	Significance and Rationale
Effects on health infrastructure and services This effect would include a loss of community access to health or social services due to the additional demand associated with an increased population.	Context (resilience): Low to moderate Magnitude: Low to medium Extent: Regional Duration: Long-term Reversibility: Fully reversible Frequency: Irregular Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Moderate Importance: High	**Not significant** The District of Wells and Quesnel likely have low resiliency due to the current strained status of health services in the more remote community. Residual negative effects to health infrastructure and services in the District of Wells would be considered medium in magnitude given the size of the population increase. The potential increase of permanently residing taxpayers in the area may bring more funding to support service expansion. The effects to Quesnel would be low in magnitude based on the existing size. Residual negative effects to health infrastructure and services (e.g., emergency health services) would extend to where workers are based, which is regional. Residual effects to health infrastructure and services, both positive and negative, would endure for the life of the mine and may be more noticeable during construction. Residual effects to health infrastructure and services may be remediated through funding for additional resources. The stresses on services, and subsequently population health, would be likely be fully reversible after the closure of the mine and the local population returns to pre-mine numbers. The effects to health infrastructure and services would be irregular, notably higher in the event of incidents for which the frequency is unpredictable. Incident frequency can be mitigated through robust safety policies and management plans. The residual effects for health infrastructure and services may disproportionately affect heavy users of the health care system or those with underlying medical conditions. The likelihood of effects on health infrastructure and services would be medium based on the likelihood of health events occurring. Consequences are predicted to be moderate (low to medium magnitude and regional extent), as services in other regions can provide services if necessary. This led to an overall assessment of moderate risk. There is a moderate level of uncertainty regarding the residual effects to health infrastructure and services due to the broader challenges facing health services in B.C. Community health was identified as highly important to the District of Wells and the Community Advisory Committee.
Effects on population health This effect would include changes to accessibility to healthy food through availability or increased access due to employment,	Context (resilience): Low to moderate Magnitude: Low to medium Extent: Regional Duration: Long-term	**Not significant** While neighbouring Quesnel may have moderate resiliency to effects on population health, the District of Wells may have low resiliency due to the current strained status of health services in remote communities. Residual negative effects on population health in the District of Wells would be considered medium in magnitude given the size of the population increase. While there would be additional stressors, there would also be additional funding brought in to support service expansion. The effects to Quesnel would be low in magnitude. Residual negative effects to population health would extend to where workers are based, which is regional. Changes to population health would continue into mine closure and

Residual Effect	Assessment Rating*	Significance and Rationale
effects to family health, mental health and addictions, increased challenges for vulnerable populations, and increased sexually transmitted and other communicable diseases. Positive effects through increased employment and resources are also likely.	Reversibility: Fully reversible Frequency: Regular Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	beyond. The stresses on services, and subsequently population health, would be fully reversible after the closure of Cariboo Gold and the local population returns to pre-mine numbers. The effects to population health would be regular for the duration of the mine life. Population health effects may disproportionately affect populations who are at an economic disadvantage or already struggle with social challenges or gender-based violence. The likelihood of effects on population health would be medium based on the likelihood of health events occurring. Consequences are predicted to be moderate (low to medium in magnitude and regional in extent), as services in other regions can provide services if necessary. This led to an overall assessment of moderate risk. There is a low level of uncertainty regarding the residual effects to population health based on information about current conditions, Stats Canada data, and the advice of provincial health authorities. Community health was identified as highly important to the District of Wells and the Community Advisory Committee.
* *Note*: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.23.8 Cumulative Effects Assessment

As ODV did not anticipate any negative residual effects on community health, ODV did not assess cumulative effects to community health. The EAO did not identify potential for existing and reasonably foreseeable projects and activities to act cumulatively with Cariboo Gold. The existing concerns for the region that may act in conjunction with Cariboo Gold are characterized in the existing conditions. The EAO recommends that the Province consider measures to ensure that residual negative effects to community health do not go unmitigated in the potential lag time between construction of Cariboo Gold, if approved, and increases in funding to the region pre-emptively.

11.24 Human and Ecological Health

11.24.1 Summary

Major mining projects, such as Cariboo Gold, have the potential to emit chemical contaminants into the air, soil and water which can adversely affect human and ecological health. The Human and Ecological Health Risk Assessment characterizes the potential effects of Cariboo Gold on the health of people and ecology. Health risks that may be associated with Cariboo Gold are important to understand for local residents, Indigenous communities, and regulatory agencies, making this a key component of the environmental assessment for Cariboo Gold.

A robust assessment of the effects to human health involves all aspects of health, including social determinants of health and mental and emotional well-being. While this chapter focuses on biological and systemic assessments of potential effects, other aspects that relate to health such as *Section 11.22* (Acoustics), *11.18* (Employment and Economy), and *11.23* (Community Health) are found in their respective chapters. As well, the assessment of well-being as self-identified by Indigenous nations is provided in each of their respective chapters.

ODV assessed the potential effects to human and ecological health and described mitigation measures that would reduce the potential effects from Cariboo Gold. The selection of Contaminants of Potential Concern for the Human Health Risk Assessment was focused on the Project effects rather than baseline conditions. The following key issues were identified by reviewers through review of the human and ecological health assessment:

- Concern about drinking water quality for ODV camp workers and the residents of the District of Wells;
- A lack of local air quality baseline information to inform the assessment and the need for ongoing monitoring;
- Lack of consensus on the methodology used for the human health assessment;

- An absence of baseline health risk data to inform concerns around the contaminated area and the effects of Cariboo Gold on the health risk associated with the contaminated area, for which Northern Health has issued a health hazard advisory under the *Public Health Act;* and
- Communication from regulators needed to inform local communities of the existing health risks from baseline conditions due to historical contamination (e.g., methylmercury in fish in Jack of Clubs Lake and contamination in the local aquifers).

To address the potential effects on human and ecological health, the EAO has proposed the following conditions:

- Air Quality condition, to complete local monitoring and mitigation prior to construction and implement a continuous ambient air quality monitoring program throughout construction and operations;
- Human Health Monitoring Plan, to monitor surface water, groundwater, air, sediment, soil, and country foods (fish tissue, vegetation, and wild game tissue) as it relates to human health risks;
- Community Effects Management Plan, to monitor the effects to the community from Cariboo Gold including from increased noise and light;
- ODV must search for and if found, install a new drinking water supply well for the District of Wells, or otherwise mitigate the movement of underground mine water following closure to maintain water quality at the drinking water source. Following the establishment of any new drinking water supply well, ODV must complete aquifer testing and provide additional information on the feasibility, quality, and location of the new water source and if the new drinking water source would impact groundwater flow or the contaminated area;
- Drinking water provided to the work camps must meet B.C. Drinking Water Quality Guidelines and be permitted accordingly under the *Drinking Water Protection Act* from both Northern Health and Interior Health in their respective jurisdictional areas; and,
- ODV must provide water quality information to the District of Wells, private groundwater well owners that are currently linked to the Wells aquifer, the Crown Contaminated Sites Program, and the public regarding the risks of using existing, untreated groundwater that may be affected by contaminated water.

The effects on human and ecosystem health from Cariboo Gold were anticipated by ODV to overlap cumulatively with other past, present, and reasonably foreseeable future projects and activities. The potential for cumulative effects from these projects and activities is considered high in consideration of extensive past, current, and planned mining activities. However, the contribution of effects on human and ecological health from Cariboo Gold itself to cumulative effects in the region was considered not significant.

Given the assessment, mitigation measures, and proposed conditions, the EAO found that there would not be a significant adverse effect or cumulative effect to human and ecological health.

11.24.2 Assessment Boundaries

The spatial boundaries for the human health assessment were the same as the surface water and air quality assessments, consisting of a local assessment area which encompassed the Mine Site (including the Willow River and Slough Creek watersheds), Quesnel River Mill (including Rudy Creek and tributaries south of the Quesnel River Mill), 100 m upstream and 500 m downstream of the Transmission Line water crossings, and 50 m upstream and downstream from upgraded access roads, and approximately 2.5 km beyond the Cariboo Gold footprint to the north, west, and south. The regional assessment area included the Willow River watershed around the Mine Site, the Maud Creek watershed and its confluence to the Quesnel River and the Quesnel River upstream from its confluence with Beaver Creek near the Quesnel River Mill, and 1 km area upstream and downstream of the Transmission Line.

The spatial boundaries for the ecological health assessment were the same as those for the wildlife and aquatics assessment, consisting of a local assessment area which included the Mine Site, Quesnel River Mill, Transportation Route, and the Transmission Line, including a minimum 50 m buffer surrounding components of the Mine Site. The regional assessment area covered approximately 1,138,555 ha and was bounded by Highway 97 to the west, Quesnel Lake and Quesnel River to the south, the eastern edge of Bowron Lake Provincial Park and Cariboo Mountains Provincial Park to the east, and the height of land to the north.

The temporal boundaries for both human and ecological health included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.24.3 Baseline Conditions by ODV

The baseline human and ecological health conditions in the region were assessed by ODV in *Chapter 7.13* of the Revised Application and are summarized here.

The existing conditions in the area immediately surrounding Cariboo Gold have been affected by the legacy of mining that has occurred in the region in the past century. This includes tailings remnants that continue to affect air, water, sediment, and soil quality. This has had repercussions for wildlife, both terrestrial and aquatic, as well as for human health. The characterization of effects on human and ecological health was based on a variety of information sources such as published reports, recent baseline field studies, historical data and information provided by Indigenous nations and other stakeholders. Most of the data was collected in the past five years. Indigenous and local knowledge was also acquired through reports on cultural land use prepared by DM Cultural Services Ltd for the Lhtako Dené Nation and by Landmark Resource Management Ltd for Xatśūll First Nation and Williams Lake First Nation. These reports were considered by ODV, particularly regarding species of Indigenous and cultural use and value. It is known that Jack of Clubs Lake and other local lakes were an important food source for Indigenous people in the area, and the quality and quantity of water is directly related to the health of plants, fish, birds, and other wildlife, and therefore the ability of the Indigenous communities to safely hunt, fish, and gather plants.

Air Quality: The characterization of existing conditions for air quality was based on available monitoring data provided by ENV, collected from 2016 to 2019 at Quesnel Senior Secondary and Kelowna College. The 98th percentile concentration for $PM_{2.5}$ (24-hour and annual averaging times) and PM_{10} (24-hour averaging time) exceeded the air quality objectives at these locations. This data does not provide information regarding baseline conditions in Wells, however. For more information regarding baseline air quality conditions, refer to *Section 11.6* (Air Quality) of this Report.

Surface Water Quality: Surface water samples collected from January 2016 to November 2021 were evaluated to determine baseline surface water quality and compare the existing conditions to human, wildlife, and aquatic health screening criteria from several government sources. For each of the previously stated categories, there were materials found that exceeded the criteria. For human health, exceedances were found for the following parameters: pH, turbidity, temperature, colour, total organic carbon, total dissolved solids, sulphate, thiocyanate, aluminum, antimony, arsenic, cobalt, iron, lead lithium, manganese, molybdenum, nickel, selenium, strontium, thallium, tungsten, vanadium, and zirconium. For the protection of aquatic life, exceedances were found for the following parameters: pH, dissolved oxygen, total alkalinity, sulphate, sulphide, aluminum, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, mercury, nickel, nitrite, cyanide, selenium, silver, uranium, and zinc. Screening for terrestrial wildlife health also found elevated levels of total dissolved solids, aluminum, molybdenum, and selenium.

Polycyclic aromatic hydrocarbons are created whenever substances are burned. They are considered carcinogenic and can affect the microbial health of soil, among other concerns.

For more information about surface water quality, please see *Section 11.9* (Surface Water) of this Report.

Sediment and Soil Quality: Existing sediment quality was assessed through sediment samples taken from 25 sediment quality stations. In several cases, the concentration of metals in the sediment were found to exceed the guidelines set to protect human and wildlife health. Sediment concentrations were found to be particularly high in Jack of Clubs Lake and its outlets. Soil samples were taken from the Mine Site and the Quesnel River Mill between August 2018 and August 2021 and were evaluated for total metals and polycyclic aromatic hydrocarbons and compared against government criteria for the protection of human and wildlife health. Selected metal constituent levels in the soil were found to exceed both human health and wildlife health criteria. For a more detailed assessment of soils, please see *Section 11.11* (Soils) of this Report.

Groundwater (including drinking water): Existing groundwater data from the District of Wells water supply from January 2017 and February 2021, as well as from the Quesnel River Mill camp for February 2022, were analyzed for total metals, conventional parameters, ions, and nutrients, and/or microbial parameters. Test results identified that the drinking water for the District of Wells did not meet provincial or federal drinking water quality criteria, exceeding the limits for both manganese and iron. For more information regarding groundwater testing, please refer to *Section 11.8* (Groundwater).

The existing conditions for *Section 11.2* (Vegetation), *11.13* (Wildlife), and *11.10* (Freshwater Fish) can be found in their respective sections of this Report.

11.24.4 Potential Project Effects by ODV

ODV assessed potential project effects to human and ecological health over five phases: existing conditions or baseline, construction, operations, closure, and post-closure. The predicted concentrations of substances in each phase were used to identify the contaminants of potential concern that may increase risk to human and/or ecological health. While the process for evaluating ecological risk and human health risk were similar, the subcomponents associated with each risk were unique.

Subcomponents selected to assess effects to human health included effects on communities, Indigenous nation seasonal hunting/harvesting camps, and recreation. Consideration was also given to the unique diets and lifestyles of Indigenous nation residents in the region. Subcomponents to assess ecological health included invertebrates, plants, aquatic-feeding wildlife, and terrestrial-feeding wildlife. Wildlife that may be exposed to changes in concentrations of chemical contaminants in soils, water, air, and food were also considered based on their importance to overall ecological health.

To identify potential project effects, ODV identified the pathways of potential effects of Cariboo Gold on wildlife, including:

- Reductions in surface water quality could have an adverse effect on terrestrial-feeding wildlife in the area (drinking water) or on aquatic species due to an increase in the concentration of metals or chemicals in the water;
- Reductions in food quality could result from changes to surface water quality and increase the concentration of constituents of potential concern in aquatic plants, aquatic invertebrates, and fish, which may be consumed by aquatic-feeding wildlife; and,
- Reductions in soil and food quality could occur due to changes to air quality, or more specifically from terrestrial wildlife and humans consuming vegetation that was exposed to contaminated dust or being exposed to soil, surface water, or other dietary components.

The primary pathways for effects on human health included:

- Changes to surface water quality (ingestion or dermal contact);
- Changes to air quality (inhalation);

- Changes to soil and food quality resulting from changes to air quality (ingestion); and,
- Changes to food quality resulting from changes to surface water quality (fish consumption).

The human health risk assessment was further divided into two components, a multimedia assessment (exposure to contaminants of potential concern identified in soil, surface water, and fish) and an inhalation assessment (exposure to airborne contaminants of potential concern).

ODV's assessment of risk to human health found that the risk of human exposure to chemicals of potential concern was low to negligible for all substances except for methylmercury and selenium, where the residual effect was classified as moderate. Levels of methylmercury were determined through the analysis of fish tissue, and the elevated risk was associated with the ingestion of fish from Jack of Clubs Lake. ODV noted that as surface water quality was not expected to change because of Cariboo Gold, a change in fish tissue concentrations was not expected. There is currently a fish consumption advisory in place for lake trout and bull trout from Jack of Clubs Lake due to historical contamination or potentially natural background levels. Selenium exposure was also assessed using fish tissue analysis; and ODV found that the dietary water quality guideline for selenium was exceeded in fish tissues. It was found that impacts to wild-caught foods may occur through changes to soil quality (through uptake into plants and incidental ingestion by wildlife) or changes to vegetation quality (through dust deposition onto plants). An elevated risk of exposure to cobalt through the ingestion of moose meat was also identified, in particular for Indigenous residents and land users due to a higher consumption rate of wild game to other populations.

The chronic inhalation assessment evaluated the potential health risks associated with predicted annual concentrations of chemicals of potential concern in air. Nitrogen dioxide, total suspended particulate, PM_{10} and $PM_{2.5}$ and diesel particulate matter were identified as chemicals of potential concern to be further assessed for residual effects. The acute inhalation risk assessment identified low to high risks for nitrogen dioxide, low risk for total suspended particulate, PM_{10} and $PM_{2.5}$, and low risk for diesel particulate matter. These residual effects were considered non-negligible and were recommended for mitigation or further monitoring measures.

ODV's assessment of risk to ecological health identified negligible residual effects from Cariboo Gold for soil invertebrates, plants, and terrestrial wildlife. Negligible to low residual risks for aquatic-feeding wildlife receptors in still and flowing aquatic environments were also identified. Some animals exposed to iron near the Quesnel River Mill or to selenium near the Mine Site were characterized as at a low risk, in particular the muskrat and spotted sandpiper. All other exposure risk to feeding wildlife was determined to be negligible.

Detailed descriptions of the potential effects from Cariboo Gold on *Sections 11.9* (Surface Water Quality) and *11.6* (Air Quality) can be found in their respective sections of this Report.

11.24.5 Proposed Mitigation Measures by ODV

Mitigation measures related to human and ecological health that were expected to reduce or eliminate an adverse effect on human and ecological health are described in *Sections 11.9* (Surface Water), *11.8* (Groundwater), and *11.6* (Air Quality). The preferred mitigation measure for issues related to drinking water quality for the community of Wells is for ODV to locate and implement an alternative drinking water supply. This mitigation method requires drilling investigations, which have been initiated. No other additional mitigation was proposed outside of what is captured through surface water, groundwater, and air quality mitigations. Management plans that would be required through permitting would include the following: water management plan, waste (refuse and emissions) management plan, including fugitive dust control plan, surface erosion prevention and sediment control plan, metal leach/acid rock drainage management plan, emergency response plan, and reclamation and closure plan.

Ongoing monitoring for water and air quality would continue to inform these management plans to best adapt to both the environment, Cariboo Gold, and best practice. Additionally, there will be an environmental monitoring plan developed as part of the permitting system to address wild-caught and harvested foods and an awareness program for mine workers

and the public related to the historical contamination associated with Jack of Clubs Lake and other areas within the District of Wells to minimize exposure to sediment, soil, surface water and fish when participating in recreational activities off-site.

Associated with the increase in emissions during the first four years of operations, ODV expected there to be increases in predicted ambient levels of total suspended particulates, PM_{10}, and $PM_{2.5}$ near the Bonanza Ledge Site, along A Road, and along Highway 26 through Wells. Most of these increases were indicated to occur away from the community of Wells, and most sensitive receptors identified in the Revised Application. ODV added mitigation measures to reduce the effects of these increases, including additional emissions control measures, such as periodic road sweeping during dry weather. Effects of these additional emissions would be reduced following the first four years as haul trucks would move underground rather than along the B Road haul route, which was removed through project design changes.

11.24.6 Key Issues Raised

Members of the Technical Advisory Committee raised the following key issues.

11.24.6.1 Decrease in air quality leading to risk to human health

Northern Health and ENV raised concerns about the predicted exceedances for nitrogen dioxide and particulate matter, as well as the metals contamination in the particulate matter, in the District of Wells over periods of time. Williams Lake First Nation and Xatśūll First Nation also raised concerns over the air quality in the region. ODV included a discussion of the health effects from nitrogen dioxide and total suspended particulates, PM_{10}, and $PM_{2.5}$ at worker accommodations in the human health and ecological risk assessment, however Northern Health considered this concern to be only partially resolved with some outstanding concerns regarding some of the acute and chronic inhalation assessment conclusions, because even incremental increases in non-threshold pollutants (nitrogen dioxide and particulate matter) can have negative health outcomes, regardless of the criteria used to measure potential exceedances.

Northern Health and ENV both raised concerns over the baseline information that was used to assess air quality effects in the District of Wells, as the data was predominantly collected in nearby Quesnel. Northern Health explained that existing conditions and baseline assessments provide context for any potential incremental health risks imposed by Cariboo Gold. Northern Health was also concerned with the use of elevated baseline concentrations for the purposes of assessing health impacts from air quality, indicating that a higher baseline could mask the relative increase due to Cariboo Gold in the airshed and hide any cumulative effects. ODV noted that the use of Quesnel ambient air quality data as a conservative baseline in lieu of monitoring data from the District of Wells was discussed with ENV prior to initiating modelling. ODV maintained that the baseline data used was considered conservative and noted that the potential effects from Cariboo Gold were assessed with and without baseline, following the accepted modelling plan. Although ENV agreed to the use of data from Quesnel for modelling purposes, ENV did not agree with the use of it as representative of conditions in Wells.

ENV had concerns regarding the total suspended particulates, PM_{10}, and $PM_{2.5}$ airborne concentration of 0.76 micrograms/m^3 that was used to estimate soil dust concentrations, noting that it differs from the recommended values provided by Health Canada of 250 micrograms/m^3 for unpaved road. ODV responded that the value was chosen due to no receptor locations being near the only unpaved road. Northern Health disagreed with this methodology because mine workers will reside at the camp near the unpaved road.

There also remained a lack of agreement between ODV and Northern Health over the inclusion of mine worker air quality exposure during both work and non-working hours. ODV maintained that assessing worker exposure while engaged in mining activities falls outside the scope of the environmental assessment (covered under WorkSafeBC), so it would not be appropriate to combine the occupational and non-occupational exposures and compare them to non-occupational exposure criteria or risk thresholds. While Northern Health acknowledged the jurisdictional differences, they maintained that the assumption that workers were only exposed to air quality concentrations during non-work hours was unsatisfactory.

In response to the concerns raised, ODV will be required to implement continuous air quality monitoring in the District of Wells in order to collect additional data prior to construction. A Fugitive Dust Management Plan would also be required through permitting under the *Environmental Management Act* to adaptively manage project-related dust. The EAO has also proposed an Air Quality condition, Human Health Monitoring Plan, and Community Effects Management Plan to require continuous air quality monitoring data prior to construction and during construction and operations.

11.24.6.2 Inclusion of metals in the assessment

Interior Health and Northern Health requested that ODV include metals as chemicals of potential concern in surface water within the human health and ecological risk assessment as they were identified as elevated initially. Northern Health also raised concerns about the removal of some metals (e.g., arsenic, cadmium, nickel) that were originally included in the multimedia assessment within the human health and ecological risk assessment in the preparation of the Revised Application. ODV explained that a metal was retained as a chemical of potential concern only if the maximum predicted concentration exceeded the selected human health screening criteria (and the regional background concentration, where applicable); and the metals not included were predicted to change by less than the laboratory method detection limit as defined in the B.C. Environmental Laboratory Manual. ODV stated that these metals did not meet this criterion and were therefore not retained as chemicals of potential concern. Northern Health remained concerned that Cariboo Gold may alter these excluded metals during project construction near the contaminated historical tailings.

In response to the concern from Northern Health, the EAO is proposing a condition requiring the development and implementation of a Human Health Monitoring Plan which would require monitoring for metals in surface water and other environmental media.

11.24.6.3 Risks to human health from contaminated drinking water

Interior Health, Northern Health, and ENV raised concerns related to the existing drinking water conditions in the District of Wells. At the time of the submission of the Application, the District of Wells had issued a drinking water advisory due to potential lead contamination in the water distribution system. A *drinking water report* dated June 2021, concluded that elevated lead was associated with lead plumbing and recommended flushing water to reduce the concentration of lead. Wells continues to experience *drinking water advisories* based on elevated lead. Baseline water quality samples taken near the District of Wells water supply well found concentrations of iron and manganese that exceeded B.C. Drinking Water Quality Guidelines, although groundwater extracted by the District of Wells is treated prior to consumption. ODV has no authority over the treatment or operation of the water supply system for the District of Wells.

ODV stated that without mitigation, Cariboo Gold has potential to alter existing groundwater quality intercepted by the District of Wells water supply well at mine closure due to the flooding of the underground mine system following the completion of operations. Closure mitigations were therefore evaluated to mitigate project-related effects at closure, and two mitigations were identified: installation of a new drinking water supply well for the District of Wells (which is preferred in consideration of the current water quality) or implementation of hydraulic controls to reduce the interception of groundwater influenced by the flooded underground workings at closure. Northern Health and ENV have both recommended that the identification of an alternative drinking water supply source for the District of Wells be required, as without mitigation mine activities were predicted to further degrade water quality. Northern Health requested that once the location of the new well has been finalized and aquifer testing completed, additional information on the feasibility, quality, and location of the new water source be provided to Northern Health.

Interior Health and Northern Health were also concerned that exposure to groundwater for the mine workers living at camp was not included in the assessment of risks to human health. ODV responded that it was excluded on the assumption that potable water that met B.C. Drinking Water Quality Guidelines would be provided to the camps. Northern Health recommended that this requirement be included in the EAO's proposed Certificate conditions. Interior Health requested that the guidelines employed must be assured to be protective of human health given the potential and known domestic uses downstream within the Quesnel and Fraser River systems.

Through additional ground truthing information on private groundwater users assessment requested by Northern Health, ODV identified five private groundwater wells, two of which are within the town of Wells and do not appear to have been included in the provincial database or may be associated, potentially erroneously in the database, with records of unsuccessful wells. One is inactive (buried) and for the second limited information is available (including if active or used for drinking water). The other three identified wells are outside of the town of Wells. Because of the uncertainty surrounding the one private well that may be extracting drinking water from the Wells aquifer, which is in turn contaminated from historical mining, Northern Health disagreed with the lack of groundwater pathway in the human health risk assessment. To account for this potential gap, Northern Health asked that ODV be required to take additional actions to ensure that no private drinking water well users are using the aquifers associated with former or predicted mine influenced water.

To address potential concerns regarding increased risks to human health, Northern Health asked the EAO to require human health monitoring which would assess changes to environmental health conditions at site to ensure that workers and residents are protected from any changes in conditions, particularly given the existing baseline conditions and contaminated area. Northern Health requested that this plan should include the monitoring and management of health risks arising from environmental media including surface water, groundwater, air, sediment, soil, and country foods (fish tissue, vegetation, and wild game tissue) as well as the characterization of health risks at baseline from the metals not included in the assessment.

In response to the concerns regarding drinking water, the EAO has proposed conditions requiring the development and implementation of a Human Health Monitoring Plan and a Drinking Water Management Plan that would require the following:

- ODV must search for and, if found, install a new drinking water supply well for the District of Wells. Following the establishment of a new drinking water supply well, ODV must complete aquifer testing and provide additional information on the feasibility, quality, and location of the new water source. If not found, ODV must implement hydraulic controls to prevent the interception of groundwater influenced by the flooded underground workings by the Wells drinking water well at closure;
- Drinking water provided to the work camps must meet B.C. Drinking Water Quality Guidelines;
- ODV must provide information to the District of Wells, private groundwater well owners that are currently linked to the Wells aquifer, and the public regarding the risks of using existing, untreated groundwater;
- Monitoring and adaptive management of surface water, groundwater, air, sediment, soil, and country foods (fish tissue, vegetation, and wild game tissue) as it relates to human health risks; and
- ODV must describe any actions related to remediation of the contaminated area through the End Land Use Plan.

11.24.6.4 Inclusion of backyard gardens in risk assessment

Northern Health noted that while the multimedia assessment for human health included country foods, it did not include ingestion from backyard or community gardens. ODV responded that while ingestion of produce from gardens was not specifically evaluated, the deposition onto soil and plants because of Cariboo Gold was found to be insignificant and would therefore not change the results of the assessment.

In response, the EAO has proposed to include backyard and community gardens in the Human Health Monitoring Plan to address this concern.

11.24.6.5 Recent updates to human health risk assessment guidance

Northern Health disagreed about what regulations and guidance should have used in the development of the human health risk assessment. Over the course of the Cariboo Gold environmental assessment process, the Ministry of Health

released *updated human health risk assessment guidance*. ODV followed the human health risk assessment guidance released by Health Canada. ODV conducted the human health risk assessment in accordance with the Contaminated Sites Regulations that were identified in the *Application Information Requirements* for Cariboo Gold (issued April 16, 2021), noting that given the timing of the final release of the updated provincial guidelines guidance (April 2022), it would have required redesigning the human health risk assessment. The problem formulation to be used for the human health risk assessment was also developed earlier, as part of the process planning phase that informs the Application Information Requirements. It would not have been possible, given this timing, for ODV to follow the updated provincial guidance for Cariboo Gold, and therefore the EAO directed in the Application Information Requirements to follow Health Canada guidance. Northern Health noted that the updated provincial guidance is in line with Health Canada guidance and would not have substantially changed the expectations for Cariboo Gold.

The provincial guidance update is noted by the EAO and will be incorporated into future project requirements. For this assessment, the Health Canada guidance was the standard by which the EAO measured the completeness of this assessment, including the methodologies used, data collected, and basis for conclusions. The EAO will continue to work with Northern Health and ODV to find ways to provide the information that Northern Health requested, such as including a requirement to update the human health risk assessment if a new water source for the District of Wells is not found.

11.24.7 The EAO's Characterization of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on human and ecological health. In addition to the mitigation measures proposed by ODV, the following Certificate conditions were also proposed by the EAO to mitigate these effects:

- Air Quality condition, to complete additional baseline work and implement a continuous ambient air quality monitoring program;
- Human Health Monitoring Plan, to monitor surface water, groundwater, air, sediment, soil, and country foods (fish tissue, vegetation, and wild game tissue) as related to human health risks;
- Community Effects Management Plan, to monitor the effects to the community from Cariboo Gold;
- ODV must search for and, if found, install a new drinking water supply well for the District of Wells. Following the establishment of a new drinking water supply well, ODV must complete aquifer testing and provide additional information on the feasibility, quality, and location of the new water source;
- If a new drinking water source cannot be found, ODV must otherwise mitigate the movement of underground mine water following closure to maintain water quality at the drinking water source;
- ODV must describe any actions related to remediation of the contaminated area through the End Land Use Plan;
- Drinking water provided to the work camps must meet B.C. Drinking Water Quality Guidelines; and,
- ODV must provide information to the District of Wells, private groundwater well owners that are currently linked to the Wells aquifer, any well drillers that install new drinking water wells related to Cariboo Gold, and the public regarding the risks of using existing, untreated groundwater.

The EAO's characterization of the expected residual effects of Cariboo Gold on human and ecological health is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued).

Table 21: Summary of Residual Effects for Human and Ecological Health

Residual Effect	Assessment Rating*	Rationale
Changes to human health Effects to human health from Cariboo Gold would primarily be driven by changes in air quality and groundwater (drinking water) quality as well as other environmental media such as noise, soil, and country food exposure.	Context (resilience): Low to Moderate Magnitude: Negligible to High Extent: Local Duration: Long-term Reversibility: Partially reversible Frequency: Regular Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: High Importance: High	**Not significant but high uncertainty** The regional setting of Cariboo Gold includes elevated baseline levels for several chemicals of potential concern that effect human health due to contamination from historical mining in the region. The existing contaminated area along the Jack of Clubs Lake shoreline was characterized by Northern Health as a health hazard under the *Public Health Act* based on elevated levels of arsenic, cobalt, cadmium and lead in the sediment and arsenic, cobalt, iron, nickel, and sulphate in the groundwater. Human health in the District of Wells may have low to moderate resiliency or be acutely to mildly sensitive to existing conditions, depending on the health status of the individual and the contaminant of concern. Resiliency and sensitivity may vary widely, may or may not be immediately apparent or apparent in the short to medium-term (e.g., from air quality, noise, soil, or country foods), and may not become apparent until over the longer-term (e.g., from exposures to metals or chronic air quality exposure). Residual effects are expected to be negligible to low from multimedia exposure to chemicals of potential concern, with the exception of exposure to methylmercury and selenium from fish ingestion which were classified as moderate which may interact cumulatively with existing exposures to arsenic and other metals but were not considered in the application. Any changes to groundwater quality could directly impact residents in the District of Wells, which, without mitigation measures, already has a drinking water supply that is above government criteria for lead, iron, and manganese, which is considered a high magnitude effect. For inhalation effects, there were negligible to high residual effects from exposure to chemicals of potential concern; for acute exposure: low for nitrogen dioxide, low for total suspended particulates, PM_{10}, $PM_{2.5}$ and iron, and moderate for diesel particulate matter. For chronic inhalation: low for nitrogen dioxide, low to moderate for total suspended particulates, PM_{10}, and $PM_{2.5}$, and low residual effects for diesel particulate matter. These changes would occur within the local assessment area. Changes to water quality and air quality would be expected regularly throughout the construction and operations phases with groundwater concerns continuing into post-closure and considered partially reversible. Disproportionate populations that would be affected would be the residents of Wells, particularly for any residents with underlying health conditions, as well as Indigenous land-users. There would be changes to air quality, including for some indicators where any increase would be considered a non-negligible effect. The risk of changes to human health after mitigation is considered moderate, with a moderate likelihood and a high consequence (high magnitude and local extent). However, there is a low to high level of uncertainty in the data – high for air quality given the lack of local baseline data. There is also uncertainty around the consumption rates of traditional foods by Indigenous nations. Local residents of Wells, Northern Health, and Indigenous nations considered this issue of high importance.
Changes to ecological health Changes to ecological health would primarily be driven by changes to surface water and sediment quality, which could adversely affect	Context (resilience): Moderate Magnitude: Low Extent: Local Duration: Long-term Reversibility: Partially reversible Frequency: Regular	**Not significant** The regional setting of Cariboo Gold includes elevated baseline levels for several chemicals of potential concern that effect ecological health due to contamination from historical mining in the region, leading to a moderate resilience to additional effects. Terrestrial-feeding species that do not have small home ranges (seasonal or otherwise) in closer proximity to and overlapping the Mine Site and Quesnel River Mill footprints may have high resiliency to existing conditions, whereas those with a small home range (seasonal or otherwise) in closer proximity to and overlapping the Mine Site and Quesnel River Mill footprints may have moderate resiliency to existing conditions. Aquatic-feeding species, those with small home ranges in closer proximity to and overlapping the Cariboo Gold footprint, may have lower resiliency to existing conditions. There would be a

Residual Effect	Assessment Rating*	Rationale
vegetation and wildlife health.	Affected Populations: Even Risk (likelihood and consequences): Moderate Uncertainty: Low Importance: High	loss of wetland communities at the Mine Site and at access roads to the Transmission Line and alteration along the Transmission Line itself. Wetlands are sensitive ecological communities that are easily adversely affected. The magnitude of changes is expected to be low based on changes to chemicals of potential concern being below applicable guidelines. The potential effects would occur within the local assessment area, particularly near waterbodies such as Jack of Clubs Lake. Potential ecological health effects of Cariboo Gold, particularly considered cumulatively with historical and ongoing resource extraction in the area, could have implications decades beyond post-closure. Changes would be expected regularly throughout the construction and operations phases of Cariboo Gold, with potential effects being considered partially reversible following closure of Cariboo Gold. Effects to ecological health would be evenly felt by all land users. Very little change to the indicators for ecological health are expected to change (low likelihood) and the consequence was minor (low magnitude and local extent), leading to a low risk rating. The uncertainty in the assessment of ecological health effects was low. The importance to Indigenous land users was high.
* *Note*: Criteria and assessment ratings are defined in *Appendix 1 - Residual Effects Characterization Definitions*		

11.24.8 Cumulative Effects Assessment

ODV conducted a cumulative effects assessment on human and ecological health, provided in *Chapter 7.13.9* of the Revised Application. ODV identified two existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Cariboo Gold: Bonanza Ledge Phase II Reclamation and Mosquito Creek Reclamation. ODV anticipated that changes to air quality and water quality affecting human or ecological health from both reclamation projects would be minor, transient, temporary, and controlled using best available technology and best management practices, and would not materially affect the magnitude, extent, duration, reversibility, consequence, and risk described for Cariboo Gold. ODV determined that past, present, and reasonably foreseeable future projects and activities within the region would not overlap with air quality effects from Cariboo Gold in a way that the regulatory thresholds would be exceeded.

Considering the lack of interaction with past, present, and reasonably foreseeable future projects , the mitigation proposed, and existing regulatory standards requirements regulating industrial activities, the EAO is of the view that there would not be cumulative adverse effects to human and ecosystem health.

11.25 Archaeological and Heritage Resources

11.25.1 Summary

Archaeological and heritage resources consist of physical evidence of ancient plants and animals (fossils), or cultural materials including remains of ancient campsites, culturally modified trees, historical structures, and burial sites. These resources are non-renewable and susceptible to damage from land-altering activities, and have value to Indigenous peoples, the public and other stakeholders.

ODV assessed the potential effects to archaeological and heritage resources (including damage and changes to access to historical, archaeological, and palaeontological sites) and described mitigation measures that would reduce the potential effects to archaeological and heritage resources.

The main issue raised by reviewers was the potential for ground disturbance from Cariboo Gold activities to affect undiscovered historical, archaeological, and palaeontological sites, particularly along the Transmission Line where archaeological studies have not yet been fully completed.

To address key issues related to potential effects to archaeological and heritage resources, the EAO has proposed the following condition to the Ministers if a Certificate is issued:

- Construction Environmental Management Plan – this plan would require the development of chance finds procedures to mitigate effects to any newly discovered sites.

Additionally, as identified in the *Regulatory Coordination Plan*, pre-1846 archaeological sites and remains are protected in B.C. under the *Heritage Conservation Act*. Permits are required for inspections, investigations, and alterations of those sites.

Given the assessment, mitigation measures, and proposed condition, the EAO found that there would not be a significant adverse effect to archaeological and heritage resources.

As ODV did not anticipate any negative residual effects on archaeological and heritage resources, there was no assessment of cumulative effects in the Application. The EAO did not identify additional potential for existing and reasonably foreseeable projects and activities to act cumulatively with Cariboo Gold for archaeological and heritage resources.

11.25.2 Assessment Boundaries

The spatial boundaries for the archaeological and heritage resources assessment included a local assessment area which encompassed the Mine Site, Quesnel River Mill, Transmission Line (plus a 100 m buffer) and Transmission Line access road footprints (plus a 15 m buffer). The regional assessment area included a 10 km buffer around the Mine Site and a 1 km buffer around the Transmission Line. The regional assessment area for the Transmission Line access roads and Quesnel River Mill was the same as the local assessment area as no additional disturbance area is proposed.

The temporal boundaries included construction (1-4 years) and operations (16 years). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.25.3 Baseline Conditions by ODV

The baseline archaeological and heritage resources conditions in the region were assessed in *Chapter 7.15* of the Revised Application by ODV and are summarized here.

The region has been heavily affected by mining activities and local industrial development over the years. This has likely affected archaeological and palaeontological resources in the area.

ODV identified only one archeological site during local studies, located within the Mine Site local assessment area. The site consisted of three lithic flakes and one post-1846 blazed subalpine fir culturally modified tree. The site is situated outside of Cariboo Gold's footprint and would not be adversely affected. No archaeology sites were found within the Quesnel River Mill local assessment area. A Heritage Resources Impact Assessment for the Transmission Line was completed in 2021 and 2022. No sites were identified.

ODV identified seven recorded historical sites, all were found within the Mine Site local assessment area. The sites were all situated outside of the Mine Site footprint and would not be affected by Cariboo Gold. Six sites were recognized under the *Heritage Conservation Act*, including the Barkerville townsite, Cariboo Wagon Road, Richfield courthouse, Chee Kung Tong building, Richfield Catholic and Chinese Cemeteries, and the Wells Community Town Hall. The other recorded historical sites included two partially collapsed log structures, a dilapidated structure, and refuse. No historical sites were identified within the Quesnel River Mill local assessment area. During the Heritage Resources Impact Assessment study, a total of 566 non-registered historical features were recorded, along with another 301 features inferred from satellite imagery. The majority were associated with historical mining activities, including prospects/pits, trenches, mined creeks,

hydraulic slopes, ditch lines, tailings/ waste rock, and adits. The Heritage Resources Impact Assessment concluded that no potential effects to the nonprotected historical sites would be anticipated.

ODV also identified one palaeontological site recorded within the Mine Site local assessment area. The site was found outside Cariboo Gold's footprint and would not be affected by Cariboo Gold. An assessment of the palaeontological potential of the Mine Site local assessment area identified that almost the entire area is considered to have negligible potential, with small valley areas assigned a low to moderate potential.

An **adit** is an entrance to an underground mine which is horizontal or nearly horizontal, by which the mine can be entered, drained of water, ventilated, and minerals extracted at the lowest convenient level. Adits are also used to explore for mineral veins.

11.25.4 Potential Project Effects by ODV

In the Application, ODV identified that Cariboo Gold could affect heritage, archaeological and paleontological sites during construction and operations. The potential effects identified by ODV were:

- Damage to the integrity and context of known or undiscovered paleontological, archaeological, or historical sites, features or objects; and,
- Changes to access to archaeological, historical, or palaeontological sites or deposits, if present.

Ground disturbance resulting from project activities could damage the integrity and context of any archaeological, historical, or paleontological sites, if present. There would also be the possibility for chance find encounters where previously unknown heritage resources are discovered during ground disturbing project activities. There remains uncertainty around the potential effects from the Transmission Line as it has yet to be fully assessed for archaeological, historical, and palaeontological resources. The assessment could identify sites that have not yet been recorded.

Project activities could indirectly affect sites by either increasing or hindering access to them. These changes could be either positive such as opening new areas to researchers, or negative through facilitating illicit artifact collection or limiting access to culturally significant sites.

11.25.5 Proposed Mitigation Measures by ODV

The following are the key mitigation measures proposed by ODV:

- Avoid identified heritage resources by designing project components to avoid physically disturbing known sites or exposing them to potential future disturbance from other agents, such as weather;
- Develop and implement a chance finds procedure;
- Avoid new heritage sites through design, where possible;
- Follow additional mitigation, including engineering controls, systematic data recovery, archaeological monitoring, and preservation by record if site avoidance is not possible;
- Reduce ground disturbance, where practicable, by using heli-logging or hand falling methods, or utilizing a feller buncher to reach into an area, thereby eliminating heavy machinery tracking over sites;
- Schedule clearing activities to occur under winter conditions with frozen ground and/or suitable snow cover to reduce or avoid ground disturbance; and,
- Halt work if any sign of archaeological remains is observed at any time during Cariboo Gold activities and notify a qualified archaeologist and the Indigenous nations.

11.25.6 Key Issues Raised

The following key issues were raised during review of the Application by the Technical Advisory Committee and Indigenous nations.

11.25.6.1 Effects to known or unknown archaeological and heritage sites from ground disturbance

During engagement with Lhtako Dené Nation, a knowledge holder identified the approximate location of a burial along Highway 26 near Pinegrove. Additional community interviews conducted in 2021 described burial sites along Highway 26 and concerns regarding disturbing these areas through ground disturbance activities such as digging. Lhtako Dené Nation community members also participated in archaeological surveys for the Transmission Line in 2021. ODV has supported Lhtako Dené Nation in completing additional baseline data collection and field visits to identify the archeological and traditional use sites that the Transmission Line would overlap.

This finding was one factor in the early decision by ODV to remove the Transmission Line option along Highway 26 from the location alternative options, moving it further north.

The EAO has also proposed a condition to require ODV to develop and implement a Construction Environmental Management Plan, which would include a chance finds procedure to mitigate effects to any newly discovered sites anywhere surface disturbance would occur.

11.25.7 The EAO's Assessment of Residual Effects

After considering proposed mitigation measures and Certificate conditions (which would become legally binding if a Certificate is issued), the EAO concludes that Cariboo Gold would not result in residual effects on archaeological and heritage resources for the following reasons:

- Identified heritage and archaeological resources would not be affected by the proposed development;
- The required chance finds procedure would help to mitigate effects to any sites that are discovered during construction and operations;
- Any pre-1846 archaeological sites discovered would be protected under the *Heritage Conservation Act* and permits would be required for inspections, investigations, and alterations of these sites; and,
- Additional investigations are required under the *Heritage Conservation Act* for the disturbance along the proposed Transmission Line.

Therefore, no additional characterization of residual effects was completed for archaeological and heritage resources.

11.25.8 Cumulative Effects Assessment

As ODV did not anticipate any negative residual effects on archaeological and heritage resources, there was no assessment of cumulative effects. The EAO did not identify potential for existing and reasonably foreseeable projects and activities to act cumulatively with Cariboo Gold.

11.26 Culture

11.26.1 Summary

The goal of this part of the assessment is to understand how Cariboo Gold might affect community culture and the ability to continue to use the land in the future as it is currently used or has been used in the past. This is valued by Indigenous communities and the public. The arts sector was also identified as particularly important to those who live and work in the District of Wells.

ODV assessed the potential effects to changes in culture by examining impacts to subcomponents that are specific to the Indigenous and non-Indigenous residents in the area. These components included plant species of cultural significance, traditional foods, Indigenous language and teaching, and the District of Wells arts sector. ODV then described mitigation measures that would reduce the potential effects.

The following key issues were identified by reviewers:

- Direct habitat alteration or loss to plant species of cultural significance primarily through clearing activities related to the Transmission Line construction activities;
- Effects of Cariboo Gold on the availability of traditional foods;
- Decreased use of traditional languages at cultural gatherings and events where teaching opportunities may occur through influx of non-traditional language speakers;
- The changing nature of Wells, support for tourism and arts, and lack of participation in community planning and volunteering;
- The lack of infrastructure related to tourism, allowing visitors to stop in the community, instead of just passing through to Barkerville or the Bowron Lakes; and,
- The disproportional increase in the mining population in the community if Cariboo Gold is approved, which may contribute further to the cohesion issue caused by already existing diverse groups; for artists there could be a fear of cultural displacement that could take place.

To address key issues related to culture, the EAO has proposed Certificate conditions to require ODV to hold biannual community meetings and develop a plan to monitor and mitigate effects on tourism and arts in Wells as well as local infrastructure and services. ODV has also committed to the District of Wells to form a Community Involvement Committee and develop and implement an Indigenous Partnership Plan with the participating Indigenous nations.

Additionally, as identified in the *Regulatory Coordination Plan*, management plans will be developed for Cariboo Gold as part of permitting, including an environmental management plan, archaeological and cultural heritage resources management plan (including a chance finds procedure), an invasive plant management plan (to manage impacts to traditional foods such as berries), and a vegetation management plan.

Given ODV's assessment, mitigation measures, and the EAO's proposed conditions, the EAO found that there would not be a significant adverse effect or cumulative effect to culture.

11.26.2 Assessment Boundaries

The spatial boundaries for assessment of effects to culture included a local assessment area which encompassed the Mine Site, Quesnel River Mill, and Transmission Line (plus a 1 km buffer) and the Transportation Routes (plus a 500 m buffer). The regional assessment area included a 10 km buffer around all project components.

The temporal boundaries included construction (1-4 years), operations (16 years), closure (2 years), and post-closure (10 years or more). These project components and anticipated duration of activities are described in detail in *Section 2.2* (Project Description and Schedule) of this Report.

11.26.3 Baseline Conditions by ODV

The baseline cultural conditions in the region were assessed in *Chapter 7.16* of the Revised Application by ODV and are summarized here.

The Indigenous nations present in the region were identified (Lhtako Dené Nation, Williams Lake First Nation, and Xatśūll First Nation), and Indigenous-specific information sources were consulted as they relate to culture. All Indigenous nations

involved expressed the importance to them of the relationship with the land that is rooted deeply in time. For generations, Indigenous peoples have moved and continue to move widely across their territory in pursuit of food and other resources through activities such as fishing, freshwater resource harvesting, trapping, hunting, berry picking, trading, and plant gathering. The presence and abundance of fish, wildlife and plant species has been well-documented in great part based on Indigenous nations observations and communications.

This knowledge is preserved and transferred in various ways within families and through 'cultural knowledge camps' where information and skills are transferred to ensure the passing on to younger generations. Environmental stewardship is a large part of these teachings. For example, community members will refrain from hunting during springtime to allow wildlife to raise young. Language also plays an important role for Indigenous nations with many members still speaking the traditional languages which often have unique vowels and sounds not found in the English language. All the Indigenous nations indicated well-being and community health is tied to their ability to carry out socio-cultural activities, practices, and pursuits, including land use activities within their traditional territories.

Discovery of gold in Williams Creek in 1861 began the regional gold rush, and in 1862, the town of Barkerville was established. Soon the town of Barkerville had a population of 5,000 people with accompanying music, art, and culture. In 1926, the Cariboo Gold and Quartz Mining Company was established, and in 1933 the town of Wells was established at the original site of a small camp and sawmill to house the Gold Company. The Cariboo Gold Quartz mine had a long and successful production life, although the mine eventually slowed down and closed in 1967. Employment in Wells then declined until the price of gold increased in the 1980s, and this reinvigorated the local mining prospects with the establishment of Mosquito Creek Mining. Though there were benefits from Mosquito Creek Mine, there was limited mining activity in the region from the 1980s onwards, and residents in Wells were supported by jobs in tourism and the development of the arts community. The Wells Improvement District was formed in 1967, which operated under the Cariboo Regional District and managed the day-to-day operations of Wells. In 1977, the Island Mountain School of the Arts, with assistance from the recently formed the B.C. Arts Council and the Community Arts Council of Quesnel, ran its first of 47 seasons (and continuing) of arts programming that has been distinctly tied to this region.

The Town of Wells voted to incorporate as a municipality in 1997 and the first mayor and councillors of the District of Wells were elected in June 1998. The District of Wells describes itself as a destination for history, art, and adventure. Wells is the nearest municipality to both Barkerville and the Bowron Lakes, which are destinations for visitors to the Cariboo region. Values in the community include maintaining the District of Wells as a viable, quiet, and safe place to live where everyone knows everyone. Many residents view it as a quaint mountain village, where people can escape from city life. Residents of the District of Wells want to see the community succeed and have a thriving arts and tourism industry.

Community and culture are currently promoted in several ways, including all-season outdoor recreation (such as hiking, skiing, snowboarding, snowmobiling, and snowshoeing), water-based recreation (including canoeing and kayaking), the arts (particularly the Island Mountain Arts and Sunset Theatre), the School of Wells, the Legion, and other cultural events.

11.26.4 Potential Project Effects by ODV

ODV identified the following potential effects on culture:

- Changes to governance and stewardship systems;
- Loss of the ability to exercise customs, beliefs, and values;
- Loss of Indigenous language and intergenerational knowledge transfer;
- Loss of culturally significant plant species;
- Loss of community and cultural cohesion; and,
- Reductions in resident artists, art schools and galleries.

Following the assessment, ODV only identified potential residual adverse effects to culturally significant plant species out of the list of potential effects. For plants, the magnitude of the effects was expected to occur in direct relation to the area and intensity of disturbance or alteration required. The majority of the Mine Site (including the Waste Rock Storage Facility at Bonanza Ledge Site) and Quesnel River Mill would be located on previously disturbed sites and thus effects were considered to be less than activities that occur on undisturbed sites. The Transmission Line would be constructed on existing forest roads and clearings where possible.

The reviewers and the EAO did not agree that there would be no additional residual effects on the remaining subcomponents – this analysis is continued below in *Section 11.26.7* (The EAO's Assessment of Residual Effects).

11.26.5 Proposed Mitigation Measures by ODV

ODV only identified potentially residual adverse effects to one of the subcomponents (culturally-significant plant species) and proposed the following key mitigation measures:

- Limit vegetation clearing, soil stripping, grubbing, and grading for construction, temporary workspace, or storage areas, to the approved project footprint and minimized to the extent practical;
- Use existing infrastructure wherever possible (e.g., Mine Site haul roads, Transportation Routes, Transmission Line, and associated access roads) to reduce new vegetation clearing;
- Develop an Indigenous Partnership Plan which will outline procedures to be implemented for maximizing opportunities for Indigenous nations and include a plan for Indigenous nations concerns and issues monitoring; and,
- Target revegetation of plant species of cultural significance during reclamation activities.

11.26.6 Key Issues Raised

The following key issues were raised during review of the Application by the Technical Advisory Committee, Indigenous nations, the Community Advisory Committee, and the public.

11.26.6.1 Decrease in use of traditional languages

Indigenous nations raised concerns that due to Cariboo Gold, a decrease in the use of traditional languages such as at cultural gatherings and events may occur. ODV responded that it will implement Indigenous awareness training as a component of employee onboarding, and that this training will include an overview of Indigenous languages and culture. ODV will work with participating Indigenous nations to ensure that members from each Nation are involved in the training and curriculum development. The EAO proposed the inclusion of this commitment as a Certificate condition under the Community Effects Management Plan.

11.26.6.2 The changing nature of the District of Wells

The changing nature of Wells, support for tourism and arts, and lack of participation of those hired to work at Cariboo Gold in community planning and volunteering were raised as concerns by the public and Community Advisory Committee. Concerns were also raised about the availability of infrastructure and related ability to have visitors stop in the community, instead of just passing through to Barkerville or the Bowron Lakes. Members of the public also indicated that Cariboo Gold could likely disproportionally increase the mining population in the community, which may contribute further to the cohesion issue caused by already existing groups. For artists there could be a fear of cultural displacement that could take place.

ODV indicated that it would develop various strategies such as a strategy to mitigate pressures on recreation and tourism in the region due to increased population and visitors and hire locally and host community events to promote and encourage arts and culture within the District of Wells. ODV also committed to developing a strategy to mitigate pressures

on recreation and tourism and contact industry leaders at least semi-annually to better understand the effect on the sectors. ODV has also considered the possibility of creating a tourist attraction near the entrance to Wells once one of the mine portals is completed.

The EAO proposed a condition in the Certificate which includes the development and implementation of a Community Effects Management Plan to monitor effects to the community and a requirement for ODV to hold biannual community meetings. The EAO also proposed a Public Information condition to require ODV to report monitoring information on a public website and provide a mechanism for complaints by the public to be responded to.

11.26.7 The EAO's Assessment of Residual Effects

After considering ODV's Revised Application and the comments received during review of the Application, the EAO concludes that Cariboo Gold would result in residual adverse effects on culture.

A number of effects on the District of Wells would also be positive, as Cariboo Gold is expected to bring increased employment to the community (see *Section 11.18* (Employment and Economy) of this Report), and this will be directly related to the potential for economic development, economic support for the arts and cultural sector, community growth and stability.

The EAO's characterization of the expected residual effects of Cariboo Gold on culture is described below, after considering proposed mitigation measures and Certificate conditions (which would become legally binding in the event that a Certificate is issued).

Table 22: Summary of Residual Effects for Culture

Residual Effect	Assessment Rating*	Significance and Rationale
Decrease in plant species of cultural significance This effect would include the loss of culturally significant plant species. The majority of Cariboo Gold infrastructure would be located on previously disturbed sites. The Transmission Line would be constructed on existing forest roads and clearings where possible.	Context (resilience): Moderate Magnitude: Low Extent: Limited Duration: Long-term Reversibility: Partially reversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Low Uncertainty: Low Importance: High	**Not significant** The baseline condition of plant species of cultural significance, and their ability to recover over time, led to this conclusion of moderate resilience. Given that most of the Cariboo Gold footprint has been previously disturbed, a limited amount of new vegetation clearing would be expected. The magnitude of residual effects on habitat and plant species of cultural significance is expected to be low. Effects to plant species of cultural significance would be limited to where vegetation clearing occurs within the Cariboo Gold footprint. Although disturbance to plant species of cultural significance would occur mainly during construction and occasionally during operations, recovery of habitat (including plant species of cultural significance) would continue into closure and post-closure and potentially beyond. Effects to plant species of cultural significance would be partially reversible following reclamation given that there may be some permanent loss. Habitat alteration and disturbance to plant species of cultural significance will primarily occur during construction, with some disturbance continuing into operations, closure, and post-closure due to edge effects and dust deposition. It is expected that effects to plant species of cultural significance would affect Indigenous nations disproportionately. The loss of plant species of cultural significance was expected to occur (high likelihood), and the consequence would be minor (low magnitude and limited extent). This led to a low risk rating of for the effect to plant species of cultural significance. There is a moderate to low level of uncertainty in the loss of plant species of cultural significance determinations based on the information provided and the analytical techniques used to support the assessment. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the potential loss of plant species of cultural significance as highly important in this region in their traditional land use studies, in particular how this may affect overall vegetation and habitat for wildlife.

Residual Effect	Assessment Rating*	Significance and Rationale
Decrease in availability of traditional foods This effect would include the loss in availability of traditional foods due to increased population in the area.	Context (resilience): Moderate Magnitude: Low to medium Extent: Local Duration: Long-term Reversibility: Partially reversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Low Uncertainty: Low to moderate Importance: High	**Not significant** The baseline condition of traditional foods, and their ability to recover over time, led to this conclusion of moderate resilience. The magnitude of residual effects on habitat and traditional foods is expected to be low to medium. Effects to habitat and traditional foods would be limited primarily to where vegetation clearing occurs and extend to the local assessment area. Although disturbance to traditional foods would occur mainly during construction and occasionally during operations, recovery of habitat (including traditional foods) would continue into closure and post-closure and potentially beyond. Effects to traditional foods would be partially reversible following reclamation given that there may be some permanent loss. Habitat alteration and disturbance to traditional foods will primarily occur during construction, with some disturbance continuing into operations, closure, and post-closure due to edge effects and dust deposition. It is expected that effects to traditional foods would affect Indigenous nations disproportionately. The loss of traditional foods was expected to occur (high likelihood), and the consequence would be minor (low to medium magnitude and limited extent). This led to a low risk for the effect to traditional foods. There is a low to moderate level of uncertainty in the loss of traditional foods determinations based on the information provided and the analytical techniques used to support the assessment. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the potential loss of traditional foods as highly important in this region in their traditional land use studies, in particular how this may affect overall vegetation and habitat for wildlife.
Decreased use of Indigenous languages and culture This effect would include the loss of Indigenous language and intergenerational knowledge transfer due to loss of access to cultural use areas.	Context (resilience): Low to moderate Magnitude: Medium Extent: Regional Duration: Long-term Reversibility: Partially reversible Frequency: Continuous Affected Populations: Disproportionate Risk (likelihood and consequences): Moderate Uncertainty: Moderate Importance: High	**Not significant** The baseline condition of Indigenous languages and culture, and their ability to recover over time, led to this conclusion of low to moderate resilience. The effect on Indigenous languages and culture was predicted to be medium given the proximity of Cariboo Gold and predicted effects. Effects would extend to the region. It is anticipated that the potential residual effects of decreased use of Indigenous languages and culture would be felt beyond closure. Effects to Indigenous languages and culture would be partially reversible given the lessening of disturbance following post-closure, with some effects that continue beyond post-closure. Effects would occur continuously throughout all project phases and affect Indigenous nations disproportionately. There is a moderate likelihood of effects on Indigenous languages and culture, and the consequence would be medium (medium magnitude and local extent). This led to a moderate risk rating overall. Uncertainty of the effects on Indigenous languages and culture is considered moderate given the unpredictable nature of effects on these values. Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation identified the potential loss of Indigenous language and culture as highly important in this region in their traditional land use studies.
Effects on District of Wells arts sector This effect would include changes to community and cultural cohesion and changes to resident artists, art schools and galleries.	Context (resilience): Moderate Magnitude: Low Extent: Local Duration: Long-term Reversibility: Partially reversible Frequency: Continuous Affected Populations: Disproportionate	**Not significant** The baseline condition of the District of Wells arts sector, and its ability to recover over time, led to this conclusion of moderate resilience. The historical existence of mining in the area was also a factor in the experienced resilience of cultural values in this region. The effect on the District of Wells art sector was predicted to be low given the proximity of the mine and predicted effects, with some potentially positive effects. Effects would be limited to the local assessment area. It is anticipated that the potential residual effects of decreased use of the arts sector (if people do not attend arts events due to mining activities) would be felt beyond closure. Effects to the District of Wells art sector would be partially reversible given the lessening of disturbance following post-closure, with some effects that continue beyond post-closure. Effects would occur continuously throughout all project phases and affect residents of Wells and artists disproportionately. There is a low likelihood of effects on the District of Wells arts sector, and the consequence would be minor (low magnitude with local extent). This led to a low risk rating overall. Uncertainty of the effects on the District of Wells

Residual Effect	Assessment Rating*	Significance and Rationale
	Risk (likelihood and consequences): Low Uncertainty: Moderate Importance: High	arts sector is considered moderate given the unpredictable nature of effects on these values. The District of Wells, other members of the public and the Community Advisory Committee indicated the high importance of the arts sector to their values.
* Note: Criteria and assessment ratings are defined in *Appendix 1 – Residual Effects Characterization Definitions*		

11.26.8 Cumulative Effects Assessment

There are existing and reasonably foreseeable projects and activities identified by ODV that have the potential to act cumulatively with Cariboo Gold: Bonanza Ledge Phase II Reclamation, Mosquito Creek Reclamation, and a telecommunications facility in Wells, as well as regional forestry, mineral exploration, transportation, and placer mining activities that are ongoing in the region.

Potential for cumulative effects on culture in the region were assessed by ODV for plant species of cultural significance only, as this was the only residual adverse effect that ODV predicted. Anticipated cumulative effects on culture were identified as:

- Additive loss or alteration of plant species of cultural significance resulting from the incremental loss and alteration from project activities and from the combination of other past, present, and reasonably foreseeable future activities; and,
- Synergistic effects resulting from clearing (i.e., edge effects), hydrological changes, dust deposition, and projected climate change.

ODV assessed the potential for cumulative effects from these projects and activities to be negligible due to proximity of Cariboo Gold to the pre-existing projects and activities and the local nature of the described works.

Although the EAO identified additional potential residual effects, the EAO did not identify additional potential cumulative effects on culture that were not already accounted for in the baseline conditions. Given the proposed conditions and ODV's proposed mitigation measures, the EAO is satisfied that there would be no significant cumulative adverse effects to culture in the area.

11.27 Risks of Malfunctions and Accidents

11.27.1 Summary

Malfunctions and accidents of a mine could include any failure of essential equipment, effects from natural hazards, or failures due to human error. ODV's assessment of the potential for malfunctions or accidents considered incidents relating to fires, explosions, flooding, spills of hazardous materials, vehicle and equipment operation, tailings dam breaches, slope failures of waste rock stockpiles, underground mine instability, power failures, and adverse weather conditions. The effects from a malfunction or accident were considered as they may relate to community health, human health, environmental valued components, Indigenous interests, and employment and economy. The risk assessments incorporated proposed mitigation measures to mitigate these potential effects.

Because Cariboo Gold would have different components and activities in different locations, the assessment of effects from some accidents may vary between locations. Some incidents considered could only occur in one location (e.g., underground mine flooding and instability could occur only at the Mine Site), while other incidents could occur in different locations (e.g., fire). If these did occur, the negative effects of some incidents could extend beyond the Cariboo Gold location into the local assessment area (e.g., such as effects to water quality). In some cases, ODV considered the

risks of worst-case scenarios for Cariboo Gold overall as opposed to specific project components or locations (e.g., floods or slope failure).

Concerns were identified by reviewers related to gaps in the assessment of the potential negative effects of malfunctions and accidents and uncertainties with the mitigation measures proposed if incidents do occur, where the consequences were most relevant to human health.

The EAO proposed a Certificate condition requiring ODV to develop and implement a Project Emergency Response Plan, which would be included as part of the Community Effects Management Plan for Cariboo Gold. The plan would include information about responsibilities and capacity during emergencies, worst-case event casualty estimates, an evaluation of the limitations of emergency services in the District of Wells and the effect of Cariboo Gold on those services, an evaluation of evacuation procedures for the community and procedures for notifications. ODV would also be required to develop a Mine Emergency Response Plan during permitting under the *Mines Act*, which ODV indicated would be applicable for all project components.

11.27.2 Potential Project Effects by ODV

ODV assessed the potential effects of malfunctions and accidents on valued components and Indigenous interests in *Chapter 9* of the Revised Application, which is summarized here.

ODV evaluated the risk of malfunctions and accidents by examining the likelihood of hazards and the potential consequences if they were to occur. Risk was rated based on an averaging of the likelihood of an incident occurring and its consequences. The assessment included the potential extent of incidents, the potential effects including worst-case scenarios, and mitigation measures to reduce the likelihood of occurrence and consequences. Likelihood was determined for each incident based on historical trends or predictive models and consequence was determined in consideration of potential environmental, economic, social, cultural, and health effects, and effects to Indigenous interests.

Incidents involving hazards with minor to moderate consequence could result in injury (no lost time, no permanent disability), minor to moderate short-term environmental effects, up to three months of lost mine production, minimal to moderate community concern, and minor to moderately serious effects on Indigenous interests. Incidents involving hazards with major to critical consequence could result in fatalities and severe injury or disability, serious to very serious widespread long-term environmental effects, three to six months or more of lost mine production, high to extreme community concerns, and serious to very serious effects on Indigenous interests.

Cariboo Gold would have different components and activities in different locations. Some incidents considered could only occur in one location, while other incidents could occur in different locations. The negative effects of some incidents could extend beyond the footprints of Cariboo Gold components into the local assessment area. In some cases, ODV considered the risks of worst-case scenarios for Cariboo Gold overall. Residual effects and risk were rated after applying mitigation. No hazards were categorized as high risk for Cariboo Gold by ODV.

Table 23: Risk Assessment of Potential Hazards

Hazard	Likelihood (percent chance)	Consequence	Risk* = Likelihood x Consequence
Flood related accidental discharges of water with sediments and metals (contaminants) from project facilities	Rare (0-<5)	Moderate	Low to moderate
Flooding of underground mine works	Unlikely (>5-30)	Major-critical	Low to moderate
Spills of hazardous materials into water	Possible (30-50)	Moderate	Moderate
Spills of hazardous materials onto land	Likely (55-90)	Minor	Moderate
Tailings dam breaches	Rare (0-<5)	Minor-moderate	Very low to Low
Failure of underground mine stability	Rare (0-<5)	Major-critical	Low to moderate
Waste rock stockpile slope failure	Unlikely (>5-30)	Major	Moderate
Fire	Unlikely (>5-30)	Major-critical	Moderate

Accidental detonation of explosions	Rare (0-<5)	Major-critical	Low to moderate
Power failure	Rare (0-<5)	Major	Low
Vehicle or equipment accidents	Unlikely (>5-30)	Major-critical	Moderate
Adverse weather	Rare (0-<5)	Moderate	Low
*Risk matrix used to determine project risks can be found in *Appendix 1 - Residual Effects Characterization Definitions*.			

Mitigation and monitoring measures proposed by ODV that would be implemented to prevent and respond to malfunctions and accidents will be identified in the following management plans which would be required through other permitting and approvals and as described in the *Regulatory Coordination Plan*: chemicals and materials storage and handling plan; explosives management plan; filtered tailings management plan; fuel management and spill control plan; ground control management plan; metal leaching/acid rock drainage management plan; mine emergency response plan; mine site water management plan; occupational health and safety plan; Quesnel River mill site and Mine Site water management plans; surface erosion prevention and sediment control plan; traffic control plan; waste (refuse and emissions) management plan; and waste rock and underground material management plan.

ODV identified mitigation measures that would be implemented through these plans, including monitoring and alarm systems, muster stations, rescue, and fire response teams, first aid facilities, emergency medical vehicles, safety drills, safe passage to refuge, hazard assessments, safe storage and handling of materials, and speed limits and maintenance of roads. ODV also identified higher level response procedures that would be included in the plans, including identification and control of risk, notifying authorities, recovery and remediation, accident investigation, and follow-up monitoring. The Mine Emergency Response Plan would describe the procedures and measures that ODV would implement to respond to incidents. This includes, for example, actions that can be taken to prevent an emergency, precautions that would minimize the effects of an emergency, actions that personnel should take to contain an emergency, who would assume command of the emergency effort, who oversees which parts of emergency operations, how personnel would obtain and assess information to make decisions, budgeting, and media relations. ODV reported that it would be responsible for any project-related incidents that occur and would respond and implement mitigations accordingly.

11.27.3 Key Issues Raised

The following concerns and issues were raised by the Technical Advisory Committee, participating Indigenous nations, the Community Advisory Committee, and the public.

11.27.3.1 Effects on environmental valued components

Reviewers from ENV and EMLI were concerned with water treatment plants at the existing Bonanza Ledge Site and the Quesnel River Mill, which were proposed to be moved to treat water from Cariboo Gold when needed to meet water quality objectives. The reviewers were concerned about whether the water treatment plants would function as intended in the new location or with different inputs. ODV responded that water quality guidelines would be met, even if water treatment plants needed adjustments or updating. Following further discussions, ODV changed the Cariboo Gold design to add a new water treatment plant at Bonanza Ledge Site and add one at the Cariboo Gold Mine Site Complex to address these concerns. Water treatment will be discussed in more detail during permitting with EMLI and ENV.

Concerns were raised by EMLI regarding underground mine stability and flooding. ODV indicated that there is some uncertainty about potential interactions between Cariboo Gold and historical underground workings, and this would be addressed as construction and operations proceeded.

11.27.3.2 Concerns about potential non-compliances

The Community Advisory Committee noted that there have been concerns with the safety of ODV's existing activities at the Bonanza Ledge Site and during exploration work for Cariboo Gold (e.g., noise, fuel storage, discharge permits, pollution abatement orders, and risk assessments), and they have a lack of confidence additional non-compliances would not occur at Cariboo Gold.

ODV responded that Bonanza Ledge and Quesnel River Mill have not had any incidents that resulted in non-compliance. ODV confirmed that two incidents of localized ground failure occurred at Bonanza Ledge; however, these were not in non-compliance and were reported to EMLI. The Mine Emergency Response Plan was implemented, and operations were stopped to repair the area. There were no injuries or damage to equipment, but loss of production occurred for a short time. ODV described that ground failure is an inherent risk in underground mining, and this risk is assessed in the Revised Application (*Chapter 9 Malfunctions and Accidents*). ODV highlights that one major improvement being implemented for Cariboo Gold, in comparison with Bonanza Ledge, is the use of a roadheader for drilling rather than blasting. Using this would substantially reduce the potential of induced fracturing in the surrounding ground.

The EAO also notes that these other projects are currently authorized under the *Mines Act* and other permitting approvals. Cariboo Gold, in order to proceed, would require the same permitting approvals as well as a Certificate. Cariboo Gold would be inspected and monitored by the compliance and enforcement division from the EAO as well. For more information, see the *EAO's website*.

11.27.3.3 Effects on human health and emergency services

Concerns were raised by Northern Health about the lack of information regarding evacuation procedures in the assessment, and that some incidents could close Highway 26 and affect access to and from Wells by emergency services. Northern Health commented that emergency response capacity within the region needs to be evaluated, and proactive planning is required to determine where additional resources are required at the community level to be able to respond to incidents that may occur. Northern Health also noted that in the event of an incident, a comprehensive health impact assessment study (or human health risk assessment) may need to be completed to inform appropriate health and social service response, and that ODV should commit to funding such assessments as part of the Mine Emergency Response Plan. ODV provided additional information about evacuation procedures and committed to, in the event of an incident, conduct an accident or malfunction investigation and conduct follow-up monitoring, including assessment of incident causes and monitoring of affected valued components. ODV also committed to working with the appropriate regulators and Indigenous nations, to implement and address the recovery and remediation.

Northern Health was also concerned about the potential effect of an accident on local hospital capacity, noting that even incidents (e.g., spills of hazardous materials) that do not result in injuries can still require involvement of Environmental and Medical Health Officers, and add to the public health system workload. ODV provided detailed information regarding the Mine Emergency Response Plan that will be developed with guidance from EMLI and outlined the additional health resources retained on site. The Mine Emergency Response Plan will highlight resources and include any signed mutual agreements with emergency departments, Shock Trauma Air Rescue Service, and nearby mines for emergency response support as well as the mine rescue team and first aid facilities will be available for Cariboo Gold at the Mine Site and the Quesnel River Mill.

Public comments added that Highway 26 requires substantial repairs and that with current levels of industrial traffic, it does not feel safe to use that highway and they were concerned that Cariboo Gold would use up to 25 haul trucks per day along Highway 26.

The Indigenous nations also identified concerns about emergency procedures during shutdowns and potential effects to community health and safety, particularly concerns about emergency procedures during shutdowns. ODV would be required to develop a Care and Maintenance/Temporary Closure Plan as part of the Reclamation and Closure Plan during permitting, prior to construction, and will follow the provincial Health, Safety, and Reclamation Code for Mines under the *Mines Act*. The Mine Emergency Response Plan will apply to Cariboo Gold (all components) during Care and Maintenance, and a Care and Maintenance Plan under the Certificate was also proposed by the EAO to understand how the conditions would apply during temporary closure scenarios.

11.27.4 The EAO's Assessment and Conclusions

The EAO's characterization of the expected risks of Cariboo Gold malfunctions and accidents to the valued components assessed is provided below, after considering proposed mitigation measures and Certificate conditions.

The EAO has proposed the following Certificate conditions related to managing risk of malfunctions and accidents:

- Construction Environmental Management Plan, which would require ODV to develop and implement a plan to manage environmental effects during construction;
- Public Information condition, which would require ODV to maintain a website to ensure the public has access to monitoring and safety data reports associated with Cariboo Gold and other public information regarding Cariboo Gold such as contact information;
- A Project Emergency Response Plan, which will be included with the Community Effects Management Plan for Cariboo Gold. The plan would include information about responsibilities and capacity during emergencies, worst-case event casualty estimates, an evaluation of the limitations of emergency services in the District of Wells and the effect of Cariboo Gold on those services, an evaluation of evacuation procedures for the community and procedures for notifications; and,
- A Care and Maintenance Plan, which would set out the requirements for the plans and conditions that would apply during a period of care and maintenance or temporary closure.

Table 24: Summary of Potential Risks to Valued Components

Valued Components	Risk Rating	Rationale
Acoustics	Mine Site – Low (from explosion)	For potential explosions at the Mine Site, noise disturbance would occur (the magnitude of effects would be medium) within the local assessment area which includes the District of Wells. Effects would be temporary and occur once. The chance of this incident occurring would be between zero to less than five percent. The risk rating does not consider a worst-case explosion above ground during construction before the explosives magazine would be moved underground.
Air Quality	Mine Site and Quesnel River Mill – Low to Moderate (from fire, explosion, or power failure)	For fire, explosion, or power failure incidents at the Mine Site and Quesnel River Mill, air quality outside of the Cariboo Gold footprint within the local assessment areas, which includes the District of Wells, would be slightly altered, or changed (the magnitude of effects would be low). Effects would be temporary. The chance of fire occurring would be from five to less than thirty percent, the chance of explosion or power failure occurring would be zero to less than five percent. The risk rating does not consider uncertainties in the assessment of effects to air quality from Cariboo Gold within the District of Wells/Mine Site local assessment area (i.e., air quality monitoring and existing air quality conditions) and the state of air quality at the time of an incident.
Groundwater	Mine Site – Low to Moderate (from failure of underground mine stability) Quesnel River Mill – Low to Moderate (from flood related discharge of sediments and metals from tailings related storage pond)	Within the Mine Site, groundwater quantity would be altered or changed by failure of mine stability. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent. At the Quesnel River Mill, which extends to the Quesnel River, groundwater quality would be altered or changed by flood related discharge. Effects would persist more than two years. The chance of this incident occurring would be zero to less than five percent. There are existing adverse effects from historical contamination and risks to groundwater at the Mine Site and Quesnel River Mill from historical and current activities. The risk

Valued Components	Risk Rating	Rationale
		ratings do not consider uncertainties in the assessment of effects to groundwater from Cariboo Gold (e.g., modelling) and mitigating effects.
Surface Water	Quesnel River Mill – Low to Moderate (from flood related discharge of sediments and metals from tailings related storage pond, or tailings dam breach) Quesnel River Mill and Mine Site – Moderate (from spills of hazardous materials into water) Mine Site – Low to Moderate (from failure of underground mine stability) Bonanza Ledge – Moderate (from waste rock stockpile slop failure)	Spill or discharge incidents at the Quesnel River Mill would substantially alter or change (the magnitude of effects would be high) surface water quality. Effects would persist less than two years from flood related discharge. The chance of this incident occurring would be zero to less than five percent. Effects would persist more than two years from a tailings dam breach. The chance of this occurring would be zero to less than five percent. Effects would persist more than two years from spills of hazardous materials into water. The chance of this incident occurring would be 30 to less than 55 percent. At the Mine Site, surface water quality would be substantially altered or changed from spills of hazardous materials into water. Effects would persist for more than two years. The chance of this incident occurring would be 30 to less than 55 percent. Water quality would be substantially altered by failure of underground mine stability. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent. At Bonanza Ledge, surface water and sediment quality would be altered or changed by waste rock stockpile slope failure. Effects would persist less than two years. The chance of this incident occurring would be five to less than 30 percent. There are existing adverse effects from historical contamination and risks to surface water at the Mine Site and Quesnel River Mill from historical and current activities. The risk ratings do not consider uncertainties in the assessment of effects to surface water from Cariboo Gold (e.g., modelling) and mitigating effects.
Soil	Quesnel River Mill – Low to Moderate (from flood related discharge of sediments and metals from tailings related storage pond, or tailings dam breach) Quesnel River Mill and Mine Site – Moderate (from spills of hazardous materials onto land) Mine Site – Low (from failure of underground mine stability)	At the Quesnel River Mill, soil quality would be substantially altered or changed by flood related discharge or tailings breach. Effects would persist more than two years. The chance of this incident occurring would be zero to less than five percent. Soil quality or quantity would be substantially altered or changed by spills of hazardous materials. Effects would persist less than two years. The chance of this incident occurring would be 55 to less than 90 percent. At the Mine Site, soil quality would be substantially altered or changed from spills of hazardous materials. Effects would persist for more than two years. The chance of this incident occurring would be 55 to less than 90 percent. Soil quantity would be slightly altered or changed by failure of underground mine stability. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent.
Vegetation	Quesnel River Mill – Moderate (from fire); Low to Moderate (flood related discharge of sediments and metals from tailings related storage pond, or tailings dam breach) Quesnel River Mill and Mine Site – Moderate (from spills of hazardous materials onto land) Mine Site – Moderate (from fire); Low (from failure of underground mine stability)	At the Quesnel River Mill, vegetation would be altered or changed by fire. Effects would persist more than two years. The chance of this incident occurring would be 5 to less than 30 percent. Vegetation would be altered or changed by flood related discharge or tailings dam breach. Effects would persist more than two years. The chance of this incident occurring would be zero to less than five percent. Vegetation could be substantially altered or changed by spills of hazardous materials onto land. Effects would persist less than two years. The chance of this incident occurring would be 55 to less than 90 percent. At the Mine Site, vegetation would be altered or changed by fire. Effects would persist more than two years. The chance of this incident occurring would be 5 to less than 30 percent. Vegetation could be substantially altered or changed by spills of hazardous materials. Effects would persist less than two years. The chance of this incident occurring would be 55 to less than 90 percent. Vegetation would be slightly altered or changed by failure of underground mine stability. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent.

Valued Components	Risk Rating	Rationale
Wildlife	Quesnel River Mill – Moderate (from fire, or tailings dam breach) Quesnel River Mill and Mine Site – Moderate (from spills of hazardous materials into water) Mine Site – Moderate (from fire), Low (from failure of underground mine stability)	At the Quesnel River Mill, wildlife habitat would be slightly altered or changed by fire. Effects would persist less than two years. The chance of this incident occurring would be 5 to less than 30 percent. Wildlife and habitat (amphibians) would be substantially altered or changed by a tailings dam breach. Effects would persist more than two years, and wildlife may not recover to the pre-project state. The chance of this incident occurring would be zero to less than five percent. Wildlife (amphibians) could be substantially altered or changed by spills of hazardous materials into water. Effects would persist more than two years. The chance of this incident occurring would be 55 to less than 90 percent. At the Mine Site, wildlife habitat would be slightly altered or changed by fire. Effects would persist less than two years. The chance of this incident occurring would be 5 to less than 30 percent. Wildlife (amphibians) could be substantially altered or changed by spills of hazardous materials into water. Effects would persist more than two years. The chance of this incident occurring would be 55 to less than 90 percent. Wildlife (aquatic habitat; amphibians) could be altered or changed by failure of mine stability. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent.
Fish	Quesnel River Mill – Low to Moderate (from flood related discharge of sediments and metals from tailings related storage pond, or tailings dam breach) Quesnel River Mill and Mine Site – Moderate (from spills of hazardous materials into water) Mine Site – Low to Moderate (from failure of underground mine stability) Bonanza Ledge – Moderate (from waste rock stockpile slop failure)	At the Quesnel River Mill, which extends to the Quesnel River, fish (aquatic organisms and habitat) would be altered or changed by flood related discharge or tailings dam breach. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent. Fish would be substantially altered or changed by spills of hazardous materials into water. Effects would persist more than two years. The chance of this incident occurring would be 30 to less than 55 percent. At the Mine Site, fish (aquatic organisms and habitat) would be substantially altered or changed by spills of hazardous materials into water. Effects would persist more than two years. The chance of this incident occurring would be 30 to less than 55 percent. Fish would be substantially altered or changed by failure of underground mine stability. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent. At Bonanza Ledge, fish (aquatic organisms and habitat) would be altered or changed by waste rock stockpile slope failure. Effects would persist less than two years. The chance of this incident occurring would be 5 to less than 30 percent.
Human and Community Health (including health and emergency infrastructure and services, e.g., hospitals, ambulance, and fire fighters)	All Cariboo Gold Activities – High (collectively for all incidents)	Over the life of Cariboo Gold, there would be potential for incidents to result in casualties or multiple casualties, which could include severe injuries, disability, and fatalities. The chances of incidents occurring range from zero to less than five percent (for explosions, failure of underground mine stability, power failure underground, tailings dam breach, flood related discharges, adverse weather), 5 percent to less than 30 percent (for vehicle or equipment accidents, fire, flooding of underground mine works, waste rock stockpile slope failure), and 30 to less than 90 percent (for spills of hazardous materials). Regardless of measures to prevent incidents from occurring and to minimize their consequences, any incidents that occur where there are multiple casualties would strain emergency services and hospitals and have consequences that could extend beyond the region. This high risk rating takes into consideration existing risks to human health, gaps in the assessment of potential negative effects to human health from Cariboo Gold, gaps in the assessment of risks to human health from malfunctions and accidents, and the risk rating for community health.
Land and Resource Use	Quesnel River Mill – Low to Moderate (from flood related	At the Quesnel River Mill, consumptive land and resource use (e.g., fishing, hunting, trapping, and vegetation gathering) would be altered or changed by flood related discharge

Valued Components	Risk Rating	Rationale
	discharge of sediments and metals from tailings related storage pond, or tailings dam breach) Quesnel River Mill and Mine Site – Moderate (from spills of hazardous materials into water) Mine Site – Low (from failure of underground mine stability)	or tailings dam breach. Effects would persist more than two years. The chance of this incident occurring would be zero to less than five percent. Fishing would be substantially altered or changed by spills of hazardous materials into water. Effects would persist more than two years. The chance of this incident occurring would be 30 to less than 55 percent. At the Mine Site, fishing would be substantially altered or changed by spills of hazardous materials into water. Effects would persist more than two years. The chance of this incident occurring would be 30 to less than 55 percent. Consumptive land and resource use would be slightly altered or changed by failure of mine stability. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent.
Employment and Economy	Low to Moderate (from failure of underground mine stability, or tailings dam breach)	Employment and economy would be altered or changed within the regional assessment area by failure of underground stability. Effects would persist less than two years. The chance of this incident occurring would be zero to less than five percent. Employment and economy would be substantially altered or changed within the regional assessment area by a tailings dam breach. Effects would persist more than two years. The chance of this incident occurring would be zero to less than five percent.
Indigenous interests (general)	Quesnel River Mill – Moderate (from fire); Low to Moderate (from flood related discharge of sediments and metals from tailings related storage pond, or tailings dam breach) Quesnel River Mill and Mine Site – Moderate (from spills of hazardous materials onto land and into water) Mine Site – Moderate (from fire); Low (from failure of underground mine stability) Bonanza Ledge – Moderate (from waste rock stockpile slop failure)	At the Quesnel River Mill, fishing, hunting, trapping, gathering, and harvesting would be slightly altered or changed by fire. Effects would persist more than two years. The chance of this incident occurring would be 5 to less than 30 percent. The availability of surface water and fish would be altered or changed by flood related discharge. Effects would persist more than two years. The chance of this incident occurring would be zero to less than five percent. The availability of surface water, fish and vegetation would be altered or changed by a tailings dam breach. Effects would persist more than two years. The chance of this incident occurring would be zero to less than five percent. The availability of surface water, fish and vegetation would be substantially altered or changed by spills of hazardous materials. Effects would persist more than two years. The chance of this incident occurring would be 30 to less than 55 percent for spills into water, and 55 to less than 90 percent for spills onto land. At the Mine Site, fishing, hunting, trapping, gathering, and harvesting would be slightly altered or changed by fire. Effects would persist more than two years. The chance of this incident occurring would be 5 to less than 30 percent. The availability of surface water, fish, vegetation, and wildlife would be altered or changed by failure of underground stability. Effects would persist more than two years. The chance of this incident occurring would be zero to less than five percent. The availability of surface water, fish and vegetation would be substantially altered or changed by spills of hazardous materials. Effects would persist more than two years. The chance of this incident occurring would be 30 to less than 55 percent for spills into water, and 55 to less than 90 percent for spills onto land. At Bonanza Ledge, the availability of surface water and fish would be altered or changed by a waste rock stockpile slope failure. Effects would persist less than two years. The chance of this incident occurring would be 5 to less than 30 percent.

The EAO understands that public safety risk from activities at Cariboo Gold would be discussed further following additional design, analysis, and review of potential mitigations during the permitting processes. The EAO appreciates that there is a high level of public, local government and Indigenous concern regarding risks associated with mining activities, particularly regarding dam breaches. While the consequences for a tailings dam breach could be major, the EAO notes that the likelihood of such an event is rare, in particular given the type of tailings storage that ODV has proposed (filtered stack tailings storage, which reduces the amount of liquid in the tailings and greatly reduces the chance of a dam breach).

The EAO also notes that that there is a well-established provincial regulatory regime that covers management of tailings through EMLI. The EAO has also proposed additional measures to address regulatory gaps and concerns heard from Indigenous nations and Technical Advisory Committee members. These relate to response planning, engagement with Indigenous nations, Northern Health, and local government and follow-up studies and reporting.

The EAO is satisfied that the potential accidents and malfunctions associated with Cariboo Gold have been adequately identified, assessed, and mitigated for this Environmental Assessment.

11.28 Risk and Uncertainty

In addition to risk and uncertainty assessments being completed for each valued component, an assessment of the overall risk and uncertainty associated with Cariboo Gold was also completed. This section intends to assess the risks and uncertainties present for Cariboo Gold as a whole, or at a systems-level approach, using the five pillars of the EAO's assessment approach: environmental, economic, health, social, and cultural effects.

Risk is the combination of the likelihood (or, probability) and consequences of a potential residual effect occurring. Likelihood may be influenced by a variety of factors, such as the likelihood of a disturbance (such as wildfire) which may cause the event to occur or the likelihood of mitigation being successful. The consequences are the residual effect, positive or negative, on values of concern. The magnitude and extent of the potential residual effect also provide information on the consequence.

Table 25: Risk Matrix

		Consequence		
		Major	Moderate	Minor
Likelihood	High	High	Moderate	Low
	Medium	High	Moderate	Low
	Low	Moderate	Low	Low

Uncertainty is the confidence in the assessment. Uncertainties are expected in an environmental assessment due to the conceptual nature of the level of project design, particularly when predicting outcomes in complex physical, biological, and human systems. Where possible, sources of uncertainty need to be reduced through additional study or mitigation measures.

11.28.1 Environmental Effects

Some uncertainty is inherent in any study or data collection of natural systems. Natural systems and wildlife natural variability complicate modelling by creating a vast number of inputs, unknowns, and other contributing factors. In some circumstances, western science is still developing a complete understanding of how changes may affect specific systems or species which contributes to the uncertainty. There is also some uncertainty in the effectiveness of proposed mitigation measures if they have not been extensively demonstrated on other projects. The risk for environmental effects to a project may underestimate the effects of contributing factors to the environment such as climate change, disease, or additional development in the area which would undermine proposed mitigation measures. Following the EAO's assessments, the following environmental valued components had a high uncertainty and/or risk rating: caribou, bats, and air quality.

What is a **Natural System**?

A natural system is made up of regularly interacting and interdependent components of air, water, land, and biological resources.

The risk was determined to be high for potential effects to caribou and bats due to the potential for Cariboo Gold to affect these species at the population level. The use of bat habitat and the ability for bats to use different hibernacula is not well understood and so the uncertainty is considered high. The effectiveness of mitigation measures for southern mountain caribou and the need for long-term monitoring and adaptive management mean that there is high uncertainty of the effect to this species. Southern mountain caribou became a key issue in this Environmental Assessment, which is described further in *Section 11.13* (Wildlife). Potential effects to bats were mitigated through changes to project design, proposed mitigation measures, and through the Environmental Effects Management Plan condition proposed by the EAO, which would be legally binding if a Certificate was issued.

The risk was determined to be high for an increase of total suspended particulates, PM_{10}, and $PM_{2.5}$ (or, dust) due to Cariboo Gold, although the main mechanism for the concern is the potential effect to human health, which is discussed below under 'Health Effects'. This key issue is also described further in *Section 11.24* (Human and Ecological Health).

11.28.2 Economic Effects

Economic uncertainty is a factor of the broader economy. A poorly performing national or international economy may affect the proponent's plans for the development of Cariboo Gold or cause them to prioritize other projects. Effects to the national or regional economy, such as a global pandemic that we experienced through COVID-19, may also affect tourism to the District of Wells. This uncertainty cannot be easily accounted for in the assessment of effects to the local economy. The economic risks of Cariboo Gold for stakeholders and Nations would include financial benefits or employment opportunities being reduced or not realized. No economic valued components had a high uncertainty and/or risk rating.

Employment and economic benefits and risks from Cariboo Gold carry some uncertainty due to broader economic uncertainties and a moderate level of risk for loss of employment of revenue following mine closure. ODV has committed to working with interested parties to develop a monitoring program that would contain a feedback mechanism so that input regarding actual effects can help identify areas where adaptive management may be required. It is also noted that this region has recovered from previous mining boom-and-bust cycles, relying on areas such as tourism for revenue and employment. This program has been included in a proposed Certificate condition by the EAO to require ODV to develop and implement a Community Effects Management Plan.

11.28.3 Health Effects

Risks related to health effects primarily relate to groundwater, surface water, and air quality, for which modelling carries a degree of innate uncertainty. Additionally, there is no local baseline information related to air quality for the District of Wells which added to uncertainty when determining the effects of Cariboo Gold on air quality and human health. Due to privacy laws, information related to pre-existing human health concerns was also limited. The risks to human health would be due to an increase in exposure to contaminants through the air or water. The following health valued component had a high uncertainty and/or risk rating: human health.

The risk was determined to be high for an increase of total suspended particulates, PM_{10}, and $PM_{2.5}$ due to Cariboo Gold, which would have negative health outcomes for community members and Indigenous nations in the airshed, leading to effects on human health. Because of the level of uncertainty in the baseline data (collected from Quesnel, not locally near the Mine Site), there was a high level of uncertainty in the assessment. This issue became one of the key issues in this Environmental Assessment, which is described further in *Section 11.6* (Air Quality).

Northern Health has suggested increased information sharing and outreach to inform local residents about dangers and human health risks of existing contamination in the community, which is being organized through EMLI, the MOF's Contaminated Sites Group and the District of Wells. Community health may also be affected by the influx of temporary workers, which brings the risk of both positive and negative effects. The uncertainty lies in trying to predict human behaviour. This uncertainty and risk would be managed through monitoring and adaptive management plans that would

be created and utilized in coordination with members of the community and the District of Wells Council, as well as a proposed Certificate condition for ODV to hold biannual community meetings.

11.28.4 Social Effects

Uncertainty for assessing the risks to social effects is primarily in unforeseen developments or activities in the region that could impose additional strain on land and resource use or infrastructure and services. Distinct human populations may also be underestimated due to uncertainty in available data and privacy implications. The following social valued components had a moderate or high risk rating: effects to the Wells art sector, increased demand for housing, increased traffic, effects on emergency (health and fire) and protection (police) services in Wells and change in population characteristics in Wells due to an increase in transient workforce.

The risk to these social valued components were discussed in detail in *Sections 11.23* (Community Health) and *11.26* (Culture) and led to a proposed Certificate condition by the EAO to require ODV to develop and implement a Community Effects Management Plan. Risks of adverse social effects for Cariboo Gold would also be addressed through monitoring and adaptive management plans that will be created by ODV and utilized in coordination with members of the community and the District of Wells Council.

11.28.5 Cultural Effects

Cultural effects to Indigenous nations and effects on traditional harvesting and species of cultural significance are intrinsically liked to the effects to the natural systems with the existing variability and risk. Uncertainty related to the changes to the District of Wells exists due to decisions made by residents. The following valued components had a moderate to high uncertainty and/or risk rating: loss of use of private or cultural lands and associated resources; the following impacts to Indigenous interests had a high uncertainty and/or risk rating: impacts to southern mountain caribou, changes to cultural land use and cultural heritage practices, changes to economic development and opportunities following mine closure, and changes to community health and safety.

The EAO has proposed Certificate conditions (End Land Use Plan, to describe the goals of reclamation and final land use; Construction Environmental Management Plan, including an access management plan; Community Effects Management Plan, to monitor and mitigate social and economic effects; and Environmental Effects Management Plan, to monitor and mitigate effects on old growth management areas) to reduce the adverse effects to land and resource use.

11.28.6 The EAO's Assessment and Conclusions

The EAO notes that although there are risks predicted with Cariboo Gold, and mining in general, potential effects from existing mining operations are generally well understood resulting in low uncertainty in many of the valued component assessments and proposed mitigation measures. The potential effects with moderate to high risk and/or uncertainty led generally to proposed Certificate conditions that would require additional baseline data collection, monitoring and mitigation measures.

11.29 Alternative Means of Carrying out Cariboo Gold

The technical and economical alternatives to carrying out a project must be assessed in every environmental assessment. This includes assessing the best available technologies and the potential effects, risks, and uncertainties of each alternative. *Chapter 1.7* of the Revised Application summarized the alternatives and options assessed by ODV.

ODV identified the technically and economically feasible alternative means and assessed their potential effects. Alternatives were considered uneconomic where implementation posed a significant risk to a return on

What is **reclamation**?

Mine reclamation is the process of modifying land that has been mined back to an ecologically functional or economically usable state.

investment. The alternatives were then evaluated using the following criteria before the preferred alternatives were selected and brought forward into Cariboo Gold's design:

- Cost implications;
- Potential residual effects on the environment;
- Amenability to reclamation;
- Community acceptability;
- Indigenous and stakeholder consultation; and,
- Other socio-economic considerations.

The alternative means of undertaking Cariboo Gold for primary project components, as evaluated by ODV, are described in *Table 26*.

Table 26: Summary of ODV's Alternative Means of Undertaking Cariboo Gold

Project Components and Activities	Alternatives Evaluated	Selected Alternative and Rationale
Project Go/No Go Decision	1) Proceed with mine development in the near-term 2) Delay Cariboo Gold until circumstances are more economically favourable 3) Abandon Cariboo Gold	1) Proceed with mine development in the near-term ODV's analysis suggested that Cariboo Gold would be technically and economically feasible, allowing ODV, the Cariboo Region, and Province to realize economic benefits in the near-term.
Mining Rate	1) Year-round mining operation at 4,000 tonnes per day 2) Year-round mining operation at 4,900 tonnes per day	2) Year-round mining operation at 4,900 tonnes per day A mining rate of 4,900 tonnes per day would represent an optimal balance for the underground production, the Services Building pre-concentration process at the Mine Site Complex in Wells and the existing Quesnel River Mill site. This production rate would maximize the material throughput and would most effectively utilize Cariboo Gold's infrastructure by efficient and effective use of the Services Building footprint.
Ore Management (including Services Building location)	1) New process facility at the Mine Site Complex, no pre-concentration* 2) New process facility at the Cow Site, no pre-concentration 3) New process facility at the Quesnel River Mill site, no pre-concentration 4) Services Building for pre-concentration at the Mine Site Complex and processing at the Quesnel River Mill site 5) Services Building for pre-concentration at the Cow Site and processing at the Quesnel River Mill site	4) Services Building for pre-concentration at the Mine Site Complex and processing at the Quesnel River Mill site Option 1, Option 2, and Option 3 were considered to be economically not feasible due to the substantial increase in capital costs that would be required to construct a new process facility when compared to Option 4 and Option 5. Options 4 and 5 were carried forward for additional evaluation. Following assessment of technical suitability, environmental considerations, socio-economic considerations and economic feasibility, Option 4, Mine Site Complex Services building, was selected. This option was preferable for the following primary reasons: • The location on the horizontal length of the deposits would substantially reduce the transport of ore, waste, and concentrate for processing. Less transport and shorter distances result in a lower carbon footprint and fewer vehicle requirements for material transport. The centralized position of the Services Building allows for the use of backfill material and waste rock underground to fill voids leftover from ore extraction without having pipelines laying on the surface or the use of trucks; • The Services Building would be located on a brownfield site, which is a site already disturbed by historical mining that has not been reclaimed and will not be required to be reclaimed if the area is not used. Locating this surface infrastructure in this

Project Components and Activities	Alternatives Evaluated	Selected Alternative and Rationale
	*Pre-concentration in mining is intended to remove barren material as early in the process, and at as coarse a particle size as possible, to reduce the amount of material requiring downstream comminution and processing	previously disturbed area would avoid affecting undisturbed areas and contribute to the rehabilitation of the historical mining site once Cariboo Gold is complete; • This would avoid additional effects in less disturbed areas near Wells (nearer core caribou habitat) by using a historically disturbed site; and, • Topography and location would allow for the grouping of buildings and activities for a smaller overall footprint.
Process Technology	1) Whole Ore Leach at the Mine Site Complex 2) Processing of ore to produce concentrate at the Mine Site Complex followed by Carbon-in-Pulp processing of the concentrate at the Quesnel River Mill 3) Processing of ore to produce concentrate at the Mine Site Complex, followed by Carbon-in-Leach process of the concentrate at the Quesnel River Mill	2) Processing of ore to produce concentrate at the Mine Site Complex followed by Carbon-in-Pulp processing of the concentrate at the Quesnel River Mill Options were assessed for their technical and economic feasibility. Whole ore leach (Option 1) was found to not be economically feasible due to the requirement for construction of an additional leaching facility and tailings storage area. Carbon-in-leach (Option 3) was not considered either technically or economically feasible due to the requirement to house a large single leaching and absorption tank outside, rather than two smaller separate leaching and absorption tanks located within the mill building as per Option 2. Due to cold winter temperatures housing these tanks outside would be impractical. Regular maintenance and washing of the tank screens outdoors at low temperatures is not feasible.
Tailings Management	1) Filtered Stack Tailings Storage Facility South of the existing Tailings Storage Facility 2) Filtered Stack Tailings Storage Facility North of the existing Tailings Storage Facility 3) Filtered Stack Tailings Storage Facility on the existing Tailings Storage Facility	3) Filtered Stack Tailings Storage Facility on the existing Tailings Storage Facility The feasibility of three tailings dewatering technologies was assessed (conventional or thickened slurry tailings; paste tailings; filtered tailings), four facility configurations (open pit backfill; underground backfill; surface Tailings Storage Facility; co-disposal with waste rock), and four facility locations (existing open pits, underground or Tailings Storage Facility; new Tailings Storage Facility within the Quesnel River Mill site boundary; new Tailings Storage Facility outside the Quesnel River Mill site Boundary; returning the tailings to the Mine Site Complex). Three Filtered Stack Tailings Storage Facility configurations were proposed for further assessment (Alternatives 1-3). A Multiple Accounts Analysis was conducted to consider the technical, environmental, economic, and socio-economic effects of each alternative. Alternative 3, which includes construction of a lined Filtered Stack Tailings Storage Facility on the existing Tailings Storage Facility, was selected as the preferred alternative means. The advantages of this option include: • It would allow for progressive reclamation of the Filtered Stack Tailings Storage Facility and results in the reclamation of the existing Tailings Storage Facility; • Desaturating the existing tailings would improve stability of the existing Tailings Storage Facility; • The existing Tailings Storage Facility and its seepage collection ponds would provide secondary containment; • An additional separate tailings facility would not be required in an undisturbed area; • Cariboo Gold tailings would be compacted and mostly desaturated, and therefore non-liquefiable;

Project Components and Activities	Alternatives Evaluated	Selected Alternative and Rationale
		• The liner and closure cover could reduce long-term seepage and oxidation to very low levels, reducing long-term potential loading to receiving waters; and, • This would be the easiest alternative to permit, be the most acceptable to the community, and result in the lowest long-term liability for ODV.
Transmission Line Location	A) 69 km overhead line following Highway 26 along the right-of-way; B) 69 km overhead line following Highway 26 along existing right-of-way; C) 69.3 km overhead line north of Highway 26 along new 36 m wide right-of-way; D) 120 km overhead line from BC Hydro Dunkley Lumber transformer station along new 36 m wide right-of-way; D) 100 km overhead line along new 36 m wide right-of-way ~25 km south of Highway 26.	C) 69.3 km overhead line north of Highway 26 along new 36 m wide right-of-way The five proposed alternatives were assessed for technical and economic feasibility. Alternatives D and E were found to be neither economically nor technically feasible due to significant costs with upgrading existing infrastructure and disturbing larger new areas with development. Alternatives A, B and C were further assessed using a Multiple Accounts Analysis. Alternative C was found to be the best alternative due to advantages in technical, economic, and socio-economic categories, despite worse environmental scores. This alternative was also selected to avoid burial sites identified by Lhtako Dené Nation along Highway 26.

11.29.1 Key Issues Raised

The following key issues were identified by reviewers during Application Review.

11.29.1.1 Transmission line location

An assessment of alternative locations for the Transmission Line was completed. Alternative C was found to be the best alternative means due to preferred ratings under technical, economic, and socio-economic categories, despite poorer results on environmental considerations. Additional detail was also provided in *ODV Technical Memo 14*.

Feedback from public engagement questioned ODV's consideration of aesthetic and visual effects of the new route, including deforestation of hills in direct view from the District of Wells, and the requirement to run a new line while an existing right-of-way that runs alongside Highway 26. During technical analysis, the Highway 26 route was found to be more complex and costly than the new route, proposed under Alternative C, due to steep slopes, line spacing requirements, access issues and regulatory requirements for constructing power lines along the existing corridor. Additionally, burial sites were identified by Lhtako Dené Nation along Highway 26.

Using the existing Ministry of Transportation and Infrastructure owned right-of-way (Alternative B) was determined to not be feasible as the permits required to operate under an existing right-of-way may not be issued to private owners without ministerial approvals, which the Ministry of Transportation and Infrastructure indicated they would not provide in this case. Development of a Transmission Line adjacent to the existing right-of-way and parallel to Highway 26 (Alternative A), would require the establishment of a new utility right-of-way that would have a significant private landowner effect. Additionally, B.C. Hydro standard design practice dictates that location of transmission lines adjacent to main roadways is not the preferred option, and as such routing the Transmission Line in this fashion would complicate the process of reaching an agreement with B.C. Hydro to assume ownership and operation of the Transmission Line in the future, should this approach be preferable to the District of Wells and B.C. Hydro.

Aesthetic effects of Alternatives A and C were considered in the assessment, noting that there would be more visible effects associated with the expansion of the corridor along Highway 26 than there would running new lines to the north.

Ultimately Alternative C was chosen by ODV. Due to its location through southern mountain caribou habitat, the EAO has proposed a condition to require decommissioning of the Transmission Line during mine closure.

11.29.1.2 Services building location

During public engagement, concerns were raised regarding the proposed location of the Services Building near the entrance of the town of Wells within sight and hearing distance of local businesses and homes. The location of the Services Building has been comprehensively analyzed and considered to date as part of the development of the Cariboo Gold design. The location was assessed by ODV against various categories including technical suitability, environmental socio-economic, and economic considerations. ODV has engaged with the District of Wells, the public, the Cariboo Regional District, and with the three participating Indigenous nations in the environmental assessment process on the Services Building location and design. During this engagement process, the Services Building was redesigned to reduce the overall height and landscaping design concepts have been developed to further reduce visual and noise effects; ODV is continuing to refine the building appearance and overall Mine Site Complex design to be more aesthetically pleasing.

To further this discussion, the EAO has proposed Certificate conditions to require ODV to hold biannual community meetings which can be a venue for discussion of the appearance of the Services Building.

11.29.2 The EAO's Assessment and Conclusions

The EAO concludes that ODV has adequately assessed alternative means for Cariboo Gold and components of Cariboo Gold design.

11.30 Interaction Between Effects

The EAO has used a systems-level approach to identify and evaluate the multiple potential effects of Cariboo Gold including cumulative effects, which when assessed individually may not be significant, but when considered together may be collectively significant. This is particularly true when trying to understand effects in the real world, which is made up of complex systems. Systems-level assessment looks at both the parts and the interactions between the parts, rather than the parts in isolation. Application of systems-level assessment in the environmental assessment process has the potential to illustrate the positive and negative interactions, interdependencies, and dynamics of the ecological, social, economic, and cultural components, or valued components, of the system in a project-specific context. This approach also intends to better represent Indigenous worldviews. *Figure 12* shows the systems-level approach to the interaction between the different residual effects predicted for Cariboo Gold.

Some cumulative effects that may be considered in this approach include[21]:

- Synergistic cumulative effects occur when the interaction between two or more effects result in greater cumulative effects than the simple addition of effects. For example, water quality contaminants may act synergistically, causing greater or different effects to aquatic biota than would be expected based on the respective concentrations of the individual contaminants; and,
- Compensatory cumulative effects occur when two or more physical activities offset each other. For example, mine effluent may add contaminants of concern that affect the overall health of fish populations, while an upstream run-of-river hydro project may increase water temperature and flows to levels more favorable to fish reproduction. In the short term, the cumulative effects to the population may result in a net neutral change to

[21] See EAO 2020. *Effects Assessment Policy*.

the population structure. However, cumulative effects assessment must consider that once the source of the compensatory cumulative effect is removed, an adverse cumulative effect may remain.

11.30.1 The EAO's Assessment and Conclusions

The EAO has identified the following key interactions between effects: between abiotic and biotic environmental factors, between environmental factors and Indigenous interests, between abiotic environmental factors and human health, and between economic and social factors. The EAO is of the opinion that the proposed Certificate conditions and conclusions represent these key interactions, and no additional significant interactions were identified.